



Flood Risk in Sudurpaschim Province:

Call for Action





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Introduction

Flood occurs every year in Nepal. However, the nature, extent, and impact of floods are not the same in all districts. The nature and patterns of rainfall and flooding determine the impact on different areas, including settlements and communities. In recent years, due to climate change, intense rainfall over short periods is becoming more frequent, increasing the risk of floods and other disasters.

Geographically, the Sudurpaschim Province consists of mountains, hills, and plains. There are different forms of flooding, such as flash floods, inundation, and erosion. Inundation, debris deposition, and erosion are more prevalent in the Terai region, whereas erosion is the dominant issue in the hill areas. In mountainous areas, floods cause landslides, and landslides cause floods. In this province, there are many large and small rivers and streams. The main rivers are the Mahakali, Seti, and Karnali. The Mahakali River, for most of its length, is the border river between Nepal and India. About 65% of its watershed lies in India. It poses additional challenges in flood risk mapping, monitoring, mitigation, early warning, and preparedness for this river.

The rivers and streams originating in the Chure and Terai and flowing south into India include the Rangoon, Chaudhar, Sunbara, Doda, Mohana, Khutia, Sivaganga, Ghurah, Likma, Gauriganga, Kandra, Kada, Kulariya, etc. Despite the short length of these rivers, they bring floods almost every

year, causing loss of life and property in the Chure and Madhesh regions. Similarly, the Jogbudha River, whose upper catchment area is in India, sometimes creates floods and damage to life and property in Dodhara Chandani Municipality, which lies across the Mahakali River in Kanchanpur.

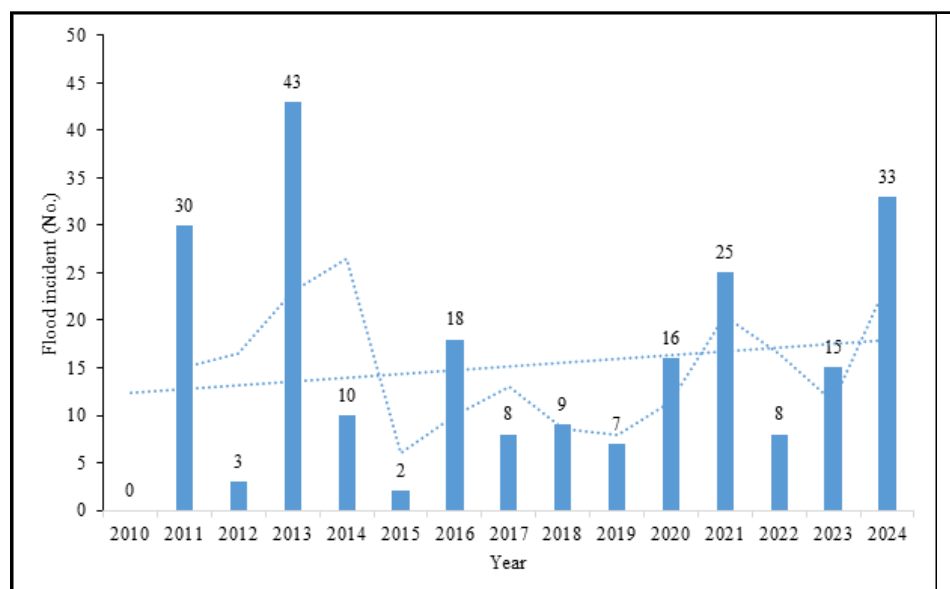
Flood risk in Sudurpaschim Province

An analysis of the major flood events in the province over the past 14 years reveals that flood events are likely to increase continuously (Figure 1).

The disaster events database in the DRR Portal of the Government of Nepal (GoN) shows that there have been continuous flood disasters from 2010 to 2024. In Figure 1, the linear and two-period moving average trend lines show fluctuations and increases in the number of floods.

The Sudurpaschim Province consists of 9 districts. Out of these, most of the areas of Kailali and Kanchanpur fall into the Terai. Baitadi, Dadheldhura, Doti, and Achham are in the hilly region, while Darchula, Bajhang, and Bajura are in the mountainous regions. When analyzing flood incidents by district, it is found that Kailali district has experienced the highest number of floods, 71 times, in the last 32 years. Similarly, 28 flood incidents occurred each in Kanchanpur and Bajura, 27 in Bajhang, 20 in Darchula, 18 in Dadheldhura, 13 in Achham, and 11 each in Baitadi and Doti.

The disaster events database in the DRR Portal of the Government of Nepal shows that there have been continuous flood disasters from 2010 to 2024.



Source: DRR Portal, Government of Nepal

Figure 1. Flood events in the Sudurpaschim Province (2011-2024)

Although the rate of increase in large-scale flood events does not appear statistically significant, qualitative analysis shows that overall flood events and disasters are increasing. Even though the loss of property and lives



caused by the floods is substantial, it seems that an accurate assessment has not been carried out institutionally. Analyzing the details published in various media outlets about the events, it is found that the socio-economic impact of the floods is increasing.

According to an analysis carried out by the Department of Hydrology and Meteorology (DHM), during the period 1971-2014, rainfall was found to be increasing in the lower regions of the Sudurpaschim Province during the winter, pre-monsoon, and monsoon periods, while it was found to be decreasing in the mountainous regions. Although it is not statistically significant, the risk of flooding is increasing in total in the province due to changes in the pattern of rainfall. Due to global warming and climate change, there is a likelihood that temperatures and droughts, as well as floods and landslides, will increase in Nepal. According to the Climate Scenario Projection report developed by the GoN for the National Adaptation Plan (NAP), the average annual rainfall in Sudurpaschim Province is projected to increase by approximately 1% between 2016 and 2045 and by 8 to 9% between 2036 and 2065 under the Representative Concentration Pathways (RCP) 4.5 scenario, relative to the baseline period of 1981–2010.

But the erratic nature of the rainfall that has already occurred suggests that the risk could be greater than projected. This year, on May 11, 2024, Darchula received heavy rainfall (55.3 mm). But May was an extremely hot and dry month, with the expected rainfall not being received in all areas. Although there was no record-breaking heavy rainfall in June, Bajura and Darchula experienced heavy rainfall once. In the month of July (7th and 8th), Dodhara in Kanchanpur received the highest rainfall ever recorded (in the past 78 years since rainfall measurements began). During that period, other parts of Kanchanpur also experienced extremely heavy rainfall. Similarly, Dadeldhura, Baitadi, and Darchula also received heavy to very heavy rainfall. In August and September, rainfall has also fluctuated more than average in various parts of the province.

On one hand, there are unexpected changes in the rainfall pattern, while on the other hand, due to the lack of consideration of the risks of landslides and floods during development, the slopes in the hilly areas are weakening and water flow in the watershed is deteriorating. Similarly, the uncontrolled and excessive removal of stones, gravel, and sand from rivers and streams has made it difficult to predict flood levels and flows. If bridges are built without leaving enough space for the river to flow, the risk of flooding increases. All these factors are increasing the risk of flooding in the province.

Most of the roads run along the riverbank. Small and large towns and cities are expanding along the riverbanks in the hilly areas, while population

density has increased in urban and rural areas of the Terai due to increased migration from the hills, and the expansion of settlements has narrowed the river's outlet. Thus, the settlements in vulnerable areas along the rivers and streams are increasing. Similarly, the risk of floods and landslides has also been created or increased due to the uncontrolled expansion of settlements. Although the embankments have reduced the risk of flooding on rivers such as the Karnali and Mahakali, in the context of climate change and recent flood events (such as those in 2021 and 2023), there is a risk that future floods will be beyond the capacity of the embankments.

Effects and impacts of flood

Flood affects almost all sectors (settlements, cities, agriculture, arable land, health and education, drinking water, electricity and communication, and other basic service infrastructures; mining and industry; hydroelectricity; forests and areas of natural ecological importance; religious and cultural importance; and tourism areas, etc.), including human and material damage. An analysis of data from the DRR portal of the GoN shows that 91 people lost their lives in the Sudurpaschim Province from 1993 to 2024. Although the number of flood incidents was lower in 2011 compared to 2013 and 2024, the highest number of deaths (17 people) occurred in 2011 (Figure 2).

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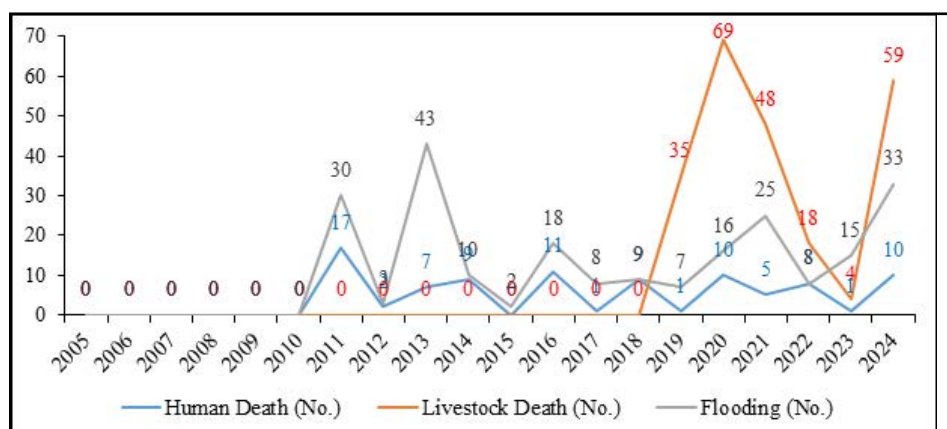


Figure 2. Annual flood events in the Sudurpaschim Province, number of people and livestock killed in the events (1993-2024)

Despite a more than two-fold increase in flood incidents in 2024 compared to 2020, the number of human fatalities hasn't changed significantly. Improved disaster preparedness and early warning systems have contributed to a decline in human fatalities relative to the frequency, intensity, and risk of floods. However, there has been extensive damage to livestock in these two years due to insufficient attention to animal safety. The DRR portal does not provide detailed information on damage



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to physical infrastructures and other properties such as food, crops, land, jewelry, forests, industries, etc.

When analyzing the flood damage district-wise in this province, Kailali district has the highest human loss (number of deaths and missing persons). Other districts with casualties include Achham, Bajhang, Bajura, Kanchanpur, Darchula, Dadheldhura, and Baitadi. The loss of livestock has been the highest in Bajura. The DRR portal records 89 livestock deaths in Bajura, 46 in Kanchanpur, 44 in Kailali, 32 in Darchula, 9 in Dadeldhura, 8 in Doti, and 5 in Bajhang.

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Policies and practices related to reducing flood risks and impacts

The Constitution of Nepal has made provisions for disaster management under the sole responsibility of the local level as well as the shared responsibility of the federal, provincial, and local levels. Similarly, the important functions of disaster management, preparedness, rescue and relief, and recovery have been placed under the shared responsibility of the federal and provincial governments. In the context of flood risk reduction and management, the provisions under Clause (6) of Article 51 of the Constitution under State Policies appear to be important. This section contains the following policies related to flood risk reduction and management.

- (4) Proper management of rivers and control of the water-induced hazards, as well as development of sustainable and reliable irrigation.
- (8) Those who pollute the environment should bear responsibility for it and adopt principles of environmentally sustainable development, such as precautionary and prior informed consent in environmental protection.
- (9) Reduce the risk of natural disasters through early warning, preparation, rescue, relief, and rehabilitation.

The GoN has implemented the National Policy on Disaster Risk Reduction, 2075, as well as the National Strategic Action Plan on Disaster Risk

Reduction (2018-2030). The Policy and Action Plan aims to significantly reduce the number of deaths, injuries, affected populations, and economic losses from disasters in Nepal, in line with the goals of the Sendai Framework for Disaster Risk Reduction (SFDRR), an international plan for disaster risk reduction. Similarly, the goal is to reduce disasters and increase resilience at various levels and sectors.

The federal Disaster Risk Reduction and Management Act, 2074 (First Amendment, 2075) has established an institutional structure at the federal, provincial, and local levels for disaster risk reduction and management and has specified their operational functions, duties, and rights.

The Sudurpaschim Province has also prepared a policy, strategic action plan, and acts, laws, and procedures related to disaster management in the province in line with federal policies, laws, and plans. All districts in this province have prepared and updated Disaster Preparedness and Response Plans (DPRPs) and monsoon preparedness plans annually. In some districts, disaster response has been conducted in coordination by establishing District Emergency Operations Centers (DEOCs). At some local levels, laws and funding arrangements, procedures, preparedness and response plans have been prepared and partially implemented. The plans have substantially incorporated issues of gender and social inclusion.

The DHM issues early warnings by forecasting adverse weather and flood risks in the province. In cases of increased risk, alerts are also sent via mobile phones. Based on the DHM's forecast as well as local monitoring of floods and rainfall, messages as early warnings are sent to the relevant communities and stakeholders through coordination between the Mahakali Basin Office, the Provincial Emergency Operations Center (PEOC), and the District Emergency Operations Centers.

The provincial government's annual plan includes programs, including the construction of embankments to reduce flood risk. The Disaster Management Committees have been formed at the provincial, district, and local levels. In some communities at risk of flooding, there is a practice of forming and mobilizing Community Disaster Management Committees (CDMCs) and task forces. Emergency funds have been established in the provinces, and disaster management funds have been established at the district and local levels to carry out response-related activities.

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Flood risk in the context of a changing climate: Required capacities and gaps



There is no clear division of responsibilities, rights, and accountability among the federal, provincial, and local governments based on the nature of the hazard, frequency and its impact in the Constitution. As a result, all three levels often get involved even in minor disaster incidents, regardless of the scale or impact. These practices have led to problems such as making disaster management more costly and time-consuming and challenges in planning and implementation. Currently, some provisions in the federal Disaster Risk Reduction and Management Act, 2074, are found to be in line with the centralized state system. Some provisions related to the functions, duties, and rights of the local level in that act are inconsistent with the provisions of the Local Government Operation Act, 2074. Even in the context of the federal and the province, it does not appear that the division of functions has been achieved in accordance with the spirit of the constitution. It seems necessary to review the federal, provincial, and local disaster management acts and laws and amend them to clarify the scope of work at each level, based on the provisions of the constitution and the experience gained to date.

Although the state's directives include disaster risk reduction, environmental protection, and sustainable development, proper attention has not been paid to disaster risk reduction while performing development, construction, and operations at all levels of government. Additionally, disaster risk and impacts are increasing due to climate change. However, the internal capacity of all three levels for disaster management has not been enhanced accordingly. International assistance for disaster management is declining. It seems necessary to reduce dependence on international organizations to formulate preparedness plans and provide relief assistance to disaster-affected people.

Floods and landslides are incidents that contribute to each other. Therefore, the issues related to both disasters need to be addressed simultaneously in policy and practice. The coordination and collaboration between the Department of Mines and Geology, Department of Water Resources and Irrigation Authority, DHM, and other relevant agencies are needed to carry out the study and mitigate the risks of landslides and floods. Level-wise coordination and collaboration are also equally important.

The resources are insufficient as the needs exceed the available resources for the implementation of disaster management-related laws and procedures, as well as policies, strategic action plans, and preparedness and response plans.

There is a lack of institutional structure and human resources at the local level for the protection of watersheds and control of water-induced disasters. Local and provincial governments need to develop human resources, tools, and capacity to assess loss and damage caused by floods, landslides, and other disasters. Although provincial and local governments allocate budgets annually for disaster risk reduction and management, they appear to be less than needed. Even though the embankments have reduced the risk of flooding in rivers, including the Karnali and Mahakali, there is a risk that floods will occur beyond the capacity of the embankments in the context of climate change, so it seems necessary to further strengthen risk reduction and preparedness.

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Recommendations

Study on disaster risk, mapping, monitoring and database

- Carry out studies and mapping, establish a database, and implement policies, laws, plans, and regulations related to flood risk in areas such as settlements, cities, agricultural land, health and education, drinking water, electricity and communication, and other basic service infrastructures; mining and industry; hydropower; forests and areas of natural ecological importance; religious and cultural importance; and tourism, etc.
- As mentioned in the Hydrology and Meteorology Policy, 2081, the DHM must monitor rainfall and floods by establishing and operating weather stations at all local levels and flood monitoring stations at appropriate locations on all rivers.
- In coordination and collaboration with the relevant federal agencies and local levels, including the NDRRMA, carry out a flood risk study and mapping in the province and maintain a record of updated data on areas at risk, physical infrastructures, productive and service sectors, community, and the vulnerable population groups.
- Make effective and comprehensive assessments of flood damage and economic impact at the local and provincial levels. Strengthen the existing data and information management system to systematically collect and record data on flood damage, impacts, and overall economic and social impacts in settlements, cities, agricultural land, health and education, drinking water, electricity and communication, and other basic service infrastructures; mining and industry; drinking water; hydropower; forests and areas of natural ecological importance; religious and cultural importance; tourism areas; etc. every year by all local levels and provincial governments.

- Develop a landslide early warning system by studying and testing landslide prediction. Carry out necessary research and testing to further improve the flood forecasting and early warning system.
- Develop local models by testing the Rainfall to Runoff Model, Flash Flood Guidance System (FFGS), etc., which can predict floods based on rainfall in each river.

Policy, regulation, planning and implementation

When formulating, constructing, and operating a development plan, make legal provisions that the government of the respective level should be responsible for mitigating and managing the disaster risks that may arise or be potential disaster risks in that plan, as well as the disaster risks that may arise due to the construction and operation of that plan.

- In accordance with the provisions of the Constitution and past work experience, provisions should be made in the act, regulation, and plans of all three levels to clarify the scope of work of the federal, provincial, and local levels. Classify floods into normal, moderate, major, and catastrophic disaster levels based on the nature, extent, and impact of the disaster, and implement directives for coordination and collaboration between the federal, provincial, and local levels accordingly.
- Classify landslides according to nature and spread of natural landslides and delineate the division of responsibility and accountability so that large landslides are controlled by the federal government, medium landslides by the province, and small landslides by the local government.
- When formulating, constructing, and operating a development plan, make legal provisions requiring the respective level of government to take responsibility for mitigating and managing the potential disaster risks in the original plan, as well as the disaster risks that may arise due to the construction and operation of that plan.
- Strengthen the weather forecasting and flood early warning systems to make them more reliable and effective. Implement Impact-Based Forecasting (IBF) at all local levels.
- Develop a model that can predict landslides based on the nature and amount of rainfall.
- Expand the practice of forming and mobilizing CDMCs and task forces in communities at risk of flooding throughout the province through the relevant local governments.

- Formulate a strong regulation to implement policy that prevents settlement expansion in flood-prone areas.

Human resources and institutional mechanisms

Include sessions and reference materials related to the mitigation of flood risk, damage, and impact in relevant thematic training of government, non-government, and private sectors at the provincial and local levels. Allocate a budget annually to provide training to employees working in the government, non-government, and private sectors.

- As mentioned in the Hydrology and Meteorology Policy, 2018, the DHM needs to arrange adequate human resources and budget in the respective field offices for flood and weather monitoring, forecasting, and early warning.
- Include sessions and reference materials related to the mitigation of flood risk, damage, and impact in relevant thematic training of government, non-government, and private sectors at the provincial and local levels. Allocate a budget annually to provide training to employees working in the government, non-government, and private sectors.
- Provide training to relevant employees, disaster management committees, and volunteers at each local level to assess the risk, damage, effects, and impacts of floods and landslides and to conduct necessary preparedness and emergency response to reduce their risk.
- Develop human resources and capacity at the provincial and local levels to communicate early warnings of heavy rain, landslides, and floods, as well as to prepare recommendations on the rules to be followed and measures to be adopted to manage flood risks in related sectors, including transportation, education, health, public and social security, agriculture and animal husbandry, tourism, industry, and others.
- Implement forecast-based disaster preparedness and emergency response plans by all local governments.
- Make programs, plans, implementation, and regulation more effective to meet the needs of children, senior citizens, and people of different age groups in disaster management at the local level.



Resources and budget

For the implementation of acts, regulations, policies and plans related to disaster management in the Sudurpaschim Province,

- Allocate an annual budget in the province and relevant local levels and agencies for preparedness and response to disasters, including floods and landslides.
- Implement flood and landslide preparedness and response plans effectively in coordination and collaboration with all stakeholders every year in vulnerable communities and at all levels.
- Plan to ensure individuals and property belonging to the high-risk groups by including floods and landslides in the existing disaster insurance program of the provincial government and make the insurance program more effective.

Please contact Mercy Corps Nepal for a detailed policy brief and references.

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