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Living in the Margins: *Coping with Flood Risks and Managing Livelihoods in Nepal's Far-western Terai*

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Cover photo: Spur construction on the Mohana river.
Photo courtesy of Poshan Dahal.

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Contents

INTRODUCTION

Nepal is considered a "hot-spot" for a multitude of natural disasters including floods, landslides, drought, windstorms, avalanches, glacial lake outburst flooding (GLOF), hailstorms, fire, epidemics and earthquakes (UN Nepal Information Platform, 2010). Communities in areas vulnerable to disaster are facing rapid changes in their environmental and livelihoods contexts, which shape their vulnerability to natural hazards and their ability to respond to them. Although monsoon rains bring significant benefits to people's livelihoods, particularly for those whose livelihoods are dependent on agriculture, they also bring real threats to people's survival. Approximately 10,000 families a year are affected by floods, landslides, fires, earthquakes, and drought alone (Nepal Red Cross Society, 2010). Of these disasters, floods and landslides are the most frequent and in the past five years have claimed an average of 200 lives per year (Nepal Red Cross Society, 2010).

In the terai region, the low-lying plain along Nepal's southern border, significant flood events occur almost every year. Considered the "food basket" of Nepal with highly fertile soil, the terai has experienced a boom in internal migration and is now home to about 50% of Nepal's population, even though it only covers 17% of the geography. Although the entire terai region sees floods on an annual basis, the far-western terai has experienced a number of highly destructive floods in the past few years.

In September 2008, the region experienced the worst flooding in 25 years due to monsoon rains that arrived late and were heavy. Over 400 millimeters of rain fell in 48 hours, causing flash floods and landslides that impacted 23,600 households, killing 15 people in Kailali (Mercy Corps, 2010). Significant, though less intense, floods hit the region again in 2009, damaging housing, crops, and infrastructure, and occurred again at the end of the rainy season in 2012. Floods continue to hit communities living on the either side of the river systems on an annual basis, limiting access to roads, destroying crops, and sweeping away assets and livestock. These floods bring significant physical damage to agricultural land and domestic property, with devastating consequences for people's livelihoods. The main victims of floods tend to be people who are already among the most vulnerable, living in marginal areas and with threatened livelihoods.

The purpose of this study was to develop a grounded socio-culturally and economically embedded understanding of the impact of floods on people's livelihoods from their perspectives. The study looks at livelihoods and relevant interventions that could reduce risk in Nepal's terai, with a focus on the impact of flooding. The research also assesses the DRR programs implemented in the area and how far they reflect the livelihood strategies of the vulnerable population and the wider political-economic context in which the local population is embedded. Therefore, the key focus of the study was to explore the strategies used by the flood-affected population—both households and communities—to cope with risks associated with flooding in the terai as well as those interventions introduced by local NGOs. Three main research questions were posed:

1. How do households prepare for and mitigate the impact of flooding?
2. What makes some households more resilient than others to the effects of flooding?
3. To what degree has the current DRR programming reduced household vulnerability to the effects of flooding?

The study has been conceptualized within the livelihoods framework in order to capture exposure to various forms of risks among the vulnerable households living in marginalized areas. By marginality we are referring to the physical, environmental, and geographical vulnerability of households to flooding, as well as the socio-economic and political marginality.

1. Executive Summary

Households in the far-western terai, and specifically Kailali District, are some of the most marginalized in Nepal. The geography of the Kailali District, which is part of the terai and basically a flood plain,[1] means that households experience flooding on a yearly basis. This is compounded by other forms of marginalization: most people do not own land, or own very little, and thus have to draw their livelihoods from multiple sources; the area is mostly populated by Tharus or those who migrated over the last 50 years from the hills and many of them are landless; the area is not well-represented in the State; it is a remote and interior part with little State involvement; there is a lack of access to modern amenities and facilities/infrastructure.

Flooding in Kailali District is not always destructive and sometimes even brings important sediments that fertilize the soil. Every few years, however, the floods bring a significant loss of livestock, assets, stocks, crops, land, and occasionally lives. The timing of the flood is correlated with the type of losses. Flooding during the planting season (summer months) has more lasting livelihood effects because it destroys crops and the seeds necessary to plant next year's crop, while flooding during and after harvesting mainly affects household assets. Households living closer to the river are significantly more vulnerable to the negative effects of flooding; however, in the case of more severe flooding (such as the 2008 and 2012 floods), almost all households are likely to be affected, regardless of distance from the river.

Given the annual nature of flooding, households utilize a myriad of coping and mitigating strategies. The more the household is impacted by the flood, the more coping strategies are used. Households use a range of coping strategies, some which may have long-term negative consequences such as taking children out of school to work, or shorter term and reversible impacts, such as a temporary reduction in household food expenditure.

Households also utilize strategies to mitigate the impacts of the floods. Most of these are done in collaboration with the entire community, such as planting bamboo or building a spur or gabion into the river. These strategies are significantly correlated with a reduced impact from the floods. However, there are several factors that affect the likelihood that a village would carry out these community-wide flood mitigation strategies. The greater the differences in wealth between households residing in the same village, the less likely they were to work together on a community-level project. The same relationship applied to other village-level characteristics. Villages where all the households were approximately the same distance from the river were more likely to work together, as were villages where the majority of households were equally affected by previous flooding. Ethnicity also played a role—ethnic diversity in a village was correlated with fewer community-level projects. In general, homogeneity led to greater community-level collaboration in flood mitigation, while heterogeneity on the village level led to more individualistic strategies.

Not surprisingly, household wealth was significantly correlated with better outcomes to flood risk. Households with greater wealth were less affected by flooding due to greater distance from the river as well as the ability to use more expensive coping strategies such as building a second story. Wealth was also correlated with utilizing fewer coping strategies with negative long-run effects. Several factors were correlated with increased wealth—whether the household had at least one household member migrating, the degree to which a household could diversify its livelihoods, land ownership, agricultural inputs, and household composition. Migration had the largest impact on household wealth for marginal households (i.e., households with low levels of education and technically landless).

Without the necessary wealth, poorer households had to rely on social capital in order to prepare for flooding and mitigate its effects. Social capital was defined by proximity to support (proxied by whether a household was originally from the village or district in which they reside) and sense of community (proxied by whether the household is an ethnic minority in the village and the overall ethnic distribution in the village). However, while wealth helped mitigate the impact of flooding no matter the severity, when

the shock was covariate (meaning it affected large numbers of households simultaneously as opposed to an idiosyncratic shock that affects individual households), social capital lost much of its potency.

The two main DRR activities taken up by international non-governmental organizations (NGOs) working in Kailali were the construction of a spur or gabion and the creation of a Disaster Management Committee (DMC). The NGOs worked with local communities to provide expertise in the construction of the spurs and gabions, as well as any materials that could not be locally sourced. Similarly, they helped facilitate the DMCs and provided necessary equipment such as life jackets, boats, and a siren. However, in both activities, it was the responsibility of the community to manage the programs, provide the physical labor for the construction, purchase any necessary additional materials, and provide upkeep for supplied materials. Households that lived in a community that had constructed a spur or gabion in the past three years were significantly less likely to report the destruction of their house, destruction of their land, and the loss of grain stores. Similarly, households that reported taking part in a DMC were significantly less likely to report losses to the grain stores, crops, livestock or destruction of their house or land. Both of these activities unequivocally help reduce household vulnerability and losses due to flooding. However, participation in these activities was not uniform across the villages. While some villages had 100% of all households in a DMC, others had less than 10%. The efficacy of these DRR interventions very much depended on the homogeneity of the community. The more diverse the ethnic breakdown, distribution of wealth, distance to river, and impact from flooding, the significantly less likely the community was to take up spur/gabion construction or join a DMC.

These findings have large implications for DRR efforts. The difference in take-up in community projects based on identified community characteristics means that in order for NGOs to be successful (or to retain the perception of helpfulness in the community), they have to target communities where these programs will actually be implemented by the community (unless they are prepared to drop the focus on "participatory" DRR and simply build the necessary infrastructure themselves). However, this does not mean that all DRR efforts need to be dropped in heterogeneous communities, as it is the poor, marginalized, small, and minority households in these communities that are the most vulnerable. The research clearly identified the link between wealth[2] and household resilience to shocks. Where social capital is not sufficient for community-level projects, NGOs need to focus on livelihood programming and migration support in order to shore up household wealth. Though this is conceived as development work rather than DRR, the research shows that the impact on reducing risk and increasing resilience are the same.

Primarily, the study used qualitative methods to answer the research questions. In order to address these questions, in-depth fieldwork was conducted in the far-western terai in the form of detailed interviews with local people and participant observation in the communities. The qualitative data collection was complemented by three quantitative household surveys on livelihood strategies, assets, and liabilities. These specifically examined access to financial capital (remittances, credit, lump sums, etc.), livelihood diversification within and among households, and mobility. These data are representative within the selected study sites. The first household survey (carried out in May 2011 prior to the flooding season) established a baseline of livelihood assets and strategies. The second household survey was carried out in September 2011 on the heels of an uneventful monsoon season, as indicated by the average amount of rainfall and flooding experienced by the research villages. The second survey helped with the identification of losses to households from an average monsoon season, or basically the type of losses they experience on a yearly basis. The final survey was done in November of 2012 immediately following the severe flooding in our research areas that October. The role of the third survey was to better understand the impact of flooding on affected households and short-term recovery.

In parallel to the fieldwork, a literature review on flood-related DRR programming in Nepal explored the impact of DRR efforts. This involved analyzing the DRR program documents and interviewing key agency staff involved in DRR programs in the area. On the ground, the team used an ethnographic approach to study DRR program implementation in Kailali.

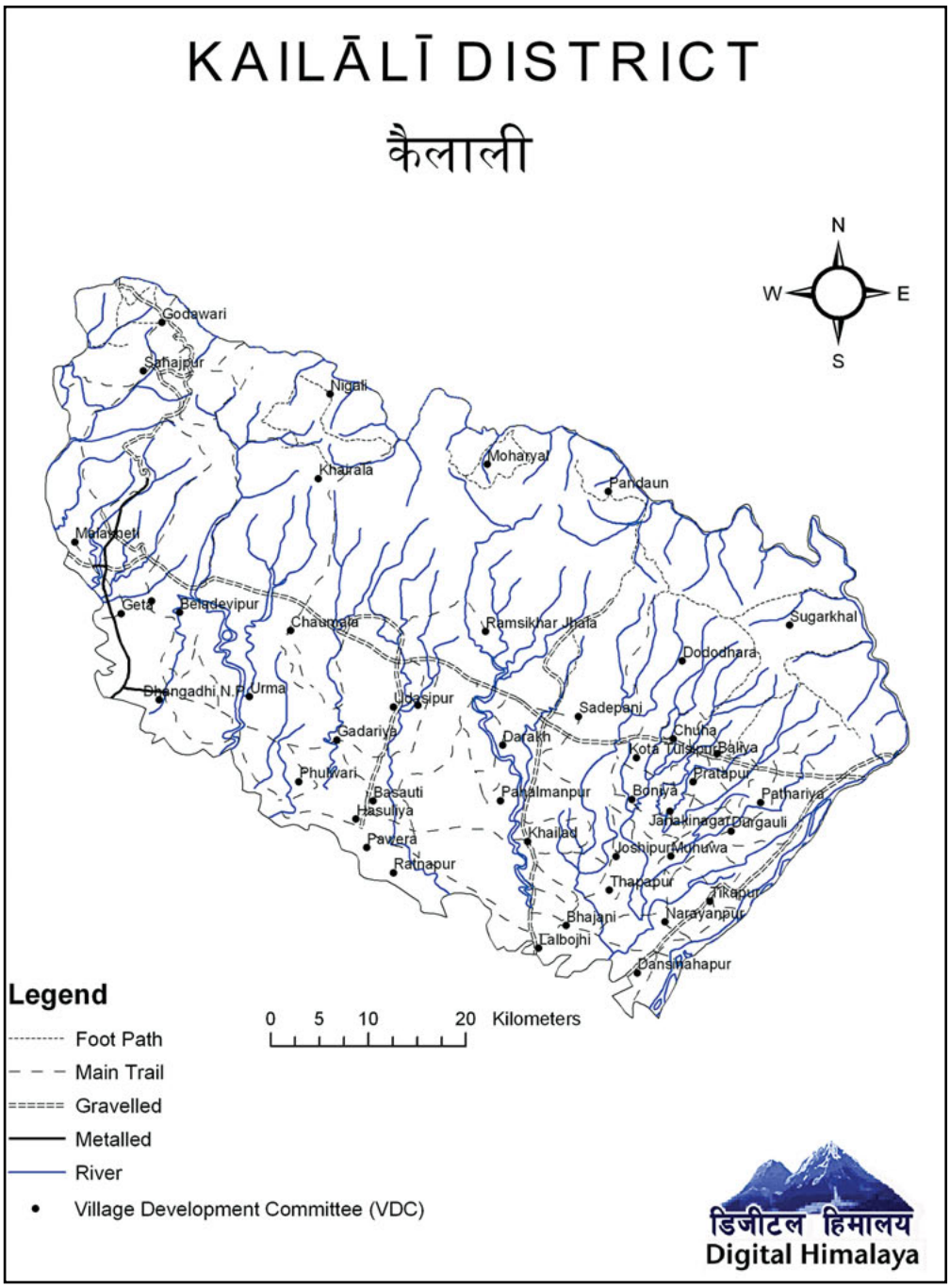
The quantitative household data were analyzed using STATA. Prior to analysis, the data were adjusted for the sampling design, and each village was assigned population weights according to the village household list registration provided by enumerators during the first round of data collection. The qualitative data were analyzed throughout the process to both help design the quantitative survey and better understand its results.

1. Sampling

For the quantitative component of the study we carried out a two-stage randomized survey in May 2011, September 2011, and November 2012. Three Village Development Committees (lower administrative units): Lalbolji, Hasuliya, and Pawera were selected for the study based on the river systems, history of flooding, and overall marginalization (see Map 1). Mercy Corps identified and provided population numbers for the most vulnerable villages in the three VDCs based on participatory assessments and proximity to rivers. We randomly selected 24 villages from the list, stratifying by VDC. Using probability proportional to size sampling we identified the number of households to be sampled from each selected village for a total of 640 households. Enumerators were then instructed to create a list of all households in the village from which we randomly drew households. A roster of all household members over the age of 16 was also carried out for a total of 2,757 respondents.

Ethnographic research as well as structured and semi-structured interviews was carried out over the course of the project. A researcher was based for the duration of one year in the research area. Several different interview techniques were utilized, including in-depth structured and semi-structured interviews, focus groups, participant observation, and key informant interviews. Key informants included staff members of NGOs working in the villages and government officials in the district headquarters of Kailali.

Map N1: Kailali District



Source: Digital Himalaya

Terai region, including Kailali, has been historically marginalized by the Nepali State. The population is predominantly but not exclusively Tharus, who have had marginal presence in the Nepali State. Practices of bonded labor such as Kamaiya and Kamalari, which have recently been abolished, were rampant in the region, resulting in poverty, inequality, and marginalization for the poorest of the population. Following the malaria eradication in the 1960s and resettlement of the hill population, the terai's population has increased rapidly from 257,905 in 1981 to 770,279 in 2011, with an annual growth rate of 2.22% (the national average is 1.4%) (CBS, 2011). Kailali has the fifth-highest population of the 75 districts in Nepal and a relatively high population density. The Government of Nepal figures indicate that Kailali ranks 21st out of the 75 districts in terms of composite development indicators, placing it above the national average (CBS, 2003). The literacy rate for the population age six and over is 60% for males and 36% for females, with a district average of 48% (CBS, 2001).

While the district has seen increased activities of NGOs and small-scale development projects in the last decade or so, it has poor physical infrastructure and limited access to trade centers and labor markets. The region is fertile with high agricultural productivity. Almost 80% of the population practices agriculture. This hot, flat district is prone to widespread flooding during the monsoon months and has strong links with India.

1. Physical Environment and Geography

Kailali District is located in the far-western terai region of Nepal bordering India. With fertile land, flash flooding presents a constant and complex set of challenges to households residing in the region. Overpopulation and the resulting need for intensive agricultural production in the terai have stressed the wetland ecosystems. Until just the past few decades, the region consisted of lush wetland and dense tropical forest, and was considered uninhabitable. Nepal's expanding population and need for productive farmland spurred a national campaign to eradicate the area of malaria, as well as forest clearing and wetland drainage projects that enabled human settlement. The terai population has been expanding ever since. Today, agricultural products from the fertile soil of the terai feed a majority of Nepal's population.

At the heart of the challenges facing the western terai is the fact that it is a floodplain, part of one of the largest river systems in the world, the Himalaya-Ganga. A number of rivers and streams, originating in the Hills or in the Chure Hills, flow from northern side of the terai to the south. In Kailali, the Ghuraha, Kataini, and Khutiya rivers flow from the north to the south, meeting at the Mohana River, which roughly flows from west to east along the Indo-Nepal border. During the rainy season, rains in the hills fill the watershed areas and cause the Mohana River to swell and flood the villages on its banks. The study sites were situated near the Mohana, Kataini, Ghuraha, and Kandra Rivers, so heavy rainfall in the watershed of any one of these rivers leads to flooding in the villages.

Wetlands do not, of course, cease to be wetlands simply because human beings decide to call them home. The terai's identity as a wetland is perpetuated not only in its name—"terai" actually derives from the Persian word for wetland—but also in its high water table, which enhances the region's soil fertility but also significantly increases flood risk. There have been numerous floods, including several catastrophic floods, in the past decade. In September 2008, the region experienced the worst flooding in 25 years. Significant, though less intense, floods hit the region again in 2012, damaging housing, crops, and infrastructure.

Poverty forces many residents to diversify their livelihood strategies across both formal and informal sectors, often migrating and/or venturing into illicit black market activities that provide some of the few available income-generating options. These geographical, human settlement and livelihood patterns combine to produce conditions of significant vulnerability

for both human inhabitants and the ecological landscape.

2. Isolation from Center of Power

Given the long distance from Kathmandu and high degree of inequality in land distribution and practices of bonded labor, the district suffers from isolation from the center of power. With the State dominated by the center in Kathmandu and by non-Tharus, Tharus, and others living in the region, feel that they have been left behind in the State formation. As indicated above, the terai region, and more specifically Kailali District, has been marginalized in the process of Nepali State formation. Land inequality, lack of land certificates, lack of citizenship cards, and practices of bonded labor meant that a large number of the population were merely subjects of the State and not citizens with rights.

In many ways, the economic survival and identity of Kailali depends on both Nepal and India. People and goods move across the border in large numbers, with the goods often smuggled due to restrictions and taxes on both sides. Goods may be subsidized in one country but not the other, while the quality and cost of services may differ significantly. When people migrate to find work, they are much more likely to go to India than elsewhere in Nepal; Kailali District is twice as far from Kathmandu as from Delhi. The region's dependence on India and the border economy impacts the connection a household living on the border might feel to the Nepali State. This is further exacerbated by the limited infrastructure in the area, compared to the rest of Nepal. Respondents often attributed the unequal distribution of services to mishandling and reception of bribes by the VDC and government officials.

The lack of services or timely provision of services exacerbates the feelings of isolation in the region. Respondents in Kailali felt, for practical purposes, quite removed from government influence. An exception to this, discussed in this report, is the presence and influence of the armed border police (Sashastra Seema Bal or SSB). In addition, there is government provision of some goods, such as subsidized seeds and agricultural materials, as well as flood relief materials. Many of these provisions, however, are sold or smuggled over the border into India, while others are reportedly inappropriate due to poor timing of receipt.

3. Legacy of the People's War

The Nepali Civil War, or the People's War, was a conflict between government forces and Maoist rebels from 1996–2006. Kailali was one of the affected districts and the site of a number of battles between the Maoists and the security forces. Many of the youths in the study VDCs joined the Maoist movement. There have been reports of the civilian population being caught between the warring factions. Some households who supported the Maoists were forced to flee to India due to the constant harassment from the security forces, and supporters of the security forces were often harassed by the Maoists; some migrated from the region.

The decade-long war disrupted economic development and led to a large number of internally displaced civilians in the district. The qualitative research and literature review highlighted a broad range of impacts, including increased migration, decreased transportation of goods, disruption of traditional coping mechanisms, breakdown of infrastructure, collapse of local government, erosion of civil liberties and restrictions on movement, increases in informal taxation, theft, and extortion, and food and livelihood insecurity (Seddon and Hussein, 2002). Widespread rural-urban migration depleted household labor—thereby increasing the vulnerability of many households to disaster and livelihood shocks—and hampered the rural-urban transportation of food, which in turn increased food costs and food insecurity. Both parties to the conflict also disrupted food systems and destroyed critical infrastructure (Seddon and Hussein, 2002). These and other factors had negative impacts on the livelihood sustainability of the study population.

There were, however, some positive impacts on local livelihood strategies as reported in both the field research and the literature. These included a more equitable distribution of land and new systems of barter in some areas. Women in particular reported benefits as a result of the

Maoists' strong position against domestic violence. During the war, women in Maoist areas were able to be more equitably involved in agricultural decision making, were able to develop new skills, and had better representation in the people's courts (Seddon and Hussein, 2002). While the continuation of these gains is likely uneven, some respondents reported that these positive developments continued.

The conflict also affected the programming of national and international humanitarian and development organizations. Much of the development work was halted in Maoist-held areas during the course of the conflict.

The war's impact and lingering political instability in Nepal continue to be felt at the local level, and there have been no local government elections in Nepal since 1999. In the absence of elected officials, the VDC secretary (a civil servant position) and an ad-hoc (not elected) committee made up of political parties have the power to make decisions. Respondents complained about the lack of popular representation at the VDC level and felt that this was one reason for inadequate attention to the flood risk on the part of local officials. Some reported that funds and infrastructure projects (such as the expansion of gravel roads and the electric grid) disproportionally benefitted specific areas—not surprisingly, these areas were not those considered vulnerable and marginalized.

Some international NGOs frame their interventions at the VDC level and proudly note their cooperation with VDC authorities. Local populations, however, report that the VDC proceedings are neither public nor transparent, and many respondents feel actively excluded from decision making. International NGOs that work through these political structures, therefore, are tainted by this association and are unlikely to realize successful programs at the local level. ■

In this section we report on flooding, characteristics of the study population, livelihoods, migration, and social capital, and presence and perception of NGO activities.

1. Flooding

The majority of households (98%) reported having experienced flooding in the past five years; this takes into account the 2008 floods, which were some of the worst and most severe in this region. The 2011 monsoon, on the other hand, was relatively light (38% of households reported being affected) and more representative of the average flooding that occurs on an annual basis in the terai, while the 2012 monsoon affected almost 80% of the population in our research area.

Flooding in the terai can be categorized into three types—kataan, pataan, and duban—based on the impact of the flood and how it affects the land. In short, kataan is the cutting of the land and is the most destructive; pataan is the deposition of sand onto arable land, making it infertile; and duban is the submersion of land, destroying household assets and killing crops if they remain submerged for several days. Duban was the most common type of flooding, with 96% of all households identifying being affected by it in the past five years. There is significant overlap between the other two types of flooding: 48% said that they had also been affected by kataan and 66% by pataan.

The flood of 2008 was due to the flooding of the Mohana River. In the memories of most respondents, this was the biggest flood that the area had seen in decades. The speed of the flood surprised the majority of villages, leaving them little time to prepare. Many households lost both their homes and livestock. At the time, the majority of houses constructed in the village were single-storied and made of mud. The houses and the grains stored within were easily destroyed by the quickly rising water. As this was just before the paddy harvesting season, many households also lost their paddy. Villagers had to leave most of their belongings behind and sought higher ground on the Indian side. One elderly woman in Shivaratnapur described the 2008 flood as follows:

> *"Flood came in the morning at around 11 am. Then I went to the neighbor's house (her husband's brother' sons). Three goats of that house drowned in the flood water. [The boat] came and took us to the Kosambaba (Indian side of the border, less than five hundred meters away from the village). When we reached there in Kosambaba it was already dark. We had nothing to eat. All of the kitchen utensils were lost; rice and clothes were also swept away. Next day I returned home. Flood had gone but all the land was covered with mud deposited by the flood. The mud was about knee high. All the fire woods had gone. Rice, wheat, flour everything had gone. The house floor was covered with mud and it was about knee high even inside the house."*

The 2008 flood was one of the most devastating in the area. Over 90% of households said their crops were affected, and over 60% of households reported that their house was either fully or partially destroyed. Though not to the same extent, households experience loss and damages on an almost yearly basis from flooding. The majority of households (66%) said that they experience flooding every year. The Mohana River and other small rivers in the area swell frequently in the rainy season. Comparing impact from the 2005–2010 time span (mostly capturing impacts from 2008 flood) with the 2011 monsoon, which was considered representative of the average amount of rainfall and flooding, the differences are large and significant. However, even though the 2011 monsoon was not severe, 30 % of households reported that their crops and land had been fully or partially affected. Interestingly, the 2012 survey was carried out following a severe monsoon that fell much later in the season than expected (late October) and therefore had a different impact. For example, crops were barely affected as the harvest season had been complete; however, almost 70% of households reported losing livestock.[3]

No matter the intensity of flooding, the

monsoon significantly reduces a household's mobility. During the rainy season, boat fare is set based on the water level. Therefore, as the water rises, transportation becomes physically and financially restrictive, limiting a household's ability to carry out daily livelihoods. Almost three-quarters of households in the study population said they had to change their routine because of difficulty in crossing the river during the 2011 monsoon, when the price of the river crossing quadrupled.

2. Study Population Characteristics

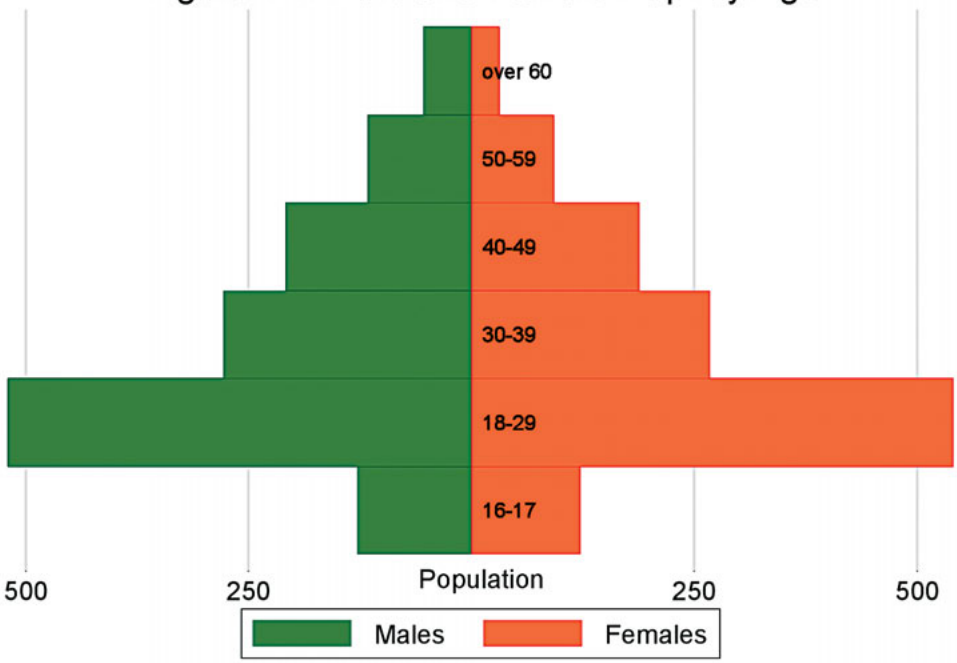
The quantitative survey captured household heads, 90% of whom where male. Of the female household heads, more than half (63%) reported being head of household on a temporary basis while their husbands worked outside the village. The remainder were widows. The majority of respondents were quite young, ranging between 18 and 29 years of age (see Figure N1).

When it came to education, 24% of all household members over the age of 16 had no schooling, and 44% had either completed primary school or had some primary education. Males had significantly more education than females. Thirty percent of all female respondents had no schooling; however, a significant proportion (25%) of females had some non-formal education, compared to only 7% of males. Literacy rates (being able to read one language) were 79% for men and 59% for women. Forty-three percent of all respondents could read at least three languages (including Nepali, Hindi, and English).

The majority of households in the area identified as Tharu (73%), the original inhabitants of the terai. The eradication of malaria in the 1960s brought a population influx from the hills, and these relative newcomers are known as *Pahadi*—literally meaning from the hills. Pahadi make up the minority in the area. In Nepal's system of social classification (region, caste, ethnicity, class) Pahadis are generally seen as higher; however, it is difficult to generalize where they stand relative to the original inhabitants of the terai—Tharu—given the complexity of the system.

Almost every household in the study population (99%) had some access to land. However, in many of the study villages, households did not actually hold a land certificate and therefore did not technically own the land they were living or working on (38% of households did not have an ownership certificate for their land). Land

Figure N1: Male and Female Pop. by Age



ownership was partly predicated on the type of land the community was built on. Many of the villages in our sample were settled on public land and therefore having a land certificate was not possible. This has a large impact on household tenure security as households without certificates are in danger of losing their land or having their land rights challenged in the future. Lack of land ownership also means that households might be less inclined to make long-term improvements if they are not sure their claim on the land is secure. In Mohanpur and Shivaratnapur, villagers have approached the government several times with the goal of acquiring land certificates for the land they occupy and use for agricultural purposes; however, a legally binding document has yet to appear.

Over half of the households in the study had access to a "marginal" amount of land—less than 15 kattha or half a hectare as defined by the Agriculture Census Survey (NSAC) in 2001. There were also a fair number of households (22%) who said they owned land outside of the village in addition to the land they owned in the village. This land was used for both agricultural purposes and for housing; the latter primarily for eventual relocation or to use during the flooding season. These were primarily the wealthiest households. The majority of households owned and worked their land or/and sharecropped on somebody else's land, with only one-tenth of all households renting out their land to other households. However, almost one-third of households actually did both—worked their own land and sharecropped on someone else's land. Land arrangements had to be diversified in order to spread out flood risk.

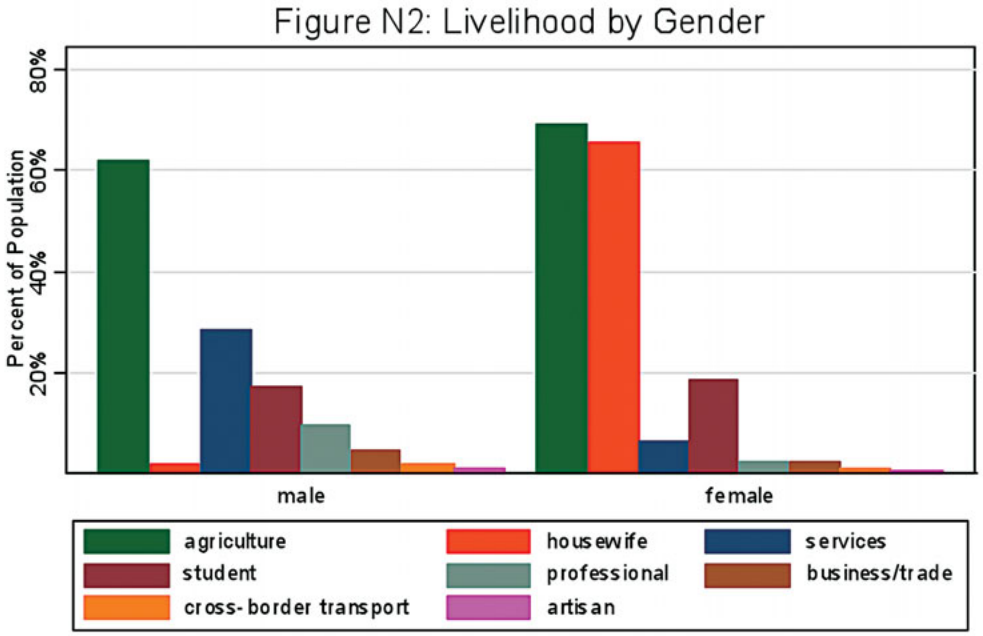
Housing consisted mainly of mud and wood structures (93%) with tile for roofing (62%). Half of all homes were two-story, and there was no significant difference in number of stories between houses that were closer to the river versus those farther away. The average house had approximately three rooms, with a range of 1–10 rooms. The majority of households used cement toilets, while 43% reported using the bush or river for defecation. Of those who had access to a cement toilet, 86% of them shared it with other households. Eighty percent of households used an ordinary hand pump for household water access, with all but one of the remaining households using a raised hand pump. The former is privately owned and the later is communal, but requiring less than a minute's walking distance for the household. The prevailing fuel type was wood (88%), with a small proportion of households using bio gas (7%), cylinder gas (< 1%), and a mixed approach (4%).

Bicycles and mobile phones were the most commonly owned assets in our sample, while less than 20% of all households had access to a computer or to the internet, a motorcycle, or a tractor. Only 4% of all households surveyed said they did not have access to any of the assets we mentioned. We also asked households about their livestock assets. Over half of all households owned small livestock (e.g., chickens, ducks, bullocks, and pigs), while less than 20% owned cows or water buffalo.

3. Livelihood Strategies

Households in the study population practiced a variety of livelihood strategies. The variety of livelihood strategies both across the population and within households is indicative of the role that livelihood diversification plays in spreading out household risk. For examples, in only 5% were all members participating in the same livelihood activity. Almost half of all households relied on at least three types of livelihood activities. Livelihoods were not only diversified at the household level, but individuals also frequently performed more than one activity. However, livelihood diversification requires a sufficient household size. Households without the necessary numbers to do multiple livelihood activities are less able to spread out risk and are therefore much more vulnerable to shocks.

Women were significantly less likely to participate in each individual livelihood activity (Figure N2) (except being a student or housewife); however, they were much more likely than men to engage in multiple livelihood activities. Though the majority of women identified themselves as "housewives," many performed other work, with 60% of women carrying out at least two different livelihood activities, compared to only 38% of men.



Agriculture

Though the majority of households (89%) engaged in some agriculture, only 13% of those households reported practicing agriculture exclusively. The most common crops planted are paddy, wheat, potato, vegetables, and lentil. For most households, agricultural work is primarily for subsistence purposes; however, families that have access to more land produce more grains, and earn a monetary income from the sale of excess grains.

Primarily only wealthy households are able to hire wage laborers for planting and harvesting. Most households do not have enough household members to carry out all of their own planting and harvesting and therefore rely on reciprocal help from their neighbors and family through the process of *madat* or *khanpin* (See Box N1). Both men and women, irrespective of their age, are involved in these practices.

Besides lack of land and manpower, lack of the necessary inputs for agricultural production limits a household's ability to produce beyond the subsistence level. For instance, households that do not own an engine pump for irrigation (69% of the sample) must hire or borrow one. A pair of bullocks is needed for plowing, but 47% of households reported owning zero or only one bullock. Seeds, pesticides, and fertilizer are expensive commodities. Some households take

Box N1: Khan-pin and Madat

Khan-pin and madat are common practices prevalent in the research villages. In the practice of khan-pin, villagers ask for help from their neighbors, and in return they invite them to have dinner or slaughter a goat in their honor. Sometimes, villagers might work for two or three days for free, and on the fourth day a feast is organized. In madat, households receiving the help do not necessarily provide a feast, but instead offer reciprocal help to the other households. Both practices are primarily used for harvesting paddy, wheat, house construction, or moving a house from one part of the village to another. This type of support is only practiced amongst close friends and family members, though not necessarily from the same village.

the risk of bringing in these inputs from the Indian side, where they are significantly cheaper. While moving small quantities of seeds and pesticides across the border is legal, carrying large quantities can result in confiscation of goods, harassment, abuse, or jail time. Bringing fertilizer over the border, in any quantity, is completely prohibited.

Many livelihood strategies center on securing adequate nutrition and a diversified diet. For instance, many members of the study population barter one crop for another to achieve dietary diversity. Cucumbers, gourds, and cauliflower grown on small plots adjacent to households are commonly bartered; few of these crops ever reach the market. Potatoes and rice are exchanged by some respondents, and barter takes place both within and between villages.

Other structural aspects contribute to the prevalence of the barter economy. The lack of markets near to villages means there is little incentive for growing cash crops, even though the flood plains near the river are suitable for large-scale production of items such as watermelon and cucumber. Similarly, the lack of a nearby sugar processing factory or efficient transportation means that few people plant sugar cane, although the climate is ideal, and sugar cane farms are prevalent just across the Indian border.

Cross-border Trade

Though less than 5% of all households reported carrying out cross-border trade in the quantitative survey, the activity was mentioned frequently in the qualitative work. This is not surprising considering it is technically illegal, and therefore households might be reticent to admit their involvement in the more formal survey interview.

Goods in the Indian markets across the border are significantly cheaper than in Nepal, and many respondents cross the border to purchase goods for both personal consumption and resale. This risky livelihood strategy exposes respondents to harassment and potential extortion by local officials. There is no customs office at the border, making it impossible to pay customs duties without taking goods to Dhangadi, and hence every non-registered transport of goods across the border is technically illegal.[4] Although there are no customs officials, both Indian and Nepalese police patrol the border looking for illegal supplies of goods, and more than 80% of households in the study population reported household members being stopped by the SSB in the past year (Table N1).

Nearly all households in the study population are engaged cross-border trade in one form of another, with important differences by gender. For example, in Shivaratnapur, a village close to the Indian bazaar of Chandan Chauki, Nepali traders pay local women approximately five rupees per kilogram of merchandise to smuggle goods from the Indian side. As shown in the table above, women are searched by the SSB as often as men, but usually just have the goods

Table N1: What Happened to Households When Stopped by SSB, by Gender

	Males		Females	
	Freq.	Percent	Freq.	Percent
only searched	473	54.12	413	70.36
physically abused	124	14.19	3	0.51
forced labor	130	14.87	6	1.02
confiscated goods	51	5.84	7	1.19
took money, no abuse	66	7.55	12	2.04
Nothing	30	3.43	146	24.87
Total	874	100	587	100

confiscated, while men can be physically abused or jailed. Anecdotal evidence indicates that the bigger traders provide a monthly bribe to the Nepalese border police in order to allow them to continue with their trade. If word spreads of more lackadaisical border police being on duty (i.e., those who accept bribes more easily), villagers tend to bring in more goods from the market and demand for goods from cross-border traders decreases. One of the main risks voiced by villagers was that if they are caught, not only are their goods confiscated, but also their transport is taken as well (ox cart, bicycle, tractor, motorcycle, bullocks) and therefore risk-averse households or those with limited financial capital to buy back these goods tend to shy away from the potentially lucrative cross-border industry (Box N2).

4. Migration

Migration was an integral component of life on the border, and leaving the village in search of better livelihood opportunities was very common across the study population. Over 75% of households had at least one household member who had migrated for employment, and one-third of all household members migrated within the past year.

Who Migrates?

Decisions regarding migration take place at both the household and community level. Overall, migration is shown to bring positive economic outcomes to sending households. How does an individual *within his or her own household* make a decision of why he (and it is predominately male) should migrate over his brothers, sisters, or parents? Within the household, the choice of who will migrate depends on several factors. A member of the household was significantly more likely to migrate compared to other family members if male, generally more educated than the rest of the family, and married. The only exception to the married criteria was in the service sector, where *single* young males were more likely to migrate compared to their married brothers. This is likely correlated to the

Box N2: Cross Border Trade

"In the middle of the night, I heard people carrying sacks (bora). In the morning I knew that all these local boys were hired to bring fertilizers from Indian market. And as usual they were doing it in the middle of the night in order to be safe from the SSB. One villager told me that these boys will get 50 rupees per sack for bringing them from the Indian side of the border, and some of them will bring up to four sacks (200 kilograms) at a time. In the village there are four to five people who bring goods from India. Many bring goods in their dallap (ox cart);, however the use of a dallap raises the risk of getting arrested, and if arrested it can become very costly. A dallap and two bullocks cost more than forty thousand [rupees] and when villagers are arrested they also lose all the goods along with the dallap. So a cycle or dallap is only used when bringing a large quantity of hardware (construction materials such as cement, rod, bolts etc.). For safety, the tradesman does not bring the goods himself and informs the youth to run away leaving everything (both cycle and goods) if they notice a SSB when crossing the border. The main tradesman then has to bear the cost of the confiscated goods, including the transport. In the past year three dallaps have been lost to the SSB.

Fertilizer is one of the main commodities brought over the border. In India the fertilizer is distributed by the government at a subsidized price. The main tradesmen has a contact person in India who then bribes the local government official to distribute a surplus of fertilizer to the farmers and then purchase it back at a slightly higher price, but still lower than what one would pay in Nepal. It costs around 800 rupees per sack in India, an extra 50 to transport it, and it can be resold in Nepal for 1,050, yielding a 200 rupees' net profit per sack."

Source: Interview notes

fact that most individuals who work in the service sector migrate to India, returning only once a year at most, and hence are unlikely to have families within the villages.

Half of the male population of the sample migrated at some point in the year compared to only 22% of the women. The average age for a migrant was 30 or 31, but ranged from 16 years of age to 70, for both men and women. After reaching the peak age for migration, at 31, migration tended to fall off progressively with increased age. The average level of education for a migrant was at least some primary school, but individuals who migrated tended to be slightly but significantly more educated as well as more likely to be able to read in at least one language compared to their non-migrating counterparts.

Within the community, males from households of average wealth were the most likely to migrate. A household with migrants tended to fall in the middle quartile but was slightly, yet significantly, wealthier than a non-migrant household. However, the number of migrants per household was not relevant to household wealth, which was simply correlated with having at least one migrant, and did not increase with more migrants in the household.

The ability to migrate was highly correlated with the makeup of the household. A lack of able-bodied men (under the age of 70, male, and not disabled) within the household was a huge impediment to migration. One respondent, in a family of six (his father, himself, his wife, two younger brothers in school, and a little son) said that *"one [either himself or his father] has to stay home"* to take care of the family (Interview notes). Households with only one able-bodied man were only two-thirds as likely to have a member of their household migrate as those with at least three able-bodied men.

Ethnicity played a larger role in determining whether a household had someone migrate. In the Pahadi communities, both young and middle-aged men go to Indian cities such as Punjab, Mumbai, and Delhi. While long-distance migration is common among the Pahadi, youths of the Tharu community will go farther afield (i.e., India), whereas middle-aged men go to nearby cities such as Dhangahdi. There is also an important distinction between Pahadi and Tharu women. While Tharu women are more likely to seek work in a neighboring town or even in India, Pahadi women appear to be reluctant to leave the village for work.

Where to Migrate?

The only external migration (e.g., out of Nepal) among the study population was to India. When asked why people did not venture further, respondents explained that going to work abroad (defined as other than India) required a large amount of savings, proper documentation, and an active social network for accessing accurate information. Migration to India to work in the informal sector requires virtually no formal documents, and migration to either India or within Nepal requires small amounts of financial capital. These latter forms of migration depend mostly on having the appropriate social ties.

Households were very mobile, with the primary destination (50% of households) being a nearby economic center, with an additional quarter going to India and one quarter elsewhere within Nepal. Kathmandu was the destination for only 2% of the sample, and individuals migrating to the capital tended to be young and wealthy male professionals. Women tended to stay closer to home; for example, 35% of females said they had worked at the nearest market or village, compared to 12% of the males. In contrast, migration to India comprised only 10% of women compared to 27% of men. Individuals migrating to India also tended to be younger than those migrating to other destinations. Individuals with only some primary education tended to favor India as their destination; many of these males had dropped out of school to work in India, some out of family necessity and others of their own volition. In contrast, half of those who had completed primary school sought work in the nearest town. Individuals from poorer households were more likely to migrate to India (21% of poorest quartile of respondents compared to 2% of the wealthiest quartile of respondents). Those from wealthier households predominately sought work outside their village within Nepal or at the nearest economic center.

Duration of migration was also correlated with

destination. Most migration to India and Kathmandu was long term: respondents reported returning home twice a year or less. Short-term migration, on the other hand, was to more nearby urban centers, with respondents returning home on a weekly or monthly basis.

Why Migrate?

Marginal households are significantly more likely to have at least one member of the household migrate. Migrants from marginal households tend to go farther from home and to stay away for longer periods of time. Marginal households, on average, are significantly more likely to have household members who are unemployed or working as wage labor employees, and who are significantly less likely to be salaried. They, by definition, are landless (have less than 11 katha or .7 hectares of land) and do not have the necessary education to seek professional employment. Hence, migration, especially long term and long distance, is often the *only* option for employment for poor households, as opposed to the *best* alternative.

The decision to migrate often happens following an unexpected shock to the household that necessitates additional (and rapidly available) income. For young people there is often no choice between migration and continuation of studies. One man said, *"Last year, I wanted to send my little son to the school. But the admission fee was Rs 900, and I didn't have that money so I couldn't send him. Then I told him 'I couldn't send you to school, now you go to India and work'"* (Interview notes). In another household, the illness of the head of the household forced the oldest son to abandon his studies in order to make money to repay the loan used to cover medical care. He migrated to India in search of work (Interview notes). In other cases, those who fail to complete school may opt to migrate. As described in the field notes: *"One boy stopped his education when he failed in School Leaving Certificate (SLC). His father was asking him to continue his education but he turned his deaf ear to them … the boy had gone to India"* (Interview notes).

Half of all households with at least one migrant reported receiving support (either money or goods) from the migrating household member. This support primarily came from migrants working in nearby urban centers/villages or India. However, households receiving support from India were much more likely to receive cash as opposed to goods.

Marginal households report that the option of migration for one or more household members significantly improves the household economic situation and lessens vulnerability to sudden shocks. One man described it as *"We have been managing by the salt and water of India. India ko nun pani le gariyeko chha (meaning: making our living by working in India)"* (Interview notes). This distinction was also evident in the quantitative data. Marginal households who had at least one migrant in the family were significantly wealthier than marginal households without a migrant. The same correlation was not found amongst non-marginal households, whose wealth did not appear to rely on migration.

The qualitative data indicate that most migrants chose a migration destination based on the personal experiences or experiences of friends or family members. In other words, they choose destinations for which they have information. Even with the benefit of these social networks, however, migration was seen as a risky livelihood strategy. One respondent described it as *"The migrant's life … is like water on a taro's leaf, not stable, not certain and can fall anytime!"* (Interview notes). Periodic shocks, such as crop failures in India, or idiosyncratic shocks, such as illness or injury, can have a big impact when a household is relying primarily on income from migrants. For instance, apple orchards in India experienced a loss in 2011, with negative ramifications for sending households within the study population. The lack of access to financial services for many migrants means that they must carry all of their earnings when they return home. Some respondents reported having been robbed while returning home and having little money to show for their months of work. Many try to spread out the risk by sending portions of their money back to the village with returning friends.

5. Social Capital

As in all societies, social capital is central to the daily lives of the study population. In particular, turning to a social network allowed people to

cope with shocks such as medical emergency and to support livelihood strategies that required more human capital than was readily available. For instance, households who could not afford to hire wage laborers depended on their family, friends, and neighbors to provide labor for planting. Social capital was particularly important for the poorer households in the study population.

The practice of *khan-pin* or *madat* was highly prevalent in the villages (see Box N1). Almost 90% of all households interviewed had one member report participating in one of these two practices. These types of exchanges usually occur only between good friends and family members. One respondent reported only asking for help of their *"Manmilne friends* (close friends). *Others may not come for help saying that they are busy"* (Interview notes). Besides friends, households also rely heavily on family. One boy told us that *gatiyaar* (paternal male relatives) work together on the planting for every household (Interview notes). Households who had greater wealth were not as dependent on this form of social support because they were able to hire wage labor when necessary.

Poorer households in the village rely heavily on their families. A man whose wife eloped with another man did not have the labor power to plant seeds, so his brothers stepped in to plant his rice seedlings (Interview notes). At times, wealthier households may deliberately pay poorer family members as laborers in order to help these relatives. Poorer households within a community may also be selected when jobs are available, as explained by a respondent who was given a job at the local school because of her family's relatively poorer position in the town (Interview notes).

Besides the important role of social capital in everyday life, social capital also proved to be vital in helping households prepare for flooding, manage its impact, and cope with the aftermath. As with the more routine forms of social support, assistance around floods served to mitigate shock, supplement labor, and support vulnerable households.

Assistance with the arduous physical task of home construction or improvement is a particularly important element of social capital. Before the flood season, households may need to move or construct a new house; generally they rely on friends and family to help without expecting payment. Shifting a house is a difficult task that usually takes two weeks and many individuals. If the proper support does not exist in the village, households that have relatives in nearby villages often request their assistance. Reciprocity is extremely important. One man described the relationship between himself and a friend in the village he had known since a young age: *"I come when he needs and he will come when I have to construct a new house"* (Interview notes). Other times, when friends or family assist in construction, they are treated to a special meal, possibly a slaughtered goat.

Much of the reciprocal support is on ethnic lines. Interestingly, within the Pahadi community, there is less of a culture of assistance and reciprocity in regards to house construction when compared to Tharu households, and most Pahadi households hire wage laborers when they need to engage in construction projects. While 87% of Tharu households in the study population said they had participated in either khan-pin or madat in the past year, only 46% of Pahadi households reported the same.

Other characteristics of the Tharu community point to higher levels of social capital than their Pahadi counterparts. For example, a common practice amongst Tharu women, and some men, is to go fishing as a large group. While some women told us they do it because *"It is fun to go in a group"* (Interview notes), others explained that catching fish is easier in a group. The total catch is then distributed evenly among the women.

Community support is very important during an actual flood event. Households who have houses at areas of higher elevation help others in their community as the water approaches, often by shifting grains and other assets to higher locations. Neighbors with two-story houses lend space to others to store goods during the flooding, and families whose houses were submerged may cook food and sleep at the homes of more fortunate neighbors. Households

that are heavily affected may also receive replacement grain and assets that have been lost in the floods (Interview notes).

6. NGO Activities, Presence, and Perception

In 2008, several NGOs began carrying out DRR activities in the area following the significant destruction caused by the 2008 flood, though not in all of the research villages. Villages received support from these organizations, with activities focusing on flood preparedness and post-flood relief. The preparedness activities involved education on building physical barriers (spurs) to prevent river cutting, technical advice, some financial assistance, the establishment of a community-based early warning system, and the provision of evacuation and search and rescue training and equipment (including a boat and lifejackets). Households within the study population responded positively to these efforts, which were tested in November 2012 when the evacuation preparedness system was put into full and successful effect.

While some villages were supported by NGOs and national organizations to construct spurs, others had to rely on money allocated from the government. In the communities that had a spur or gabion, over 90% of households in the community reported participating in the construction. Households that lived in a community that had constructed a spur or gabion in the past three years were significantly less likely to report the destruction of their house, destruction of their land, and the loss of grain stores. However, many respondents explained that such funds were rarely forthcoming, as bribes and special connections with government agencies were allegedly prerequisites for most government-funded or supported programming. Villages that had someone with the right political and financial capital were more likely to receive government support, with others left to fend for themselves. This phenomenon is due in part to the current state of government in Kailali, where a lack of local elections means there is little accountability or recourse for civilians.

As part of their prevention programming, the leading NGO in the area helped set up Disaster Management Committees (DMC) in some of the villages following the 2008 flood. Prior to the NGOs, DMCs did not exist in the community. However, Tharu communities did have a *Bhalmansa* (an elected community leader) who carried out some of the same activities related to flooding. The DMC is meant to help organize households in the village to build spurs or gabions on the river to prevent river cutting, sedimentation, and submersion during flooding, prepare evacuation plans, warn community members of coming floods, identify households with pregnant women or the elderly, and conduct search and rescue operations. However, not all communities have a DMC even though they lie directly on the river. In the communities that did have a DMC, participation or membership ranged from 100% of the community to less than 10%. Having a DMC and being in a place where the majority of the community participates appears to make a stark difference in the levels of flood preparedness and organization within a village. Households that reported taking part in a DMC were significantly less likely to report losses to the grain stores, crops, livestock, or destruction of their house or land.

Both construction of spurs and gabions (either with or without NGO support) and the establishment of DMCs (always with NGO support) unequivocally help reduce household vulnerability and losses due to flooding. However, as noted before, not all communities have taken up these DRR efforts. Homogeneity in the community, whether in regards to ethnicity, wealth, distance to river, or impact from flooding were all significant predictors of whether the community took up a construction project or joined a DMC. The same story line was repeated in the ethnographic work. Given that community-level mitigation projects require the majority of the community to participate, villages where households were unequally affected by the flooding or did not have the necessary manpower to take up these activities did not have them. Similarly, the greater the discrepancy in wealth, and hence in households' ability to recover, the less likely the community as a whole was to build a spur or gabion or take

part in a DMC. Though all of our villages were supported by NGOs, the level of uptake was significantly different from village to village based on these variables.

Ethnicity of the household mattered in regards to whether they joined a DMC, but there was no distinction in participants in spur construction by ethnicity. Not a single Pahadi household in our sample was part of a DMC. Household size was also correlated with participation in a DMC: the larger the households, the more likely one member of the household was part of a DMC (within the communities that had them). This is not just a result of better odds, but one of capacity. This is further reflected in the fact that while poorer communities were significantly more likely to take part in these activities, within the community it was the wealthy households that were significantly more likely to take part in construction or a spur or gabion and reported taking part in a DMC. This reflects the issue of capacity, and the poorest of the poor often have many other demands on their time.

Following the 2008 flood, many households in the study population had lost the entirety of their belongings. NGOs and the Nepalese government provided relief materials to the affected areas, with distribution supported by the VDCs. Households that had lost their homes were given monetary compensation. However, when this type of support was given to only a few households in the village, it was decided by the villagers that the aid should instead be equally distributed amongst all households in the village. While some respondents applauded this effort, others claimed that it resulted in a more unfair distribution. Many respondents felt that the relief distribution was unfair and politicized.

Almost all households reported receiving aid following the 2008 flood. The most common form of aid was either food relief or seeds, some of which were provided at the wrong time and consumed (Table N2). Most households said they were satisfied with the aid (60%); however, 20% of households said it was not enough, 5% said it was the wrong kind of assistance, and 17% said that the method of distribution was poor or inappropriate. When looking at household responses to the different types of aid, households reported being the least satisfied with financial assistance, reporting that it was "not enough." Respondents felt the distribution of both seeds and food was poor. Timing of relief was cited as a major problem: only 5% of households had received support within three months of the November 2012 monsoon, even though almost 80% of households were severely affected.

Table N2: Type of Assistance

	food relief	*shelter assistance*	*health services*	*seeds*	*tools*	*financial assistance*	*education*	*none*
Percentage of households	97%	15%	45%	90%	25%	11%	12%	1%

In the following section we explore household mitigation and coping strategies in the case of a flood and how household characteristics and strategies are correlated with resilience or vulnerability to flooding.

1. Household Mitigation and Coping Strategies

In order to better understand how households responded to flooding, we asked them about coping and mitigating strategies. The most common strategy was hanging a *khatiyaa* (a hammock for storing assets), planting bamboo, or taking out a loan, followed by reducing household food expenditure and building a second story on the home (Table N3). Some of these activities were done on an individual household basis, such as hanging a khatiyaa, while others were community-level projects or strategies, such as erecting a physical barrier or participating in a DMC.

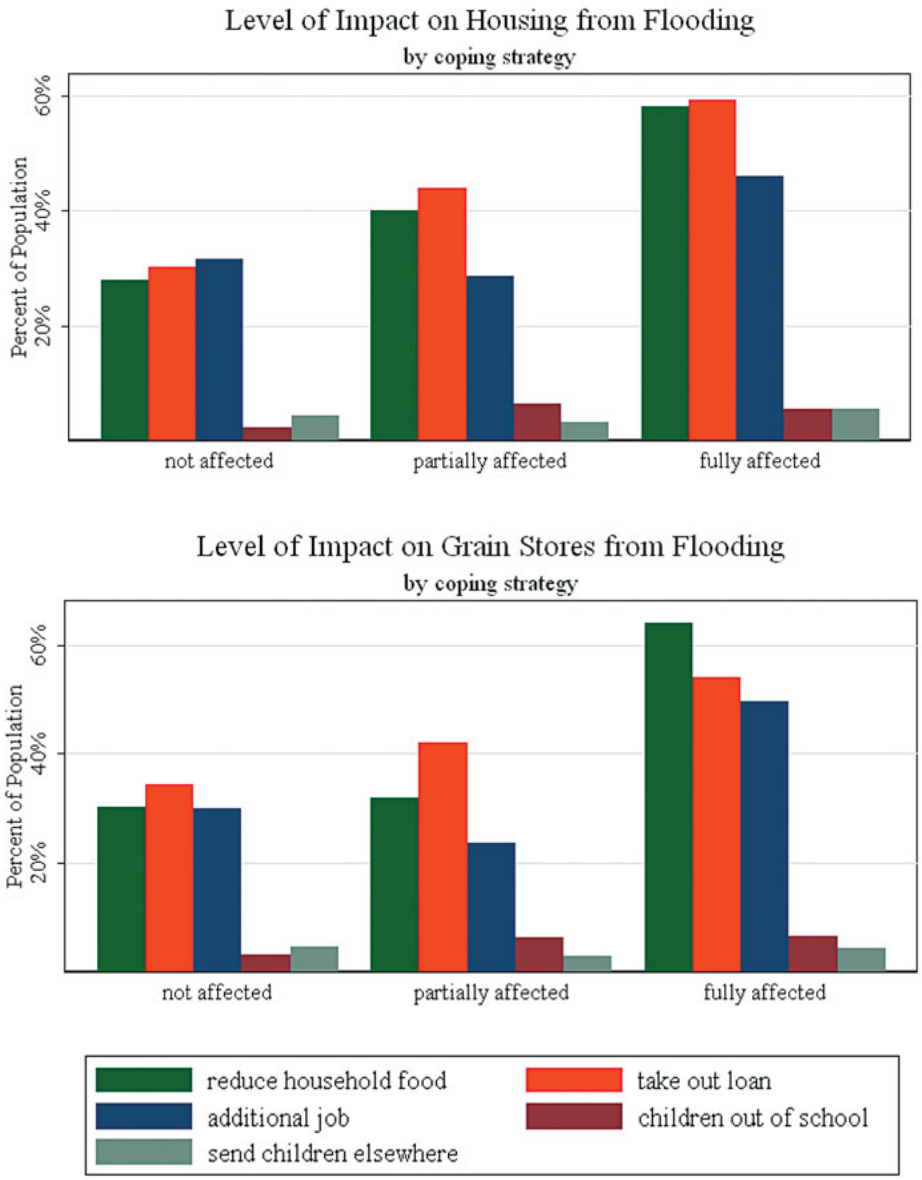
To note, households used the above coping strategies at various times and in response to various types of shocks (such as a medical emergency) or, in the case of the financial strategies, to afford expenses such as weddings or ceremonies. Households that were "fully" affected by flooding (crops, land, house, or grain stores) were significantly more likely to use the above coping strategies. This was also true, though to a lesser degree, for households that reported being partially affected by flooding. In most cases, taking out a loan was the most common choice, with over 50% of households "fully affected" reporting taking out a loan due to flooding. The only exception was if grain stores were affected, then over 60% of households said they also had to reduce household consumption, given that the grains were a source of food. Often these strategies were taken in conjunction with each other, such as taking a child out of school and sending them to live or work elsewhere, and reducing household food and searching for an additional job.

Taking out a loan was the most common strategy used by households to respond to the damage caused by flooding. The source of the loan differed based on the degree of damage to the house.[5] Unaffected households leaned the most heavily on savings groups for loans (40% of all loans). That percentage jumped to 50% for households whose house was partially affected,

Table N3: Household Coping Strategies (multiple responses possible)

Strategy	*mean*	*Freq*
household members searched for additional job	31%	198
children removed from school	5%	32
household food reduced	38%	243
children sent to work elsewhere	4%	25
take out a loan	40%	256
built a second story	35%	224
planted bamboo/tree/bush	46%	294
hung khatiyaa	50%	320
joined/part of DMC	27%	172
made a spur/gabion	27%	172
shifted your house to another part of the village	16%	102
Nothing	11%	70

Figure N3: Level of Impact from Flooding on Housing and Grain Stores, by Coping Strategy



and to 60% for those reporting their house was fully affected (Figure N3). Less reliance was placed on family and friends as the severity of flooding increased, with the percentage of households "fully affected" by flooding taking loans from family and friends falling from 20 to 10%. This was likely due to the covariate nature of flooding: because floods affect an entire community, the availability of loans available from family, friends, and neighbors dwindles. Households who were heavily affected were also less likely to pay back their loan or provide a loan to someone else.

All three of the community-level strategies (joining a DMC, plating bamboo/tree/bush, making a spur or gabion) were negatively and significantly correlated to distance from the river: the closer a household lived to the river compared to other households in the community, the more likely they were to take part in one of these activities. The same was true of whole communities. Villages that on the whole were closer to the river and their households more homogenous in regards to distance to the river were significantly more likely to have the majority of their community

members take part in a DMC or plant bamboo, a tree, or a bush.

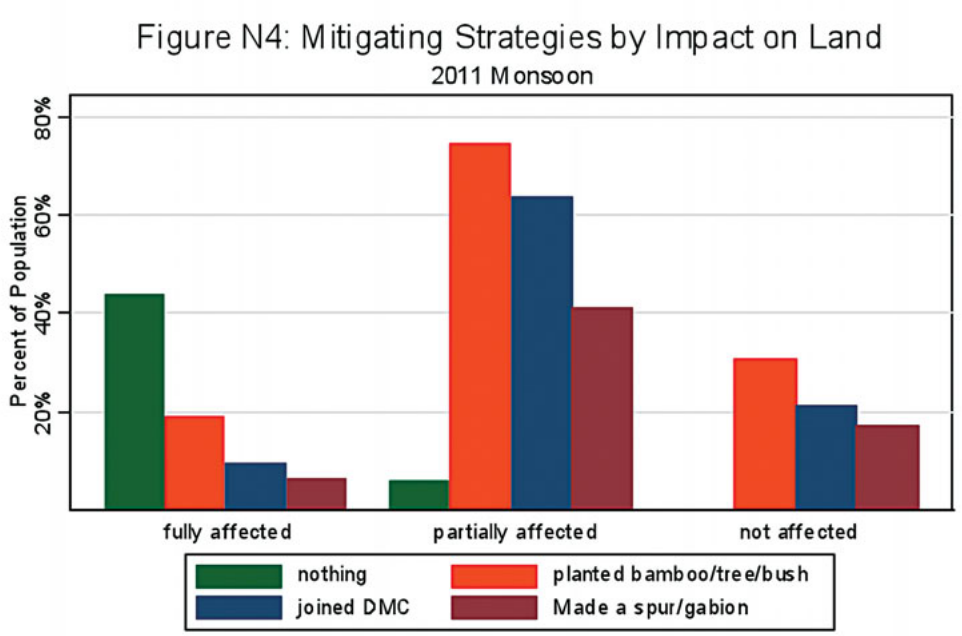
The impact of community-level strategies was significant. Households that reported not carrying out any of these mitigating strategies were significantly more likely to have their land "fully affected" after the 2011 monsoon season. Households who planted bamboo, joined a DMC, or made a spur or gabion were significantly more likely to have their land only "partially" affected compared to "fully" affected (Figure N4). In this regard, these three community-level strategies clearly mitigated floods for the communities that utilized them.

However, we found evidence that community diversity (in wealth, ethnicity, distance to river, and extent of flooding impacts) hinders participation in community-level mitigation strategies. For example, a respondent who was asked why the community had not addressed river cutting responded that the river was only cutting into the land of a few households. Lack of interest from the non-affected households meant that no community-wide action was taken. Observation at a flood mitigation community meeting indicated that households at higher elevations appeared to be the most reluctant to engage in broader flood mitigation efforts (Interview notes).

More heterogeneous communities, on the other hand, were significantly more likely to share their aid within the village following the 2008 monsoon. Wealthier households that were farther from the river were significantly more likely to say they split their assistance with other members of their village. Therefore, communities that were more unequally affected by flooding had a greater capacity for sharing aid *but* a significantly smaller probability of working on community-level flood prevention projects. In other words, post-flood assistance was more readily forthcoming in diverse villages than pre-flood prevention activities.

2. Household Vulnerability and Resilience to Flooding

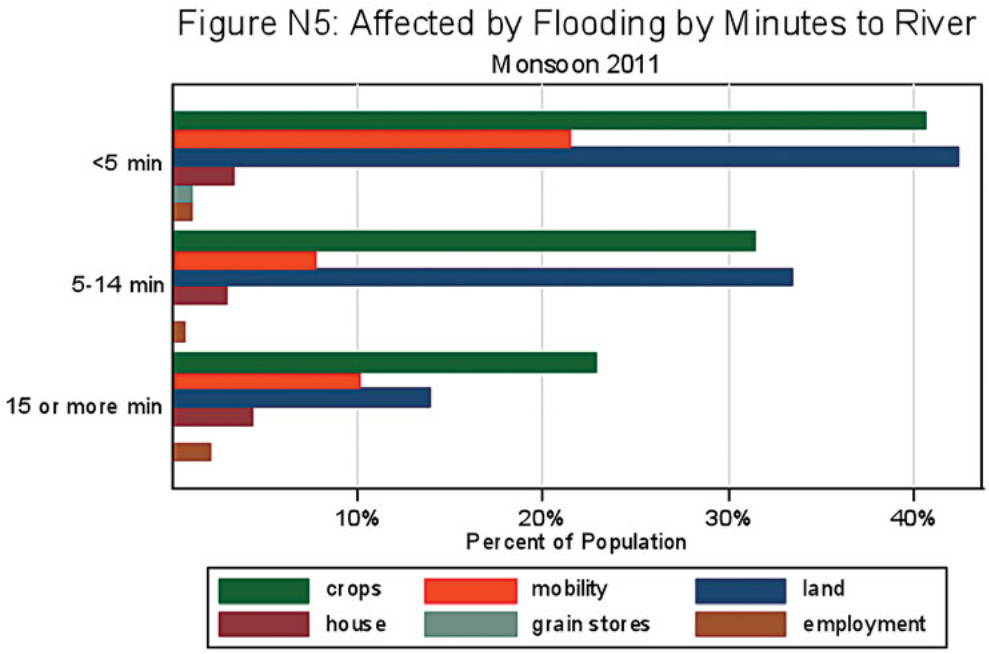
The degree to which a respondent's house, crops, and land were affected was highly correlated with distance to the river during both heavy and light flood years (Figure N5). However, the relevance of distance to the river was far more important during the 2011 monsoon. During both the 2008 and 2012 monsoon, the majority of households were affected, regardless of distance. However, for most communities in the area, distance from the river is a relative concept. Most households in the study population live extremely close to the river: half of all respondents reporting living within 10 minutes walking distance and 12% living within

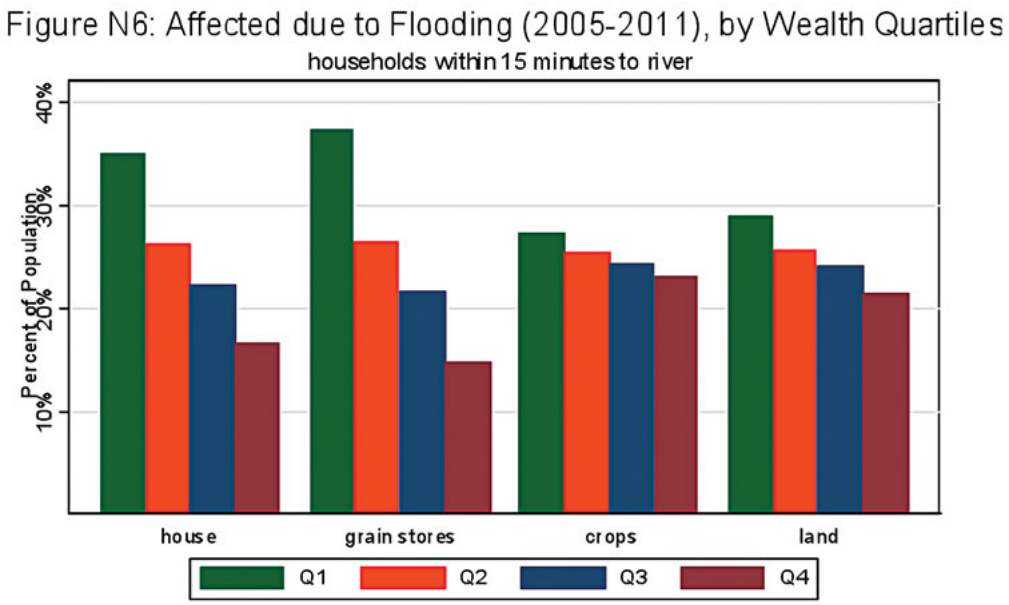


one or two minutes from the river. In some communities, the majority of households resided within one minute of the river.[6] One-third of all households in the study population experienced a decrease in distance between their home and the river over the course of the 2011 monsoon season. All communities had some households that were closer to the river after 2011, ranging from 5% of all households in the community to 60%.

Wealth

Not surprisingly, greater household wealth was consistently correlated with less loss of household assets (Figure N6). Greater wealth meant households had the necessary means to minimize the impact of flooding and better manage risk. In addition, wealth also translated to overall lower vulnerability to flooding, as households that were better off were also significantly more likely to live farther from the river. However, the importance of wealth was most pronounced for households that lived within 15 minutes of the river.



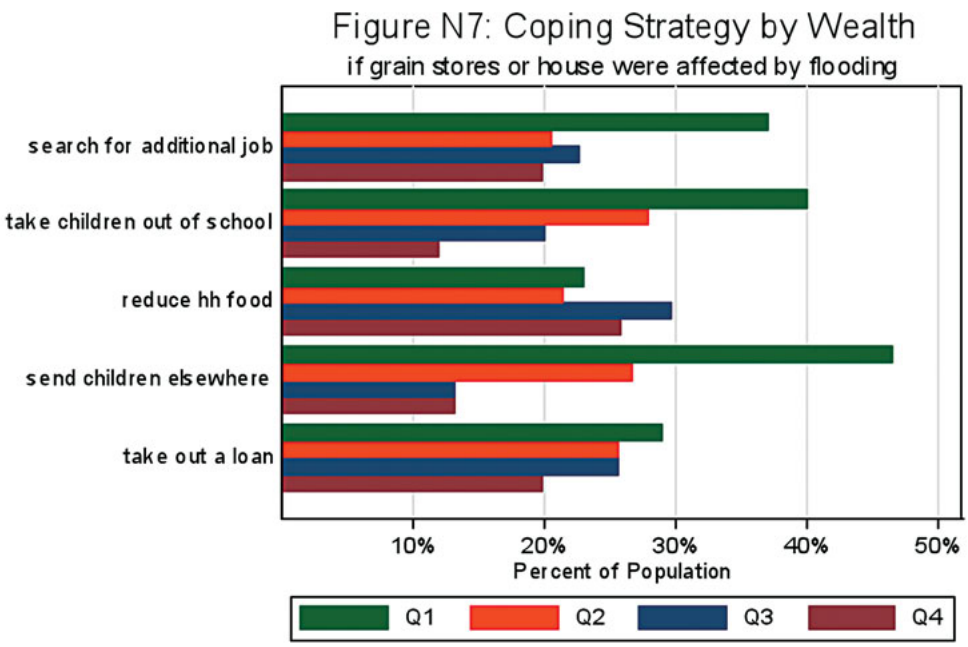


Few households were not affected by flooding in some way over the course of the recall period (2008 to 2012) and therefore most utilized some form of coping and mitigation strategies. Greater wealth, however, meant that households were significantly less likely to engage in coping strategies that might have increased their vulnerability in the long run. Households that fell into the bottom 25th percentile of wealth and whose house or grain stores were affected were more likely to reduce future human capital by sending their children to work or live elsewhere, take their children out of school, or look for additional cash either via a loan or searching for another job (Figure N7). Consumption reduction, on the other hand, was more likely done by wealthier households if they had been affected by flooding. Households in the bottom quartiles that were affected by flooding had less freedom or capacity to reduce food, as they were likely already at their minimum consumption level and therefore had to utilize more extreme coping measures.

Poorer households on the whole were more likely to take out a loan in non-flood periods, but significantly *less* likely to seek a loan when affected by flooding. One individual reported, *"I don't have any source of income and people will give loans only to those who have some source of income and can pay their money back"* (Interview notes).

Potential lenders—commercial or otherwise—were unlikely to take the risk on poorer households, especially those who were flood-affected. The source of loan also differed by wealth and flood impact. Wealthier flood-affected households were more likely to rely on a money lender, merchant, or community forest group for a loan, while poorer households were more likely to rely on a landlord, employer, or savings group. While we did not inquire about the amount of the loan, money lenders and merchants are generally able to provide larger loans than friends, family, or saving groups. The ability to access a sufficient lump sum is important for recovery.

Households also engaged in mitigation strategies that could potentially reduce the impact of flooding prior to the event. Wealthier households were both significantly more likely to be able to afford to build a second story on their house *and* to report engaging in no mitigation strategies. There was no difference in regards to wealth status and whether or not a household hung a khatiyaa or shifted their house to another part of the village. Interestingly, although overall poorer households were more likely to participate in community-level mitigation strategies—planting bamboo, joining a DMC, or making a spur or gabion—*within* the villages it was the wealthier households that were more likely to participate in



such activities. In other words, poorer communities were more likely to take up these activities, but within those communities households who had greater wealth were more likely to take part. This finding was confirmed in the qualitative work as well. Poorer households often had difficulty sparing manpower to participate in the community activities.

Given the importance of increased wealth to resilience to the impacts of flooding, we investigated the household characteristics correlated with these higher wealth levels. We identified five main factors: i) whether the household had at least one household member migrating; ii) the degree to which a household could diversify its livelihoods; iii) access to land; iv) agricultural inputs; and v) household composition.

Firstly, households who had at least one migrant in the family were significantly wealthier. The impact of migration on wealth was the largest for marginal households. Though households in the bottom wealth quartile made up the largest proportion of migrants, migration allowed for an additional external income, making them significantly more likely to build a second story, reduce food consumption (a more easily reversible strategy than adjustments to human capital), or live farther from the river. In other words, if they had a migrant they ended up being significantly less likely to have their house, grain stores, or land affected by flooding, even when controlling for wealth and distance to river. Though migration has its risk and uncertainties, it allows households who are generally marginalized to increase their income, use more easily reversible coping strategies, and increase overall resilience to flooding.

Secondly, livelihood diversification was significantly correlated with greater wealth, allowing households to better manage risk. The more different types of livelihood activities a household took part in, the better off they were, both overall and within a community and controlling for the number of household members. More so, households in the bottom quartile and middle quartiles benefited more from taking part in multiple livelihoods than those in the top quartile. However, the data do not indicate the same benefit on wealth from income diversification for households that did not have a single member involved in agricultural work. Households in our study site, even if working on less than 15 katha of land and therefore technically landless, still benefited from livelihood diversification activities only if they had other sources of income on top of agriculture.

Thirdly, given this reliance on agriculture for income, land ownership was highly correlated with increased wealth. The correlation likely goes in both directions, as when households acquire more wealth they invest it in additional land. Fourthly, besides land, agricultural inputs such as a dallap, tractor, and engine or pump for irrigation were strongly correlated with not just increased wealth, but also greater food security (more months of grain) and a more diversified livelihood portfolio. Households that do not have these inputs have to rely on physical labor, which diverts them from pursuing other supplementary livelihoods. It also requires additional capital. Households that do not own an engine or pump for irrigation have to rent it from a neighbor.

Fifthly, household composition was also closely related to household vulnerability. Households tended to be wealthier if they were Tharu, had a smaller dependency ratio, had a male household head, and/or had a household head with education beyond the primary level. Having a sufficient number of able-bodied working age adults (which impacts the dependency ratio) was found to be particularly and significantly important for boosting wealth.

Social Capital

Overall, higher wealth was correlated with households utilizing fewer negative coping strategies, reporting fewer effects from flooding, and living a greater distance from the river. Social capital played a similarly important role in helping households be better prepared for flooding as well as recover from its impact. When asked who helped recover household losses, the majority of households said family members living inside the village (77%), followed by help from a neighbor (23%) (Table N4). However, the ability to access and use social capital depends on proximity to the support (proxied by whether a household was originally

from the village or district in which they reside) and sense of community (proxied by whether the household is an ethnic minority in the village and the overall ethnic distribution in the village). The effectiveness of the social capital is predicated on whether the shock was idiosyncratic or covariate across the district.

Households that had a head of household who was born in the village or other village in Kailali were significantly less likely to have their house, crops, or land affected in the 2011 monsoon season. In other words, people with roots in the village had higher levels of social capital that had a preventive effect on the impacts of flooding. This was true for low-intensity flooding, but this same effect was not present for more intense flooding, as the impact was covariate and therefore affected the whole village, making it less likely that a household had friends, family, or neighbors that were in a position to help recover from the damage.

Most households relied on friends and family to help with rebuilding or fixing their houses in preparation for or following the monsoon season. Similarly, when floods did occur, many households counted on the help of neighbors to protect their home and grain stores. Therefore, households who had originally come from another district or country were less likely to have that support. The social net in this regard appeared to extend beyond the village, but not past the general vicinity within the district, with households calling upon friends and family in neighboring villages for assistance. In regards to crops, land, and house, households that were not from the village, but came from the district (Kailali) were not affected significantly differently during the 2011 monsoon than households that were born in the village. This effect remained even when controlling for wealth.

The majority ethnicity in most villages was Tharu, with only a couple of exceptions. Recovery from flood damage was determined to be closely related to whether a household was part of the majority ethnicity in a village: 0% of households that represented an ethnicity making up less than 10% of the village recovered their losses. Just as with a household's village of origin, ethnic majority households were significantly less likely to have their house or grain stores affected. Within the villages, ethnic majority households, controlling for wealth, were significantly more likely to have shifted their house to another part of the village with the help of family, friends, and neighbors. Minority households were also significantly less likely than households from the ethnic majority to feel confident that in the future someone from the community would help them in the event of a shock (Table N5). ■

Table N4: Who helped you recover your losses following the 2012 monsoon?

	percent	*freq*
help from a neighbor	23%	21
help from family living in the village	77%	70
help from family not living in the village	15%	14
help from non-family living in the village	10%	9
help from non-family living outside the village	4%	4
DMC	2%	2
NGO	2%	2

Table N5: How confident are you that if you experienced a shock someone in the community would help you recover?

	Majority (>50 %)	*Minority (<50 %)*	*Minority (<10%)*
not confident	5%	8%	10%
somewhat confident	36%	36%	60%
very confident	58%	56%	30%

DRR has entered the mainstream dialogue in recent years, and Nepal's particular confluence of challenges has garnered concern and increased international funding and programs. Unfortunately, much of the attention and resources thus far has been devoted to technical capacity and scenario planning, a scientific/technology-based approach to disaster management that remains all too typical. As UN-HABITAT's "Nepal and Natural Disasters" report (2003) and other UN and Nepali government documents have pointed out, there is actually no shortage of risk analysis on many of the region's hazards. Likewise, there appears to be no shortage of international partnerships, meetings, and web-based information aimed at reducing disaster risk. But actual risk *reduction* requires further efforts and a different—and increased—emphasis on vulnerabilities, exposure, rights, and livelihoods.

The focus of our research is on a particularly marginalized area of Nepal—the flood plain of the far western terai bordering India. The area not only experiences flooding on an annual basis due to its geographical specificity, but is also far removed from the educational and livelihood opportunities and the seat of power in Kathmandu given its historical exclusion in the State formation. Several NGOs have been working in the region providing much-needed relief for flood victims as well as putting in place programming with the hope of mitigating some of the effects of flooding.

The NGO approach to DRR efforts in Nepal in general and the western terai in particular are grounded in the concept of community ownership and management of DRR efforts, and therefore in capacity building to enable such management. However, several critically important assumptions remain unstated, namely that the community supports such programming and has both the desire and the ability to participate in these efforts. This presumption can be dangerous; if inaccurate, it could lead directly to program failure, wasted funding, and frustrated community members and NGOs. The critical question is which communities take part in these activities, and what are the household characteristics of participants *within* the communities? Having a better understanding of this has the potential to lead to more successful and better targeted programming.

Where the majority of households in a community have taken part in a DMC initiated by an NGO or in the construction of a spur or gabion, the negative consequences of flooding have been significantly reduced. Community-based DRR programming has been most successful in communities that are homogenous and where there is a shared problem. Working together as a community requires sufficient social capital to institute socially sanctioned regulations around participation but also an equal need for the benefits of those activities. Communities that are ethnically diverse are significantly less likely to take up these activities, as are communities that are unequally affected by the flooding. We found that the greater the diversity in wealth, distance to the river, and therefore overall impact from flooding, the less likely a community will carry out any mitigating activities together.

Besides overall community participation in community-level projects, it is important to note who in the community participates. Just as there are benefits to participation in community mitigation projects, there are also costs, and these costs affect the poor disproportionately. Not only do wealthy households have the option of opting out of labor contribution by providing an agreed-upon financial sum, but they also are more likely to have a sufficient number of able-bodied men to both continue their own livelihoods and contribute to labor. We found that in the communities, it was the larger and wealthier households that were more likely to participate in the community-level projects. It is therefore important for NGOs to think through how poor households can be involved without reducing their ability to invest their time and resources in their fields or other income-generating activities. Though communities generally understand their own composition, there is always the potential that non-participating households will be poorly perceived

and lose even more social capital if they do not participate in community-wide projects.

Provision of agricultural inputs would not only help increase household wealth and food security but also free up a household's time to participate in community-level mitigation projects, as well as allow them to pursue other livelihood activities, place less reliance on the need for support from already overstretched family and friends during the planting and harvesting seasons, and reduce the amount of capital spent to rent these inputs.

Households living in communities with characteristics unlikely to lead to collective DRR activities still require support to ensure greater resilience against flooding. While it is not surprising that increased individual household wealth corresponded with a reduced flooding impact, the study was able to identify specific components of household wealth associated with greater resilience to flooding: livelihood diversification, access to markets, access to cash, and financial management strategies.

The majority of households in our study primarily rely on agriculture for their livelihood. However, it is precisely this livelihood that is extremely sensitive to the impacts of flooding. The majority of households lost either some of or their entire crop during the floods of 2008. The ability to diversify household livelihoods outside of agriculture not only shores up wealth but also provides households with other sources of income in the case of a flood. Transferring the risk of flooding on livelihoods outside of the affected area, either via long-term migration to India, working in the nearby urban center, or engaging in other income-generating activities offers additional insurance. Households in Kailali already use multiple and dynamic strategies to cope with the ubiquitous risks associated with the flood plains and their own marginal position in Nepal. Therefore, it is only a matter of supporting and encouraging spreading out livelihood risk via livelihood diversification in terms of both the activity and location.

However, before the institution of vocational training for these households, it is important to note that the benefit of a diversified livelihood portfolio was only for households that also did agriculture. Households that did not report agriculture but carried out multiple livelihood activities tended to be the most vulnerable. Therefore, any vocational or skills training cannot be done at the expense of subsistence agriculture, but has to first fortify the agricultural livelihood before providing supplemental income-generating activities rather than substitutes.

Along with an added focus on livelihood diversification, the study identified a clear lack of access to markets in the area. Participation in the labor and goods market comes with additional costs on the household: the transportation cost associated with migration, the legal and financial costs associated with cross-border trade, and the transportation costs associated with accessing the one market in the area.[7] Increasing access to markets not only offers additional opportunities for livelihoods (legal trade, small business, cash crops, etc.) but also facilitates a move towards a more cash-exchange economy.[8] And unlike the majority of current household wealth—livestock, assets, and housing—cash, if stored securely, is not physically affected by flooding.

Access to a cash lump sum is integral for quick recovery from the impact of flooding.[9] While the majority of households reported taking out loans as their primary coping strategy, poorer households were significantly less likely to report having access to a loan if affected by flooding. When households are affected by a covariate shock such as flooding, internal and informal sources of cash quickly vanish. Therefore, households vulnerable to flooding risk need access to the secure financial management strategies: savings, credit, and insurance. While there are some villages that have informal savings groups, these forms of savings are highly insecure during covariate sudden-onset disasters. In order for households to be able to transfer risk out of the community, they need access to semi-formal savings and credit institutions such as microfinance organizations (MFIs). Index-based microinsurance has been making steady headway and has shown successes in India (Manuamorn, 2007). Such models should be considered for import to farmers in Nepal. Mobile banking could particularly reduce some

of the risk associated with migration—transferring and carrying large amounts of cash over a period of several months.

Another limitation to community and household flooding resilience identified in the research was the limited access and awareness of NGO programming and government support. The communities that were able to secure government and NGO grants were those that were lucky enough to have at least one individual in the community with the proper social connections outside of the community and the wealth to get past all the institutional barriers and lobby for the community. Increased awareness of potential funding and project opportunities would increase both demand for and expectation of government and NGO services.

In situations like that of Nepal where there are poverty *and* disaster *and* post-conflict dynamics in play all at once, the whole context is even more difficult than the sum of its very challenging parts. Current disaster risk analysis focuses too narrowly on protection and flood risks, when the reality is that households are vulnerable to numerous risks, and flood simply exacerbates existing vulnerabilities. Before the institution of any DRR programming, organizations need to carry out a full risk analysis that takes in the full context of the affected communities. It is the household's initial marginalization that makes them both incredibly creative in their survival strategies and highly vulnerable to flooding.

Given the findings of the study, several recommendations are made:

- Participatory DRR programming should only be carried out where sufficient social capital already exists. This offers a greater guarantee for the success of the programming.
- Where social capital exists and DRR programming can be put in place, it is important to consider some of the costs of participatory programming that disproportionately affect poorer households. The added strain of contributing time and labor might negatively impact the household's own survival strategies. Organizations should consider the provision of goods, such as agricultural inputs, that might simultaneously increase their capacity and therefore free up time for communal projects.
- Livelihood diversification needs to be encouraged and supported, not only in regards to a diversity of livelihood activities but also of livelihood locations in order to transfer risk outside of the community geography.
- Access to markets needs to be promoted in order to bolster a cash-exchange economy, reduce the current high costs of goods and labor markets, and provide additional incentive for livelihood diversification outside of agriculture.
- Access to financial services needs to be promoted. Cash is an integral component to post-disaster recovery and, if properly secured, is not affected by flooding in the same way that current household wealth—livestock, assets, housing—is. There are numerous opportunities to help reduce or transfer risk, such as mobile banking for migrants transferring cash, index-based microinsurance for farmers, and secure savings through formal and semi-formal institutions.
- Build capacity of local committees and community-based organizations (CBOs) in order to raise community awareness of NGO and government programming, as well as increase demand for services and infrastructure.
- In dynamic contexts, such as Nepal, organizations need to carry out risk analysis that takes into consideration the local livelihood systems, conflict and post-conflict dynamics, and overall household and community marginalization.

ANNEX N1: WEALTH

A key issue in constructing the wealth index is how to assign appropriate weights for the individual components (assets) of the index. We used principal component analysis (PCA), a procedure that allows for greater accuracy than a linear index with equal weights, which imposes numeric equality on all the variables.[10] The PCA technique explores the relationship between a set of correlated variables and creates a single variable (the index) through the summation of the individual weighted variables, thereby reducing dimensionality without losing too much information (Chatfield and Collins, 1980). We further standardized our index in relation to a standard normal distribution with a mean of zero and a standard deviation of one.

The variables used for the construction of the wealth index were roofing material, number of rooms, type of toilet facility, whether the household could raise the equivalent of 50 dollars in a week, and ownership of the following assets: bicycle, mobile phone, dallap, solar panel, access to internet or computer, engine or pump set for irrigation, ownership of pigs, and male water buffalo. The choice of variables to include was based on internal correlation—only asset and housing variables that had a 40% or higher item-test correlation were kept. The final Cronbach's coefficient alpha for scale reliability was .7321, signifying internal consistency and is evidence that the items measure an underlying, or latent, construct—in our case "wealth."

Table N6: Assets Making up the Wealth Index

	scoring factor	Mean	sd	% of Index
Good quality roofing material (not mud and wood—kachi)	0.31	0.79	0.40	10%
Number of rooms (3 or more, including kitchen)	0.36	0.53	0.50	9%
Access to a latrine (do not defecate outside)	0.26	0.37	0.48	7%
Access to the equivalent of 50 dollars for an emergency	0.23	0.68	0.47	6%
Own a bicycle	0.27	0.91	0.29	12%
Own a mobile phone	0.26	0.79	0.41	8%
Own a dallap	0.38	0.55	0.50	10%
Have access to internet or a computer	0.24	0.13	0.34	9%
Own an engine pump for irrigation	0.28	0.31	0.46	8%
Own solar panels for energy	0.21	0.21	0.41	6%
Own at least one pig	0.35	0.49	0.50	9%
Own at least one water buffalo	0.25	0.23	0.44	7%
Wealth Index		-0.53	1.81	100%

Note: Scoring factor is the "weight" assigned to each variable (normalized by its mean and standard deviation) in the linear combination of the variables that constitute the first principal component.

All the index components are dummy variables—with a value of one if true, zero otherwise—so the weights have an easy interpretation: a move from zero to one changes the index by the following expression:

$$\%\ contribute\ to\ index = \frac{scoring\ factor}{sd\ (scoring\ factor)} \times \frac{1}{total\ index\ spread}$$

This value is calculated individually for each asset and reported in Table N6. Of all the assets, having a bicycle, a dallap, and good-quality roofing contribute the most to a household's wealth, while solar panels or having access to 50 dollars for an emergency together contribute as much to wealth as simply owning a bicycle.

Using the wealth index, respondents were grouped into quartiles: the first is the bottom 25% of the population (the "very poor"'), the second and third quartiles comprise the middle 50% of the population, and the fourth quartile is the top 25% of the population (the "least poor"). The difference in the average wealth index score between the very poor and the middle poor is 2.57 units (or 35% of the index), and the difference between the middle and least poor is 2.15 units (or 29% of the index). Therefore, the difference between very poor and middle poor households is 4 to 5 assets, and the difference between middle poor and least poor household is approximately 3 to 4 assets. ■

ACRONYMS

BASE	Backward Society Education
DDC	District Development Committee
DMC	District Management Committee
DMC	Disaster Preparedness Committee
DRR	Disaster Risk Reduction
GLOF	Glacial Lake Outburst Flooding
NGO	Non-governmental Organization
NRCS	Nepal Red Cross Society
NSAC	Agriculture Census Survey
PCA	Principal Component Analysis
SL	Sustainable Livelihoods
SLC	School Leaving Certificate
SSB	Sashastra Seema Bal (India's Armed Border Force)
VDC	Village Development Committee
WFP	World Food Programme

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END NOTES

1 Several rivers crisscross through Kailali District. The main ones are Mohana, Khutiya, Kandra, Karnali, Ghuraha, Kandra, and Likma Rivers.

2 Our study did not collect data on income or consumption. Instead we constructed a "wealth index" based on housing and asset ownership (Montgomery et al., 2000; Filmer and Pritchett, 2001). The index was used throughout the analysis. For a description of how the index was constructed, refer to Annex 1: Wealth.

3 Information on livestock loss was unfortunately omitted from the first two surveys, so it is impossible to compare across.

4 According to the Nepalese law, though a Nepali or Indian citizen can cross the border without a visa, when it comes to goods, they have to pay customs for each good worth more than one hundred rupees, and certain types of goods are completely prohibited (such as cement, fertilizer, iron rods, sugar, onion, etc.).

5 We decided to only look at housing for this analysis, because, unlike crops and land, the impact on housing by flooding is more uniform and easier to homogenize, given the wide disparity between how much land a household owns and the land quality.

6 All households in the Bandargauri community, 92% of households in Belaha, and 82% of households in Chhotki Puruwa are within one minute from the river.

7 On average, it takes four hours to get from the research villages to the nearest market.

8 Currently, over 40% of households still reported a reliance on bartering to acquire goods.

9 Please refer to the Haiti case study, "Disaster Risk Reduction and Financial Strategies of the Poor: Demand for, Access to, and Impact of Cash in Haiti Following the 2010 Earthquake" for more details on financial resilience to disasters.

10 Another option would be to treat each component separately in a regression. This approach creates weights—the linear coefficients—but makes any inference about the impact of an overall increase in wealth impossible

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