ANNEX: CLIMATE CHANGE TECHNICAL NOTE
Nepal Disaster Resilience Second DPC with Cat DDO (NDRC) (P181344)

A. Climate change vulnerability context

1. Nepal is highly vulnerable to climate change. According to the Climate Risk Index, Nepal ranks 10th in the world as a country most affected by past climate hazards.[1] The ND-GAIN Country Index also ranks the country as the 44th most vulnerable to future climate risks and 64th least ready to adapt in the world.[2] Nepal is facing challenges from both extreme and slow-onset climate-related hazards. Key risks are from flooding and landslides, torrential rainfall[3] and increasing the risk of glacial lakes bursting. Apart from these disaster events, droughts, more erratic rainfall, heatwaves, and rising average temperatures are also high and increasing slow-onset risks.[4] By the 2080s, Nepal is projected to warm by 1.2°C–4.2°C, under the highest emission scenario (RCP8.5) compared to the baseline period 1986–2005. Rises in maximum and minimum temperatures are expected to be stronger than the rise in average temperature, likely amplifying the pressure on human health, livelihoods, and ecosystems. Projected precipitation trends show a decrease in rainfall in the 2050s and an increase in rainfall in the 2090s. More precipitation is expected to be received through increased intensity and occurrence of extreme events. What would historically have been a 1 in 100-year flood, is projected to become a 1 in 50-year or 1 in 25-year event, contributing to a projected increase in the number of populations experiencing extreme floods.[5]

2. Nepal's climate vulnerability stems from an interplay of climatic factors, unique geography, weak policies and institutions, and existing development pathways that are not resilient to shocks. Nepal has a fragile mountainous topography, diverse ecosystems, and monsoon-driven hydrology. With a climate that varies considerably both seasonally and according to altitude, warming in Nepal is projected to be higher than the global average.[6] In addition to natural factors, unplanned settlements and a lack of resilient infrastructure, inadequate hydrometeorological networks, weakness in disaster response mechanisms, and an economy that has sustained several shocks in the recent past (floods in 2017, landslides, floods, and the ongoing COVID-19 pandemic in 2020) are key drivers of Nepal's climate vulnerability.

3. The impacts of climate change are profound across economic sectors in Nepal, particularly those related to natural resources and agriculture. Water and forests are Nepal's most abundant natural resources, with freshwater (derived from glaciers, snowmelt, and rainfall) accounting for an estimated 2.27 percent of the world supply. An increase in soil erosion, landslides, flash floods, and droughts has been reported in recent years across the country, with increased intensity and impact on the lives and livelihoods of natural resource-dependent communities.[7] The effects of rising mean annual temperatures are increasingly evident in the high mountains, as permafrost and glaciers have melted, dangerous glacier lakes have formed, and landslides are occurring more frequently.[8] Further, a reduction in winter snow and greater rainfall variability in Nepal is predicted[9] to adversely impact water security, hydropower potential, food production, biodiversity, and tourism resources. The frequency of droughts is likely to increase, particularly during the winter months and especially in the western Terai plains, with considerable impact on primarily (75 percent) rain-fed agriculture. With agriculture comprising around 64 percent of employment, most livelihoods are

[1] *https://germanwatch.org/sites/default/files/Global%20Climate%20Risk%20Index%202021_1.pdf*
[2] *https://gain.nd.edu/our-work/country-index/rankings/*
[3] *https://thinkhazard.org/en/report/175-nepal; https://climateknowledgeportal.worldbank.org/country/nepal*
[4] *https://thinkhazard.org/en/report/175-nepal; https://climateknowledgeportal.worldbank.org/country/nepal/vulnerability*
[5] Climate Risk Country Profile: Nepal (2021)
[6] Climate Risk Country Profile: Nepal (2021)
[7] Climate Risk Country Profile: Nepal (2021)
[8] ICIMOD (2019) Hindu Kush Himalaya Assessment Report.
[9] Asian Development Bank (2014) Assessing the costs of climate change and adaptation in South Asia.

highly exposed to climate change.[10]

4. Climate impacts also negatively affect infrastructure, service provision, and public health in urban and rural areas. Municipalities' prosperity is undermined by their vulnerability to climate hazards, which are in turn amplified by Nepal's rapid urbanization rate (6 percent per year in some cities), coupled with the absence of guidelines and technical standards for good-quality infrastructure. A recent study also shows that urban informal settlers in Nepal are particularly vulnerable to climate change due to high exposure to climate-related hazards and very low adaptive capacity. To adapt to climate change, these vulnerable groups will require support in livelihood diversification and improved infrastructure. [11] Despite a generally high national water supply, many Nepalese communities are vulnerable to water stress, particularly in rural and remote areas.[12] In addition to deaths from drowning, flooding, and drought, it is causing extensive indirect health effects, including impacts on food production, water provision, ecosystem disruption, infectious disease outbreaks, and vector distribution, both for people and animals.

5. Nepal's susceptibility to epidemic and pandemic potential diseases is multifaceted and likely to be amplified by climate change. The country's exposure to climate-related health risks, particularly with rising temperatures, is expected to put an additional 60,000 people at risk of malaria and an additional 400,000 at risk of dengue. This is in addition to an already high burden of vector-borne diseases (VBD) in the Terai and hills of Nepal. In 2022, 491 malaria cases were recorded, up from 377 in 2021, and 733 confirmed dengue cases in 2022, much higher than in 2021 (489). Emerging and re-emerging diseases, not limited to VBD, have a high potential of creating outbreaks with widespread morbidity and mortality.

6. Additionally, buildings in Nepal are prone to damage during earthquakes and climate-related disasters such as floods and landslides due to poor building construction practices, such as rubble stone masonry. Furthermore, human-induced disasters such as fire are among the hazards causing more fatalities and casualties, and local municipalities are ill-equipped to manage fire emergencies. Fire incidences are typically exacerbated by cooling needs due to hotter summers. Unregulated use of heating appliances, malfunctioning heating units, and deficient ventilation systems are among the major causes of fires leading to severe injuries and death, as evidenced by recent incidents globally.

B. Prior Actions' Contributions to climate objectives

7. The reforms financed through this operation contribute directly to Nepal's key climate change adaptation policy priorities. Submitted to UNFCCC on December 8, 2020, Nepal's second NDC underscores Nepal's priorities on climate change adaptation (e.g., climate-resilient infrastructure and improved disaster risk management, etc.) while promoting nature-based solutions and social inclusion in climate policy implementation. The NDC reaffirms that adaptation will be a constant requirement for the country. As per the National Climate Change Policy (2019), adaptation priorities and actions adopt an integrated approach to cover climate-sensitive sectors, exemplifying the inter-sectoral nature of the responses.

8. This Nepal Disaster Resilience Development Policy Credit operation implements the NDC's adaptation priorities. It consolidates the gains of the previous Cat DDO by deepening the policy and institutional reforms on climate disaster resilience. The operation strengthens its institutional mechanisms to respond to climate-related disasters in a decentralized and quicker way, improves its capacity to reduce risk to infrastructure, and expands health emergency preparedness, including the increased prevalence of climate-related diseases. The operation also aligns with the GRID programmatic and Nepal's Disaster Resilience Framework. It furthers the significant progress towards

[10] *https://data.worldbank.org/indicator/SL.AGR.EMPL.ZS?locations=NP*

[11] Giri, M., Bista, G., Singh, P. K., & Pandey, R. (2021). Climate change vulnerability assessment of urban informal settlers in Nepal, a least developed country. *Journal of Cleaner Production*, *307*, 127213. *https://doi.org/10.1016/j.jclepro.2021.127213*

[12] Climate Risk Country Profile: Nepal (2021)

developing its overarching institutional, legal, and policy framework for disaster risk management and climate adaptation. It responds to the imperative to devolve disaster management responsibilities to provincial and local levels while providing adequate financing and technical support.

Table 1: Prior Action-wise CCB Assessment

Prior Action 1: To enable the allocation and transfer of funds from the Disaster Management Fund (DMF) at the central level to provincial and local level DMFs and effective utilization, the Recipient through the Council of Ministers, has approved the Disaster Risk Reduction and Management (First Amendment) Regulation 2081 (2024), as evidenced by its publication in the Recipient's gazette (section 74 Gazette No. 13, June 17, 2024).	Strengthening climate finance management and improved disaster risk reduction and management (DRM) are key adaptation thematic priorities in Nepal's Second NDC. In the past, the lack of an institutional mechanism to facilitate timely fund allocation and transfers between levels of government hampered effective disaster risk reduction, preparedness, and responses to climate-related disasters. This policy reform will address constraints in funds flowing for decentralized DRM actions by enabling NDMF to transfer funding to province, district, and local disaster management funds for relief, response, and risk preparedness and reduction in line with the updated NMDF operational guideline. Building an agile and adaptive funding allocation and transfer system that can quickly provide support to people affected by climate risks, including excluded groups, is critical to effective climate responses at the local level.
Prior Action 2: To enhance building resilience to disasters and strengthen construction requirements, practices and compliance for emergency evacuation, disaster risk mitigation and fire safety, and to facilitate implementation monitoring, the Recipient, through the Ministry of Urban Development, has approved the amended National Building Codes NBC 206: 2024 Architectural Design Requirements and NBC 205:2024 Ready to Use Detailing Guideline for Low Rise Reinforced Concrete Buildings Without Masonry Infill, as evidenced by their publication in the Recipient's gazette (Section 74 Gazette No. 8, May 27, 2024; Section 74 Gazette No. 11, June 10, 2024).	Nepal's NDC aims to strengthen the climate resilience of urban and rural settlements as a critical climate change adaptation priority. National building codes play a crucial role in this context, mainly through improved building codes and infrastructure standards incorporating climate resilience requirements. Building on the NDC, the National Adaptation Plan (NAP), approved on 28 October 2021 by the Council of Ministers of the Government of Nepal, sets a target to update and promote climate-resilient building designs, codes, practices, and construction technologies and to implement national capacity building in this aspect. The amended National Building Codes supported by this reform strengthen several aspects of climate resilience and mitigation requirements in buildings. Technical provisions related to these NBC updates also contribute to better performance under multi-hazard risks, including floods and rainfall-induced landslides prevalent during monsoons, and provide an opportunity to explore the scaling of Compressed Stabilized Earth Brick (CSEB), which have lower greenhouse gas (GHG) emissions and better temperature regulation properties compared to traditional bricks.
Prior Action 3: To improve disaster risk preparedness and response capacity, and to facilitate public-private partnerships to expand the scope of early warning communication from single	Early warning systems are among the most effective risk reduction and climate adaptation measures to reduce disaster mortality and economic losses. Such a system is essential to the country's climate risk management framework. This reform directly supports Nepal's

to multiple hazards, the Recipient, through the Department of Hydrology and Meteorology (DHM) has entered into memorandum of understanding with the key telecom service providers, as evidenced by public notification published on DHM's website.	NDC target to establish a multi-hazard monitoring and early warning system covering all provinces by 2030. It also supports the specific goal of the National Adaptation Plan (NAP) on "Maintenance, Upgradation and Strengthening Early Warning Systems and Multi-Hazard Monitoring to Facilitate Climate Adaptive Function of Key Economic and Service Sectors."
Prior Action 4: To manage water-induced disasters and regulate the extraction of river and river-based construction materials, protect watershed and river network, and clarify the institutional mandates across three tiers of government, the Recipient, through the Council of Ministers, has approved the River and Water Induced Disaster Management Policy, as evidenced by the letter dated December 14, 2023 (Council of Ministers M./321/2969), from the Office of Prime Minister and Council of Ministers and its publication on the MOEWRI's website.	Water management and improved disaster risk reduction and management are key adaptation thematic priorities in Nepal's Second NDC. Achieving Nepal's NDC adaptation strategy in these two sectors calls for a climate-resilient holistic approach. It requires coordinated implementation of NDC commitments through federal, provincial, and local governments in collaboration with key stakeholders. Effective climate change adaptation in the water sector also needs more investments to reduce risks related to riverine and water-induced hazards. This reform directly incorporates the climate-resilient holistic approach in integrated water resource management and reducing water-induced disaster risks. The reform also promotes the adoption of a climate risk-informed approach to river basin management and infrastructure development, including through the use of multi-hazard risk assessment, exposure mapping, and early warning, and improving data sharing between relevant agencies in a coordinated way.
Prior Action 5: To enhance its preparedness and response capacities for public health emergencies, the Recipient, through the Council of Ministers, has approved a new list of notifiable prioritized diseases, syndromes, and conditions to expand the scope of monitored diseases and health risk within its disease surveillance system for early warning and emergency actions pursuant to section 49 (1) of the Public Health Service Act 2018, as evidenced by the decision approved by the Council of Ministers and its publication in the Recipient's gazette (Section 74, Gazette No.17, July 4, 2024).	Nepal's NDC sets the target that "By 2025, climate-sensitive disease surveillance systems will be strengthened through the integration of climate and weather information into existing surveillance systems." This reform enhances Nepal's capacity to build a climate-resilient disease surveillance system. Expanding the list of prioritized diseases, syndromes, and conditions under this reform considers the impacts of climate change on vector-borne, food- and water-borne, zoonotic, emerging, and reemerging climate-sensitive diseases.