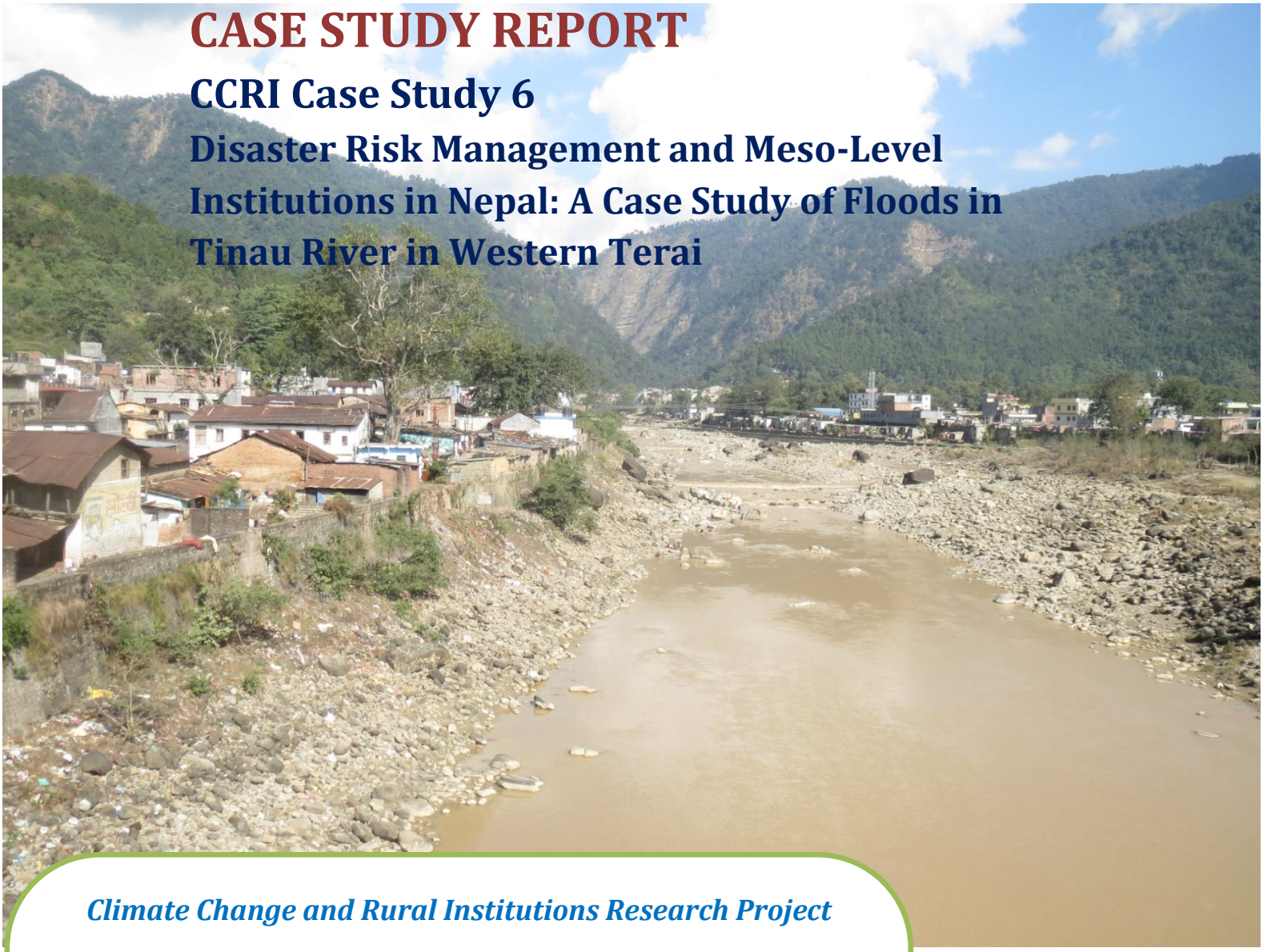
CASE STUDY REPORT

CCRI Case Study 6

Disaster Risk Management and Meso-Level Institutions in Nepal: A Case Study of Floods in Tinau River in Western Terai



Climate Change and Rural Institutions Research Project

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Disaster Risk Management and Meso-Level Institutions in Nepal: A Case Study of Floods in Tinau River in Western Terai

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The views expressed in this discussion paper are entirely those of the authors and do not necessarily reflect the views of SIAS Nepal.

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Acronyms

DDC	District Development Committee
DDMC	District Disaster Management Committee
DDMP	District Disaster Management Plan
DDRC	District Disaster Relief Committee
DISCO	District Soil Conservation Office
DRM	Disaster Risk Management
DRR	Disaster Risk Reduction
DWIDP	Department of Water Induced Disaster Prevention
FNCCI	Federation of Nepalese Chamber of Commerce and Industries
GON	Government of Nepal
IBWT	Inter-basin water transfer
LDRMP	Local Disaster Risk Management Plan
NRRC	Nepal Risk Reduction Consortium
NSDRM	National Strategy for Disaster Risk Management
PEP	People's Embankment Programme
SATA	Swiss Association for Technical Assistance
TWP	Tinau Watershed Project
VDC	Village Development Committee

Abstract

Floods are one of the most important hazards in Nepal, and over the past four decades they have been the third largest source of disaster-related casualties in the country. Floods are a particularly recurring phenomenon in many rivers in the Terai region in the country's southern frontier. This discussion paper examines flood events in one of the Terai rivers — the Tinau — of south-central Nepal in recent history and relates these events to the complex set of drivers and policies and programmatic approaches to reducing flood risks, including preparedness, response and recovery. In doing so, this paper looks at how and to what extent existing institutional actors around the river identify the flood risks and engage in addressing those risks and hazard events over time. On the basis of the Tinau case study, this paper draws wider implications for Nepal's evolving institutional arrangement for disaster risk management, especially Nepal's current policy approaches, the capacity and limitations of current institutional and legal systems, and their privileging of the particular framing of disasters vis-à-vis the interests of major actors that are at play.

We argue that the Tinau river and flood hazards are intricately enmeshed into a political economy characterised by rapid migration, rapidly increasing and largely unplanned urbanization, growth of extractive industries including the collection of riverbed materials, and an agrarian change transitioning to adoption of more capital-intensive (mechanised) agriculture. Accordingly, first, we suggest that a narrow and regimented approach to understanding flood risks and response measures are ill-suited to flood risks that have multiple drivers and involve multiple and conflicting interests of river use. Secondly, while with the promulgation of National Strategy of Disaster Risk Management (NSDRM) effort is underway to decentralize disaster planning and implementation, the approach fails to effectively account for risks spread into the entire river watershed, leading to fragmented measures of risk reduction if any. Thirdly, the flood mitigation measures are conceived either as engineering solutions or tokenistic community measures, both of which fail to reduce risks and to effectively respond to and recover from floods when they happen. There is therefore a need to devising a coherent watershed-wide strategy for reducing flood risks and create a more competent, accountable and coordinated institutional mechanism to effectively handle disaster risk management.

1 Introduction

For many nights during the rainy season, the locals in *Sukumbasi basti* (informal settlement) of Buddhanagar on the margins of the city of Butwal in south-central Nepal engage in a rotation system to watch whether the Tinau River will swell to endanger their lives and property. A number of men in these *Sukumbasi* households remain awake through the night and make sure that their families remain safe. Fear grows in these settlements as the monsoon clouds gather on the sky over the upstream areas of Rupandehi and the hill district of Palpa. When the river level reaches the dangerous level, these locals wake others, start packing their belongings and prepare to run away. The unpredictable and unruly river of Tinau and its branch Dano, which bifurcates west-southwards just below the Tinau bridge on the western side of Butwal bazaar, surround these settlements from the east and west. In 2011, the people in the *Sukumbasi* settlements witnessed 17 houses just across the Tinau River swept away within an hour.

The story above reveals the complexity of flood disasters as well as the river economy in and around the Tinau River. The Tinau is a case of a medium-sized river in Nepal – originating in the mid-hills (Mahabharata lek)--which nurtures life and causes frequent flood damage in the plain land of Terai. It actually informs the wider disaster planning and response work and institutional arrangement in Nepal, even though Tinau flooding is not a yearly phenomenon. For instance, the Tinau problem was largely unreported in the monsoons of 2014, as the news mostly covered the devastation in mid-western districts of Dang, Banke, Bardiya, and the eastern district of Sindhupalchowk. The people in these districts faced floods unprecedented in recent memory. The Tinau River was not covered in the news in 2014, despite its history of severe flood damage around Butwal city and through the agriculture and settlements along the stretch of the river as it finally enters the India border in the south.

This paper is based on the case study of Tinau River in Rupandehi district of Nepal's Terai region, which is a flat area in South Nepal comprising the extension of the Gangetic plains. Tinau is one of the several rivers in Nepal which experiences flooding every couple of years. Unlike major rivers that originate from the Himalayas, Tinau originates in the Mahabharata range (Lesser Himalaya) and is not snow-fed. Accordingly, it has very little river flow in the late winter and spring, but with a significant rise in flow during the monsoons. As the government plans for inter-basin water transfer (IBWT) from snow-fed Kali Gandaki River into Tinau, the problem would become even more serious when the project materializes. The monsoon flow in the river affects a significant population of the district, especially while entering the Terai region crossing the Churia hills in the dense settlements of squatters beneath of Butwal *bazaar*. The Tinau River passes through the middle of agricultural land crossing these squatter settlements (especially in Marchawar area, south-west of Bhairahawa *bazaar*) down to reach the Indian border in the South. The episodes of flooding in this river has impacted both urban and rural settlements, agriculture and health of the population and reportedly led to the creation of district branch of Red Cross in 1970. During our period of study so far (2012- 2014) there has not been a major flood event in this river, and our exploration will thus be on ongoing efforts and initiatives vis-à-vis the memory of disaster experience of the past and new policy and programmatic approaches evolving in Nepal.

Against this backdrop, this study uncovers the narratives of flood disasters, the facts and discourses of boulder and water economy, local people's livelihoods connected to the river and institutional responses to manage floods and their associated impacts in and around the Tinau River.

First, we discuss the significance of flood disaster, as well as river economy, in the Terai region in general on the basis of the Tinau case study. Second, the floods of the Tinau and their multifaceted effects are elaborated in a historical trend over time. Third, the major drivers of flooding are assessed in the context of urbanization, boulder economy and informal settlements. Past interventions in the Tinau are highlighted in the fourth section, followed by arguments on the institutional responses to floods at present in the fifth section. Finally, some analytical issues drawn from the study are highlighted.

2 Floods in Nepal Terai

2.1 The Tinau River in context

Sitting at the base of the Himalayas, the Terai receives full outflow of water from the hills and higher Himalayas through the rivers that flow into it. The biggest of the rivers are the Koshi, the Gandaki, the Karnali and the Mahakali, which are sourced from the high Himalayas. Each is fed by multiple tributaries. As will be seen by virtue of their size and peak flows, they have historically been associated with widespread major floods, damage and loss of life. There is a second category or rivers (Adhikari, 2013), which originate from the Mahabharat hills, which also cause major floods and damage; but these are more spatially confined to the districts into which they flow. These include the Tinau in Rupandehi but also the Kankai in Jhapa, the Kamala in Siraha and Dhanusha, the Bagmati in Sarlahi and Rautahat, the West Rapti in Dang and Banke and the Babai in Bardiya district. Finally, there are the numerous small rivers, some of which have seasonal flows that originate from the Siwalik[1] and Churia hills. Characteristic of all these rivers and reflecting the relatively young geological age of the Himalayas, and in particular of the Churia hills, is the high sediment load that they carry and the resulting deposition of this sediment as they flow across the Terai.

With Nepal's monsoonal climate, characterised by extreme rainfall events, there has been a long history of major floods in the Terai. Adhikari (2013) lists major floods events which have occurred at least three times in 100 years prior to the 20th century in 1785, 1787, 1793, 1806, 1867 and 1871. Since the start of the 20th century major floods happened in 1902, in 1926 and 1934 (both times by the Bagmati) and then in 1954, 1956, 1958, 1960, 1962, 1981, 1987, 1993, and 1998. Since the start of the 21st century three major floods have been experienced in 2002, 2004 and notably in 2008 when there were two major events. First, the Koshi River burst its embankments causing major loss of life and severe flood damage and second, there was a major flood in the far west.

To what extent the rising frequency of floods is a result of more accurate recording is unknown but rapid settlement of the Terai since the 1950s and the building of infrastructure has, by all accounts (Adhikari, 2013), led to an expansion of a population vulnerable to the risk of flood

[1] The foothills adjoining Terai in Nepal with an average elevation of 1,500 to 2,000 m.

effects and the creation of blockages to river flow that have compounded the flooding. In the expansion of the population, many of the poorer migrants have come to settle on riverbanks unable to get legal settlement elsewhere, thus putting themselves at risk. Further, many of them have found casual employment in the collection of river bed materials for construction purposes. While much of this is considered illegal, the issuing of permits by the District Development Committees (DDCs) for these activities has been an important source of revenue for the DDCs.

However, the construction of roads, bridges and culverts and embankments on both sides of the Nepal-India border, and barrages on the Indian side, many of which appear to have been poorly designed with respect to flood risk, have acted to constrain water flow and impede the movement of flood water. This has led to severe backing up of flood waters in the southern part of the Terai causing major damage to crop lands. Thus while the source of the flooding clearly lies within the Nepalese Himalaya, the management of the flood waters is clearly a cross border issue which has remained a matter of contention and debate between India and Nepal.

A central question that runs through the literature on flooding in the Terai and the neighbouring regions is the extent to which embankments to discipline river flood flow are the solution and to what extent they are as much a cause of the flood disasters that have occurred. There is a debate which stretches back to colonial India amongst officials as to whether or not embankments, the preferred engineering solution to floods, should be constructed or not. The Orissa Flood Committee in 1927 established to examine the cause of the floods in the Indian state rapidly came to the conclusion that the embankments and canal systems for funnelling water were a root cause of the floods because they impeded drainage (Das et al., 2013:8) and recommended their gradual removal. As far as the Koshi River is concerned, after major floods in 1869 and 1870, there has been a long running argument as to whether or not embankments should be put in place with many river engineers being strongly opposed to such interventions.

The debate over the management of the Koshi River and the events that have unfolded have direct relevance to this study of the Tinau River and are briefly summarised here. Despite strong disagreement in some quarters, the Indian government finally in 1953 came to the decision to construct flood embankments both on the Indian and Nepalese sides of the river. In addition a barrage was constructed on the Indian side with the ambition to expand the area of irrigation. None of these ambitions have been achieved. The Koshi embankments have been breached eight

times since they were built – three times in Nepal and five times in India. It has been estimated that in spite of the flood protection measures, Bihar's flood prone area has actually expanded from 2.5 million ha in 1952 to 6.0 million ha in 1994 (Das et al., 2013: 28). Moreover, the expansion of irrigated area because of the stored water has been less than half of what was expected.

The debate on measures of river and flood control in the Terai came to a head with the major Koshi River flood of 2008 which affected 3.5 million people in Bihar and 50,000 in Nepal, resulted in 56 deaths and flooded over 100,000 ha of farm land. The immediate cause of the flood was a breach of an embankment at Kusaha but this took place when the river was not even in peak flow. Underlying the breach was a long term failure of embankment maintenance and poor cross border communication and management (ibid :29).

However there is also a strong body of opinion that there has been a more fundamental problem in river management which has been firmly rooted in an engineering 'river control' approach, of which the embankments are emblematic. As Sinha et al. (2014) have argued, engineering approaches aimed at control cannot work with dynamic and unruly rivers such as the Koshi that carry heavy sediment loads. Historically, such rivers have been migratory and unstable shifting course periodically as a result of the sediment deposition and the flat terrain over which they flow. As discussed below, the Tinau River in 1998 did just that, splitting into two rivers – the Tinau and the Dano rivers with the latter reoccupying an old river channel. The Koshi River has shown historically major shifts in course creating a large flood plain shaped in a fan and nearly 200 km in length. There are numerous old river channels indicating previous directions of flow. As Sinha et al. (2014:3) argue 'the construction of embankments along the Koshi in the 1950s has prevented the river from oscillating and from spreading its sediment over the fan surface. This has made its behaviour much more unpredictable and sudden, provoking disaster.

The advantages and disadvantages of embankments have been very contentious. Not only do they have a fixed life and require regular maintenance but they create water logging problems and encourage settlement in risky places. As Sinha et al. argue, they also create a false sense of security which is dangerous given the nature of the river. Further, the focus on managing the flood discharge, seeing this as the driver of flooding rather than managing the sediment and changing river bed elevation and channel morphology, has been a key part of the problem.

These arguments allude to the reality that only engineering fixes, particularly the embankments are not the sustainable approach to flood management. They argue therefore for a shift to river management that focuses more on addressing drainage, recognising the dynamic nature of the Koshi River, and by implication the Terai Rivers in general and a much more participatory and local management approach drawing on both scientific and local knowledge of river hazards. These are lessons that are carried forward to the analysis of Tinau River and its floods.

2.2 The Tinau River and its watershed

Tinau River flows through two districts, Palpa and Rupandehi in Western Nepal. It originates in the Mahabharata range upstream in Palpa district. The headwaters of the Tinau lie on the southern slopes of the Mahabharata range surrounding the Madi *phaant* of Palpa district, tributaries contribute to the Tinau from much of Western Palpa and include streams such as the Kusum, Dobhan, Sisne and Jhumsa *kholas* (Gyawali and Dixit, 1999, p. 60). The Tinau then flows through the gorge of Churia hills before reaching the town of Butwal in Rupandehi district, comprising a length of 95 kilometres from the source to the India border (Dahal et al., 2012). The river bifurcates into two branches from the sides of Butwal bazaar—the eastern one is called Tinau and western one Dano[2]. The two meet again 40 kilometres downstream from Butwal in Marchawar area in Southern Rupandehi district, at a point called Duimuhan, that lies at the lower end of Pakadisakron Village Development Committee (VDC) separating Majhganwa VDC (in the east) and Sipawa VDC (west) (see Figure 3). In the south of Duimuhan, the river is called Dano and after it reaches India border it is called Kunda River, which eventually joins the Rapti River in Uttar Pradesh.

The Tinau River has a total watershed[3] area of 3200 square kilometres, of which about 850 square kilometres lie in India and the remaining in Nepal (Poudel, 2012). However, Gyawali and Dixit (1999) estimate that the total watershed area of the Tinau River within Nepal is about 1194 square kilometres, consisting of 554 in the hills and about 640 square kilometres in the Terai.

[2] In the southernmost Marchawar area of Rupandehi, this river is called Dano, whereas this name denotes only one branch of the river (the western one) in northern Rupandehi. Dano comes from Sanskrit term, *Danav,* which means demon—so named for the destructive nature of the river to local lives and livelihoods

[3] Nepal's forestry and soil conservation authorities use the term 'watershed' and its derivatives, such as sub-watersheds in order to describe the total land surface from which water drain into a river (Kandel and Joshi, 2007). It is equivalent to a catchment area, but the later is rarely used in watershed literature in Nepal. The term 'basin' is used to denote the larger area consisting of many river watersheds (Kandel and Joshi, 2007).

The hills watershed portion of Tinau River lies mainly in the northern district of Palpa and a portion of Siwaliks of Rupandehi district, whereas the Terai portion of watershed comprises Butwal municipality and several VDCs in Rupandehi district. However, the idea of Tinau watershed which came to be popularized from Tinau Watershed Project (which is discussed later in this report), is confined to the hill areas only. The project defined only 22 villages in Palpa district in the hill as the 'watershed' of the Tinau and excluded all the portion of the watershed that lied in the downstream Rupandehi district in the plains (Dhungana, 2014). As a watershed is considered in relation to a particular location of the river, the city of Butwal as a main reference for the river is privileged. It was primarily because Butwal was a major settlement and a bazaar linking the trade between hill areas with India. At the same time, the privileging of (hills-only) Tinau watershed, ignored the flood impacts and problems experienced by mainly agricultural settlements in the southern parts of Rupandehi district.

Indeed, a watershed's boundary is often articulated or manipulated in line with the political interests of the authority that defines the watershed (Cohen and Davidson, 2011) . The area is either inflated or deflated from the true watershed depending on who delineates the boundary and why (Cohen, 2012). Instead of taking the watershed as a hydrologic entity, the boundary is agreed upon or negotiated by the stakeholders to justify the implementation of certain policies, programmes or projects (Cohen and Davidson, 2011; Dhungana, 2014). In Figure 1, the boundary of the Tinau watershed is delineated in line with the Tinau Watershed Project, while in Figure 2, the boundary of the watershed is restricted between Butwal and Bhairahawa. In the latter case, a Non-Governmental Organization (NGO) that was interested in running a programme in the portion on the river defined the area as a 'corridor' instead of the 'watershed' in order to justify its delineation. These examples suggest that the Tinau watershed has been represented differently by different actors and authorities in order to suit their plans and actions. Following Cohen (2012), it implies that a watershed is partly hydrologic or geographic but largely a socially constructed idea that is used or misused to impose certain policy interests or to justify certain actions on the watershed.

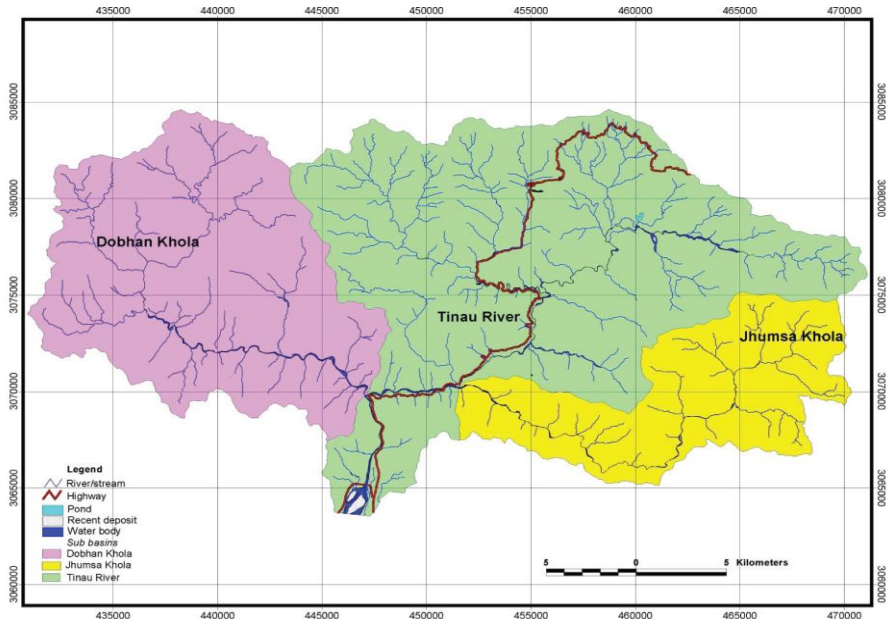

Figure 1: The boundary of Tinau watershed in its hills-only emphasis

(Source: Poudel, 2012:24)

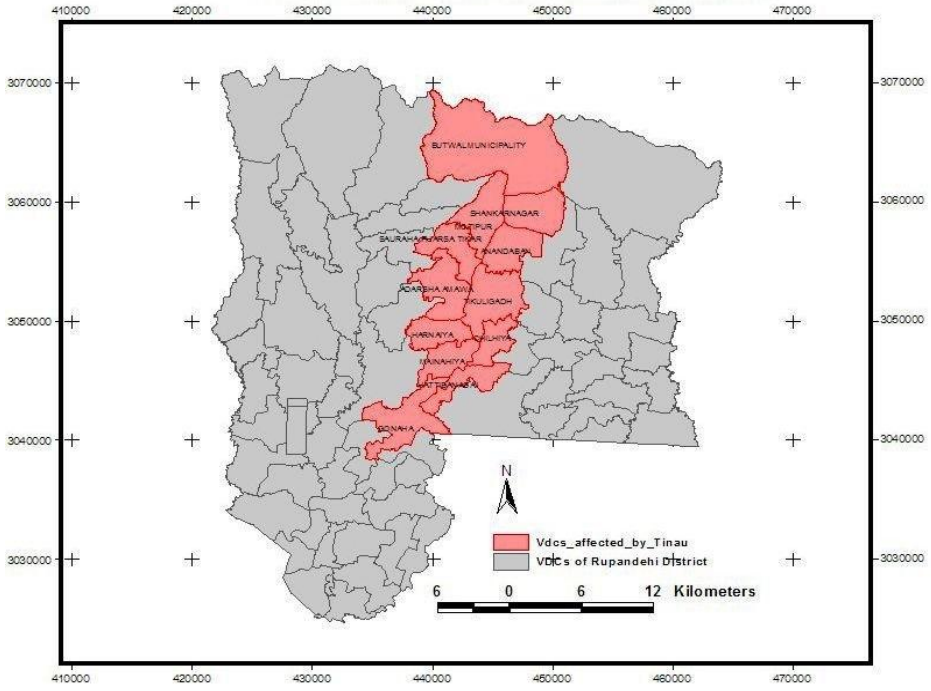

Figure 2: NGO representation of Tinau watershed in the Terai portion

Source: IDRC, 2009

As has been documented in relation to Tinau watershed, in late 1970s, the Tinau watershed (the hills portion) had a land use in which 62% was covered with forest, and one third was under agriculture (Shrestha, 1988, p. 66). The Tinau Watershed Project designed several interventions that were expected to improve forest management, retain moisture and improve overall conservation in the watershed (see below). But an assessment of the soil and other conditions of the watershed reveal biophysical problems that posed challenges for conservation work:

> Soil conditions in the Siwaliks prevent an effective retention of rainfall, although the vegetative cover is still intact. In the northern part of the project area, natural vegetation has been removed to a great extent, and appropriate agricultural techniques and practices (e.g. terracing) have not been developed or are not applied on a scale to suit the topographical and ecological situation. The widespread grass-covered slopes permit accelerated water run-off to the valleys forming erosion of all kinds and, further downstream, flood hazards ("Tinau Watershed Management Plan, Vol.1, Main Text," 1980, p. 28).

These assessments made in the late 1970s also provide important pointers to the risk of floods in the Tinau valley and into the Terai plains downstream.

> During the drier parts of the year, the rivers do not look very impressive in the Tinau watershed. However, their level can quickly rise to dangerous heights during the rainy season. Water volume, debris and rocks carried along not only cause devastation to agriculture, but once in a while also to other structures in the valleys. The dangerous increase of the water level along the rivers of the watershed is clearly indicated by the lack of vegetation along the river banks several meters above the dry season water flow ("Tinau Watershed Management Plan, Vol.1, Main Text," 1980, p. 28).

The studies from Tinau Watershed Project ignored the downstream part of the Tinau River and its watershed in Rupandehi. As the river passes through Butwal and flows into the Terai plains, the river takes a serpentine flow and frequently changes course, as river materials deposit on one side and river cutting occurs on the other one. Other streams and tributaries join the Dano River from the west (see Figure 3) and they add up to the river's flow and its direction.

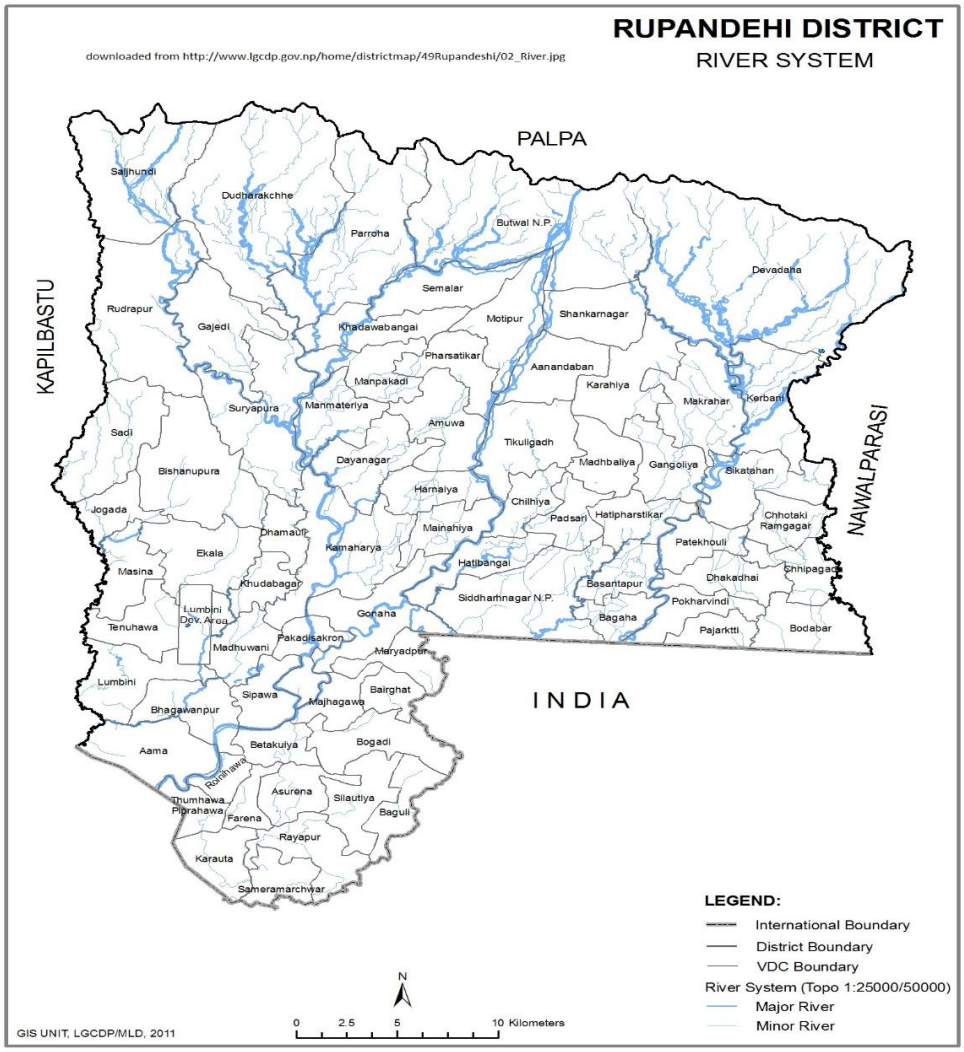

Figure 3: River system of Rupandehi district

Source: LGCDP (2011)

2.3 Water flow and rainfall

The flow in Tinau River is extremely variable across seasons. Unlike snow-fed rivers that originate in the north, its river flow significantly depends on rainfall. [On average] the flow of Tinau River in Butwal is about 25 m^3/s and at the India border about 60 m^3/s, and the minimum flow in April nears to 1m^3/s and 3 m^3/s, respectively (Poudel, 2012, p. 25). Dry season flow is derived from the groundwater and base flow contribution. The average monsoon flow in August can be as high as 110 m^3/s and instantaneous peak is close to 2,500 m^3/s(Poudel, 2012, p. 25).

Tinau watershed in the monsoon season (June to September) receives an average of 1637 mm of rainfall, which comprises 82.26% of total annual average of 1985 mm in the watershed. This rainfall itself is much greater than Nepal's national average of 1700 mm a year (Shah, 2009, p. 3). The flooding however is caused by exceptional cloudbursts or due to the failure of embankments suddenly caused by landslides in the upstream. A landslide in Tinau Gorge for example, blocks the river for several hours until it collapses to devastate the downstream areas.

Studies carried out in the late 1970s suggest that there is little retention of the rainfall in Tinau watershed and hence any cloudburst can easily lead to a devastating flood in the Tinau valley and Terai plains. "A rough calculation based on presently available precipitation and discharge figures indicate that some 87% of rainfall flows from the watershed as surface water in Butwal" ("Tinau Watershed Management Plan, Vol.1, Main Text," 1980, p. 28).

The river flow in Tinau will change considerably if a government plan goes forward. The government has put in pipeline a plan for inter-basin water transfer (IBWT) to Tinau River from Kaligandaki River (Khanal, 2011). So far the government has conceived seven projects for IBWT in the country—and Kaligandaki-Tinau Diversion project is one of them. This project is currently at the preliminary study stage and would follow the progress on another IBWT project. It has been conceived that the Kaligandaki-Tinau project will have a 30-km long tunnel from its intake located at Ramdi (a point in the Kaligandaki River in Syangja-Palpa border) and divert a discharge of 90 m^3/s to Tinau River. This is envisioned as a multi-purpose project, providing irrigation to a cultivated catchment area (CCA) of 106,000 hectares and generating 104 MW (Mega Watt) of hydro-electricity (Khanal, 2011)[4]. Local irrigation users that we met in the course of field study in Karaiya VDC[5] told us that discussion about this project is also held among farmers who see this as an opportunity for addressing water scarcity in agriculture[6]. Some social and political concerns, however, have emerged and these may block or delay the implementation of this project. It has been suggested that the project would hit people living in 36 VDCs in Syangja, Palpa, Tanahun and Nawalparasi. Furthermore, as one local leader in

[4] Another source from Department of Irrigation(Belbase and Khanal, 2011, p. 135), however, suggests that the estimate for Kali Gandaki Tinau diversion project is the diversion of 50 m3/s of water and the generation of 65 MW of electricity.

[5] This VDC has recently been changed into Tilottama municipality.

[6] Group discussion with local farmers of Pradipnagar Mauja and Dipnagar Mauja in Karaiya, Jan 2015.

Butwal told us,[7] this project also faces the risk of obstruction from India in reference to the Indo-Nepal Gandak treaty. On top of this, there is persistent policy uncertainty over funding and administration of the project. If this IBWT project materializes, Tinau will have considerably greater river flow compared to the present level, and will change irrigation, environment as well as disaster risks. Planning for disasters in Tinau should accordingly be changed as the project gains momentum.

3 Flooding and its effects

Major floods in Tinau are caused by either or combination of two factors. Cloudbursts in Palpa and landslides in upstream of Butwal are the immediate physical drivers for floods in Tinau and inundation in the watershed. The two major floods that most of our respondents in Butwal referred to—the one of 1970 and the other of 1981—were caused by landslides in the Tinau watershed in Palpa district. These landslides blocked the river—which reaches as much as 2,500 m^3/s in terms of spontaneous peak flow (Poudel, 2012, p. 25) for few hours. A maximum of 24 hour rainfall recorded in 1981 was 320 mm. In 1981, the flood caused sediment deposition, caused by landslide in the upstream areas which blocked the river for several hours and then breached (Shah, 2009, p. 2). As the blockage of the river caused by landslide failed it caused big floods leading to devastation in the downstream in Butwal and settlements and agriculture lands further south.

There has not been a significant case of flooding in Tinau River during the course of the CCRI research period, from 2012 to 2014. However, the river is remembered as regularly causing flooding, inundation, river cutting and damages to human life, settlements and irrigation systems. There are frequent inundations in the Marchawar area, in the south of the Rupandehi district on the Indian border caused by a combination of increased river flow and backing up of water during peak flow. This is due mainly to the embankments and dam structures that have been built on the Indian side of the border. This has led to extensive flooding of agricultural lands and crop losses, but in some intervals of years.

[7] Interview with Mahendra Ligal, in (old) Butwal, Jan 2015.

Box 1: Media account of Tinau floods

> Locals [in Butwal] claim that the mighty Tinau might once again unleash disaster like it did in the past - or even worse. Over a hundred people were killed by floods of the Tinau 44 years ago. It again killed 64 locals of Dobhan of Palpa and Butwal 33 years back. The Tinau river flooding has, in fact, continued to wreak havoc several times over the last two decades, causing loss of scores of human lives and property worth billions of rupees besides displaced hundreds more. Against such a backdrop, the rising level of water in the Tinau over the recent days has terrified the locals of Butwal.

Source: KC 2014

The effects of the Tinau River in terms of immediate physical manifestation is threefold—called *katan*, *patan* and *duban*, according to the locals. *Katan* refers to cutting of the sides of the river, which results in the damage or washing away of houses, crops and lands on either or both sides of the river. Katan or side cutting occurs mainly in northern areas of the plain portion of the district, affecting settlements in Butwal and several VDCs downstream. In Marchawar area in the south, the river is serpentine and frequently changes its route, by cutting the river bank on one side and depositing silt on the other.

Patan refers to deposition of sediment load carried by the river into agricultural land and settlements. For instance, the *Sukumbasi* settlements in Butwal themselves were a product of sediment deposition, caused by the two floods – one in 1970 and the other in 1981 (see Table 1). Before that, these were agricultural lands producing paddy, but became a "desert-like" after sediment deposition[8]. The original owners of the land were declared 'flood-victims' and provided with land in nearby Nawalparasi district, even though they continued to retain their land certificate (land title) after receiving the land in compensation.

The third, *duban* occurs in areas with lesser slope on the river bed and constricted outlets to the flow of river. In this case water is held in agriculture land and settlement for some days, causing crop damage and considerable difficulty for local residents, such as having to move to safer

[8] Interview with Ishwari Shrestha, Chair of Buddhanagar Basti Bikas Samiti [Informal Settlement Committee], Butwal.

places and relatives' home for temporary residence[9].Inundation happens mainly in areas in the southernmost VDCs of the Marchawar area where river velocity is low. It was also found that inundation does not only happen from the overflow of Tinau River, but also from other small rivers which together form a wide swath of inundation in certain years[10]. For example, the areas in and around Bhairahawa *bazaar* in the Nepal-India border often get inundated in certain intervals, as the natural course of river gets obstructed by the ongoing construction of roads, buildings and other infrastructure.

It should however be noted that a certain level of water flow in the Tinau River becomes a flood in one locality and not in other places along the stretch of the river. This is explained by a number of factors. First, the river is more unruly in and around Butwal as the gradient is high, whereas in gentle slopes downwards the river flows with less speed—changing the character of damage. Second, the river is joined by other tributaries – especially on the Dano part—as it moves south, causing an increase in water flow in the river as the river goes south. Accordingly, some VDCs or villages in Marchawar are likely to experience flood effects even when there is no news of flooding from Butwal area. Third, the vulnerability of people to the floods is diverse across the stretch of the river. There are dense settlements in close vicinity of the river in and around Butwal, while settlements are not too close in Marchawar villages. In Marchawar whole settlements and the expanse of agriculture land may get submerged. More attention is accorded in the media to events near the Butwal bazaar, and less to areas in further south.

From Butwal municipality, the river's two branches—Tinau and Dano—pass through several VDCs to reach Pakadi Sakron where the two meet again. In the Tinau portion alone, there are 11 VDCs[11] to the south until Bethari (the point where Tinau reaches Bhairahawa-Lumbini road) in Gonaha VDC. One respondent said that the flood of 1970 damaged all these VDCs in addition to the areas in Butwal municipality[12]. South of that, the flood seems to have spread more widely due to the gentle gradient of southern Terai. This type of flood effect is experienced more regularly in southern Marchawar area than less frequent big floods in northern Rupandehi. The

[9] This is common in some locations in Marchawar area.

[10] Interview with Red Cross Officials, Bhairahawa, June 2013.

[11] Some of these VDCs have been recently reorganized into Butwal and a new Tilottama municipality. However the maps are not yet available.

[12] Interview with Shiva Pathak, Jan 2015.

experiences discussed below elaborate the differential experiences and vulnerabilities in the north and south of Rupandehi.

Table 1: Flooding in Tinau and its effect in Butwal and Marchawar areas

Year	Description
2011	Swept away 17 houses in *Sukumbasi* settlement in the eastern bank of Tinau (Gurans Tole), Butwal
2008	Swept away a dozen houses on the river bank, affected 200 households in Butwal
2006	Inundation in Marchawar
2001	Inundation in Marchawar- paddy crops in six VDCs destroyed
1996	Landslide in Jyotinagar; some 40 households were relocated to Tamnagar; Widespread inundation in Marchawar, Bhairahawa
1981	Dano river formed (BS 2038 Asoj 13); took 70 lives, Swept away 100 houses, irrigation intakes, agriculture land; considerably damaged Tinau Hydropower project
1979	New East-West highway bridge in Butwal completely damaged
1970	Over 100 people dead, mainly in Daure tole of Butwal bazaar

(Source: Field interviews 2013-14; Shah 2009: 2; KC 2014; Poudel 2012)

The experience of the floods, as recounted by some local people we interviewed in the course of field visits, reveal some horrors as well as the local myths and traditions around floods. The accounts also reveal some of the strategies that people have traditionally adopted to deal with the problem. Similarly, they reveal what the government and local social organizations did after the floods. A group of senior-aged people with whom we discussed in Butwal *bazaar* suggested that

they count only two instances of major floods in Tinau—the first one in 1970 and another in 1981[13].

According to a local, senior women and men in the old Butwal bazaar,[14] before 1970 the neighbourhood of the old Butwal *bazaar* housed mainly *Newar* and *Madhesi* business people. The first major flood that they recounted, that of 1970, started at 3 am in the month of August. The flood damaged a whole settlement of *Daure Tole* (neighbourhood people who sold fuel wood as their means of livelihood) and many houses in *Ganesh Tole* of the old Butwal *bazaar* were swept away, while there was water up on the road and inside the houses which are located above the river base of the river. The woman we talked to mentioned that she watched army men loading one and a half trucks of human corpses but she did not know where they were transported to. She also saw army helicopters coming in and distributing clothes and food items to people displaced by the flood. The then King Mahendra also visited Butwal after the flood. These locals suggested that the river itself had changed course—in Butwal the river shifted westwards – they heard their seniors say that the river flowed from the eastern part before the 1950s[15].The problem of flood damage seems more of a problem of constructing houses in the close vicinity of the river and an attempt at disciplining the river by the house constructions along the banks.

But major *patan* or sedimentation in the Butwal area occurred through the flood of 1981. Our discussion with local elders showed that before this flood the Tinau River bed was just slightly lower than the nearby surrounding area and any flood inundated a large area on the left and the right. With considerable sedimentation in 1981, the sides of the river became higher than in previous periods and the problem of river cutting (or *katan*) rather than *patan* (sedimentation) became a more prominent feature of flooding around Butwal.

[13] Another earlier instance of major flood was probably in 1954. There is a scanty reference in Sharad Ghimire (2014) "The flood of 1954: the beginning of a developmental state," New Angle, 3, pp.5-54, about politicians travelling to Bhairahawa in relation to relief operations about a major flood of that year. This document shows the widespread flood effects in other several areas of Nepal, but there is no mention particularly of Tinau river and Butwal bazaar.

[14] Interview with Sabita Gurung and Dharmadas Tuladhar, old Butwal bazaar, Jan 2015.

[15] As also suggested by some respondents in Marchawar, the change in river course is more frequent in southern parts of the district.

Some senior people[16] we interviewed described the experience of the 1981 flood, revealing especially how the *shivirs* (rescue camps) were organized following the flood, the government and other actors' activities after the flood, and the provisioning of land to 'flood victims' (see Box 2).

Box 2: Recount of 1981 flood by a local couple

A couple in Naharpur tole said that their family came to this land (Naharpur—which is an area with formal land title) in 1963, when this settlement was 'opened'. They heard about the settlement opening from a relative who was running a *bhatti* (a restaurant serving locally made liquor and food items). The government sent a cadastral survey team in 1970, after which the people who had money took land title certificates, and others with no money took it several years later. The land was covered with *bayer* and *khayer* trees of thorny bushes/trees. They cleaned it up and paid money for land title certificates in instalments.

In 1981, in the 13th of month of Asoj (September), there was a big flood that deposited a considerable amount of gravel in areas close to the river and inundated a larger area. The time had begun for harvesting paddy. The flood began at 9 am (but there was small flood earlier in the night), triggered by a landslide upstream of Jhumsa. The flooding went on for about four hours. Many households were washed away and many were displaced into a number of camps on both sides of the river. These camps were set up in over a half dozen places, mainly local public schools and open public places, for example Kalika School, Butwal High School, Tamnagar, Jitgadhi, Kanti School.

They left their cattle and could not gather any of their possessions to bring to the camps. They lived in Kalika School camp for a month where they used to survive with *khichri* (mixed cook having rice, lentils and vegetables together). The government provided *kambals (Blankets)* and the merchants of Butwal provided food

[16] Interview with Tek Lal Gurung and his wife, Naharpur, Jan 2015.

items such as rice, pulses, and potatoes. In food provision, one kilogram of rice was provided for each day pro rata to a family of four persons. In this flood the victims received immediate relief support from the government, Red Cross (they saw Red Cross Vehicles) and businessmen in Butwal.

After one month in Kalika School camp, the flood victims were shifted to a safer place provided by the government near Bardghat. The government provided 4 *katha* (equivalent to approximately 0.13 hectare) of land to households with four or more family members, while 10 *dhur* were provided to those with less family members. These lands were planned according to the suggestion provided by the camps and the new settlements were also emerged by the name of the camps. This new settlement also settled flood victims from other locations (Jhahare khola of Nawalparasi). They returned to their original land after a year of stay in Bardghat.

Upon return, their original land was elevated from *patan* (sedimentation) of Tinau river. They started doing '*roi karai'*—meaning desperate requests to the authorities to ask for gabion on the Tinau river and gabion wall construction began after that flood.

In southern Marchawar area the river has a gentle flow and human settlement is sparse. D*uban* (inundation) is a frequent phenomenon and occurs in some of the Marchawar VDCs, especially those lying close to the India border, Thumawa Piparahawa (east of Dano River) and Aama VDC (west) along the India border. In other VDCs in the Marchawar area, such as Gonaha, Sakraun Pakadi, Majhganwa, Maryadpur, Rohinihawa, Sipawa, Bhagawanpur[17] and Betkuiya are also identified as flood-affected VDCs by the District Disaster Relief Committee[18]. The two VDCs on the border experience more frequent inundation, while those in upstream Marchawar VDCs experience it relatively less frequently. The settlements and farmland close to the Dano are also affected by *katan* (river cutting) as Dano changes course in either direction and there are accounts of people frequently changing their homes and farms in the past. The *duban* of the

[17] This VDC has now been Lumbini Cultural Municipality Ward 2.

[18] District Disaster Relief Committee (Rupandehi), 2014. Review of Disaster Preparedness and Response 2014/15. Bhairahawa: Red Cross Society, World Vision International and USAID Suaahara.

entire area and change of the river course over a period of some decades are a source of constant fear for the locals in these areas.

Within the VDCs identified above, not all areas are equally affected by the flood in Dano. In Bhagawanpur VDC (which now is Lumbini cultural municipality Ward 2), a particular village called Bharathapur experiences most frequent *duban* as well as *katan*[19]. Another village similarly affected by the river include the village called Chakiya in the nearby Rohinihawa VDC, Ward 3. River cutting and change of river course has been reported to be most pronounced in Amarhawa village in Aama VDC, which lies west of the Dano River just north of the Indian border. Another village receiving frequent inundation and river cutting is Bharauli village in Thumawa Piparhawa VDC.

Box 3: Inundation in Bharathapur

The Bharathapur village in Lumbini Cultural municipality ward 2 is primarily an agricultural settlement comprising a few local jimidar (landlord) and mostly of occupational castes (such as Mallah—the fishermen) and Muslims. The village has approximately 75 households.

Over the past decade, the village has experienced three major floods—in 2013, 2011 and 2009[20].Of the 75 households in the village, 45 houses were partly submerged by the flood. Houses are built on slightly elevated places and floodwater reaches one foot to three feet high and roads and trails become unidentifiable. Paddy crops become almost fully submerged. While no deaths have been experienced in this village in these years, the villagers complained of loss of land due to river cutting and loss of crops due to the submergence. The villagers suggest that crop loss is generally 40 %. The *duban* makes life particularly challenging for the children and elderly people. In 2009, for example, the villagers used boat to travel to a safer location from this village to go to Rohinihawa. The water generally drains in two to three days (and sometimes in few hours).

[19] Interview with Bahadur Mallah and Gudu Mallah, in Bharathapur village, Lumbini Cultural Municipality Ward 2, Jan 2015.

[20] It should be noted that the years 2013 and 2009 were not reported as having floods by people in Butwal.

Source: based on discussion with Bahadur Mallah and Gudu Mallah, in Bharathapur village, Lumbini Cultural Municipality Ward 2, Jan 2015.

Indeed the village of Bharathapur – which now lies at the east of Dano river—was on the west of the river before the major flood of 1970. The river changed course towards the west in 1970 and the entire village moved to the east of the river[21].Many of the villagers have lost their lands to the river, which has left a considerable area of wasteland. The villagers suggest that *duban* cannot be fully controlled but it's effects can be minimized with some river control measures and managing drainage across the villages, such as by making culverts at some points in the east of the village. On the other hand, there were fears that the construction of a dam in the Indian side of the border would aggravate *duban* (inundation). For example, in 2001, there was a big inundation in Marchawar in July[22]. The inundation lasted for a week and damaged rice crops. Many houses get inundated and one resident suggested that people in the past have even used boats to navigate around the village[23]. In recent years there has been less inundation, partly because there has not been a major flood in the river and partly because the flow of water has been facilitated with the construction of bridge (see box 4).

Box 4: Embankment construction and local people's resistance

The provincial government of the Uttar Pradesh in Luckhnow initiated the embankment on the Indian side in 2002. The locals in Marchawar saw that there were people working on construction in the Indian side of border. They seemed to be constructing a road. The local people immediately south of the Indian border, however, understood that they were in fact constructing an embankment which is 10 feet high from the surface. The areas that would be inundated with the embankment included six VDCs on the Nepal side and three village council areas in India. Thus locals on the Nepalese side knew from the people across the border that India was going to make an embankment. They then started making "huge noise" and went to the government in Kathmandu. Many people came to observe this from Kathmandu and there was publicity around this construction.

The plan of Uttar Pradesh government, as described by the locals in Marchawar, was

[21] Group discussion with Amit Tiwari (school teacher), and local villagers in Bharathapur tea stall, Jan 2015.
[22] Interview with Jagannath Kurmi, April 2014.
[23] Interview with Jagannath Kurmi, June 2013.

to irrigate vast areas of land in the district of Siddharthanagar through the construction of the embankment. There was also a rumour that the purpose was to produce electricity. With negative publicity in the potentially affected areas of India and opposition from Nepalese locals and media, the original plan was dropped from design changes in the embankment. With the new changes in the design, bridges were constructed along the embankment road, allowing drainage.

Source: CCRI Field Data 2014

3.1 Effect on Irrigation, Infrastructure and Agriculture

There are a number of projects related to infrastructure which are based in Tinau River. Prominent among projects that impacts the river's environment and also is affected by it, including the level of river flow and flooding as well as extractive activities on the river comprise the irrigation system, small hydropower project, and other infrastructure such as bridges. In addition, there has been a significant surge in extractive activities – the collection of river bed materials—from 2004 which interact with other uses and entangle with the need of local governments to generate revenue amid a time of vacuum of elected representatives. These processes complicate disaster planning efforts and response measures.

The most prominent infrastructure affected by the river's flow (including flooding) is the irrigation system in Rupandehi district. Indeed, an irrigation project, constructed in financial support of India during 1962-1967 (Tinau Irrigation Project) was damaged after a year of operation (1968) due to a devastating flood. This flood had a flow of 3,500 m^3/s and damaged the head works that lie 2 km downstream of the Tinau's emergence from a gorge at Butwal (Poudel, 2012). There was no maintenance carried out on the damage, primarily because there was little pressure from beneficiary farmers as they are located a long way downstream of the headwork site and also because the Madhesi population in the southern settlements had little voice to actually influence the budget allocation from Kathmandu[24].

At present there is an intricate network of irrigation, involving above ground as well as underground systems, in Rupandehi. The most prominent of the above ground systems include *Sorha-Chhatis Mauja* irrigation system and *Char Tapaha* irrigation with head works in Butwal

[24] Interview with Jagannath Kurmi, April 2014.

and Marchawar Lift Irrigation project in the downstream in Marchawar. The *Sorha-Chhatis Mauja* (Sixteen and Thirty Six Villages) is one of the farmer-managed irrigation systems evolved over 150 years, originally devised by the indigenous Tharu communities. While originally they were meant to irrigate a total of 52 villages, they are now expanded to cover irrigation in 95 villages (Poudel, 2012). Similarly Char Tapaha irrigation system is also managed by beneficiary farmers, irrigating about 3500 ha of land. According to the local leaders,[25] the farmers are concerned about the ongoing river material collection in the Tinau River as it lowers the river bed, impacting the flow of river into the canal system. They are also worried that lowering the riverbed causes the water table in surrounding areas to decline, causing stresses on drinking water and pump irrigation. The farmer leaders also object to the way in which People's Embankment Program (PEP) works in Tinau-Danav River. They argue that the embankment work is done with substandard materials and workmanship.

Tinau River has a small hydroelectric project upstream of Butwal *bazaar*, which was constructed during 1970s. The project was owned by the Nepal Electricity Authority (NEA). It was also damaged in the 1981 flood and was repaired subsequently.

Other infrastructure along the Tinau River includes a number of bridges in Tinau and Danav rivers. Some are already constructed and some are under construction. The river crosses through the East-West Highway encompassing Butwal and the bridge was completely damaged by a flood in 1979, apparently affecting transportation and creating a huge cost to the government.

3.2 Effect on human settlements and agriculture

The flooding and inundation from Tinau River has had considerable effect on human settlements, drinking water and agriculture, eventually impacting the livelihoods of groups living around the river. The settlements in Butwal – while the *bazaar* itself is a relatively old one in its small size and extends well into distant memory—most of the crowded settlements are the products of the government's policies in the post-1950 period, including the eradication of malaria, the encouragement of hill settlers into the area, and the 'free' distribution of land in 1950s and early 1960s. The settlements first started as informal ones—either autonomously or with some leaders encouraging to do so—and gradually converted into a formal settlement, as the inhabitants

[25] Interviews with leaders of Sohra-Chhatis Mouja Irrigation Committee and Char Tapaha Irrigation committee, June 2013.

influenced the political leaders to formalize their land titles. As this process went on, more and more settlers resided closer to the river, placing themselves to risky condition in terms of flooding, house collapse and other effects.

It should, however, be noted that the effect on settlements is not homogenous through the 40-km long expanse of the river from Butwal to Nepal-India border. The river becomes more wild around Butwal *bazaar*—as it carries significant load of debris from landslides and other damages in the upstream areas—and as the debris deposition is fully exhausted some 20 kilometres downstream from Butwal, the effects on settlements tend to become milder. In recent memory, for example, the local people in Buddhanagar in the informal settlement told that they saw seventeen houses collapsed in a span of an hour in the daylight[26]. In 2008 September, as Red Cross records in Bhairahawa reveal, 20 houses were damaged and some 200 families affected in the informal settlements. The death of several individuals and damage to settlements is also shown in Table 1. In Marchawar area, in the far south of the district, inundation of houses sometimes lasted for 12 days, frequently for a week, and almost annually for a 12-hour interval. One local key informant suggested that they would sometimes have to use boats to travel around the village. In those times the villagers go to their relatives in safer areas, but at the same time risk their property from being stolen. They also get exposed to bad health and risks of bites from snakes and mosquitoes.

The flooding and inundation in Tinau also significantly affected agriculture in the nearby lands. A case in point is Buddhanagar settlement itself, which turned into a desolate land after floods in the 1970s made a considerable deposition of debris. There were over a dozen landlords in the area where Buddhanagar settlement is located at present and the land was used for raising paddy crop. These landlords, however, were businessmen in Butwal bazaar and the flood did not seriously jeopardize their livelihood. Elsewhere, such as in areas of Marchawar in the south, inundation for several days during the months of July to September can lead to significant damage to crops or entire damage of the whole crop. Paddy is cultivated in June or July and the subsequent inundation of the paddy field poses the crop at most risk. Research on rice in recent years has also focused on developing varieties to withstand inundation, but it has yet to be

[26] Group discussion in Buddhanagar, June 2013.

successfully adopted in the district[27].The above observations reveal that those living closer to the river and in the border areas experience negative impacts of flooding and inundation, while those living elsewhere face little difficulties. Those with lack of alternative sources of income and with little social support at times of stress get traumatized by the loss of crop caused by the floods and inundation in Tinau.

3.3 Differential Experiences of floods and inundation: the case of Butwal informal settlements

As shown above, the impact of flooding is not the same for people living in different locations over the stretch of Tinau-Dano River. It is not only the location of settlement and agriculture land that matters in regards to how badly they will be affected, but it is also about whether some groups have alternative sources of income and other support provisions. The people living along the banks of the river, which is usually not a 'private land' with a land ownership certificate, those who have agriculture or river-based livelihoods have different experiences than those who live nearby the town of Butwal. Those living on the river bank and with little land or income or occupying a *Sukumbasi* land have had hard time, on one hand, coping with the vagaries of Tinau River, and on the other, negotiating with the neighbouring communities, the municipality and district level agencies as well as with higher level politicians in search of safeguarding their livelihoods and securing land titles. A small case of the informal settlements in Buddhanagar by the side of Tinau river in Butwal provide insights on how some groups come to populate a disaster-prone location, their experiences of some of the recent disasters, their struggles with the government, and local police[28] . This also reveals the collective action that these affected communities organize in relation to their livelihoods and existence around the river.

The story of the experience of disasters in informal settlements is a complex stories of how some groups come to settle in the flood-prone area, how they are looked down socially by their neighbours and others in the government and civil society, and their struggles for existence amid natural hazards and social stigma of being a *Sukumbasi*. Buddhanagar is one of the early informal settlements on the banks of the Tinau River, some others being Hattisundh, Tinaunagar, Khayarghari and Pragatinagar in the area. The once rice-land of the present-day Buddhanagar

[27] Interview with District Development Officer (DADO), Rupandehi (Dec 2012).
[28] Interview with Ishwari Shrestha and DB Rasaily, June 2013

was deserted first by the 1970 flood, which deposited considerable debris on the land and was rendered unsuitable for agriculture. Some 14 households owned these lands and the owners were primarily the businessmen of Butwal *bazaar*. These businessmen were then declared '*badhi-pidit*' or flood-victims and the government provided them with compensation land in the Bardhghat area of nearby Nawalparasi district. Another flood in late 1970s again deposited debris on top of the first flood and rendered further unsuitable for agriculture. The land remained 'desert-like' with some trees and grass for a long time. Until 2001, a person who was living in a formerly informal settlement of Deepnagar[29] in Butwal led a group of families to capture the lands.

People who now comprise the residents of the informal settlement of Buddhanagar are of two kinds: those who originally 'captured' a plot of land in early 2000s and those who bought lands from people who initially occupied land plots. Buying and selling of land in Buddhanagar and other informal settlements continues even today in an informal manner; however the price of land was reported to be almost close to formal lands, even though formal land titles are not available in the former. So there is question on who are these people and how did they come here and why?

According to the leader of the settlement, who is locally respected as Ishwari *Ba* (meaning father Ishwari) by other residents, the people who live in Buddhanagar settlement came in order of their number from the districts of Gulmi, Palpa and Arghakhanchi that lie in the north and north-west of Butwal *bazaar*. The opportunities for employment and greater efficiency of agriculture itself made Terai more attractive to those living in the hills. According to Ishwari *Ba*, the abandoned land in the present-day Buddhanagar became attractive to different kinds of people, but mainly several occupational people[30]. These include rickshaw drivers, those living on crushing stones for gravel making, those who had to live on rent (*derawala*) including some who are municipality staff or other government employee, businessmen, and few labourers from Bhairahawa and Taulihawa who are drawn from amongst the *Madhesi* community. Many of them stayed in rented rooms in Butwal or elsewhere when they were working and as they got

[29] This place, Deepnagar, itself is named after a Panchayat politician Deepak Bohara who was a government minister during panchayat period and as recent as until 2009. Because of his support for the settlement and its formalization, this settlement was named after him.

[30] Interview with Ishwari Shrestha, Settlement Leader in Buddhanagar, June 2013.

emboldened by having a leader they started capturing a plot of land back in 2001. They first made quick-fix huts, and gradually developed cemented and other permanent-type houses, gradually developing settlement infrastructure, gravelled roads, school, drinking water and so forth, through a settlement committee and specific-purpose committees (for example, for water, school among others). Because the settlement was not formally recognized by the municipality and formal apparatus of the government, and indeed the police and municipality officials came to the area several times to evacuate them. Even the paramilitary, Armed Police Force, was deployed, sometimes burning some huts and scaring others. While they first came in, they made some ground rules about the distribution of land plot—it was mostly 4 dhurs (0.0067 ha[31]) size, which is just enough to construct a small building.

Box 5: How did the people come to Buddhanagar: Story of DB Rasaily

DB Rasaily, a Dalit man, left his home village in the Western district of Parbat and migrated to Butwal in 1981. He came to Butwal with his brother. He first lived in Jogikuti for the first four years (until 1985) on a rented house. Eventually, they purchased a small hut with land in Deepnagar, Butwal in 1985 (which was an informal settlement) and they lived in Deepnagar until 1990. The same year, he went to Bahrain for employment and returned to Butwal in 1995, when he also got married. (At present, the earlier Deepnagar hut converted into a *ghaderi*, which now belongs to his brother.)

Mr. Rasaily's couple then went to Chhapiya (a nearby village settlement) in 1995 and established a furniture workshop on a rented place. In the next year, the couple moved to Pharsatikar, and in 1997 they moved to Shivnagar in Butwal where they constructed a house in formally owned plot of land. However they faced some financial problems with their business and vehicle they had bought and therefore sold the land/house in 2006. After this, they purchased the land in an informal settlement of Buddhanagar and constructed the present house three years ago (in 2011) after staying in the place for five years in rent. They have a furniture workshop and also sell electric items. He said, "I came to this place because land across the river (in

[31] 1 Hectare = 590.61 dhur

Butwal) is very expensive."

While a portion of Buddhanagar at present is a flourishing *bazaar*, comprising several three storied reinforced concrete column (RCC) buildings, shops, restaurants, and with some utilities. The background of many of the residents is humble while others impoverished[32]. There are some 1329 households in Buddhanagar, and according to the settlement committee leader, some 60% of them are from Dalit community. Many of them lived off crushing stones and selling gravel as the Butwal *bazaar* was expanding[33].There were others who could not afford land in Butwal, but for occupation and other reasons required to live around the *bazaar*. There are still others who purchased land in an informal basis from those who originally occupied land plots. Accordingly the informal settlement both the poor and marginal people and relatively well-off people who sought to have their own house, even without being able to afford it in the Butwal *bazaar*. Accordingly the settlements are socially and culturally complex, as it draws the residents from different districts, caste and ethnic backgrounds, and from different occupational groups, with differential access to political power and voice.

Settlement in new areas still continues to this day. In our discussions, it was also suggested that most of the original occupants of the land plots have already sold off their land to others, who have now built more modern buildings in the area. However, in more recent settlements, the police have successfully evacuated the areas. In some areas, one can see small "houses" constructed as a marker of land occupation, but no one is living there. In this case, the occupants pay someone to "guard" the houses, so that the tenancy of the occupant is socially acknowledged, and that person would eventually receive land certificates which have not been an easy task. Some people, though have managed to negotiate with previous landlords to secure land certificates by paying some money, without letting know the settlement committee, which is opposed to making such deals with original owners of the land. Thus some households – an unknown number of them amongst some 1300 households in Buddhanagar—have land ownership certificates while others do not. They are however still expecting that some land

[32] Interview with Ishwari Shrestha, June 2013.

[33] More recently though gravel is purchased from crusher mills and crushing gravel by hand no longer remains the practice.

commission, some day would provide them with formal titles—and this has indeed been the case for several settlements around Butwal and Rupandehi and Terai districts more generally.

As the informal settlement people live in this way, they are posed to the risks of flood in Tinau every summer—from July to September. While the work of People's Embankment Program in the Tinau has constructed several structures over the past five years, they feel that the work is sub-standard material and workmanship, and some damage has already happened on those structures. They reported in our group discussion that the families get scared when summer clouds gather in the sky and travel northwards to Palpa – as the river may go wild with cloudbursts in Palpa, even without having a rain around Butwal. In our discussion, the young boys from Buddhanagar suggested that they themselves saw 17 houses collapse in the daylight during the 2011 flood, just across Tinau River in a neighbourhood called "Gurans Tole." It was also reported in the media – in the following year— for other settlements near Buddhanagar that "the landless squatters living in the settlements complained that they could not even sleep during the night fearing of possible inundation as the water level in the river was on the rise with the rainfall" ("Flood risk threatens 2,500 families along Tinau river," 2012).

As reported to us in the interviews and group discussion, the people of Buddhanagar have devised their own way to monitor whether there will be a damaging flood in Tinau. They assign a group of young men with the duty of keeping a vigilance of the river through the night during the rainy season. The idea is, if the river starts reaching to a dangerous level of flow, these youths would make a noise to wake everyone up and to prepare for evacuation, along with their property and children.

The local residents suggested that they have also received disaster training from Red Cross Rupandehi—and some gears to use it during disaster event. But those gears would not be of much helpful to deal with the flood in Tinau, because the flood poses more life-threatening risks that can be dealt with by wearing the gears. They have also established a local disaster relief committee in the settlement, but it functions as a cooperative, rather than as providing support to those whoever is affected by flood. While the idea is to support those affected by flood the committee collects funds from its members (which does not include all people)—and apparently its support, if any, will be limited to those who have participated in the scheme. As mentioned earlier, there is however cases of support in the form of emergency rescue and evacuation and

support on some food and non-food items, during flood events. But these measures hardly do anything with recovery of the affected families— nor with mitigation as even the engineering structures in the river are seen as fully trustworthy.

More than the above, the major preoccupation of the residents of Buddhanagar is with gaining recognition, dignity and formalization of their land titles. They feel to have been harassed by the authorities, stigmatized by the society in the neighbourhood, and not properly recognized by others. A *Sukumbasi* person is looked down by others, because they don't have the formal title to the land and is seen as being in the constant risk of being chased away. The settlement leader, Ishwari Shrestha, hopes that they would eventually receive the land title, because many previous informal settlements in and around Butwal have been formalized at some periods of over the past fifty years. The trick, they see, lies in having relationships with officials in the district as well as with high-ranking politicians, who can appease them as voters by providing land certificates. They try different ways to offset risks from the police action and remain in good terms and contact with senior politicians.

In the early years of people coming to occupy the present-day Buddhanagar, they deliberated on the name of the place, so that the name itself could evoke some respect and reverence from powerful groups. There was significant favour to name the settlement as "Gyanendranagar" –or, town of Gyanendra—to evoke a reference to the reigning King of the time. Others, however, suggested that as Maoist insurgency was gaining momentum and the then King was increasingly unpopular, the alternative name would be Buddhanagar—named after Lord Buddha—which would evoke some reverence amongst whoever would challenge their settlement. That however did not stop authorities to take action: there were many police actions in the settlement. The police would visit there to suggest evacuating the place, and the next time they would come with the gun to burn down the new huts. But the locals immediately prepared new huts and continued their occupation of the land. Sometimes, the people from neighbouring settlements (which have formal land titles) would come into the *Sukumbasi* settlement to harass them, primarily because the new settlements damaged their grazing land. Sometimes they scolded the *Sukumbasi* people—as they are seen by others as 'second class' citizen.

On the other hand, they lobbied with the officials of the municipality not to take any action on the settlement. This was made easier as some municipality staff also have their plots in the

settlement. Some *Sukumbasi* leaders maintain contacts and remain in communication with locally powerful and some nationally known politicians of different parties—so that they could leverage their relationships in case of difficulties. NGO officials, Red Cross officials and some government officials suggested that the *Sukumbasis* are 'protected' by the politicians and they could not be 'touched' out of the land. For them, these *Sukumbasis* are hukumbasis (or 'fake landless') who have been seen as residing in the land for greed of land. As the discussion above suggests, the people came here with different incomes and endowments and with different motivations—and the attitude to see them as greedy and illegitimate has shaped opinions against initiating some genuine initiative for supporting those living under greater flood risks in Tinau.

4 Drivers of Flooding

As the discussions above points out that the risks of flood in Tinau cannot be explained in terms of a plain cause-effect relationship for a particular disaster spot. The river itself is about 95-km long within Nepal and passes through two districts—across which interventions on the river are not coordinated. Equally important is the fact that the effects of flood varies across the stretch of the river—what counts as 'floods' in southern VDCs does not constitute as such in northern areas in Rupandehi. The ongoing in-migration to Rupandehi from hill districts and urban sprawl around Butwal and Bhairahawa *bazaar* interact with competing uses of the river for the purposes of irrigation, drinking, and with the growth of industries and business that depend on extractive activities on the river. Thus, there are complex reasons/drivers causing disaster in Tinau River—encompassing specific physical context of the river, the basin and their hydrology on one hand, and larger political-economic drivers related to the rapid urbanizing and developing region, with competing uses of water in the Rupandehi plains.

On the other hand, the existence of disasters and their impacts are also due to limited capacity of the government and other organizations to undertake effective activities on disaster mitigation, response and recovery. At the societal level, we find the competing uses of the river as one of the responsible factors that hinder a collective social will to combat disasters in Tinau. The factors, for example, entangle with demands for sand and gravel for expanding urban areas and rapid development in the district – which fits with the interest of crusher mill owners, cement factory as well the DDC for generating revenue and for potential kickbacks and local VDCs and

municipality. For several years since 2004, the demand for these materials also came from rapid development in India—with which interests and livelihoods of local crusher mills owners, transport entrepreneurs and growing number of workers are linked.

Accordingly the causes for disasters are multiple and interconnected—and the biophysical causes are further exacerbated by competition between stakeholders. We start with 'physical' determinants first and then move to two of the factors -- the informal settlement and riverbed extraction—that are frequently referred to by many interviewees to be two serious problems in the river.

4.1 Development and urbanization

Another driver to cause flooding concerns with haphazard development and construction around Tinau River (e.g., see Gyawali and Dixit 1999). Rivers have their own rhythm of highs and lows for water flow, and when they get significantly obstructed by development of building, road, infrastructure, they are bound to cause inundation and damages as the river flow goes high. According to an engineer with People´s Embankment Program (PEP), Butwal, "the Tinau River needs a breadth of 237 meters to flow freely without affecting the people living on its banks. But due to rampant encroachment, the river at some places is merely 50 to 70 meters wide"(KC, 2014). The construction of buildings very close to the river—either as informal settlement or as formal settlements—pose these households at risk, as the river's 'natural' flow gets obstructed. The high engineering solution being adopted by PEP, in the same manner, tends to limit the flow of river into a pre-determined course. But once weak spots are found—as already indicated by low quality of construction and damage in some areas—the damages are likely to be high. Similarly the construction of dams across Danav River immediately south of Nepal-India border has been seen as a threat for inundation by the residents in India and Nepal[34]. The effects of construction on inundation are also visible outside the Tinau River. In Bhairahawa, for example, the respondents at Red Cross suggested that the Bazaar itself gets inundated because the construction of houses obstructs the over ground and underground flow of water, and due to lack of drainage, the areas get inundated for several days in some years.

[34] This has been discussed elsewhere in this report—showing how the locals in Nepal allied with affected households in India to effect the change in the design of that embankment.

The rapid urbanization around Butwal *bazaar* and on the stretch of the road from Butwal to Bhairahawa also increase pressure on the exploitation of natural resources, including the use of water and the extraction of river bed materials. Local farmer leaders perceive that the increase in population around Butwal will consume more and more water at the expense of irrigation water for downstream areas[35].The construction of houses also increase demands for sand, gravel and cement which put pressure on excavation from Tinau as well as for cement on the extraction of rocks in the Tinau watershed in Palpa district[36].Indeed the ongoing expansion of Bhairahawa-Butwal portion of Siddhartha highway, the expansion of Bhairahawa airport to the standard of regional international airport has already increased the demand on gravel and sand—and a part of supply of these materials is met by imports from nearby districts (especially Nawalparasi in the east).

4.2 Extraction of river materials

The extraction of river materials—along with considerable growth of informal settlements along Tinau River—comprises one of the two major drivers that cause "problems" in Tinau River, including for increasing the risk for disasters and for the vitality and environmental health of the river. The Tinau River brings with it a considerable amount of gravel, stone and other debris every rainy season. Over a decade, there has been a considerable growth in the collection of river bed materials for one or the other purpose. Nepal's Local Self Governance Act (LSGA) of 1998 allows the local government—District Development Committee (DDC)—with the right to manage and sell the river materials and to raise revenue out of this. Rupandehi DDC has long used this as one of the principal revenue sources. But at the same time the collection of river bed materials has alarmed farmers, the residents living near the river as well as the environmentalists. It has nurtured resentment and led to court proceedings by those who opposed it. The concerns are as politico-economic and law-enforcement related, as they are with the river's environment and disaster risks.

The collection of river bed material started on a significantly organized scale since 2004, though some crusher plants emerged since1995[37].The gravel, and stones collected from the rivers are

[35] Interview with Yagya Gaire, chair of 16-36 Mauja Irrigation system, Jan 2015.
[36] Interview with Shiv Pathak, chairman, Rupandehi chapter of Nepal Crusher Industries Association, Jan 2015.
[37] Interview with Shiv Pathak, Jan 2015.

processed at the crusher plants dotting the district around the river and are eventually supplied to construction areas within the district and to India. It is also used in cement factories. The emergence of crusher mills have changed the previous practice in which individuals—many of them became residents of informal settlements—used to hand-crush the stones and sell for the construction of houses and other structures. As the crusher industry emerged and became systematic, the revenue from river bed materials for the local government was 154 million Nepalese rupees (NRs) in fiscal year 2004/05, and it increased to 189 million in 2006/07 and 354 million in 2009/10(Dahal et al., 2012, p. 50).

Our interviews with the Red Cross officials, NGOs, and government officials, and local irrigation leaders suggest that the collection of river bed materials in recent years have caused significant environmental degradation of the river—especially by lowering the river bed, increasing the height of river bank (increasing the risk of side cutting), and lowering water table, and impacting aquatic life. The debris is carried out to the river from the catchment in the hills, whereas the deposition occurs up to 20 km south (of total 45 km) from south of Butwal (Dahal et al., 2012). Thus the collection of river bed material occurs within this 20-km stretch of the river. Yearly deposition of river bed material has been estimated to be 1.37 million m^3, and as of 2009, the quantity of reserve river bed material is estimated to be 19.9 million m^3(Poudel, 2012). The quantity of the annual collection of the river bed material was 0.74 million m^3 in 2004/05, which increased to 16.7 million m^3 in 2008/09. While this was officially banned through the Supreme Court ruling based on pending the recommendations of environmental impact assessment (EIA). A subsequent EIA and the agreement between DDC, mill owners and other stakeholders agreed to allow the collection for the use within the district. The local respondents suggest that cement factory, crusher mills are still operating on full capacity and the collection is ongoing in an illicit manner. It has now given way to informal procedure, which benefits several actors in the value chain.

More than the effect of river bed materials in increasing disaster risks, environmental degradation of the river and promoting an illicit economy and kickbacks in an informal regime, it has also created an ambience of resentment around corruption, and lack of law enforcement amongst several groups. Irrigation users and water users, in particular, resent that rampant corruption prevails around river bed material collection and impact the availability of water for

irrigation canals, underground sources and drinking water. This situation seems to have been rendered feasible with tacit consensus between government agencies, the police, powerful politicians and local vested interests. The continuous collection of river bed material thus comprises an evasion of institutions and blocks collective action towards any serious initiative for the betterment of Tinau environment.

However for entrepreneurs, the crusher industries served as an important source of livelihoods for many people, provided funding for development in the VDCs and also raised revenue for the DDC[38]. The river bed of Tinau was gradually elevated after the flooding of 1971 and by 1995 the river bed was almost at the level of neighbouring areas of inhabitation. The mechanised extraction and crushing of the river bed material attracted a huge investment—around five to six billion rupees. Shiva Pathak, chair of Rupandehi chapter of Nepal Crusher Industries association, told that 70% of the investment was loan from financial institutions while 30% was invested by the respective entrepreneurs themselves. These plants employed as high as 7000 workers in a total 48 crusher plants (see Table 2) and in related functions of transportation etc. In the beginning, the investment was triggered by huge demand for road and other construction in India, and with peace prevailing in Nepal after 2006 domestic demand also increased.

Table 2: Crusher plants in Rupandehi

VDC/Municipality	**Location relative to Tinau**	**Number of crusher plants**
1. Anandaban	East	11
2. Shankarnagar	East	8
3. Motipur	West	4
4. Butwal Municipality, Tamnagar	West	1
5. Paschim Amuwa	West	8

[38] Interview with Shiv Pathak, chair of Rupandehi chapter of Nepal Crusher Industries association.

6. Tikuligadh	East	12
7. Hati Bangai	East	4
TOTAL		48

Source: interview with Shiv Pathak, Jan 2015.

There are altogether 11 *Tatiya* (riverside) VDCs that directly benefitted from revenues from the crusher plants (down from Butwal to Gonaha VDC). According to Mr. Pathak, the paved roads in most of these VDCs were financed through revenue from river bed materials. He resents that the environmental concerns raised on river-bed material extraction has been exaggerated and were sponsored by international non-governmental organizations. Mr. Pathak further added that the Supreme Court ruling of 2010 has damaged the local industry and has created a situation to import the products from other districts. The industry association is currently into an agitation mode, lobbying with the government. Pathak told that the government is engaged in contradictory policy approaches—while on one hand a ministry (Industry Department) is issuing licenses for new industries, in its bid to make investment friendly environment, it has failed to spell out and enforce standards of river bed material extraction.

The core problem on river bed extraction – in light of above discussion—is the lack of transparent and technically sound process of developing standards for resource extraction, licensing for collection and the development and enforcement of environmental and governance safeguards and compliances.

4.3 Informal settlements

Another closely related problem on Tinau River—as reported by almost everyone outside the settlements—is the continuous rise of the informal settlers along the river. There has been rapid increase of informal settlement along its banks in parts of the Butwal municipality. There are at present about 4000 families living as *Sukumbasi* having constructed their houses along the banks of Tinau River and Danav River, and in areas between them. These settlements comprise an overwhelmingly hill-origin (*pahade*) population from neighbouring districts of Palpa, Gulmi and Arghakhanchi with a significant (over 50%) population of Dalits. In Buddhanagar, which is one of major informal settlements, there are a total of 1329 households. The existence of these

settlements means different things to different groups—and rather than being too direct driver for any disaster—the informal settlers represent an illegality and aberration and a source of resentment for the farmers and others.

First, the informal settlements are seen as a burden to disaster work, posing disaster risks for the families themselves. The Red Cross officials[39] told us that they suggested the settlers to go away, because the latter got exposed to disaster risk for themselves. The informal settlements pose as a burden to disaster work for the district agencies and NGOs.

Second, the people as well as officials see the informal settlements as fake and greedy ones interested to capture a valuable piece of land close to a big city. According to a NGO official in Butwal, the people who come to settle there are both real and fake 'landless' people. Many of them are real *Sukumbasis* and settle here because they have no other place to live in. The second category is those that have lands elsewhere but live here for claiming ownership of land and make money. Still, those who live here tend to have a complex living history of their own and at least some of them struggle to make a living – rather than seeing this as a 'plunder' of land.

Third, the informal settlements are also seen as having collaboration with crusher mills, leveraging political support to the crusher industry and promoting illegal collection and supply of the river materials.

Fourth, our interviews also indicated that the informal settlements leverage considerable political power, rather than by those living in the formal settlements. Politicians are frequently accused of 'appeasing' them to buy votes[40]. This should be seen as an attempt and strategy by these settlers to engage in an exchange with powerful groups to legitimize their claims to land and other services on one hand and by the politicians to achieve popular mandate for their office tenure on the other. The process of seeking authorization for property claims also works to authorize the authorizers and, at the same time, institutions underpinning various claims of access—hence catering for particular constituencies—undermine rival claims to the same resources (Sikor & Lund, 2009). These households are seen as a vote bank of one or the other political party and become important during election times and after. For example, in the run-up to the election of

[39] Interview with Tuladhar and team at Red Cross office, June 2013.

[40] Interview with Ishwari Shrestha, settlement leader in Buddhanagar, June 2013; with Yagya Gaire, irrigation leader, June 2013.

Constituent Assembly (CA) election in November 2013, the then Prime Minister Baburam Bhattarai stayed a night in one of the households in the informal settlement. As informal settlement, they are not required to pay tax and fees, but they tend to have greater political leverage and command a valuable land, which is envied and resented by officials and others alike.

Thus, more than obstructing the flow of river by the construction of houses along the river bank the existence of informal settlement is a simultaneously a law enforcement problem for officials and a source of resentment for others. These informal settlers are resented by local people (the residents of Butwal as well as farmers in the neighbouring VDCs) and despised by government agencies, municipality, NGOs. They are also seen to be one of the causes of environmental problems in the river. As with the case of river bed material collection, informal settlements tend to be seen as an obstacle for concerted societal response to the Tinau problem by entrenching a sense of informality, lax law enforcement and reign of power and illicit interests in the eyes of 'ordinary' farmers and officials.

5 Response Activities: Institutional Arrangements and Contradictions

As the discussion above demonstrates, the Tinau represents a complicated river, involving a medium sized river, crossing through the Mahabharata and Churia hills and having different impacts on multiple constituencies in the downstream in Rupandehi. Here we try to briefly outline the institutional response to flooding problems in the river and point out some deficiency and contradictions. Response here is meant to include mitigation activities, immediate response involving rescue and support, and recovery and rehabilitation.

Government interventions to respond to floods and other watershed related problems associated with the Tinau started in the 1980s with the implementation of Tinau Watershed Project. However, multiple actors have been active in regards with the floods in recent times. We divide the arguments into the past interventions and recent institutional arrangements in connection with the response activities.

5.1 Past Interventions

The Tinau flooding occurs in the plain areas downstream from Butwal but the ongoing disaster planning in Rupandehi has little to do with how the watershed is managed in the upstream in Palpa district. It is partly because development activities are planned and implemented at the district level while the Tinau watershed covers two districts-- Palpa in upstream Siwalik hill and Rupandehi in the downstream Terai plain. For instance, the District Forestry Sector Plan of Rupandehi targets to manage the part of the Tinau river watershed which is located only in Rupandehi district excluding Palpa district (DFCCR, 2009). With huge publicity on Himalayan Degradation Theory around mid-1970s, there were efforts from several donor agencies to initiate integrated conservation and development projects in various watersheds/regions of Nepal. The one which worked in Tinau watershed was Tinau Watershed Project that started preparation in mid-1970s and lasted until late 1980s. This project, although named as a 'watershed' project also excluded the part of the Tinau watershed in the downstream Rupandehi. Here we make a brief review of this work, from document sources, and suggest that the discourses of government and development authorities and the management activities on disasters since 1970s misses the holistic approach to watershed , which affects water related disasters in the Tinau.

The project was conceived through international conferences (December 1974 in Munich and September-October 1975 in Kathmandu) organized “in view of the often very critical economic and ecological situation in the mountain areas of developing countries” that discussed the worsening of the ecological situation in the Himalayas ("Tinau Watershed Management Plan, Vol.1, Main Text," 1980, p. 3). The governments of the Federal Republic of Germany and Switzerland showed great interest to support any venture designed to address the problems of ecology in the Himalayas on a sufficiently broad front and in a very practical way. The government of Nepal also recognized the deteriorating ecological situation in the hills of Nepal and invited the interested parties to select the project area in the hills (ibid). Then Himalayan Ecosystem Research Mission, comprising a group of experts from Germany and Switzerland came to Nepal in 1976 to identify a suitable region for an integrated pilot research and demonstration project and the Mission recommended the Catchment of Tinau River in Palpa district for further consideration as a pilot project area (ibid).

Based on these arrangements, the preparatory phase of the Tinau watershed project started in December 1978. During the first phase of 18 months, a strategy for the integrated rehabilitation and development of the project area was elaborated as the "Tinau Watershed Management Project". A general project duration of 10 to 20 years was proposed and Tinau Watershed Management Plan was drawn up in 1980 ("General Workplan 1983-1988: Tinau Watershed Project HMG/SATA Second Implementation Phase.," 1983).

In terms of project administration, the lead organization for the project was Nepal's Department of Soil Conservation and Watershed Management (DSCWM) under the Ministry of Forest and Soil Conservation (MoFSC). The project also formed a National Conservation Commission (NCC) chaired by the Minister of Forest and included the secretaries of the various concerned departments to provide policy guidance and national level coordination between the different agencies involved. The project management, however, was entrusted to German and Swiss entities. The Swiss and German governments contracted Helvetas and the GTZ respectively for the implementation of the project, and Swiss Association for Technical Assistance (SATA) Nepal was assigned to coordinate the work of the two implementing agencies ("Tinau Watershed Management Plan, Vol.1, Main Text," 1980).

The objectives of the TWP were "to devise, test, implement, extend and evaluate strategy to slow down, halt and if possible to reverse the economic and ecological decline in the Tinau watershed and to develop the experience, skills and expertise required to deal with the problems of economic and ecological degradation of the hills of Nepal on a broader basis." The project objectives were claimed to have been harmonized with the basic principles of the Sixth Plan of Nepal (1980-1985) as follows:

a. the conservation, development and efficient utilization of the area's natural resources;
b. the fulfilment of minimum basic needs of the population
c. the elimination of existing socioeconomic disparities and exploitation
d. Gradual elimination of absolute poverty.

The project office of TWP in Tansen, the district headquarter of Palpa, itself was divided into four sections: agriculture (including horticulture), livestock (including fodder development), forest, and soil and water conservation and utilization. The activities concerned with soil and

water conservation were in three folds: a) erosion control including trails and gullies and on landslides, b) gabion check dam construction, and c) low cost river control measures ("Tinau Watershed Management Plan, Vol.1, Main Text," 1980). The TWP went on for two phases until 1988. But by the end of the second phase, several of the planned activities on soil and water conservation and engineering were dropped. For example, river training, spur construction, and community torrent control were already phased out in 1984/85, because they were deemed ambitious (Bajracharya and Wagley, 1988). It was also reported with a list of several activities conducted in small scale, including a) check dams (gabion check dam, dry stone check dam, bamboo check dam), bio-engineering (jute net trials, cutting plantation, bamboo trials, trail on pioneer plants), soil stabilization, conservation work along local roads, trail improvement, and conservation work in sloping field. These activities however were not reported as successful activities during the evaluation (Bajracharya and Wagley, 1988).

An indication of this was already evident to the project's adviser in 1984. He suggested, in relation to the first phase of TWP, that "one has also to state that some of [the TWP's] outlines were too ambitious, other ideas simply not practicable" (Niederer, 1984, p. 1). He continues, "The quality of the field work sank to a level which was frustrating for all involved parties and consequently would have had a bad impact on the objectives of the TWP […] (Niederer, 1984, p. 2). The advisor realized that the society of Madi plain and the social system was itself a main problem, as it was characterized by (Niederer, 1984, p. 8):

- a low degree of self- and the group organization capability
- rivalries and greediness
- an inhomogeneous composition of ethnic groups with deep cracks and even hostility between the working class and the talking class (Brahmins)
- comparatively high living standard not forcing people to work and struggle together
- fast-changing creation of groups according to selfish interests

He concluded that "I personally think that any activity requiring solidarity and group or community-oriented decisions and actions are condemned to fail at present due to the above described social environment" (Niederer, 1984, p. 8). With the end of the project in late 1980s, it is the DSCWM which had more matching mandates to the projects. But district offices of this

department – as will be discussed later –have significant limitations to undertake all necessary activities to effectively address disasters on a watershed scale since they are not mandated to work collectively over the whole watershed, but rather confined within the boundary of their district.

The TWM Project phased out in the late 1980s. However, the concept of upstream-downstream plays a crucial role in watershed management particularly in the case of rivers, such as the Tinau, flowing from the hills to the plains in the present context. Churia Area Programme Strategy of 2008, which conceptualizes the management of the watershed in a holistic approach, recognizes the management of both upstream and downstream over the watershed. However, the organizational set up of watershed management authorities remaining the same. The strategy has not been effective enough to address the issue of watershed and disaster management in the Tinau.

5.2 Recent responses to floods in the Tinau

The response to disasters – preparedness and mitigation, immediate response and relief, and recovery and rehabilitation—are primarily guided by the National Strategy for Disaster Risk Management ("National Strategy for Disaster Risk Management in Nepal," 2008) and partly by the Environment-friendly Local Governance Framework ("Environment friendly local governance framework," 2013) and the 2013 guidelines for District Disaster Management Plan (DDMP) and Local Disaster Risk Management Plan (LDRMP), issued by the Ministry of Federal Affairs and Local Development (MOFALD). From 2008 onwards a bill on disaster management—prepared by the Ministry of Home Affairs (MOHA) -- has not yet gone through the parliament's deliberation and significant changes in the current arrangement have not yet taken place. There is further informal arrangement of District Lead Support Agency (DLSA) for disaster work, in which an International Non-Governmental Organization (INGO) or United Nations (UN) agency prescribed as DLSA is supposed to support disaster planning and implementation in a district. We consider here the institutional arrangement for responding to flooding and inundation caused by Tinau river in following aspects: a) activities from centralized entities, b) activities under local governance arrangement, c) response from NGO and donor-funded initiatives, d) community-level initiatives, including those undertaken by the affected

communities themselves and in upstream-downstream cooperation, and e) cross-border cooperation and communication between the government and communities.

Centralized entities

A number of centralised entities—that includes the government agencies whose decisions are made at the central level—are involved in and related to Tinau River, its catchment and to responding to disaster in different yet sometimes overlapping roles. A principal agency under 'centralized' category is the District Administration Office (DAO), which operates under the MOHA that is the focal ministry on disaster. The MOHA has national emergency operation centre (NEOC) and district emergency operation centre (DEOC).The other centralised entities include the Department of Water-Induced Disaster Prevention (DWIDP) its project People's Embankment Program (PEP), District Soil Conservation Office (DISCO) and the Rastrapati Chure Terai Madhesh Samrakshan Samiti, as well as the police. The police and district administration respond to emergency during crisis times and are not discussed (which will partly be covered in the next section). Our focus here is on DWIDP/PEP and DISCO.

Department of Water-Induced Disaster Prevention (DWIDP) is the main government agency which is tasked with the control and mitigation of water-induced disasters and its activity is focused mainly on major rivers. While this program is a new one, there has been almost two decades of river training and disaster prevention work by the government through donor support and on its own budget. Early work on disaster prevention through river training in Tinau started in 1994 (Fiscal year 2050/51 BS) with the creation of Disaster Prevention and Treatment Centre (DPTC). Support on disaster in Tinau came mainly through Japan government. These were primarily technical, engineering solutions designed at river training.

But since 2009, the government introduced the 'People's Embankment Program' within the DWIDP for carrying out embankment and other activities in Tinau, along with other six rivers from west to east: Mahakali, Rapti, Tinau/Dano, Narayani, eastern Rapti, Koshi, and Mechi[41].While the DWIDP is primarily responsible for "minimizing human casualties and damages of infrastructures, due to water induced disasters, by appropriate management and

[41] Interview with People's Embankment Program (PEP) staff in Butwal, June 2013).

conservation of rivers and river basins of Nepal,"[42] a part of its mandate was taken over by the PEP on a project basis. Indeed, the rivers are divided between the project and department, and once a river is assigned to a project, the department is relived of its responsibility on that river. For this, Tinau master plan ("Master Plan of Danav-Tinau River training works Rupandehi," 2009) was prepared and implemented from the Butwal office of PEP.

In December 2009, The Tinau Master Plan ("Master Plan of Danav-Tinau River training works Rupandehi," 2009) was prepared for a duration of five years, suggesting a total cost outlay of NRs 2050 million. It has planned a series of engineering solutions to the control of river floods in Tinau (and Danav), outlining specific river control activities without specifying the overall strategy and need for them. The activities in the Master Plan include the construction of structures such as embankment along the river bank, revetment, launching apron, spurs, toe wall at the river bank, bed bar at the river bed, and masonry retaining walls at the various intersections of the river. The PEP takes primarily engineering approach to controlling river flow and mainly engages the private contractors in its work on construction of the structures. It has a cut-off point of budget that separates construction to be done by the contractor or those to be entrusted to local 'user committees'. Accordingly smaller projects are undertaken by user committees, while bigger ones are constructed by the contractors.

A number of problems have been encountered in the activities of PEP. First, its engineering approach to controlling the river as primarily an engineering solution—which involves significant contracts and would be rewarding to related staff—can itself become problematic (Gyawali and Dixit, 1999). Second, the project's contractors have run away without completing the project, vitiating the completion of the awarded projects[43].Third, local people in Buddhanagar allege that the project's construction is made with sub-standard materials and is likely to last less than for expected life. Fourth, and more importantly, the initiation of the program itself—rather than conducting the river training work from DWIDP—is seen as institutional subversion, because there is less compliance to existing institutional norms and

[42] See: Department of Water Induced Disaster Prevention, 2014. http://www.dwidp.gov.np/about-dwidp-67.html.
[43] Interview with PEP engineer, June 2013.

accountability of the DWIDP and concerned ministry. For some, it is a vehicle to do things faster, but with political patronage and for easing rent-seeking.

The other centralized office which is concerned with Tinau is the District Soil Conservation Office (DISCO) and Rastrapati Chure Terai Madhesh Samrakshan Samiti. The DISCO in Rupandehi looks after soil and water conservation issues in priority watersheds in Rupandehi and Kapilbastu districts and conducts a part of Chure Conservation program. While the DISCO officials argue that their department is more experienced and have a longer track of working on activities related to climate change adaptation and controlling landslides, moisture conservation, river control, its role has not been recognized in national and districts' process on adaptation and disasters. At present, the DISCO is largely limited to supporting small projects in Churia region, such as rainwater harvesting, making spurs or conducting plantations. In this line, the DISCO has been conducting activities on moisture conservation, pond conservation and related small projects in the Marchawar area. The decision making for Chure conservation program is carried out through the District Forest Sector Coordination Committee (DFSCC), which exists independently of disaster planning framework in the district. DISCO's work is partly of mitigating disasters, but are not connected and coordinated with PEP or other disaster initiatives in the district. Furthermore, the DFSCC as such is neither properly institutionalized, nor includes DWIDP or PEP, but heavily emphasizes only forest related programmes or problems whenever it is active.

In addition, another response activity of the government has historically been the provision of compensation of land for 'flood victims'. Many of the previous informal settlements around Butwal were established with such government support. This has however been almost stopped from 1995 onwards.

Mechanisms of response under local governance arrangement

The National Strategy for Disaster Risk Management (NSDRM) ("National Strategy for Disaster Risk Management in Nepal," 2008) seeks to guide disaster planning and implementation through a coordinated and harmonized approach. The more recent guidelines from the government ("Environment friendly local governance framework," 2013) prescribes a template for disaster response work in the local governance structures. Until now, as elsewhere in Nepal, disaster

work is coordinated in the district according to Natural Calamities Act of 1982 and accordingly structures are established.

The main district based response comprises the formation of District Disaster Relief Committee (DDRC) and developing a plan and specifying responsibilities across a number of government and non-governmental agencies, and holding periodic meetings. The DDRC in Rupandehi engages a number of government and non-governmental organizations (NGOs)–within which roles are divided across eight clusters, and each cluster is led by one organization. The meetings—which are held either monthly or in an interval of a couple of months—of the DDRC is chaired by the Chief District Officer(CDO). Normally, the DDRC meetings are held in April or May—prior to the seasons prone to fire and monsoon rains. Disaster plan is updated mostly on an annual basis, identify key disaster risks, identifying activities and allocating roles are the principal activities of the DDRC meeting.

The planning efforts of recent works—after the formulation of NSDRM—have changed the ways of disaster planning and response is carried out[44]. The change in the past five years or so has been a greater emphasis from district agencies for community-based preparedness and a more decentralized approach. Further change has been on a shift from multi-door system to one-door policy, such as for allocating roles to the identification of victims and their number calculation, arranging food and non-food items, providing cash support etc. More coordination between agencies has been achieved through regular meetings in the recent years.

However, the response from the decentralized entities is limited to immediate rescue of the flood affected families and partly to some awareness raising on controlling fire. It does not reach to the watershed level to plan any mitigation actions on watershed and on the upstream areas. There is also no support available for post-disaster rehabilitation and livelihoods improvement from district agencies.

Response from NGOs and donor-funded initiatives

Donor-funded projects and NGOs also play some roles in the preparedness, response of disasters in Rupandehi. In particular, a Christian faith-based INGO called World Vision is centrally

[44] Interview with Red Cross Officials and NCDRM chairman, June 2013.

appointed as district lead support agency (DLSA) for Rupandehi district. The World Vision provided support to NGOs in Rupandehi to prepare disaster risk management plan, which is updated almost annually.

The Red Cross Society also has a much longer track record and experience of supporting disasters in the district. The Rupandehi Branch of Red Cross was established following the major flood of 1970. Its main members are drawn from amongst relatively well-off people, including business persons and industrialists and other social workers. Red Cross is involved in preparing grassroots cadres by providing training them on acting on disaster events and it possesses the capacity to garner support for food and non-food items from local businesses.

When some disaster happens, it is often the Red Cross and local NGOs who avail themselves with small support for the affected families in Rupandehi. An example of this, as made available from Rupandehi District Red Cross records,[45] suggests that in a small flood in 2008, Red Cross teams first carried out a preliminary survey of the affected households in Devinagar Hattisund area of Butwal Municipality -12 and estimated that the flood in Tinau affected some 200 to 250 households, with population approximately 500-600, and two persons reported missing. Red Cross Rupandehi and Red Cross Butwal teamed up with two other organizations—World Vision Nepal and Friends Service Council and placed the affected individuals in two places: Butwal Multiple Campus and the office building of Federation of Nepalese Chamber of Commerce and Industries (FNCCI). Red Cross officials also suggested in interviews that FNCCI often provides food items for flood affected population in the district. Red Cross reported that they would conduct a more detailed assessment of the flood effects and arrange food and non-food items for the affected families.

But again the NGOs have significant limitations on the scale of the problem Tinau poses and the political-economic complexity and vested interests involved with it. Their work is very limited in scale and primarily community-based, without any capacity to go beyond the project locations. A major limitation lies in their work on a project basis approach—once the donor withdraws funds, they cannot offer any support.

Community-level initiatives

[45] Nepal Red Cross Society Rupandehi, 2008 "Report of Preliminary Survey of Flood Victims," September 22.

Apart from the activities mentioned above, the disaster affected communities also take some initiatives to prepare for and respond to disasters in Tinau. These include activities undertaken by the affected communities themselves and in upstream-downstream cooperation, and times between the communities of Nepal and India.

One of the community initiatives related to Tinau disasters is the training and preparedness in disaster-risk locations, such as Buddhanagar. The local communities have received support from the Red Cross to store some gears and tools to work during floods. As discussed earlier, they have established a disaster committee—which though operates as a cooperative—and would provide relief and other support to those who will be affected by the flood. The vigilance of Tinau River is another work, self-initiated by the residents in Buddhanagar.

The third community response comprises an upstream-downstream mechanism of communication between Butwal and Marchawar residents. They have assigned individuals in two places and whenever a big flood appears in Butwal, the information is passed to residents in downstream by the means of telephone communication, so that the people in Marchawar would take measures for their safety

Fourth community initiative comprises an initiation of upstream users for the conservation of the source of Tinau (see box 6)

Box 6: "Locals gear up to conserve source of Tinau River"

Dobhan Forest Coordination Committee, which has been working for conservation of forestland, environment and biodiversity for a long time, has now initiated the campaign to conserve the source of the Tinau River, which is drying up rapidly. As a part of the campaign, the committee has already implemented different awareness raising activities among locals of Dobhan, Kachal, Koldanda and Masyam areas.

Dil Bahadur Gurung, secretary of the committee, said, "Implementation of conservation initiatives needs to be more effective. For this, we are seeking equal participation of people residing at downstream villages." Gurung further said that they

are sensitizing the stakeholders for their meaningful participation.

Source: ("Locals gear up to conserve source of Tinau River," 2014)

Finally, a national network of community-based disaster risk management has been established, with support from some INGOs. The chairperson of this committee comes from the Marchawar area of Rupandehi and they are engaged in advocacy and rights based approach to disaster response at a national scale. But they are still to find a political voice to be effectively heard.

Cross-border cooperation and communication between the government and communities

Because Tinau River crosses Nepal to reach Rapti River in the Uttar Pradesh state of India, cross border cooperation and communication are vital to taking effective disaster preparedness and response. At the national level, joint technical committees comprising the Ministry of Water Resources of both governments of Nepal and India are engaged in regular communication and the decisions are made public through websites. There is however no mention about Tinau river in recent technical committee meetings. There was significant media coverage about the embankment construction across Danav River in India around 2002 and several politicians visited the embankment site as well, which was one of the reasons why the design of embankment was changed.

In addition to the government and political engagements, some community level effort has also emerged. For instance, India-Nepal Friendship society established by people in India and Nepal living on the border area meet in border towns to discuss problems facing the people along Nepal-India border. One important part of this is the discussion on inundation in the border areas in Nepal and India, which are mainly caused by India's recent waves of road constructions very close to the border. Several representations from the communities from both countries helped raise the concerns on inundation from the embankment in India and comprised one of the reasons for the design change of the embankment, which reduced the risks of inundation in Marchawar.

6 Analytical issues

The narratives of the Tinau floods allude to a number of issues that have implications in the lives and livelihoods of the people dependent on the river, meso level institutional arrangements to

respond to flood disasters and the effectiveness of the institutional responses. The following are some of the analytical issues that emerge out of this case.

6.1 Absence of holistic watershed approach to mitigate flood risks

Current approaches to planning and responding to disasters related to rivers are limited in space to disaster spots and have little to do with drawing a comprehensive strategy on a watershed scale. The government started decentralization of disaster Risk Management (DRM) responsibilities but the decentralized institutions—the DDCs, municipalities and VDCs, as well as the 'community' have their own territorial limitation on one hand and have limited technical and financial capacity on the other. Current planning of responses to floods is confined at the district level, while the river stretches onto more than one district. Whenever the response is targeted at watershed level, it is fragmented to either upstream or downstream instead of the whole watershed. For example, the Tinau Watershed Project focused on only upstream area of the river, while the DISCO of Rupandehi has mandate to work only in Rupandehi district, which is the downstream of the river. Rastrapati Chure Terai Madhesh Samrakshan Samiti is limited to the Siwalik hill, which is a midstream portion of the watershed. The Tinau-Danao Master Plan is also confined to the downstream area in Rupandehi district.

6.2 Lack of clear responsibility and accountability

While several organizations—both within the government and non-governmental sectors—are involved in supporting disaster work, there is lack of clarity in terms of responsibility and accountability especially on the part of government organizations. As discussed in the earlier section, the government agencies, such as DWIDP, District Forest Office, DISCO among others do not have a coordination mechanism to support the efforts made by one another. These government agencies often lack accountability to local government such as the DDC or VDCs. These organizations have their own departmental directives and the monitoring of their activities is not part of the local governments. Furthermore, which agency is more responsible for floods is not clear in the government directives. For example, DISCO has limited capacity in terms of both financial and human resources to stabilise the soil, while DWIDP has mandates only to engineering works, such as embankments without considering what actually the local people or local government prioritize.

6.3 Disconnect between institutions

The government institutions in particular have fragmented mandates, even though the formal policy intent has been to take a coordinated and harmonized approach to preparedness, response and recovery. The DDC could be a mechanism to coordinate among various actors in flood management. However, some central government agencies have their own departmental channels and system of works, while INGOs and NGOs do not have a formal mechanism to work together with other agencies or organizations at district or watershed level. Their efforts are fragmented, and at worse, duplicated without any substantial synergistic effects.

6.4 Construction and development work

In Tinau River, the emphasis has been on devising engineering solutions on one hand, and ignoring the environmental and disaster consequences of ongoing development, such as building construction and development. The extraction of river bed materials, such as sand and boulders has had multiple effects on the local economy and ecology. On the one hand, the extraction works provide employment and livelihood supports to many people including the poor families, while on the other hand, the environmental issues have been debated nationally. The ban on collection of river bed material sparked conflicts between the central and local government, between the contractors and government authorities, between environmental NGOs and local people and many other actors and institutions. A clear mechanism therefore to address these complex issues is often lacking.

6.5 Approach to disaster support

As elsewhere in the Terai, the overriding framework for disaster support in Rupandehi is relief focused, and it is less on preparedness, mitigation and rehabilitation and restoring livelihoods. Support is very nominal for affected households and the capacity support is provided on a 'one-size-fits all' template—providing the same gear for fire risks and for big floods, for example. The efforts made by different government and non-state organizations are not coordinated, nor planned in order to synergize these efforts.

6.6 Bureaucratic fix of disaster planning

The emphasis has been on preparing paperwork as per government prescriptions—it is especially evident in district disaster planning and making of the committees. These exercises are far short of drawing up comprehensive strategy to mitigate risks, respond to the multiple scales and types

of disasters, and supporting post-disaster situation. The planning at the DDC overly focuses on infrastructure development and social welfare, let alone the planning of the central government agencies, which have their own tasks prescribed by their departments. Virtually, there is no disaster planning at the district or central level. The management of the disaster, such as the floods, is not considered a part of the 'development planning'.

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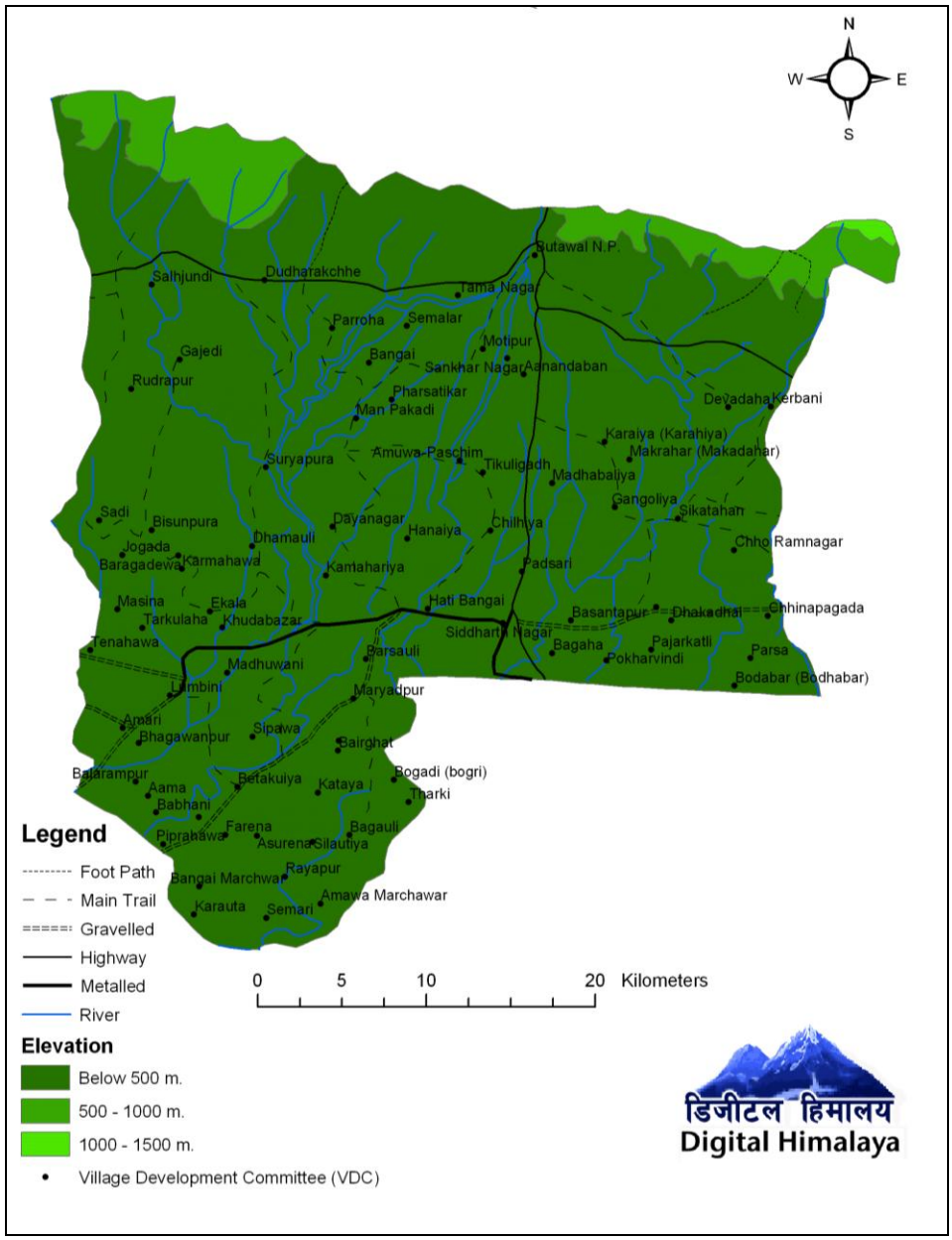
Annex 1: List of Interviews and Group Discussions Conducted for the Study

S.No.	Date	Interviewee	Affilitation
1	Jan- 2015	Mahendra Ligal	(old) Butwal
2	Jan- 2015	Sabita Gurung	old Butwal bazaar
3	Jan-2015	Dharmadas Tuladhar	old Butwal bazaar
4	Jan-2015	Tek Lal Gurung and his wife	Naharpur
5	Jan-2015	Bahadur Mallah	Bharathapur village
6	Jan-2015	Gudu Mallah	Bharathapur village
7	Jan-2015	Yagya Gaire	chair of 16-36 Mauja Irrigation system
8	Jan-2015	Shiv Pathak	chairman, Rupandehi chapter of Nepal Crusher Industries Association
9	Jul-2014	Pradip Shah	Indreni Gramin Bikash Sastha
10	Jul-2014	Mina Pandey	Rup Community Forest
11	Jul-2014	Madan Rana	World Vision
12	Apr-2014	Jagannath Kurmi	Community Disaster Management Committee
13	Apr-2014	DB Rasaily	Buddhanagar Informal Settlement
14	Apr-2014	Chandra Bahadur Pun	
15	Apr-2014	Hari Prasad Pandey	Shantinagar
16	Apr-2014	Krishna Malla	Red Cross
17	Apr-2014	DambarDhital	DWIDP, Bhairahawa
18	Apr-2014	Chairman	16-36 Mauja Irrigation System, Buddhanagar
19	Jun-2013	LaxmiThapaMagar	NGO Federation –district chapter
20	Jun-2013	Dharam Raj Ghimire	Community Disaster Manageent Committee
21	Jun-2013	Reoresentative	Creative Youth Information Center
22	Jun-2013	Mahesh Dhungana	District Soil Conservation Office
23	Jun-2013	Sumitra Ghitang	
24	Jun- 2013	Jagannath Kurmi	Community Disaster Management Committee

25	Jun-2013	Yagya Gaire	Sohra-Chhatis Mouja Irrigation Committee
26	Jun-2013	Neupane	Char Tapaha Irrigation committee
27	Jun-2013	Ishwari Shrestha	Settlement Leader in Buddhanagar
28	Jun-2013	DB Rasaily	Buddhanagar Informal Settlement
29	Jun-2013	SailendraTuladhar	Red Cross office
30	Jun-2013	Ishwari Shrestha	Buddhanagar
31	Jun-2013	Official	People's Embankment Program (PEP)
32	Jun-2013	Ishwari Shrestha	Chair of Buddhanagar Basti Bikas Samiti
33	Dec-2012	Official	District Development Office (DADO), Rupandehi
Group Discussions			
1	Jan- 2015	local farmers of Pradipnagar Mauja and Dipnagar Mauja in Karaiya	
2	Jan- 2015	Amit Tiwari (school teacher), and local villagers in Bharathapur tea stall,	

Annex 2: Rupandehi- river map



Source: http://himalaya.socanth.cam.ac.uk/collections/maps/nepalmaps/district_rupandehi_everything.gif