पत्रोत्तरमा पत्र संख्या मिति उल्लेखित हुन अपेक्षित छ ।

नेपाल सरकार

वन तथा वातावरण मन्त्रालय

जलवायु परिवर्तन व्यवस्थापन महाशाखा

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सूचना प्रकाशन मितिः २०७९/०५/१२

विषयः राष्ट्रिय अनुकूलन योजना (NAP) को मस्यौदामा राय सुझाव उपलब्ध गराउने बारेको सार्वजनिक सूचना ।

नेपाल पक्षराष्ट्र रहेको जलवायु परिवर्तन सम्बन्धी संयुक्त राष्ट्रसङ्घीय प्रारूप महासन्धि अन्तरगत पेरिस सम्झौताको धारा ७ अनुरूप सम्झौताको लक्ष्य हासिल गर्न हरेक सदस्य राष्ट्रहरूले सम्बन्धित योजना तथा नीतिहरूको तर्जुमा वा परिमार्जन गर्दै जलवायु अनुकूलन प्रक्रियालाई आन्तरिकीकरण गर्नुपर्ने र अनुकूलन योजनाहरूको कार्यान्वयन गर्न राष्ट्रिय अनुकूलन योजना (NAP) तयार गर्नु पर्ने दायित्व पक्षराष्ट्रहरुको रहेको छ ।

यस सन्दर्भमा यस मन्त्रालयले Green Climate Fund (GCF) को आर्थिक तथा United Nations Environment Program (UNEP) को प्राविधिक सहयोगमा सङ्घ, प्रदेश तथा स्थानीय तहका विभिन्न सरोकारवालाहरूसँग छलफल तथा परामर्श गरी राष्ट्रिय अनुकूलन योजना (NAP) को Summary for Policy Makers संस्करण नेपाल सरकार, मन्त्रिपरिषदबाट मिति २०७८/०७/११ स्वीकृत भएको थियो । तत्पश्चात् विभिन्न चरणको छलफल तथा परामर्शको आधारमा उक्त राष्ट्रिय अनुकूलन योजनाको विस्तृत दस्ताबेजको मसौदा तयार भई मन्त्रालयको वेभसाट (www.mofe.gov.np) मा राखिएको अवगत गराउन चाहन्छु । उक्त मस्यौदा सम्बन्धमा सबै सरोकारवाला सङ्घ-संस्था, निकाय तथा व्यक्तिले देहायको ठेगानामा यो सूचना प्रकाशन भएको १५ दिन भित्र आफ्नो राय सुझाव लिखित रुपमा उपलब्ध गराई दिनुहुन वन तथा वातावरण मन्त्रालयको मिति २०७९/०५/०८ को सचिव स्तरीय निर्णयानुसार अनुरोध छ

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सुरेन्द्र राज पन्त
सहायक वैज्ञानिक अधिकृत

राय सुझाव उपलब्ध गराउने ठेगानाः

वन तथा वातावरण मन्त्रालय
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GOVERNMENT OF NEPAL

NATIONAL ADAPTATION PLAN (NAP) 2021–2050

GOVERNMENT OF NEPAL

NATIONAL ADAPTATION PLAN (NAP)

2021–2050

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Message

Foreword

Acknowledgement

ABBREVIATIONS

ADB	Asian Development Bank
AEPC	Alternative Energy Promotion Centre
AFS	Agriculture and Food Security
AR5	Fifth Assessment Report
AR6	Sixth Assessment Report
ARCB	Awareness Raising and Capacity Building
asl	Above Sea Level
CbA	Community-based Adaptation
CBD	Convention on Biological Diversity
CBO	Community-based Organization
CBS	Central Bureau of Statistics
CCAFS	CGIAR Research Programme on Climate Change, Agriculture and Food Security
CCMD	Climate Change Management Division
CCVRA	Climate Change Vulnerability and Risk Assessment
CEAPRED	Center for Environmental and Agricultural Policy Research, Extension and Development
CFM	Climate Finance Management
CFUG	Community Forest User Group
CIMMYT	International Maize and Wheat Improvement Center
COP	Conference of the Parties
Covid-19	Coronavirus 2019
CSO	Civil Society Organization
CWG	Crosscutting Working Group
DFRS	Department of Forest Research and Survey
DHM	Department of Hydrology and Meteorology
DNA	Designated National Authority
DRRM	Disaster Risk Reduction and Management
DWRI	Department of Water Resources and Irrigation
EbA	Ecosystem-based Adaptation
EIA	Environment Impact Assessment
EPCCMNC	Environmental Protection and Climate Change Management National Council
EU	European Union
EWS	Early Warning System
FAO	Food and Agriculture Organization of the United Nations
FBWC	Forests, Biodiversity and Watershed Conservation
FECOFUN	Federation of Community Forest User Groups Nepal
G77	Group of 77
GCAP	Global Climate Adaptation Partnership
GCF	Green Climate Fund
GDP	Gross domestic product
GEF	Global Environment Facility
GESI	Gender Equality and Social Inclusion
GESILG	Gender Equality, Social Inclusion, Livelihoods and Governance
GHG	Greenhouse gas
GLOF	Glacial lake outburst flood
GMST	Global mean surface temperature
GoN	Government of Nepal
GRID	Green, Resilient and Inclusive Development
H-NAP	Health National Adaptation Plan
HDI	Human Development Index
HDWS	Health, Drinking Water and Sanitation
HKH	Hindu Kush Himalaya
ICIMOD	International Centre for Integrated Mountain Development
ICT	Information and communications technology
IDS-Nepal	Integrated Development Society-Nepal,
IMCCCC	Inter-Ministerial Climate Change Coordination Committee
IP	Indigenous Peoples

IPCC	Intergovernmental Panel on Climate Change
IRRI	International Rice Research Institute
ITPI	Industry, Transport and Physical Infrastructure
IUCN	International Union for Conservation of Nature
LAPA	Local Adaptation Plans for Action
LC	Local Community
LDC	Least Developed Country
LDCF	Least Developed Country Fund
LEG	Least Developed Countries Expert Group
LI-BIRD	Local Initiatives for Biodiversity Research and Development
M&E	Monitoring and Evaluation
MDB	Multilateral Development Bank
MDG	Millennium Development Goal
MIS	Management Information System
MoALD	Ministry of Agriculture and Livestock Development
MoFE	Ministry of Forests and Environment
MoFSC	Ministry of Forests and Soil Conservation
MoHA	Ministry of Home Affairs
MoLESS	Ministry of Labour, Employment and Social Security
MoLMAC	Ministry of Land Management, Agriculture and Cooperatives
MoPE	Ministry of Population and Environment
MoSTE	Ministry of Science, Technology and Environment
MoUD	Ministry of Urban Development
MR&R	Monitoring, Review and Reporting
NAP	National Adaptation Plan
NAP-Ag	National Adaptation Plan-Agriculture
NAPA	National Adaptation Programme of Action
NARC	Nepal Agriculture Research Council
NASA	National Aeronautics and Space Administration
NAST	Nepal Academy of Science and Technology
NbS	Nature-based Solution
NCCP	National Climate Change Policy
ND-GAIN	University of Notre Dame Global Adaptation Initiative
NDC	Nationally Determined Contribution
NDRRMA	National Disaster Risk Reduction and Management Authority
NGO	Non-governmental Organization
NPC	National Planning Commission
NPR/NRS	Nepalese Rupee
PA	Protected Area
PAC	Practical Action Consulting
PES	Payment for Ecosystem Service
RC	Research, Technology Development and Extension
RCP	Representative Concentration Pathway
REET	Rare, Endangered, Endemic, and Threatened
RTDE	Research, Technology Development and Extension
RUS	Rural and Urban Settlements
RSLUP	Risk Sensitive Land Use Plan
SDG	Sustainable Development Goal
SMEs	Small and Medium Enterprises
SNDC	Second Nationally Determined Contribution
SSP	Shared Socioeconomic Pathway
TNCH	Tourism, and Natural and Cultural Heritage
TWG	Thematic Working Group
UN	United Nations
UNCCD	United Nations Conference to Combat Desertification
UNDESA	United Nations Department of Economic and Social Affairs
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction

UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNICEF	United Nations Children's Fund
USAID	United States Agency for International Development
USD	United States dollar
WASH	Water, Sanitation and Hygiene
WB	World Bank
WECS	Water and Energy Commission Secretariat,
WFP	World Food Programme
WMO	World Meteorological Organization
WRE	Water Resources and Energy

SUMMARY

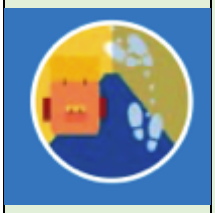
The Nepal NAP sets out priority programmes in the nine thematic sectors as outlined in the National Climate Change Policy (2019). The programmes include adaptation actions that are best able to address climate vulnerabilities and risks in the short (2025), medium (2030), and long-term (2050); as well as adaptation actions that contribute to the achievement of national economic and development priorities. The institutions involved in the implementation of NAP programmes are the Environmental Protection and Climate Change Management National Council, Inter-Ministerial Climate Change Coordination Committee, Ministry of Forests and Environment, National Planning Commission, Thematic and Crosscutting Working Groups, Province Climate Change Coordination Committee, sectoral and provincial ministries, local climate change management committees including academia, development partners, occupational federations, non-state stakeholders, media and private sector.

On behalf of the government, MoFE, the climate change focal point, is responsible for reviewing and reporting on the implementation of the NAP. Nepal NAP also serves as the instrument of adaptation communication. A review of the implementation of the NAP and adaptation interventions will take place in every five years. The Nepal NAP will also be reviewed and updated in 2031, at that time the long-term programmes will be revisited and restructured to reflect changes in the country's economy, development, policy framework, international commitments, and assessed climate change hazards, vulnerabilities, and risks. Institutional arrangements, monitoring and review framework and financial strategy are being developed separately as the integral suite of Nepal NAP.

A total of 64 priority programmes are identified in the Nepal NAP. The total budget of Nepal NAP implementation is USD 47.4 billion to implement priority programmes until 2050. Nepal will contribute USD 1.5 billion and external support totaling USD 45.9 billion is required to implement the NAP to 2050. The government requires USD 2.1 billion per year for the delivery of adaptation services through the implementation of NAP for medium term. The priority adaptation programmes of ten sectors are given below.

Priority Adaptation Programmes and Budgets		
Sector	**Priority Adaptation Programmes (2025, 2030, 2050)**	**Budget (USD)**
Agriculture and Food Security	1. Programme on Sustainable Agriculture, Food and Nutrition Security, and Climate Resilient Health and Hygiene 2. Commercial Animal Husbandry for Climate Resilient Rural Livelihoods (753 Model Demonstration Projects) 3. Development of Insurance, and Community and Peasant Friendly Climate Induced Risk Sharing Model and Expansion in both Agriculture and Livestock 4. Genetic Resource Conservation Programme for Climate Resilient Agriculture in Nepal 5. Enhancing Agriculture Productivity through Building Climate Resilient Water Management Systems 6. Climate Smart Transformative Collective Agriculture Promotion in the Hills and Mountains 7. Integrated Soil and Nutrient Management for Resilient Agriculture 8. Strengthening Climate Services and Agriculture Information System 9. National Capacity Building of Agriculture and Livestock Institutions and Professionals on Climate Change Adaptation Research, Planning and Implementation	**11.2 billion**

 **Forest, Biodiversity and Watershed Conservation**	10. Forests Fire Preparedness, Prevention and Control 11. Karnali Watershed Management Programme for Reducing Climate Risks and Vulnerabilities and Promoting Irrigation Facilities in the Downstream 12. Integrated Sub-Watershed Management for Climate Resilience and Increased Water Availability and Agricultural Productivity 13. Improvement of Forest Health and Restoration of Rare, Endangered, Endemic, and Threatened Species for Building Resilient Forest 14. Restoration of Habitats and Strengthening Ecological Connectivity for Wildlife and Biodiversity 15. Promotion of Multiple Uses of Protected Areas and Natural Heritage and Generation of Climate Adaptation Services by Maximizing the Utility of Protected Areas 16. Control of Climate Induced Disasters and Extension of the Network of Protected Areas for Resilient Ecosystems 17. Development and Strengthening of Ponds/Lakes in Community Forests for Resilient Biodiversity (One Community Forest - One Wetland) 18. Wetlands Development, Conservation and Management at the Foothills of Chure 19. Integrated Green Economy and Green Job Promotion Programme through Sustainable Forest Management and Circular Economy in the Hills and Mountains 20. Upland Conservation and Climate Resilient Livelihoods Programme in High Mountains	**8.7 billion**
 **Water Resources and Energy**	21. National Capacity Building on Policy Reform, Bridging Climate Information Gaps, Promoting Climate-Informed Decision Making, and Developing Climate-Smart Design and Guidelines for Water Resources Infrastructure 22. Promoting Energy Mix System for Industrial Sustainability and Climate Resilient Livelihoods 23. Establishing GLOF Risk Reduction and Early Warning Systems (EWS) in Glaciated River Basins (Gandaki, Koshi, Karnali) 24. Promoting Water Pumping Technology in Water Scarce Areas (To Address Water Stress for Food Security in Hilly Areas) 25. Promoting Climate Resilient Renewable Energy in Rural Vulnerable Settlements and Institutions 26. Constructing Climate Resilient Check Dams on the Rivers of Nepal to Sustain Life 27. Programme on Sustainability of Run-of-River Systems and Backing by Reservoir Systems at Feasible Locations Together with Climate Change Awareness Raising and Capacity Building of Hydropower Developers and Stakeholders 28. Efficient Energy and Clean Technology Development and Retrofitting to Build Resilient Systems and Infrastructure	**5.35 billion**
 **Rural and Urban Settlements**	29. Promoting the Circular Economy for Sustainable Urban Development (Piloting, Integration, Capacity Building, and Implementation) 30. Developing Integrated Settlement and Urbanization Models for Climate Risk Reduction and Supplying Climate Adaptation Services through Nature-based Solutions and Policy Reform 31. Updating and Promoting Climate Resilient Building Designs, Codes, Practices and Construction Technologies and National Capacity Building to Further Implementation	**2.85 billion**

 **Industry, Transport and Physical Infrastructure**	32. Developing and Strengthening Capacity, Awareness, Resources (Databases), Institutions, Technologies and Policies for Building Climate Resilient and Environment Friendly Industries, Transport Systems and Physical Infrastructure 33. Diversifying the Energy Supply for Industrial Districts 34. Developing and Promoting Clean Energy-based Transportation Systems through National Capacity Building and Policy Reform 35. Developing Climate Resilient Infrastructure Systems for Climate Risks, Hazards and Pandemics 36. Upgrading, Maintaining, and Relocating Vulnerable Industries, Physical Infrastructure, and Transport Sector to Increase Resilience to Climate Risks.	**3.05 billion**
 **Tourism, Natural and Cultural Heritage**	37. Climate Resilient Tourism for Ecological Sustainability and Economic Prosperity 38. Climate Risk and Tourism Information System for Resilient, Safe and Sustainable Tourism 39. Establishment and Operation of Emergency Relief and Rescue Services in Adventure Tourism 40. Regulatory Framework Development, Awareness Raising and Capacity Building on Climate Proofing, Protection, Retrofitting and Use of Natural and Cultural Heritage 41. Develop Climate Resilient Infrastructure and Explore and Enhance Knowledge and Capacities for Resilient Mountain Tourism 42. Community-Based Adaptation through Eco- and Cultural Tourism 43. Promotion of 'One Local Level One Tourism Destination' and Planning for Functional Climate Resilient Tourism Destinations (Piloting, Demonstration and Replication. One Project in each Province) 44. Diversifying and Promoting Alternative Destinations and Products for Climate Resilient Tourism Business	**1.13 billion**
 **Health, Drinking Water and Sanitation**	45. Capacity Building of Health and Hygiene Service Providers (Institution and Personnel) on Climate Resilient Health and Hygiene Service Planning and Implementation 46. Climate Change Resilience Development through Capacity Building, Innovation, Improvement and Construction of WASH Services and Facilities 47. Strengthening of Climate Sensitive Disease Surveillance System with Emergency Preparedness and Response 48. Health Promoting Cities: Health, Environment and Life (HEAL) 49. Promotion and Conservation of Water Sources along with Watershed Management for Sustainable Water Supply Service 50. Policy Reform, Strategy Development and National Level Awareness Raising on Climate Resilient Health and WASH Programme, Planning, Operationalization and Sustainability 51. Research, Innovation and Development of Climate Resilient Measures/Technologies for Water Supply, Sanitation and Health Systems	**4.75 billion**

Disaster Risk Reduction and Management	52. Building Climate Resilience by Developing and Harmonizing DRRM and CCA at Federal to Local Levels through Policy Reforms (Integration of DRR in Local Adaptation Plans) 53. Strengthening Adaptive Social Protection/ Shock Responsive Practices Initiatives for Transferring Climate Risk 54. Maintenance, Upgradation and Strengthening Early Warning Systems and Multi-Hazard Monitoring to Facilitate Climate Adaptive Function of Key Economic and Service Sectors 55. Development of Federal and Provincial Strategy and Action Plans on Control of Climate Induced (Primarily Water Borne) Disasters in the Forest Areas of Nepal and Phase-Wise Implementation Under the Leadership of Forest Authorities 56. Develop Regulatory Framework for Domestic and Industrial Fire Control and Mitigation, and Implementation Strategy and Build National Capacities with Supply of Technology and Equipment 57. Promote Culture of Safety and Build Climate Resilience through Climate Risk Sensitive Land Use Plan (RSLUP) Guideline and Standards	**8.05 billion**
Gender, Social Inclusion, Livelihoods and Governance	58. Strategy and Action Plan on Restrengthening, Establishing and Functionalizing Climate Change Aware Gender Focal Desks in all State and Non-State Institutions (Including Private Organizations) 59. Building Human Capital for an Inclusive Climate and Disaster Resilient Society through Promoting Safe and Equitable Access to Disaster Reduction Response Services 60. Integrating GESI and Climate Foresight in Social Protection and Development Interventions (Piloting and Replication) 61. Enhancing Resilience to Climate Change through GESI Responsive Livelihood Programmes	**0.7 billion**
National Capacity Building, Research and Awareness Raising	62. Continue to Implement the NAP Process including Research on Climate Risks and Vulnerabilities, and Capacity Building of Actors and Stakeholders on Climate Change Matters 63. Strengthen Capacities of Federal Thematic Ministries and Provincial Governments on Developing and Implementing the NAP Process 64. Establish and Operationalize Climate Change Data Management System and Programme Monitoring Centre at Federal and Provincial Levels	**0.16 billion**
Total NAP Implementation Cost		**USD 47.4 billion**

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1. INTRODUCTION

1.1 Context

Nepal is one the countries most affected by climate change. The country is very exposed to the impacts of climate change and highly vulnerable to climate risks because of its mountainous topography and abrupt ecological and climatic transitions, combined with a low level of development, a reliance on natural resource-based livelihoods, and multidimensional poverty. The country is experiencing climate change, reflected in changes in temperature and precipitation. The impacts of these climatic changes range from drought and floods in the Tarai region; to melting glaciers; to reductions in snowfall that impact livelihoods, tourism and ecology in the mountain regions; to changes in the amounts and intensity of rainfall contributing to soil erosion and landslides in the mid-hills and downstream areas. These changes may have severe impacts to humanitarian crises, increased societal vulnerabilities and muliti-hazard scenarios (UNDRR, 2019). Climate change threatens to undermine the historical socioeconomic achievements of Nepal; with millions of Nepalese at risk from climate impacts that include reductions in agricultural production, food insecurity, damaged infrastructure, and reduced water supply (MoHA, 2017).

Adaptation to the adverse impacts of climate change is a priority for Nepal, and the government is committed to building climate resilience and integrating adaptation in policies and planning. Since 2010 the government has been engaged in adaptation planning, including the development of a National Adaptation Programme of Action (NAPA) in 2010, preparation of Local Adaptation Plans for Action (LAPAs) in 2012 and the launching of Nepal's National Adaptation Plan (NAP) process in 2015. The Fifteenth Plan (Fiscal Year 2019/20 - 2023/24) identified climate change as a crosscutting issue and set the overarching targets for the period of five years between 2019/20 and 2023/24. It focuses on protecting public life, public and private property, natural and cultural heritages, physical properties and minimising the disaster risk. The Disaster Risk and Management Act (2017) recognizes earthquake, fire, storm, flood, landslide, heavy rainfall, drought, famine and epidemics as disaster (MoHA, 2019). The National Climate Change Policy (NCCP) (2019) prepared based on the learning from the Climate Change Policy (2011) identified eight thematic sectors and four cross-cutting sectors for priority action on climate change (Box 1).

Box 1: Nepal's National Climate Change Policy, 2019 – Priority Sectors

Thematic sectors:

- Agriculture and Food Security (AFS)
- Forests, Biodiversity and Watershed Conservation (FBWC)
- Water Resources and Energy (WRE)
- Rural and Urban Settlements (RUS)
- Industry, Transport and Physical Infrastructure (ITPI)
- Tourism, Natural and Cultural Heritage (TNCH)
- Health, Drinking Water and Sanitation (HDWS)
- Disaster Risk Reduction and Management (DRRM)

Cross-cutting sectors:

- Gender Equality and Social Inclusion (GESI), Livelihoods and Governance (GESILG)
- Awareness Raising and Capacity Building (ARCB)
- Research, Technology Development and Extension (RTDE)
- Climate Finance Management (CFM)

The Ministry of Forests and Environment (MoFE), Environment Protection and Climate Change Management National Council and the Inter-Ministerial Climate Change Coordination Committee, led and coordinated the development of the Nepal NAP and its associated iterative process. This NAP was formulated as a component of the country's NAP process and drew on experience gained through the development and implementation of the NCCP, NAPA, and LAPAs. In addition, the Nepal NAP is informed by an extensive body of research and is guided by input from broad stakeholder engagement (Annex 1 includes a list of background documents prepared through the NAP process). MoFE led an extensive consultation process to ensure that the Nepal NAP reflects the inputs and priorities of a range of stakeholders at the federal, provincial, and local levels. The methodology to develop the Nepal NAP is summarized in Section 5.2.6, and described in Annex 2 and 3.

Nepal NAP (2021 – 2050) is a critical component of the country's adaptation response and is a framework to integrate adaptation across sectors and levels of the government. The plan sets out short term priority actions to 2025, medium term priority programmes to 2030, and long term adaptation strategic goals to 2050; with the aim of assisting Nepal to better integrate priority measures to address climate risk and vulnerability in development planning and implementation. The short and medium term measures are designed to help the Government of Nepal achieve the adaptation strategies set out in its Second Nationally Determined Contribution (NDC, 2020). This NAP also serves as Nepal's Adaptation Communication, a requirement of the Paris Agreement under the United Nations Framework Convention on Climate Change (UNFCCC).

Delivering the adaptation actions will be a shared responsibility between the national, provincial, and local governments. The NAP will guide the climate change response of the three levels of government, civil society, the private sector, and other actors; and set Nepal on a pathway of socio-economic prosperity by building a climate-resilient society and reducing the risk of climate change impacts on people and ecosystems.

1.2 Organization of NAP document

Section 1 presents an introduction along with an overview of the organization of the sections of the NAP. Section 2 discusses the national circumstances to provide context and background in regard to priority adaptation actions; and Section 3 reviews climate trends and projected climate change in Nepal. Section 4 elaborates on climate hazards, risks and vulnerabilities in Nepal. Section 5 describes the progress on adaptation in Nepal, including the NAP process and alignment with other international agreements. Section 6 sets out the long term vision, objectives, principles, and expected outcomes that guide this Nepal NAP.

Section 7 describes the priority adaptation programmes and profiles in nine thematic areas; highlighting the key climate risks, adaptation needs and explaining how adaptation actions can address these risks, setting out the strategic long term objective to 2050, describing priority actions and the expected results of undertaking these actions in the short and medium terms, and identifying priority adaptation projects in the sector for the short term.

Section 8 sets out the crosscutting enabling actions needed to address adaptation. Section 9 provides details on the institutional and financial arrangements required to support the implementation of the NAP, including oversight and coordination, roles and responsibilities, and financing. Section 10 includes an action plan for NAP implementation.

The Annexes include a list of technical documents developed under the NAP process, details on the priority adaptation projects, the long list of adaptation actions, and elaboration of the methodology used to identify the priority adaptation actions and develop the Nepal NAP.

2. NATIONAL CIRCUMSTANCES

2.1 Physiography

Nepal is a small landlocked country that lies along the slopes of the Himalayan mountains between China and India. It has a land area of 147,516 km^2 spanning 800-850 km from east to west, and 144-240 km north to south. Physiographically, it stretches between 80°04' – 88°12' E and 26°22' - 30°27' N, and has the largest elevational gradient in the world, extending from tropical alluvial plains as low as 67 meters above sea level (m asl) in the lowland Tarai to the alpine-nival earth's highest peak, Mount Everest at 8,848.84 m asl (GoN, 2021). The country is divided into five physiographic regions from north to south: i) High Himalaya (above 5,000 m) with 24% area, ii) High Mountains (3,000 - 5,000 m) with 20% area, iii) Mid-Hills (1,000 - 3,000 m) with 30% area, iv) Siwalik (500 – 1,000 m) with 12% area, and v) Tarai (< 500 m) with 14% area (MoSTE, 2014) (Figure 1). Altitudinal and physiographic heterogeneity affects temperature and rainfall patterns.

Figure 1: Physiographic map of Nepal

2.2 Environment and Biodiversity

The diverse terrain and topography, along with varied climatic conditions across altitudes means that various regions of Nepal have unique flora, fauna, livelihoods, and cultures (Kunwar et al., 2021). This includes more than 10,630 plants and 3,000 wildlife species growing in 118 different ecosystem types, 75 vegetation types, and 35 forest types (MoFSC, 2014). The nation-wide forest resource assessment (2010–2014) of Nepal catalogued 5.96 million hectares (ha) of forest (40.36% of total land area) and 0.65 million ha of other wooded land (4.38% of total land area) (DFRS, 2015). Agricultural land comprised 28.75 % of total land area in 2018 (WB, 2021). Agricultural practices, increasing population, aggressive development programmes including construction of roads, hydropower plants, and expanding urban areas are the main drivers of land use changes and their effects are further exacerbated by the impacts of climate change (Rimal et al., 2017). There is change in forest cover, and agricultural land and shrub land have decreased with increasing built up structures (Figure 2, Annex 4).

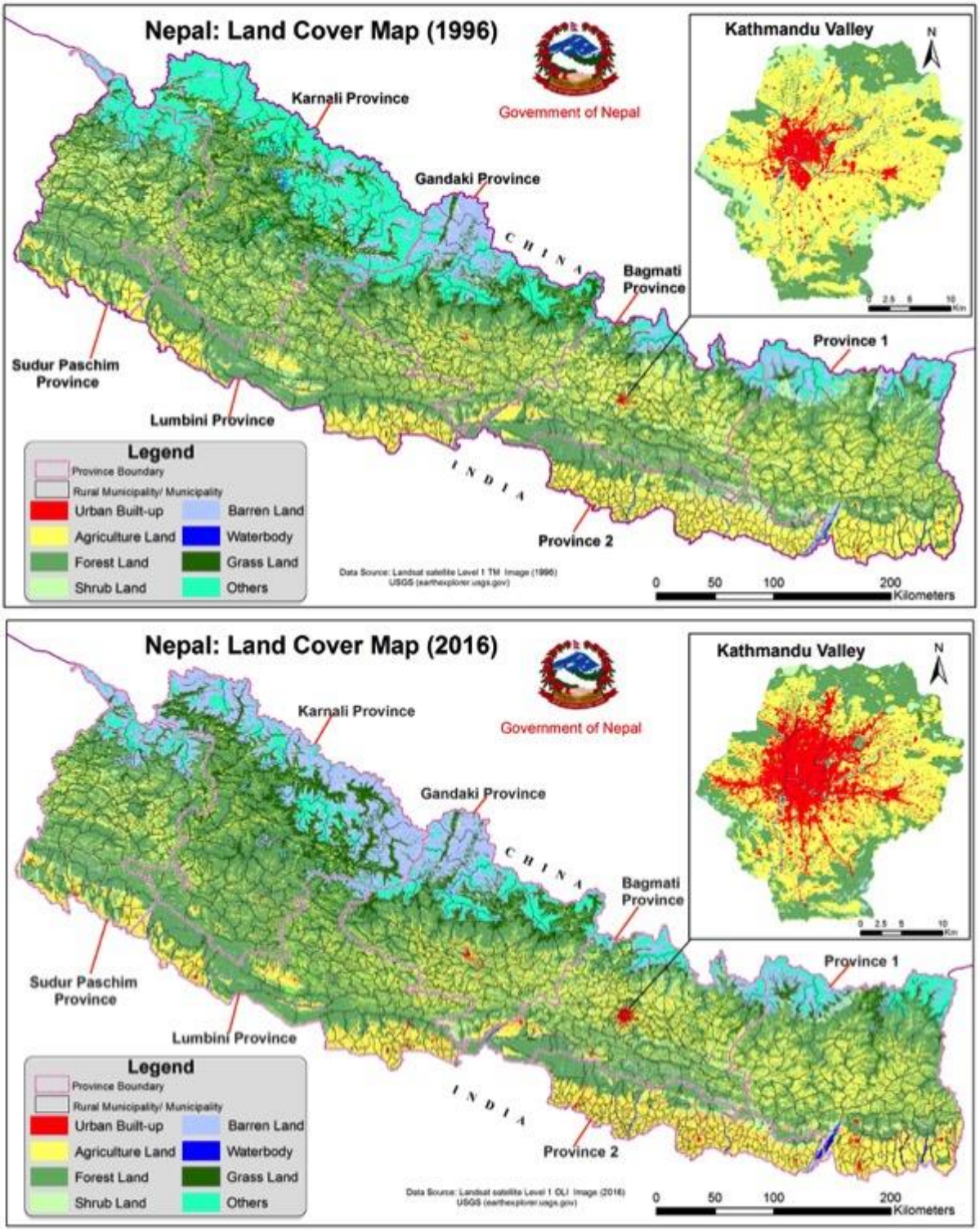


Figure 2: Land use and land cover change map of Nepal at municipal level, 1996 and 2016

2.3 Climate

The annual minimum temperature varies from -4°C to 19°C while the maximum temperature ranges from 4°C to 30°C. Manang district has the lowest (<5°C) annual average maximum temperature while most of the low-lying southern districts have the highest annual average maximum temperature above 30°C (MoFE, 2021c). Nepal receives average annual rainfall of around 1,600 mm but this distribution pattern varies considerably in both north-south and east-west directions. The southern flanks of the Himalayas, such as Pokhara, receives the highest amount of rainfall (3,345 mm), while the rain shadow areas such as Dolpa and Mustang receive less than 10% of that amount (295 mm). Total annual rainfall increases with altitude up to approximately 3,000 m asl and then diminishes at higher elevations (MoSTE, 2014).

2.4 Demography, Culture and Society

The total population of Nepal was 26.5 million in 2011 (CBS, 2014) and 29.19 million in 2021 with annual growth rate 0,93% (CBS, 2014; ADB, 2021; CBS, 2021). The dense population is found in the major cities such as Kathmandu, Bhaktapur, Lalitpur and the cities of lowland Tarai (Figure 3). An analysis of human population patterns from 2001 to 2021 shows that the major cities such as Kathmandu, Pokhara and Butwal and the Tarai areas have experienced the highest population gain (Annex 5). Over 50% of the population lives in hills and mountains with a fragile and remote physiography and low economic productivity (Cosic et al., 2017). The proportion of the population living in hills and mountains is projected to decrease to 47% by 2031, although the country's landmass in the mountain and hill regions is 74% (CBS, 2018). In 2020, 20.57% of the country's total population resided in urban areas (WB, 2021). Socio-culturally, the country has over 125 ethnic groups and castes including *Chepang, Raute*, and others, and 123 languages. The *Raute, Chepang, Byanshi* are semi-nomadic minority groups of people in Nepal (CBS, 2021).

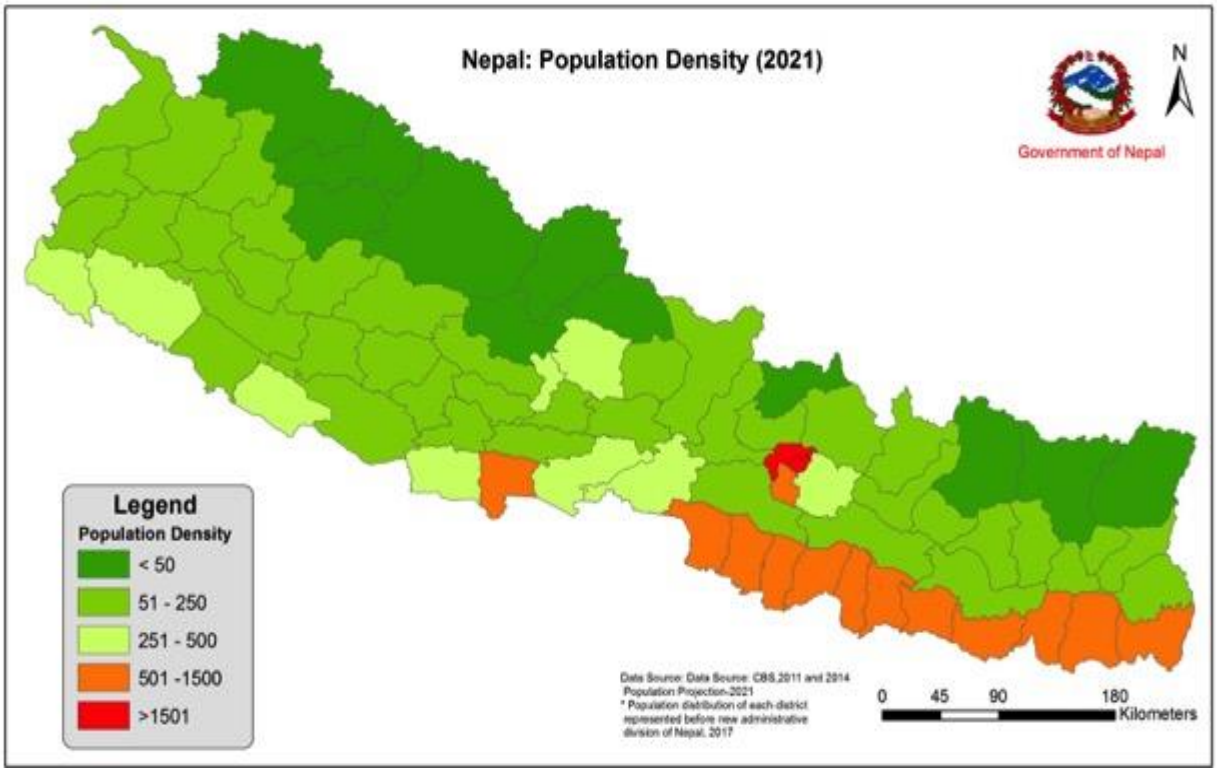


Figure 3: Population density (person/km²) in Nepal

Women, particularly those who are reliant on agriculture, are impacted differently due to climate change than men (Sandal, 2021). Climate change will have greater negative effects on women because of their limited, or often lack of, rights, assets, resources and power, which results in their exclusion from decision-making processes that affect their lives (Goodrich et al., 2019). Despite progress stated in NPC (2020c), gender inequality persists in most sectors, as seen in the wage gap between men and women, women's limited access to productive resources, gender-based violence, and low participation of women in the labor force (UN Women, 2021). Geographically dispersed population, limited economy, diverse castes and ethnic groups, caste-based discrimination and traditional livelihood contribute to compound the socio-economic vulnerability of the country (UNDRR, 2019).

2.6 Economy and Livelihoods

Nepal's economy, which is largely dependent on agriculture and remittances from working abroad, is growing but the rate of growth varies greatly year to year. The economy is also dependent on the use of natural resources, including agricultural land, pastures, and forests. The agriculture sector contributed about 27.65% of Nepal's gross domestic product (GDP) in 2019/20 (Nepal Rastra Bank, 2020), and about 66% of the country's population worked in the agricultural sector in 2020 (GoN, 2021). Informal businesses made up about 50% of enterprises in Nepal in 2019 and were the main source of income for most of the labour force (WB, 2020). Two million Nepalese migrants employed abroad remitted about USD 8.79 billion in 2018-2019, accounting for over a quarter of the country's GDP at that time (MoLESS, 2020). This out-migration is predominantly male (91.5% of migrant workers) and has resulted in an increase in female-headed household and 73% of the female workforce being engaged in the agricultural sector (Poudel et al., 2020; MoLESS, 2020).

In 2019, 18.7% people were living in absolute poverty, which was a significant decrease from a poverty level of 42% in 1995 (NPC, 2019). Total 28.6% of Nepal's population was multi-dimensionally poor in 2019, meaning they suffered from under-nutrition or their household lacked any members that had completed five years of schooling (NPC, 2019). Nepal's national Human Development Index (HDI) stood at 0.602 in 2019, which surpassed the 2018 score of 0.587 (UNDP, 2020) and placed the country in the medium human development category. Nepal's per capita GDP in current price was USD 1,074 (approximately NPR 125,660) in 2019 (UN data, 2021). The country is classified as a Least Developed Country (LDC) and is taking action to graduate to lower middle-income country status by 2026, and to achieve the national goal of *Prosperous Nepal Happy Nepali* by 2043. This decision may be impacted by the global Covid-19 pandemic, which has the potential to increase levels of poverty after years of decline (Box 2).

Box 2: Covid-19 pandemic recovery and adaptation

The Corona virus 2019 (Covid-19) pandemic has resulted in disruptions to Nepal's economy. This health crisis and its economic impacts have demanded the attention of the Nepali government as the country has experienced economic activity decline, with real GDP growth decreasing from 6.7 % in 2019 to -2.1 % in 2020 (ADB, 2021); although the economy was anticipated to grow by 2.3% in 2021 and 4.1% in 2022 (ADB, 2021a). The pandemic has taken a serious toll on Nepal's economy that relies on the agricultural and tourism sectors (26% and 8% of GDP in 2020 respectively), international remittances (25% of GDP in 2020), and informal labour (UNDP, 2021b). In 2020, remittances declined, jobs were lost, and poverty increased (UNDP, 2021b).

The transition from crisis to recovery remains challenging, but it is crucial for Nepal's economic recovery programme to incorporate and prioritize adaptation and climate resilience. Decision making requires a longer term perspective that emphasizes strengthening resilience to the impacts of climate change in infrastructure investments, investing in natural infrastructure to improve climate resilience, and building climate-resilient food systems (Murphy & Parry, 2020). The recovery response needs to address the environmental determinants of health - including water, sanitation, and nutritious food - and the expected impact of climate change on these sectors. Factoring climate adaptation needs into public investments can help to build resilient and sustainable communities and systems that encourage economic and social development (Hammill, 2020).

In 2021, Nepal adopted the Green, Resilient and Inclusive Development (GRID) approach to address the impacts of Covid-19 and structural challenges, including slow domestic job creation, large infrastructure gaps, and a high vulnerability to climate change and environmental degradation. The GRID approach builds on Nepal's NDC and the 15th Development Plan. Development partners have pledged USD3.2 billion in resources and identified up to USD4.2 billion in potential future support in GRID relevant sectors, which include agriculture, forestry, eco-tourism, water resource management, renewable energy, urban development and transportation (Shrestha, 2021). This NAP plays an important role in providing guidance on ways in which these GRID investments can advance adaptation efforts.

2.5 Government and Governance

The Constitution of Nepal, 2015 created the devolved system of government that includes seven provinces and 753 local government units (urban and rural municipalities). The provincial and local governments have key roles in implementing adaptation action, having jurisdiction over sectors relevant to adaptation including agriculture, physical infrastructure, landslide control, forestry, and watershed conservation (MoFE, 2020c). Provincial and local governments are allocated about 40% of public sector finance on an annual basis (in 2018-19 local governments received about 24% and provincial governments about 16% of total public sector finance), meaning that they have considerable scope to influence adaptation investment (Boex, 2019). The Constitution also advances gender equality. Women hold at least one-third of the seats in government and various ethnic groups, minorities, and deprived communities are represented. The 15th Plan (2019/20-2024/25) recognized that addressing issues of GESI, marginalized people, backward regions, classes and communities and excluded groups required consolidated efforts to address the sustainable and equitable generation and distribution of resources, and to increase the adaptive capacities of the society (GoN, 2020a).

3. CLIMATE CHANGE TREND AND SCENARIO

3.1 Global Climate Change

3.1.1 Observed global climate change

The Sixth Assessment Report (AR6) of the Intergovernmental Panel on Climate Change (IPCC) on the physical basis of climate change concluded that human influence has warmed the climate and has contributed to many observed changes in weather and climate extremes (IPCC, 2021). Human influence is a significant cause of the increase in global surface temperature, a contributor to changing precipitation patterns, and a main driver of the global retreat of glaciers and the decrease in Arctic sea ice (IPCC, 2021). Increasing levels of greenhouse gases in the atmosphere due to human activities are the main cause of the warming of the earth in the industrial era. The best-known indicator for tracking climate change is global mean surface temperature (GMST), or the average temperature for the world, which is derived from measurements of sea surface temperatures and of near-surface air temperatures above the land. GMST was 1.09°C higher in 2011-2020 than 1850-1900, with larger increases over the land (1.59°C) than the ocean (0.88°C) (IPCC, 2021). 2020 tied with 2016 for the warmest year on record; and 2013 to 2020 are the warmest seven years on record (World Meteorological Organization, 2020; and National Aeronautics and Space Administration (NASA) Global Climate Change, 2021).

AR6 reported that climate zones have shifted poleward, and the average growing season has been lengthened by up to two days per decade since the 1950s in the Northern Hemisphere. Hot extremes have become more frequent and more intense over land areas, and the chance of compound extreme events has increased (such as concurrent heat waves and drought) (IPCC, 2021). Rising global temperature has impacts on the hydrological (water) cycle, although the effects of increasing atmospheric greenhouse gases on precipitation are more complex than for temperature. AR6 reported that globally averaged precipitation over land has increased since 1950, with a greater rate of increase since the 1980s (IPCC, 2021). Increases in atmospheric water vapour can lead to increased intensity of extreme precipitation events, and the frequency and intensity of heavy precipitation events has increased since the 1950s (IPCC, 2021).

Global mean sea level increased by 0.20 m between 1901 and 2018 from the expansion of ocean waters caused by warming as well as from the addition of water previously stored on land in glaciers and ice sheets (Hartmann et al., 2013). Climate warming is associated with declines in snow and ice cover, and cryosphere changes in high mountain regions due to climate change include declines in low-elevation snow cover, glaciers, and permafrost (Hock et al., 2019). Global temperature rise to date has had significant impacts on human and natural systems including increases in droughts, floods, heavy precipitation events, heat extremes, sea level rise, and biodiversity loss (IPCC, 2014). The most affected people live in low- and middle-income countries, and high mountain ranges are among the areas most impacted (IPCC, 2018).

3.1.2 Projected global climate change

Climate models project patterns of change in the future, with the amount of warming dependent on future greenhouse gas emissions. Global warming is likely to reach 1.5°C above pre-industrial levels between 2030 and 2052 (IPCC, 2018). Global mean temperatures are expected to continue to rise over the 21st century if GHG emissions are not reduced (IPCC, 2014).

The IPCC AR6 used five Shared Socio-economic Pathways (SSPs) to predict future increases in temperature and sea level rise (Table 1). Warming globally will be similar under the five pathways over the next two decades. Efforts to reduce greenhouse gas emissions will have an increasing impact on global warming from 2040 onward. A low emission scenario (SSP1-1.9) would see additional warming of about 1.4°C by the late 21st century; while a high emission (business as usual) scenario (SSP5-8.5) would see global annual mean temperature increase by an additional 4.4°C in the same time period (IPCC, 2021).

Table 1: Changes in global surface temperature, which are assessed based on multiple lines of evidence, for selected 20-year periods for five emissions scenarios

	Short term, 2021-2040		Mid term, 2041-2060		Long term, 2081-2100	
Scenario	**Best estimates (°C)**	**Very likely range (°C)**	**Best estimates (°C)**	**Very likely range (°C)**	**Best estimates (°C)**	**Very likely range (°C)**
SSP1 - 1.9	1.5	1.2 – 1.7	1.6	1.2 – 2.0	1.4	1.0 – 1.8
SSP1 - 2.6	1.5	1.2 – 1.8	1.7	1.3 – 2.2	1.8	1.3 – 2.4
SSP2 - 4.5	1.5	1.2 – 1.8	2.0	1.6 – 2.5	2.7	2.1 – 3.5
SSP3 - 7.0	1.5	1.2 – 1.8	2.1	1.7 – 2.6	3.6	2.8 – 4.6
SSP5 - 8.5	1.6	1.3 – 1.9	2.4	1.9 – 3.0	4.4	3.3 – 5.7

Source: IPCC (2021), p. 17.

Climate-related impacts and risks grow with increasing amounts of global warming. AR6 reports that every additional 0.5°C of global warming is expected to increase the intensity and frequency of hot extremes including heat waves, of heavy precipitation, and of agricultural and ecological droughts in some regions. Rare weather events are expected to occur more frequently, and the frequency and intensity of extreme precipitation events will increase. Precipitation and surface water flows are projected to become more variable over most land regions, and an earlier onset of snow cover melt is expected.

The IPCC (2021) reports that monsoon precipitation is projected to increase in the mid to long term over South Asia; and heavy precipitation and associated flooding are projected to intensify and be more frequent in most regions in Asia. Mountain glaciers are committed to continue melting for decades or centuries, permafrost in the high mountain areas will continue to thaw, snow line elevations are projected to rise, and landslides triggered by rainfall are expected to increase.

3.2 Climate Change in Nepal

A summary of observed and projected climate change in Nepal is taken mainly from two studies prepared by MoFE and the Department of Hydrology and Meteorology (DHM) to inform the NAP process, Climate Change Scenarios for Nepal for NAP and Observed Climate Trend Analysis in the Districts and Physiographic Zones of Nepal (1971-2014). The reports can be accessed on the MoFE website (https://napnepal.gov.np/).

3.2.1 Observed climate change

Nepal's climate has warmed, and temperature has increased in all climate zones in Nepal from the Tarai region in the south at altitudes of less than 500 m asl to the high Himalayas region in the north at altitudes of over 5,000 m asl. Data from the Berkeley Earth Dataset estimated historical warming in Nepal at between 1.0°C and 1.3°C between the periods 1900-1917 and 2000-2017 (World Bank Group & ADB, 2021).

The DHM completed a study in 2017 on observed climate change for the period between 1974 and 2014 that suggested a significant positive trend in annual maximum temperature data, indicating warming at the rate of 0.056°C per year (DHM, 2017). Warming occurred in all regions of Nepal, with the highest rate of increase taking place at higher altitudes in the mountains and Himalaya regions (Figure 4). The number of warm days and warm nights, and warm spell duration significantly increased in the majority of districts. The number of cool days per year decreased in most districts, with a significant decrease of cool days noted in high mountains and high Himalayas districts (DHM, 2017).

While DHM study showed that precipitation decreased in all seasons in the 1974-2014 period, the trends were insignificant. Among the Nepal's five physiographic regions, trends of decreasing precipitation were observed mainly in the high mountains and high Himalayas in all seasons. Pre-monsoon precipitation showed a significant upward trend in the Tarai and Siwalik regions, and demonstrated a significant negative trend in the high Himalayas, with a higher rate of decrease in the east. Monsoon precipitation increased in the mid-mountains and central high mountains. Post-monsoon precipitation significantly decreased across all regions of Nepal, and winter precipitation decreased in the western mid-mountain region (Karki et al., 2017). The number of rainy days increased significantly in the northwestern districts; and very wet and extremely wet days decreased significantly in the northern districts. Extreme precipitation showed spatial variability and inconsistent trends (DHM, 2017).

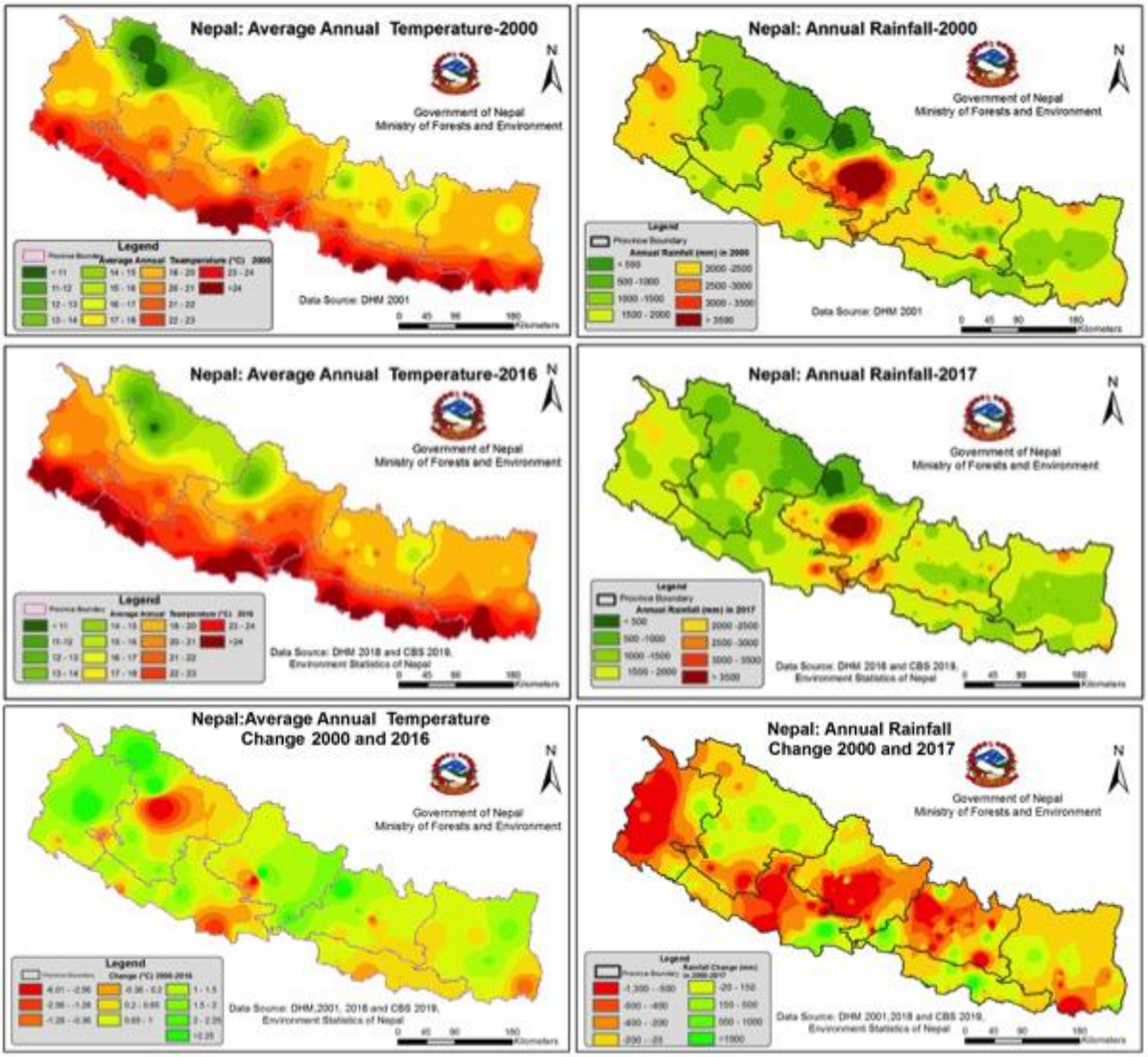


Figure 4: Average annual mean temperature and rainfall

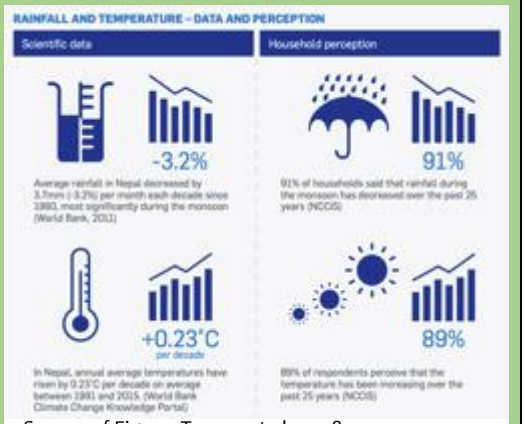
Nepal already experiences a range of climate hazards. More than 80% of property loss due to disasters is attributable to climate hazards, particularly water-related events such as floods, landslides and glacial lake outburst floods (GLOFs) (MoFE, 2018). Water-related disasters claim more than 300 lives a year, displace people, and destroy homes, farmland and other essential infrastructure (Bishokarma, 2017). Extreme rainfall in 2020 caused 445 flooding and landslide incidents that claimed about 430 lives and displaced more than 5,000 people (NDRRMA, 2020). On the ground in Nepal, most households have observed changes in temperature and precipitation over the past 25 years (Box 3).

Box 3: Perceptions of Climate Change in Nepal

In 2016, Nepal's Central Bureau of Statistics (CBS) conducted a survey to better understand how people across the country are experiencing the impacts of climate change. The process collected both qualitative and quantitative information from over 5,060 households in both rural and urban areas. Over 90% of surveyed households indicated that the monsoon rainfall had decreased over the last 25 years. A similar proportion reported that they felt that temperatures were increasing. Respondents also reported shifts in the timing of the seasons. The climate hazards of most concern were drought, hailstorms, and floods; however, there were regional variations. Almost all respondents felt that the occurrence of drought had increased (CBS, 2017).

When the survey results were compared with available data on rainfall and temperature trends, it was found that there was a high degree of convergence between the perceptions of the respondents the scientific information. The study highlighted the value of incorporating local perspectives in climate change vulnerability and impact assessments, to complement scientific data, fill information gaps and inform assessment of vulnerability to climate change.

Source: MoFE (2018).



Source of Figure: Tanner et al., 2018.

3.2.2 Projected climate change

Nepal's climate will warm further, with increases in temperature projected for all seasons. MoFE's report Climate Change Scenarios for Nepal, analyzed the future climate change scenarios for two possible trajectories – representative concentration pathways (RCP) 4.5 and RCP 8.5 for the medium term (2016-2045), long term (2036-2065), and end of century with respect to the reference period (1981-2010). The analysis suggested that the climate in Nepal will be significantly warmer and wetter in the future, but for a decrease in precipitation during the pre-monsoon season (MoFE, 2019) (Table 2).

Table 2: Mean of change in precipitation and temperature in the medium and long-term periods for Nepal compared to the reference period 1981-2010

Climatic variable	Medium term (2016-2045)		Long term (2036-2065)		End of the century (2071-2100)	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
Change in precipitation (%)	2.1	6.4	7.9	12.10	10.70	23.0
Change in temperature (°C)	0.92	1.07	1.30	1.82	1.72	3.58

Source: MoFE (2019), p. 20.

The highest temperature increase is projected for the post-monsoon season for both the medium- and long term periods. The high mountains region is likely to warm at a higher rate than other regions in the RCP 4.5 scenario, with the Tarai and Siwalik regions expected to experience slightly greater warming in the RCP 8.5 scenario (Table 3).

Table 3: Projected range of mean change in temperature (°C) compared to the reference period 1981-2010 in the five physiographic regions of Nepal

Physiographic regions	Medium term (2016-2045)		Long term (2036-2065)		End of the century (2071-2100)	
	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5	RCP 4.5	RCP 8.5
High mountains	0.95	1.09	1.36	1.86	1.79	3.61
Middle mountains	0.89	1.04	1.27	1.76	1.66	3.44
Hill	0.90	1.06	1.26	1.80	1.69	3.56
Siwalik	0.94	1.10	1.29	1.87	1.72	3.66
Tarai	0.93	1.11	1.29	1.87	1.73	3.69

Source: MoFE (2019), p. 20.

Warm extreme events (determined by number of warm days and warm nights, and duration of warm spell) are projected to increase, while cold extremes are projected to decrease in both the medium and long term periods (MoFE, 2019). The increase in warm days and warms nights is expected to be more pronounced in the middle mountains and high Himalayas (Agrawal et al., 2015). The higher temperature increase in the mountains is consistent with projections across the Hindu Kush Himalaya region. Even if global warming were kept to 1.5°C, warming in the Hindu Kush Himalaya region would be at least 1.8°C and up to 2.2°C because of elevation dependent warming, a phenomenon where mountains experience rapid changes with rise in temperature (Krishnan et al., 2019).

Average annual precipitation in Nepal is likely to increase by 2-6% in the medium term and 8-12% in the long term relative to the 1981-2010 reference period, although there is considerable uncertainty in the precipitation projections (Table 4). Annual, monsoon, and post-monsoon precipitation projections indicated an increase in precipitation in all time periods for both RCPs, while pre-monsoon precipitation is projected to decrease for both RCPs and for all time periods (except for RCP 8.5 in the long term period). Winter precipitation is projected to increase in the long term and at the end of the century for both RCPs. Maximum precipitation increase is observed during the post-monsoon season followed by the monsoon season. The end of the century period also suggests an increase in precipitation for all seasons except the pre-monsoon season. The frequency of heavy precipitation events is likely to increase in the future (MoFE, 2019) (Table 4).

Table 4: Projected range of mean change in precipitation (%) for different seasons compared to the reference period 1981-2010

Seasons	Medium term (2016-2045)		Long term (2036-2065)		End of the century (2071-2100)	
	RCP - 4.5	RCP - 8.5	RCP - 4.5	RCP - 8.5	RCP - 4.5	RCP - 8.5
Winter	-5.8	7.2	13.6	5.0	24.4	20.9
Pre-monsoon	-5.0	-4.0	-7.4	4.2	-7.8	-3.1
Monsoon	2.7	7.8	9.4	13.6	12.4	27.1
Post-monsoon	18.6	6.0	20.3	19.0	16.5	22.9
Annual	2.1	6.4	7.9	12.1	10.7	23.0

Source: MoFE (2019), p.21.

Annual precipitation is projected to increase in the order of 5% to 20% over the 21st century in mountain regions, including the Himalaya (Hock et al., 2019). Across the Himalayan Mountains, the frequency and intensity of extreme precipitation events are projected to increase through the 21st century, particularly during the summer monsoon (Sanjay et al., 2017). The IPCC's report on oceans and the cryosphere in a changing climate noted that increased snowfall is projected at higher elevations; while snowfall is projected to decrease at lower elevations with more precipitation falling as rain. The snow depth or mass at lower elevations of mountain regions is projected to decline by 25% between 1986–2005 and 2031–2050, regardless of the greenhouse gas emission scenario. By the end of the century, reductions in snow depth or mass at lower elevations of mountain regions are expected, with up to 80% reductions under RCP 8.5 and 50% reductions under RCP 4.5 (Hock et al., 2019).

When it comes to climate change, the future projections are dire (UNDERR, 2019). These climate change projections suggest that Nepal will be more exposed to climate hazards in the future (Figure 5, Annex 6). Warming in Nepal could trigger biophysical and socio-economic impacts that will impact livelihoods and well-being, including biodiversity loss, increased glacial melting, and less predictable water availability (Shrestha & Shrestha, 2019). Of particular concern is the potential for changes to the flow and quality of water derived from glaciers, snowmelt, and rainfall, leading to excess water at certain times of the year and prolonged dry periods and extreme drought in others (Bartlett et al., 2010). These climate hazards, as well climate vulnerabilities and risks in Nepal, are discussed in the next section.

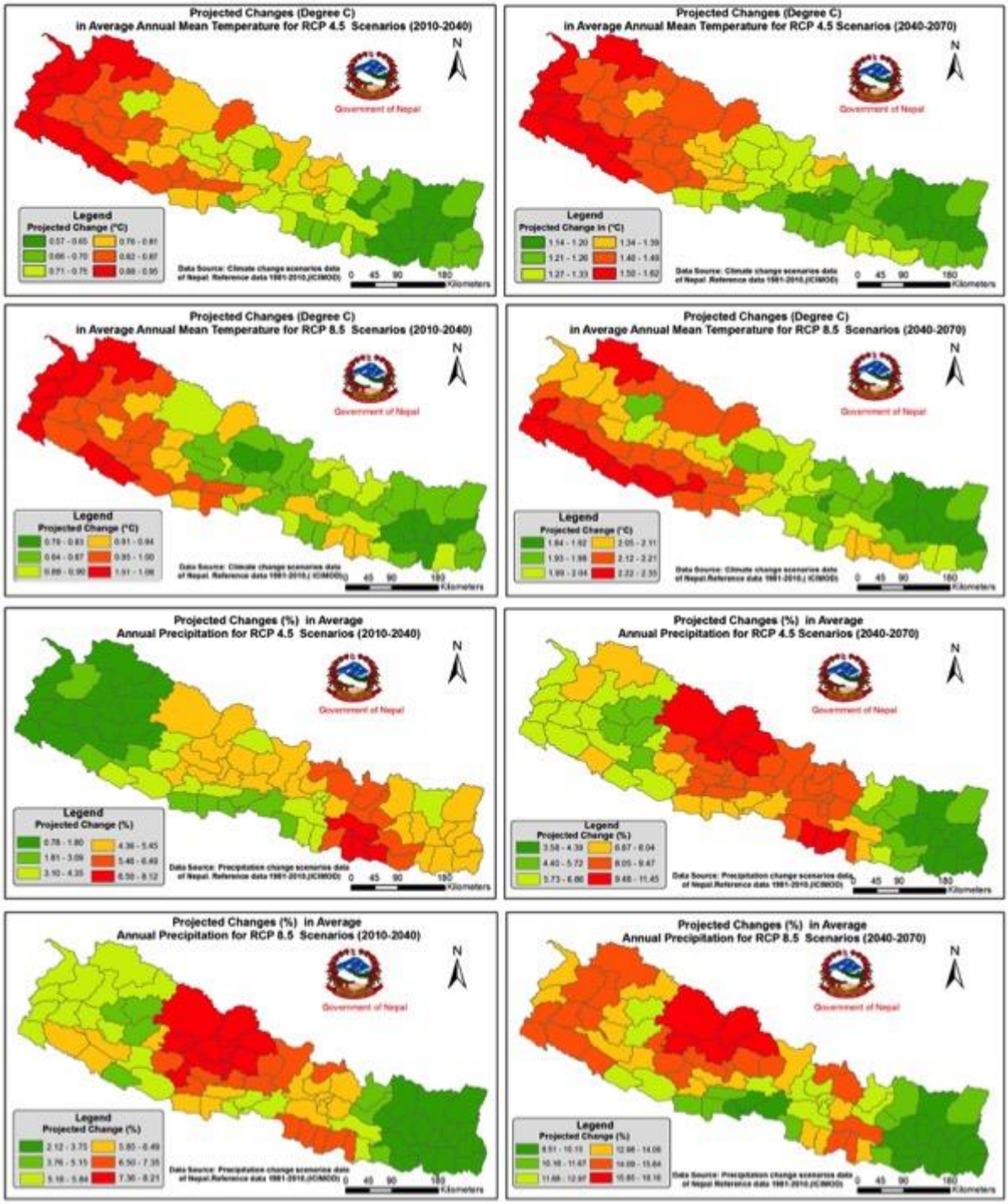


Figure 5: Projection of Temperature and Rainfall for RCP 4.5 and 8.5 for 2010-2040 and 2040-2070

4. CLIMATE HAZARDS, VULNERABILITIES, RISKS AND IMPACTS

Nepal is experiencing the impacts of climate change and a combination of political, geographic, and social circumstances mean that Nepal is particularly vulnerable to climate change (World Bank & ADB, 2021). The section provides an overview of climate vulnerabilities, risks and impacts in Nepal that is informed by reports developed under the NAP process (see for example MoPE, 2017a), the 2021 vulnerability and risk assessment (MoFE, 2021c) and Nepal's Third National Communication to the UNFCCC (GoN, 2021).

4.1 Climate Hazards and Vulnerabilities

Nepal was the 10th most affected country from 2000 to 2019 on the long term Global Climate Risk Index, reflecting that the country was highly impacted by extreme weather events and was highly vulnerable to climate risks (Eckstein et al., 2021). It was ranked 127th out of 182 countries in the 2021 index of the University of Notre Dame Global Adaptation Initiative (ND-GAIN), which assessed a country's vulnerability to climate change as well as its readiness to improve resilience. Nepal was the 46th most vulnerable country and the 74th least ready country to address the climate impacts (ND-GAIN, 2021). Nepal ranked 51st out of 163 countries on UN Children's Fund (UNICEF) climate risk index that measures children's exposure and vulnerability to climate change (UNICEF, 2021). Such exposure can have impacts on childhood nutrition, education and health, with long-term development outcomes.

Climate variability and extreme events have major impacts and economic costs in Nepal, estimated to be equivalent to an annual cost of 1.5 to 2% of GDP in 2014 (IDS-Nepal, PAC & GCAP, 2014). NPC (2017) estimated that Nepal lost about NPR 60 billion in 2017. The MoFE's 2021 climate vulnerability and risk assessment reported that on average, Nepal loses 647 lives and sustains economic loses of over NPR 2,778 million each year to climate-induced disasters (MoFE, 2021c). The report asserted that flood, drought and forest fires are common hazards in the country that occur more frequently in the low-lying south-west regions and cause severe harm to the ecosystems and livelihoods.

Nepal's disaster risk profile is one of the worst in the world. Nepal has one of the highest fatality rates in the world from landslide events; between 1972 and 2016, 5,190 people lost their lives in 3,419 landslide events (Bhushal, 2020). The heavy rainfall that accompanied the 2020 monsoon season caused flooding and landslides that killed at least 132 people in Nepal (Khairat, 2020). Quantitatively, more than 80% of the population is exposed to the risk of natural hazards (MoHA, 2017), which include earthquakes, droughts, floods, landslides, extreme temperatures, and GLOFs (UNDRR, 2019). Tornados are likely to be added to this list of natural hazards, despite there not being a Nepali word for tornado. In 2019, Nepal recorded its first tornado; the hail, rain and winds killed at least 28 people, injured more than 1,100 people, damaged about 2,600 houses, and damaged a national park that is listed as a World Heritage Site (Mallapaty, 2019).

The 2021 climate vulnerability and risk assessment identified 50 districts that have high-very high vulnerability to climate change, with the majority in hilly or mountainous terrain (MoFE, 2021c). Several of these hill and mountain districts - including Dhading, Dolakha, Khotang, Parsa, Saptari, Solukhumbu, and Taplejung - have not received adequate climate investment or been considered for priority research projects (Kunwar, 2021b). The mid and far western hills and mountains are associated with very frequent climate disasters (Mainali & Pricope, 2018), high levels of poverty, and the least climate investment (ADB,

2017). Vulnerability is moderate to low in the majority of districts in the Tarai region because of high adaptive capacity and comparatively lower sensitivity (MoFE, 2021b).

In Nepal, specific regions (such as high mountain), populations (poor, marginalized communities, women, landless, indigenous people, people with disabilities, and people residing in climate-vulnerable geographical areas), and systems (such as food production systems) have a predisposition to be adversely affected by current and projected climate hazards. Rural hill and mountain communities are particularly vulnerable to climate change due to their dependence on climate-sensitive natural resources, chronic poverty, limited livelihood options, and low adaptive capacity to address the adverse changes. These communities have experienced acute shortages of water for drinking and irrigation over the past decade (Gurung et al., 2019). The severity and intensity of disaster events varies at the district level. Floods are common in the southern lowland Tarai districts whereas the landslide occur more frequently in the mid-hills districts. Multi-hazard mapping indicates that the Tarai districts experience a greater number of climate hazards (Figure 6, Annex 7).

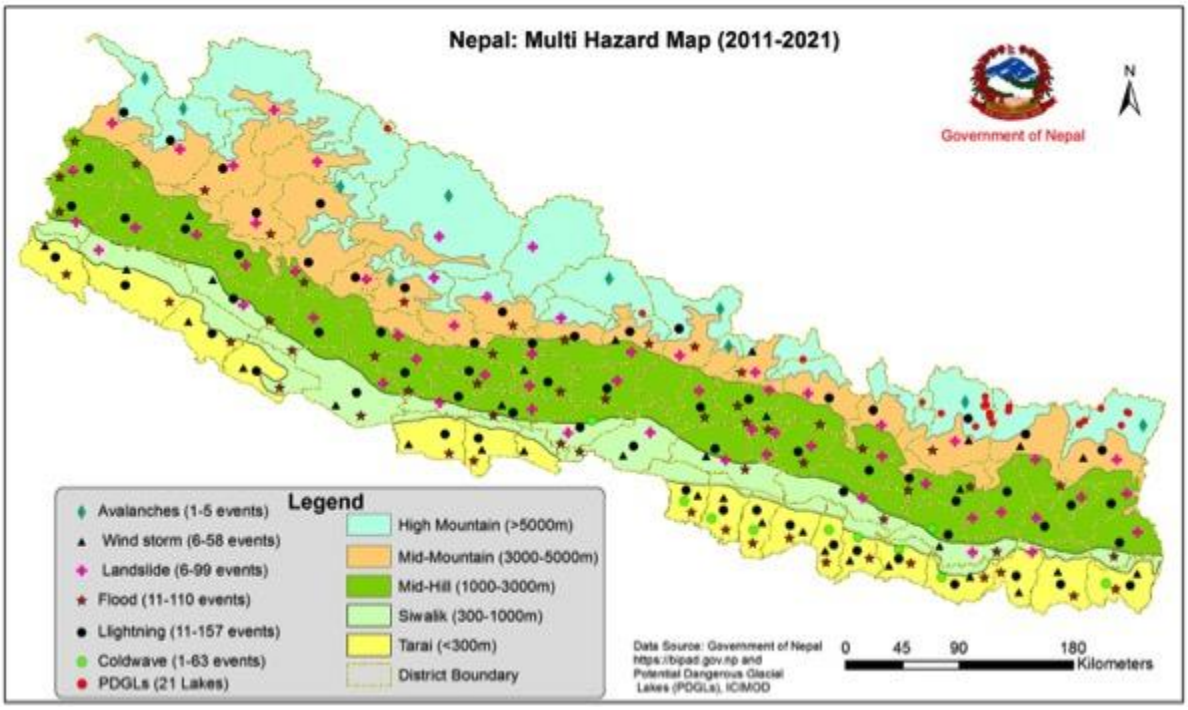


Figure 6: Multihazard map showing number of climatic hazards at district level, 2011-2021

Rising temperatures and erratic rainfall, and extreme weather events impact on seasonal and temporal trends of vector-borne diseases, water-borne diseases, food-borne diseases, respiratory illnesses, nutrition-related diseases, injuries, and mental illnesses. They also affect water availability and timing, prompting water-related disasters. Out of the 445 landslides reported in 2020, 59 occurred along roadsides and 62 occurred on roads, obstructing vehicular flow (NDRRMA, 2020; MoF, 2020). Every year during the monsoon, the impact of climate change on roads grows due to landslides caused by rains and constant toe cutting caused by flooding rivers. High mountains are expected to be more vulnerable to avalanches and Glacial Lake Outburst Floods (GLOFs); hills to landslides, flash floods; and the Tarai lowlands to floods and forest fires, all of which will have impact on Tourism sector (MoFE, 2021c). The consequences of these hazards severely burden the rural livelihood.

Agriculture is a main source of incomes and livelihoods in rural areas, and there is a high reliance on small-scale, rain-fed agriculture and dry land farming, where productivity is impacted by climate change (Paudel, 2016). Small landholdings limit crop diversification for small farmers (Panthi et al., 2015). Poverty, food insecurity, and malnutrition plague farming communities; and almost 50% of households in the country are food insecure, nearly 25% are poor, and 14% are undernourished (MoALD, 2019a). Women from poor and marginalized households spend more time and energy on collecting fuel for their livelihood (MoFSC, 2018). Moreover, a woman in the rural mountains spends 4 to 6 hours a day collecting a bundle of firewood (Gurung and Bisht 2014). As a result women are time poor and unable to pursue job opportunities, gain new knowledge and skills, and engage in community activities (UN Women, 2021).

Quite significant development gaps exist between rural and urban areas have been attributed to "persistent discrepancies in income and education between urban and rural areas" (International Fund for Agricultural Development, 2014). These gaps contribute to rural-urban migration, which is a factor in the proliferation of informal settlements in the Kathmandu valley, many of which are located on the floodplains of rivers. Rural out-migration - of which the impacts of climate change are only one of many influences - has left behind empty ghost villages in the Manang, Mustang, Ramechhap, and Nuwakot districts (Khatri, 2013). Households with fewer years of schooling and lower wealth levels are considerably more likely to be affected, experience casualties, and incur livelihood losses as a result of floods and landslides (Shrestha et al., 2016). Poverty has affected the ability of mountain communities to recover from landslides (Devkota & Lal, 2017). Marginalized and indigenous groups - particularly *Majhi, Raute, Chepang, Satar* - experience high levels of poverty which increases their vulnerability to climate change (GoN, 2021).

Gendered vulnerability to climate change is related to the inequitable gender divisions of labour, women being the primary caretakers of water and natural resources management, and inequitable incomes complicated by women's control over income being more limited than men (GoN, 2021). Gendered vulnerability is also impacted by predominantly male outmigration (women comprise 12% of migrant workers [GoN, 2021]), which is often a response of the most marginal cultivators that is influenced by climate impacts on agricultural productivity (Nellemann et al., 2014; Koirala, 2014). Women and girls are more likely to die as a result of flooding. Flood-related fatalities in 1993 were 13.3 per 1,000 girls aged 2–9 years, 9.4 per 1,000 boys aged 2–9 years, 6.1 per 1000 adult women, and 4.1 per 1,000 adult men (Pradhan et al., 2007). Poor, marginalized, disadvantaged and female-headed households are more vulnerable than medium, well-off, and male-headed households (Poudel et al., 2020). Compared to men, women have a higher risk perception of climate variability and associated impacts on food security. In terms of adaptation practices, women usually adopted short-term coping mechanisms whereas men adopted long-term options (Bastakoti & Doneys, 2020). Social barriers, including low social status, are factors that hinder the access of women to climate adaptation (Malla, 2015).

4.2 Future Climate Hazards, Risks and Impacts

Nepal climate vulnerability and risk assessment (MoFE, 2021c) determined that future climate change is expected to lead to more extreme climate events (precipitation and temperature) by 2045 and 2065. Most of the districts of Province one, Province two, Bagmati Province, and Gandaki Province are highly likely to experience high/very high incidences of climate extreme events in 2030. In the future, all the Tarai districts and districts of Province two are expected to experience increased extreme events, and the eastern districts of Province one will experience a very high incidence of extreme events. These changes in climate are expected to result in climate hazards (Table 5) that are more frequent, widespread, long-lasting, and intense under future climate change (MoFE, 2021c).

Table 5: Descriptive scenarios of climatic hazards under future climate change

Climate hazards	Impact	Medium term scenario	Long term scenario
Heat waves	Increase	Likely	Very likely
Cold waves	Decrease	Likely	Very likely
Heavy rainfall	Increase	Likely	Very likely
Snowstorms	Decrease	Likely	Likely
Thunderbolts	Increase	Likely	Likely
Windstorms	Increase	Likely	Likely
Hailstorms	Increase	About as likely as not	About as likely as not
Floods	Increase	Likely	Likely
Landslides	Increase	Likely	Likely
GLOFs	Increase	Likely	Likely
Droughts	Increase	About as likely as not	About as likely as not
Forest fires	Increase	Likely	Likely
Fires	Increase	Likely	Likely
Avalanches	Increase	Likely	Likely
Epidemics	Increase	Likely	Likely

Note: Virtually certain 99-100% probability, very likely 90-100 %, likely 66-100%, about as likely as not 33-66%, unlikely 0-33% and very unlikely 0-10%, exceptionally unlikely (0-1%). Source: MoFE (2021).

As temperatures rise in Nepal, acute climate hazards such as extreme weather events (including heavy rainfall, snow storms, high winds, hailstorms, and increased lightning), heat waves, cold waves, floods, landslides, and wildfires are expected to increase in frequency and severity; and chronic or slow onset hazards such as drought, changes in precipitation patterns, snow cover changes, glacier retreat, and GLOFs, are expected to intensify. Multiple events may occur simultaneously across regions, which could be catastrophic (MoFE, 2021).

The climate hazards will interact with and cause harm to vulnerable systems, leading to climate risks that are expected to impact critical systems and human well-being In Nepal, including natural ecosystems, food production, livelihoods, human health, communities and settlements, and infrastructure. These risks will impact Nepal's efforts to achieve the United Nations Sustainable Development Goals (SDGs) and national development goals, such as economic development and poverty alleviation. This will entrench reliance on aid and increase the need for donor delivery of basic services. The future economic costs of climate change in Nepal could be very large, equivalent to an additional 2 to 3% of current GDP per year by 2050 (IDS-Nepal, PAC & GCAP, 2014).

4.3 Summary of Climate Hazards, Vulnerabilities, Risks and Impacts

An overview of Nepal's climate hazards, key sources of vulnerability, and climate impacts in the nine priority thematic areas, and particularly vulnerable groups and regions are summarized in Table 6. The climate vulnerabilities and risks for each thematic priority are discussed in Section 7 to provide context for the identification of priority adaptation actions; and are described in detail in NAP technical reports, and government and academic publications (for overviews of the research, refer to MoPE, 2017a; Kunwar, 2021a; GoN, 2021).

Table 6: Summary of climate hazards, climate vulnerability and climate risks in Nepal

Climate hazards	Key factors of vulnerability	
Acute Increased frequency and severity of: ▪ Extreme weather events ▪ Heat waves ▪ Floods ▪ Landslides ▪ Avalanches ▪ Forest fires **Chronic / Slow onset** ▪ Drought ▪ Changes in precipitation pattern ▪ Snow cover changes ▪ Glacier retreat ▪ Glacial lake outburst floods (GLOFs)	▪ 28.6% of the population is multidimensional poor; 18.7% live in absolute poverty ▪ Significant disparities between rural and urban areas ▪ Significant disparities along lines of caste and ethnicity ▪ Low levels of gender equality ▪ Reliance on ecosystem services for subsistence livelihoods ▪ Largely natural resource-dependant agrarian economy ▪ High reliance on natural rainfall and insufficient irrigation systems ▪ Small, fragmented landholdings in rural areas ▪ Poor urban and land use planning - rapid and haphazard urbanization ▪ Large number of informal settlements due to rural-urban migration ▪ Poor health infrastructure ▪ Inadequate access to improved technologies ▪ Inadequate evidence and knowledge base ▪ Illiteracy (in 2018, 32% of the population was not literate) ▪ Inadequate, but improving, governance structures ▪ High dependence on international finance to address adaptation priorities **Particularly vulnerable regions** ▪ High mountain landscapes and ecosystems ▪ Tarai region **Particularly vulnerable groups** ▪ Women, indigenous people, Madheshi, Tharu, Muslim, oppressed groups, backward class, minorities, landless, marginalized farmers, labourers, youth, children, senior citizens, persons with all forms of disability, pregnant women, incapacitated and disadvantaged persons or groups ▪ People in remote communities with small landholdings and/or livelihoods dependent on natural resources ▪ Communities in the mid and far western hills and mountain communities that have attracted the least climate investment and experience the highest levels of poverty	
sectors	**Vulnerable regions / regions with very high climate risk in the sector**	**Climate Impacts**
Agriculture and food security	*Highly vulnerable regions:* ▪ Mid- and high-hill districts ▪ Karnali Province and Sudurpaschim Province *Regions with very high risk of climate impacts in the sector in 2050:* ▪ Lumbini Province ▪ Gandaki Province ▪ Province one ▪ Province two	▪ Declining crop, livestock and fisheries production ▪ Shifts in agro-ecological regions ▪ Increase in disease and pests ▪ Declining water availability ▪ Land degradation, including soil erosion and declines in soil quality ▪ Deterioration in food availability ▪ Major losses in subsistence farm production leading to increased risk of food insecurity and a decrease in incomes ▪ Changing dates of sowing and transplanting ▪ Changes in flowering and fruiting time of horticultural crops ▪ Shorter recovery time between droughts ▪ Higher weather uncertainties
Forests, biodiversity, and watershed conservation	*Highly vulnerable regions:* ▪ Hills and mountain districts ▪ Mugu, Sankhuwasabha, Dolpa and Kalikot districts *Regions with very high risk of climate impacts in the sector in 2050:* ▪ High and middle mountain regions and districts ▪ Chure and Siwalik regions	▪ Decline in and depletion of ecosystem services such as wetlands, rangelands, and forests ▪ Changes in forest distribution and composition ▪ Decreased production of non-timber forest products ▪ Biodiversity loss - changes in species growth and production, including declines in productivity and extinction ▪ Shifts in the geographical range of many species as they move upward in elevation from current locations ▪ Changes in flowering and fruiting times creating food deficiencies for wild animals and insects ▪ Loss/change of habitat of wildlife ▪ Increased wildlife death and injury ▪ Higher incidence of pests and disease ▪ Increase in alien and invasive species ▪ Increase in damage and destruction from forest fires

Disaster risk reduction and management	*Highly vulnerable regions:* ▪ Districts of Dhading, Makawanpur, Sindhupalchok, Gorkha, Kailali, Sindhuli, Morang, and Jhapa *Regions with very high risk of climate impacts in the sector in 2050:* ▪ Almost all districts in the Tarai, mid-hills, and mountains	▪ Negative impact on livelihoods because of increase in and frequency of climate-related disasters ▪ Destruction of physical, social, cultural and financial assets. ▪ Loss of life and property
Health, drinking water, and sanitation	*Highly vulnerable regions:* ▪ Health – Hills ▪ Drinking water and sanitation - Karnali Province, Province two and Sudurpaschim Province *Regions with very high risk of climate impacts in the sector in 2050:* ▪ Health: Sunsari, Dhankuta, Terhathum, sankhuwasabha, tanahu, Parbat, Syangia, Morang, Taplejung, Panchthar, Jhapa and Ilam districts ▪ Drinking water and sanitation - Province two	▪ Greater risks of death and physical and psychological disease and injury ▪ Increased risk of death and illness due to heat stress ▪ Greater risk of vector-borne diseases, such as malaria spreading to higher altitudes ▪ Higher incidence of water-borne diseases, such as diarrhoea and cholera after severe precipitation events ▪ Increased incidence of respiratory infections ▪ Increased risk of food insecurity ▪ Reduced progress in reducing mortality and morbidity from under-nutrition ▪ Reduced labour productivity and work capacity ▪ Scarcity of water for drinking, sanitation, and hygiene; because of depletion of water sources, such as springs in mountains ▪ Decrease in groundwater table ▪ Low water flows lead to higher pollutant concentrations ▪ Failure of water and sanitation infrastructure leading to higher diarrhea risk ▪ Damage to and destruction of health facilities
Industry, transport, and physical infrastructure	*Highly vulnerable regions:* ▪ Mid-hills and mountain districts ▪ Province two, Bagmati Province, Gandaki Province, Lumbini Province, and Karnali Province *Regions with very high risk of climate impacts in the sector in 2050:* ▪ Bagmati Province and Province two	▪ Damage to and destruction of physical and natural infrastructure ▪ Disruption of transportation networks ▪ Disruption to communication networks ▪ Damage to industrial sites and job losses ▪ Disruptions in the supply/availability of water and other raw materials for industrial processes ▪ Disruptions in industrial value chains
Rural and urban settlements	*Vulnerable urban municipalities* ▪ Concentrated in the Karnali Province and Sudurpaschim Province. *Vulnerable rural municipalities* ▪ Concentrated in Province two and Bagmati, Lumbini, Karnali and Sudurpaschim. *Regions with very high risk of climate impacts in the sector in 2050:* ▪ Urban - Suryodaya and Biratnagar in Province one, Janakpur in Province two, Bhanu, Byas, and Pokhara Lekhnath in Gandaki Province, and Sitganga in Lumbini Province ▪ Rural - Dhading, Makawanpur, Sindhupalchok, Gorka, Tanahu, Kavrepalanchok, Pyuthan, Kailali, Sindhuli, morang, Chitawan, Dang, Jhapa, Mahottari, Saptari	▪ Building and property damage and destruction ▪ Migration from rural to urban areas leading to overcrowding of informal settlements, often in risk-prone areas ▪ Forced migration or displacement - ghost villages in rural/mountain areas ▪ Heat islands in urban settlements ▪ Constraints on urban water provision ▪ Damage and loss to urban ecology ▪ Shifts in production of food and non-food crops in rural areas
Tourism, natural and cultural heritage	*Highly vulnerable regions:* ▪ Mountain districts ▪ Province one, Bagmati Province, Gandaki Province, Karnali Province and Sudurpaschim Province *Regions with very high risk of climate impacts in the sector in 2050:* ▪ Bagmati Province, Gandaki Province, parts of Province one, Sudurpaschim Province ▪ Majority of protected areas	▪ Decreasing snowfall leading to fewer visitors ▪ Restricted access to tourist destinations ▪ Obstruction of trails and passages used by trekkers and mountaineers ▪ Destruction of tourism infrastructure ▪ Damage to archaeological sites ▪ Historical buildings exposed to high levels of humidly leading to decay and pest infestation ▪ Destruction and alteration of flora and fauna habitats that negatively impact nature-based tourism
Water resources and energy	*Highly vulnerable regions:* ▪ Bagmati Province, Gandaki Province, Lumbini Province, Karnali Province and Sudurpaschim Province *Regions with very high risk of climate impacts in the sector in 2050:* ▪ Energy - Bagmati Province and Gandaki Province	▪ Reduced water availability for households, agriculture, and industry ▪ Increased water availability from glacial runoff in short term; decreased in long term ▪ Disruptions to springs in middle hills ▪ Low seasonal river flows

	▪ Water resources - districts of Bagmati Province, Gandaki Province, Karnali Province, and Province one	▪ Soil erosion and sedimentation causing damage to irrigation canals, hydropower dams and turbines, and reduced life span of reservoirs ▪ Reduced water availability for hydroelectricity generation ▪ Damage to energy infrastructure (generation, transmission and distribution) ▪ Increased electricity demand for heating and cooling ▪ Forest fires and impacts on forests reduce availability of fuelwood
Gender Equality Social Inclusion, Livelihoods and Governance	*Highly vulnerable regions:* ▪ Karnali Province, Sudurpaschim Province, and districts in Province 2 and Bagmati Province *Regions with very high risk of climate impacts in 2050* ▪ Morang district in Province one; Saptari, Siraha, Dhanusha, Mahottari, Sarlahi, and Bara districts in Province two; Dang district in Lumbini Province; Kailali district in Sudhurpaschim Province	▪ Destruction of physical assets impacting livelihoods ▪ Drought, pests, lack of rainfall impact agricultural livelihoods ▪ Flood-related fatalities are higher for girls and women, than boys and men ▪ Increased rural to urban migration, leading to increases in urban poverty ▪ Increase in female-headed households ▪ Short recovery time between droughts, moving toward tipping points in rainfed farming households ▪ Shift from transient to chronic poverty

Source: Patra & Terton (2017); World Bank & ADB (2021); MoPE (2017); GoN (2021, 2020b); MoFE (2021c).

5. THE NATIONAL ADAPTATION PLAN (NAP) PROCESS

5.1 The International Context

5.1.1 International Framework for Climate Change Adaptation

Climate change is a global problem that requires a global solution. The international response is framed around the **UNFCCC** that entered into force in 1994. A total of 196 countries and the European Union (EU) are Parties to the Convention, and Nepal signed the UNFCCC in 1992 and ratified the Convention in 1994. The aim of the Convention is to "stabilize greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time-frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic development to proceed in a sustainable manner" (United Nations, 1992). The **UNFCCC calls** for cooperation to address the impacts of climate change, including assistance for developing countries that are particularly vulnerable to climate impacts and lack the resources to meet the costs of adaptation. The Convention notes that developing countries with fragile mountainous ecosystems are particularly vulnerable to the adverse effects of climate change (United Nations, 1992).

While the Convention initially emphasized mitigation, the release of the IPCC's Third Assessment Report in 2001 raised the profile of adaptation (IPCC, 2001). The Least Developed Countries (LDC) work programme was established in 2001 and included, among other things, National Adaptation Programmes of Action (**NAPA**). The **NAP process** was formally established in 2010 under the Cancun Adaptation Framework, which was an outcome of the 16th Conference of the Parties (CoP 16) to the UNFCCC. Article 7(9) of the Paris Agreement noted that countries shall engage in adaptation planning processes and the implementation of actions making the NAP process central to the adaptation goal of the Paris Agreement (Box 4). The 2010 Cancun Adaptation Framework also established the Adaptation Committee, and agreed on a process to address the adverse impacts of climate change and to establish a funding process for adaptation (UNFCCC, 2010). The elements of the LDC work programme were updated in 2018 and included, among other things, "supporting the process to formulate and implement NAPs and related relevant adaptation strategies, including national adaptation programmes of action" (UNFCCC, 2018).

Box 4: The NAP process

The NAP process is a strategic process that enables countries to identify and address their medium- and long term priorities for adapting to climate change. The NAP process helps countries integrate adaptation in development decision making. This nationally drive process involves analyzing current and future climate change and assessing vulnerability to its impacts, and then reviewing the gaps, identifying and prioritizing the adaptation options, implementing these options, and tracking progress and results.

The NAP process puts in place the systems and capacities needed to make adaptation an integral part of a country's development planning, decision making and budgeting. There is both a plan and process associated with the endeavour. The NAP process and NDCs represent important elements of countries' responses to climate change, in line with the Paris Agreement. NDCs outline countries' commitments to helping achieve the global goals of the Paris Agreement. A country's NDC communicates the goals and targets that are envisioned fo adaptation, while the NAP process elaborates how adaptation will be planned, implemented, and monitored. *Source: Hammil et al. (2019); United Nations (2015).*

Source: UNFCCC (2012)

The **Paris Agreement**, a legally binding international treaty on climate change under the UNFCCC, was adopted by 196 countries in December 2015 and entered into force in November 2016. Section 2.1(b) of the Agreement includes an adaptation goal of "increasing the ability to adapt to the adverse impact on climate change; and Section 7(1) sets a global adaptation goal of "enhancing adaptive capacity, strengthening resilience and reducing vulnerability to climate change, with a view to contributing to sustainable development and ensuing adequate adaptation repose in the context of the temperature goal" (UNFCCC, 2015a). The Paris Agreement requires that countries engage in adaptation planning and implementation. Countries set out their national contributions to achieving the global goals of the Paris Agreement in their **NDCs**, and many countries, including Nepal, have include adaptation in their NDCs. The legally binding aspects of the agreement include the provisions on transparency, reporting, and accountability; meaning that countries have an obligation to prepare NDCs, and to report on their emissions and progress in implementing their NDCs.

5.1.2 Other International Agreements Aligned with Climate Change Adaptation

Many adaptation actions present considerable opportunity to contribute to the goals and objectives of multiple international agreements. The three Rio conventions - UNFCCC, **United Nations Convention on Biological Diversity** (CBD), and the **United Nations Convention to Combat Desertification** (UNCCD) - are intrinsically linked because they address interdependent issues. Adaptation actions can have multiple benefits including combating desertification and preventing biodiversity loss through such initiatives as sustainable land management, ecosystem-based adaptation (EbA), and improving early warning systems (CBD, UNCCD & UNFCCC, 2012).

The **Sendai Framework for Disaster Risk Reduction** (DRR) (2015-2030) calls for addressing climate change as one of the drivers of disaster risk (Article 13), and shares a foundation of resilience building with the Paris Agreement. The process of developing policies and investing in climate adaption and DRR strategies have similar approaches, common challenges and complementary advantages for governance, financing, information and data analysis, capacity development, and monitoring (UNDRR, 2021).

Sustainable Development Goals (SDGs) are designed to build on the success of the earlier United Nations Millennium Development Goals (MDGs), which aimed to end all forms of poverty by 2030. The 17 SDGs go beyond MDGs to focus on the root causes of poverty. Each goal has several associated targets and a set of measurable indicators used to track progress; there are 169 targets and 230 approved indicators in total across the SDGs. Goal 13 is targeted to urgently addressing climate change and its impacts (United Nations, 2015). Leveraging the common objectives of the NAP process and SDG targets 13.1 and 13.2—building adaptive capacity and integrating adaptation considerations into planning processes—can serve as a bridge for linking adaptation efforts under the Paris Agreement and implementation of the SDGs in pursuit of climate-resilient development (Hammill & Price-Kelly, 2019).

An integrated approach to adaptation, sustainable development, and disaster risk reduction has been pursued by many countries. Nepal has also explored potential entry points in integrating adaptation, sustainable development and disaster risk reduction (GoN, 2020). Building resilient futures, for example, is a key component of all three agendas, and abundant interconnections go beyond resilience building activities that contribute to the goals of multiple agendas (UNFCCC Secretariat, 2017). The overarching objective of adaptation, sustainable development, and DRR – to benefit vulnerable people and communities – can aid in identifying highly effective adaptation actions that contribute to all three sets of goals simultaneously (UNFCCC Secretariat, 2017).

Climate change poses risks to the enjoyment of the human rights protected by the International Convention on the Elimination of all Forms of Discrimination Against Women; the International Covenant on Economic, Social and Cultural Rights; the International Convention on the Protection of the Rights of All Migrant Workers and Members of Their Families; the Convention on the Rights of the Child, and the International Convention on the Rights of Persons with Disabilities. Climate change impacts affect women and men differently, fall disproportionately on the marginalized and vulnerable, and causes damage to ecosystems that affect the enjoyment of human rights. Complying with human rights provisions and meeting the terms of the Paris Agreement requires that countries reduce greenhouse gas emissions and foster climate resilience (United Nations Human Rights Office of the High Commissioner, 2019).

5.2 The National Context

5.2.1 Nepal and the UNFCCC

Nepal, being a party to the UNFCCC, recognizes the importance of preparing to face the impacts of climate change through adaptation actions. The country ratified the UNFCCC in 1994 and the Paris Agreement in 2015. Its **First NDC** was submitted in 2016 and its **Second** in 2020; which outlined Nepal's planned contributions to the achievement of the goals set out in the Paris Agreement. Both NDCs included adaptation actions; and the NDC and NAP process are aligned in Nepal, with this NAP setting out actions to achieve the high-level adaptation contributions in the country's NDC.

Nepal also reports to the UNFCCC through its National Communications that include a national inventory of greenhouse gas emissions and as well as a chapter on vulnerability, impacts, and adaptation assessment. Nepal submitted its **First National Communication** in 1999, **Second National Communication** in 2015, and **Third National Communication** in 2021. This NAP will support both NDCs and National Communications, which was established by article 7 (Paragraph 10 and 11) of the Paris Agreement.

Nepal's inclusive NAP process responds to the UNFCCC's call to consider vulnerable groups, communities, and ecosystems, and to effectively engage a range of stakeholders. The NAP process also responds to the Paris Agreement's requirement for countries to engage in adaptation planning and implementation, as well as to communicate priorities, plans, actions, and support needs. Nepal adheres to Article 7 of the Paris Agreement, that states adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach.

Nepal is an active participant in the international climate change negotiations, and negotiates with the Group of 77 countries (G77) and China and the LDC Group. The country

led the LDC Group at COP 19 in Poznan, Poland and COP 20 in Marrakech, Morocco. In addition, Nepal supported the LDC Group in the negotiations of the NAP process. Nepal was elected to the Chair of the Adaptation Fund Board in 2016, after serving as a board member in 2015 (MoFE, 2020b). It has been a member of the LDC Expert Group (LEG) since 2008.

Nepal is one of 40 countries (as of January 2022) that has joined the Adaptation Action Coalition that was formed in January 2021. Nepal became a member of the Coalition's steering committee in March 2021, and brings its experience in addressing adaptation to inform the building of global resilience. The Coalition aims to accelerate adaptation by delivering sector-specific, action-orientated work streams, initially focused on health, infrastructure, and water (Gov.UK, 2021). This Coalition builds upon the UN Climate Action Summit Call for Action on Adaptation and Resilience. It calls for "equal and increased urgency to adapt to climate impacts and build resilience for the future" and commits to acting to respond to climate impacts, putting climate risk at the centre of decision making, and increasing the availability of adaptation and resilience finance (UN Climate Action Summit, 2019). In addition, Nepal is a member of the Vulnerable 20 Group (2021) that is a high-level dialogue pertaining to action on climate change.

5.2.2 Adaptation in Nepal and Alignment with Other International Agreements

The strategies and actions for climate-resilient development set out in this NAP present considerable opportunity to contribute to the goals and objectives of other international agreements. Nepal's NAP process aligns with the key principles of the 2030 Agenda for Sustainable Development and its 17 SDGs, including the commitment to leave no one behind. The common pathways commit to the development of adaptation plans for local governments, climate-smart agriculture, and the integration of climate change into school curricula (NPC, 2017). The SDG financing strategy highlights that climate-proofing infrastructure is a major intervention requiring investment (NPC, 2018).

Nepal has ratified a series of human rights treaties, including the International Convention on the Elimination of all Forms of Discrimination Against Women (1991); the International Covenant on Economic, Social and Cultural Rights (1991), the Convention on the Rights of the Child (1990), and the International Convention on the Rights of Persons with Disabilities (2010). Addressing the impacts of climate change is necessary to ensure that Nepal citizens continue to enjoy human rights, and adaptation actions will be guided by these treaties in regard to ensuring that actions appropriately address the needs of children, women, and persons with disabilities. Nepal adopted the Sendai Framework for Disaster Risk Reduction in 2015 and prepared the National Disaster Risk Reduction Policy and Strategic Plan of Action: 2017-2030. The policy has a vision of a climate-adaptive society; acknowledges the need for an umbrella policy for disaster risk reduction and climate change; and calls for integration of disaster risk reduction and climate change actions, climate adaptive infrastructure, integration of climate adaptation concerns in mega-projects, and development of agriculture and health systems that consider climate adaptation (GoN, 2018b). The strategy calls for a development process that assesses disaster risks and climate risks in an integrated manner, and coherence between DRR and climate adaptation actions in the agriculture, energy, health, and urban and rural development sectors (GoN, 2018a) (Figure 7). Nepal has committed to a range of additional voluntary measures under the Sendai Framework.

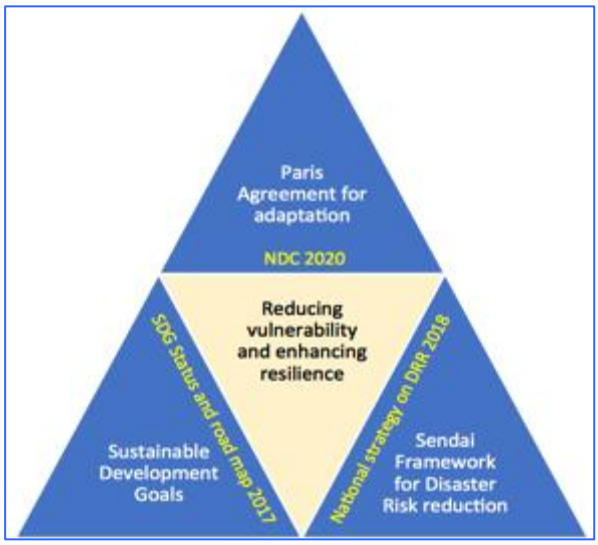


Figure 7: Synergy of adaptation, sustainable development and disaster risk management and Nepal's preparation

Nepal is a member of the **Regional Consultative Group** (RCG) on Humanitarian Civil-Military Coordination for Asia and the Pacific, a regional forum that brings together the humanitarian, civilian and military actors involved in disaster response preparedness planning and disaster response in the region. Nepal served as Chair of the forum in 2020. Nepal is signatory to the other two Rio conventions, CBD and the UNCCD. The Nepal Biodiversity Strategy and Action Plan (2014-2020) includes a cross-sectoral theme of adaptation and mitigation to address the impacts of climate change. Two identified strategies under this theme are: adaptation to and mitigation of the impacts of climate change on biodiversity, and enhancing the resilience of ecosystems, species and human communities to the climate change impacts (MoFSC, 2014).

5.2.3 NAP Nepal and Associated National Policies, Strategies and Plans

The Nepal NAP document is one output of the NAP process, and it is informed by a substantive body of research that informed the preparation of a series of technical documents (Annex 1). These technical documents include the Technology Needs Assessment for Climate Change Adaptation (MoFE, 2021b), the Vulnerability and Risk Assessment and Identifying Adaptation Options: Summary for Policy Makers (MoFE, 2021c), and the adaptation chapter of Nepal's Third National Communication (GoN, 2021). Other government departments have also undertaken adaptation-related research and planning, including the Health NAP published in 2017 (GoN, 2017b) and substantive adaptation planning in the agriculture sector (FAO, 2021). The NAP process reflects the Government of Nepal's commitment to building climate resilience, and is guided by a robust framework of policy, plans, and institutions to address climate change, including climate adaptation. The process is an important element of the overarching institutional and policy framework for climate change and development.

The foundation of the institutional and legal framework for adaptation action is the **Constitution of Nepal.** Part 1, Article 30 guarantees the fundamental right to live in a clean and healthy environment, which establishes a framework for the country to manage the impacts of climate change (GoN, 2015).

Actions to address adaptation are supportive of the Government of Nepal's **25 Year Long Term Vision 2100** for a "*Prosperous Nepal, Happy Nepali*". Adaptation actions will contribute to the goal of graduation to a middle-income country by 2026 by achieving the SDGs, and the long term national strategy to "*to conserve and utilize natural resources and improve resilience*" (NPC, 2019).

The Fifteenth Plan (Fiscal Year 2019/20 - 2023/24), which sets out actions to be taken in a four-year period to work toward the 2100 goal, includes strategies for macroeconomic, economic, social, and infrastructure sectors, as well as private sector and cooperatives, and democracy and good governance. Crosscutting sectors include climate change, hydrology and meteorology, disaster risk reduction and management, and environment (GoN, 2020a). Actions in the crosscutting climate change sector aim "to contribute to building a sustainable society by augmenting the capacity to adapt to climate change and minimizing its adverse effects"; and will result in the preparation and implementation of local level adaptation plans, at least five major projects that increase capacity to adapt to the adverse effects of climate change, and the provision of climate change education in approximately 90% of schools (NPC, 2019).

Nepal's legal framework guiding adaptation action includes the **Environmental Protection Act, 2019**, which is a national law that sets out actions to help Nepal, *inter alia*, "face the challenges posed by climate change" (GoN, 2019a). Chapter 4, "Provisions Relating to Climate Change" mandates that the relevant Ministry will periodically provide information to local communities about climate change impacts; that authorities at the national, provincial, and local levels will adopt and implement adaptation plans; and that the government can authorize the adoption of measures, and enact and enforce standards for actions and technologies to address the adverse impacts of climate change (GoN, 2019a).

The **National Climate Change Policy, 2019** updated the 2011 policy. The policy provides the overarching policy direction for the country and aims "to contribute to the socio-economic prosperity of the nation by building a climate-resilient society" (GoN, 2019c). The policy sets out objectives and priority adaptation actions for each of the eight thematic areas and four cross-cutting areas.

Nepal has submitted two **NDCs** to the UNFCCC Secretariat, in 2016 and 2020 (GoN, 2016; GoN, 2020b). Both NDCs included adaptation, and priority thematic and crosscutting areas in the adaptation NDC are aligned with those in the national climate change policy. The adaptation section in the 2020 NDC highlights policy priorities out to 2030, including actions and process results to be monitored and tracked. The updated NDC (2020) notes that Nepal's NAP will outline the country's contribution to meeting the adaptation goals of the Paris Agreement (GoN, 2020b).

Climate adaptation is mainstreamed in several sectors and components including agriculture, livestock, irrigation, industry, tourism, health, forests, biodiversity, wildlife conservation, urban development, disaster management. A review is included in Nepal's Third National Communication to the UNFCCC (GoN, 2021).

5.2.4 Existing Institutional Mechanisms for Climate Change Adaptation

Key institutions engaged in the NAP process are briefly described below. Additional information can be found in NAP technical reports.

Overarching coordination

Environmental Protection and Climate Change Management National Council (EPCCMNC) - established by the Environment Protection Act (GoN, 2019a), the Council is chaired by the Prime Minister, with membership comprised of four Ministers, seven Chief Ministers (of all provinces), a representative from the NPC, two professors (at least one women), three experts (at least one woman), and the MoFE Secretary. The Council directs on "integrating the matters relating to the environment and climate change into the long term policies, plans and programmes"; provides "policy guidance to the Provincial and Local Levels with regard to environmental protection and climate change"; and manages "economic resources for environmental protection and climate change" (GoN, 2019a).

Inter-Ministerial Climate Change Coordination Committee (IMCCCC) - established by the NCCP (2019), coordinated by MoFE, and chaired by its Secretary with membership comprised of the Joint Secretaries of 22 federal ministries; NPC; representatives of the Nepal Academy of Science and Technology (NAST), National Agriculture Research Council (NARC) and Alternative Energy Promotion Centre (AEPC); and additional members invited at the discretion of MoFE secretary. The Committee is responsible for effective communication and coordination between government and non-governmental institutions.

Federal level

Thematic Working Groups (TWGs) and Crosscutting Working Groups (CWGs) - led by the respective coordinating ministry (Table 7), the working groups are responsible for mainstreaming adaptation into sectoral policies, plans, and programmes.

Ministry of Forests and Environment (MoFE) - responsible for the NAP process and for policies, laws, and standards for climate change; providing guidance and technical support to provincial and local governments; M&E of adaptation actions; reporting on adaptation actions on an annual basis; and approval of adaptation projects funded through international sources. The **Climate Change Management Division** (CCMD) - responsible for coordination of the NAP process within MoFE and the mainstreaming of adaptation in sectoral, provincial, and local policies, plans, and programmes; leads development and implementation of the Nepal NAP; leads studies and research on adaptation; reports annually on climate change; serves as the focal point for the UNFCCC; coordinates all climate change-related projects; and provides coordination across working groups.

Ministry of Finance - has established a climate finance unit and serves as the focal point for the Green Climate Fund (GCF) and Global Environmental Facility (GEF); works to increase access to domestic and international financial resources related to adaptation; and helps to coordinate climate finance.

Sector Ministries - responsible for establishing climate change units to mainstream the NAP (and NDC) in sectoral policies, planning and activities; relevant ministries are responsible for coordinating TWGs and CWGs.

National Planning Commission (NPC) - leads the federal government's planning process and coordinates efforts to achieve the SDGs and the mainstreaming of climate change in these planning processes; ensures that plans and programs are climate-resilient; and assists MoFE in the Monitoring and Evaluation (M&E) of the climate change policy.

National Disaster Risk Reduction and Management Authority - coordinates actions on disaster risk reduction including policies and planning; provision of technical and financial support to provincial and local governments; studies and research; and knowledge management.

Provincial level

Provincial Climate Change Coordination Committee - established in each of the seven provinces with responsibility to integrate and mainstream climate adaptation into policies, plans, strategies, programmes, and projects. This includes vertical linkages with the federal government, integrated approaches across provinces, and coordination of capacity building for provincial governments.

Ministry of Industry, Tourism, Forests, and Environment - the focal ministry for climate change affairs at the provincial level responsible for implementing and coordinating climate adaptation actions; sharing of adaptation information with sector ministries and local governments; and monitoring the implementation of adaptation planning and budgeting. The ministry's related to Science, Environment and Climate Change Division coordinate and support local governments.

Local level

Infrastructure and Environment Management Section - the unit responsible for facilitating climate change activities, including adaptation; M&E of adaptation action; raising public awareness on adaptation; implementing adaptation projects in areas under local jurisdiction (such as environmental conservation, biodiversity, agriculture and livestock, hydroelectricity, watershed management, and wildlife) and integrating adaptation into local level services (such as health, sanitation, agricultural extension, and drinking water).

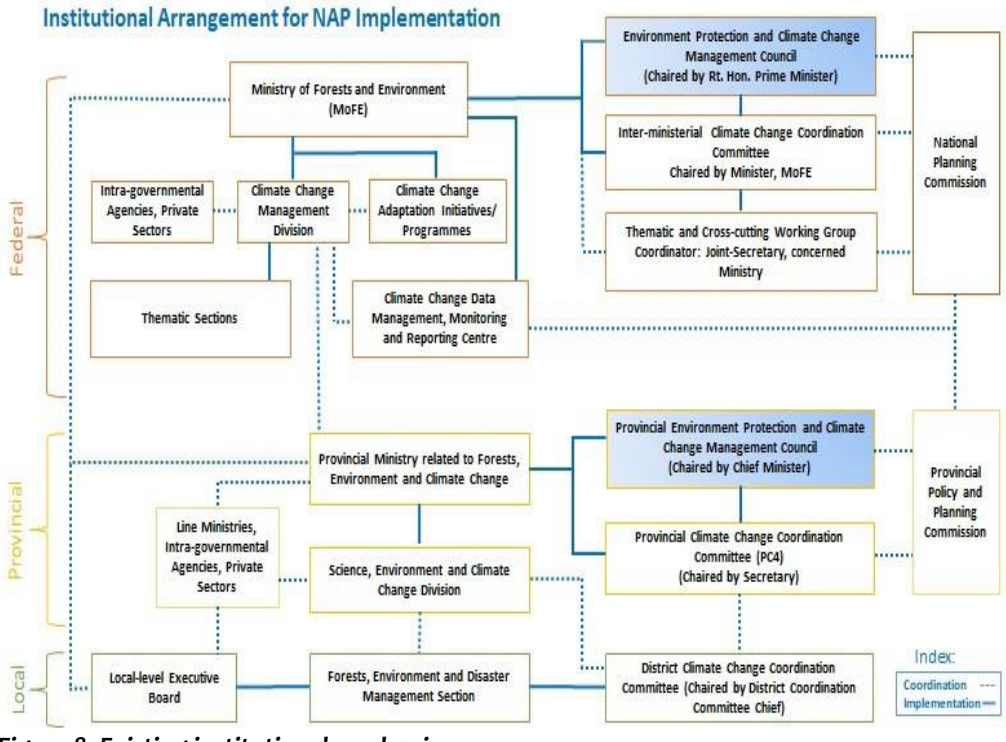


Figure 8: Existing institutional mechanism

5.2.5 Nepal's NAP process

Nepal launched its NAP process in 2015 (Figure 8). The NAP process aims to reduce the country's vulnerability to climate change and facilitate the integration of climate change adaptation measures into government policies, programs, and activities across multiple sectors and the three levels of government (MoPE, 2017a). Nepal's inclusive NAP process responds to the UNFCCC's call to consider vulnerable groups, communities, and ecosystems, and to effectively engage a range of stakeholders. The NAP process also responds to the Paris Agreement's requirement for countries to engage in adaptation planning and implementation, as well as to communicate priorities, plans, actions, and support needs. Nepal adheres to Article 7 of the Paris Agreement, that states "adaptation action should follow a country-driven, gender-responsive, participatory and fully transparent approach."

The NAP process builds on a body of work that began in 2010, when the Government of Nepal prepared its NAPA and began to develop LAPAs to guide implementation of adaptation programs at the local level. Since 2010, Nepal has made significant progress on integrating climate adaptation in policy and planning, and implementing adaptation and climate resilience projects and programmes. This progress includes expanding the priority themes for focused adaptation action from six sectors and two cross-cutting priorities set out in the NAPA in 2010, to eight thematic priorities and four cross-cutting priorities in the 2019 National Climate Change Policy (Table 7).

Table 7: Evolution of priority themes for adaptation in Nepal and their alignment with SGDs

NAPA (2010)	NAP process (2015)	National Climate Change Policy (2019)	Alignment with SDGs	Coordinating Ministry
Thematic Sector				
1. Agriculture and Food Security	1. Agriculture and Food Security	1. Agriculture and Food Security	**Goal 1:** End poverty. **Goal 2:** End hunger, achieve food security and improvised nutrition and promote sustainable agriculture. **Goal 12:** Ensure sustainable consumption and production patterns.	Agriculture and Livestock Development
2. Climate Induced Disaster	2. Climate Induced Disaster	2. Disaster Risk Reduction and Management	**Goal 13:** Take urgent action to combat climate change and its impacts.	Home Affairs
3. Urban Settlement and Infrastructure	3. Urban Settlement and Infrastructure	3. Urban and Rural Habitats	**Goal 11:** Make cities and human settlements inclusive, safe, resilient, and sustainable.	Urban Development
4. Public Health	4. Public Health, Sanitation and Hygiene	4. Health, Drinking Water and Sanitation	**Goal 3:** Ensure healthy lives and promote well-being. **Goal 6:** Ensure available and sustainable management of water and sanitation.	Health and Population/Water Supply
5. Forest and Biodiversity	5. Forest and Biodiversity	5. Forest, Biodiversity and Watershed Conservation	**Goal 15:** Protect, restore, and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss.	Forests and Environment
6. Water Resource and Energy	6. Water Resource and Energy	6. Water Resource and Energy	**Goal 7:** Ensure access to affordable, reliable, sustainable, and modern energy for all.	Energy, Water Resources, and Irrigation
-	7. Tourism, Natural and Cultural Heritage	7. Tourism, Natural and Cultural Heritage		Culture, Tourism and Civil Aviation
-	-	8. Industry, Transport and Physical Infrastructure	**Goal 9:** Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation.	Physical Infrastructure and Transport/Industry, Commerce and Supplies
Cross-cutting Sector				
7. Livelihood and Governance 8. Gender and Social Inclusion	8. Livelihood and Governance 9. Gender and Social Inclusion	9. Gender, Equality and Social Inclusion, Livelihoods and Good Governance	**Goal 5:** Achieve gender equality and empower all women and girls. **Goal 16:** Promote peace and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable, and inclusive institutions at all levels. **Goal 10:** Reduce inequality within and among countries.	Women, Children, and Social Welfare
-	-	10. Awareness Raising and Capacity Development	**Goal 4:** Ensure inclusive and equitable quality education and promote lifelong learning opportunities.	Education, Science, and Technology
-	-	11. Research, Technology Development and Expansion		Forests and Environment
-	-	12. Climate Finance Management	**Goal 17:** Strengthen the means of implementation and revitalize the Global Partnership for Sustainable Development.	Finance

Source: Kunwar (2020a).

5.2.6 Procedure of Nepal NAP Preparation

On September 23, 2018 the Government of Nepal and the UN Environment Programme (UNEP) launched the National Adaptation Plan (NAP) Project – "Building Capacity to Advance the NAP Process in Nepal" – to build institutional capacity to deal with the adverse impacts of climate change. This was Asia's first Green Climate Fund (GCF)-financed NAP project to support multi-sectoral, medium- to long term adaptation planning and budgeting across sectors in order to advance the country's adaptation planning process. The formulation of Nepal's NAP was supported through this project.

Nepal's NAP process was redefined, contextualized, and advanced through the project. Building on foundational work and research, the process re-established the thematic and cross-cutting working groups as guided by the NCCP, and set up institutional mechanisms at federal (Inter-ministerial Climate Change Coordination Committee), and provincial levels (Provincial Climate Change Coordination Committee).

The methodology to develop the Nepal NAP followed the UNFCCC LDC Expert Group guidelines and steps (2012) that include: A) Laying the groundwork and addressing gaps; and B) Identifying specific needs, options, and priorities. Moving forward on the NAP process will include: C) Developing implementation strategies for the actions; and D) Reporting, monitoring and review. Adhering to the Leave-no-one-behind (LNOB) principle, Nepal NAP process engages multiple stakeholders (Box 5) in identifying the medium- and long-term adaptation needs in the sectors identified by the NCCP. More than 784 participants from federal to provincial to local level were directly consulted/engaged representing about 368 institutions while formulating the NAP (detail in Annex 2.2).

Box 5: Development of the Nepal NAP - Stakeholder consultations

The adaptation actions in this NAP were identified through extensive consultations with stakeholders from:

- Thematic Working Groups (TWGs) and Cross-cutting Working Groups (CWGs)
- National government sectoral ministries
- Provincial governments
- Local councils and wards
- Vulnerable groups
- Civil society organizations
- Academia
- Subject experts
- Private sector entities
- Development partners

The methodology to identify and prioritize climate change adaptation actions, projects, and programmes built on the review reports prepared in the nap process (see annex 1,2). An adaptation appraisal tool that applied multi-criteria analysis was used to prioritize adaptation actions during the coordinators' conclave and write-shop. The approach built on the experiences of NAPA formulation, and the comparative strength of multi-criteria analysis over other tools. Long list of adaptation measures were sorted out following review and consultations (Annex 3). A long list of adaptation actions collected from the provinces was scored and ranked to identify priority adaptation actions and programmes (Kunwar, 2021a; Paudel and Adhikari, 2021). Consideration was given to identifying specific needs, options, and priorities on a country-driven basis; utilizing the services of national, provincial, local, and community-based entities, where appropriate; and promoting the principles of ecosystem integrity, participatory processes, gender-responsive and socially inclusive processes, and policy coherence. The methodology promoted eco-friendly and nature-based solutions that align with sustainable development objectives and programmes.

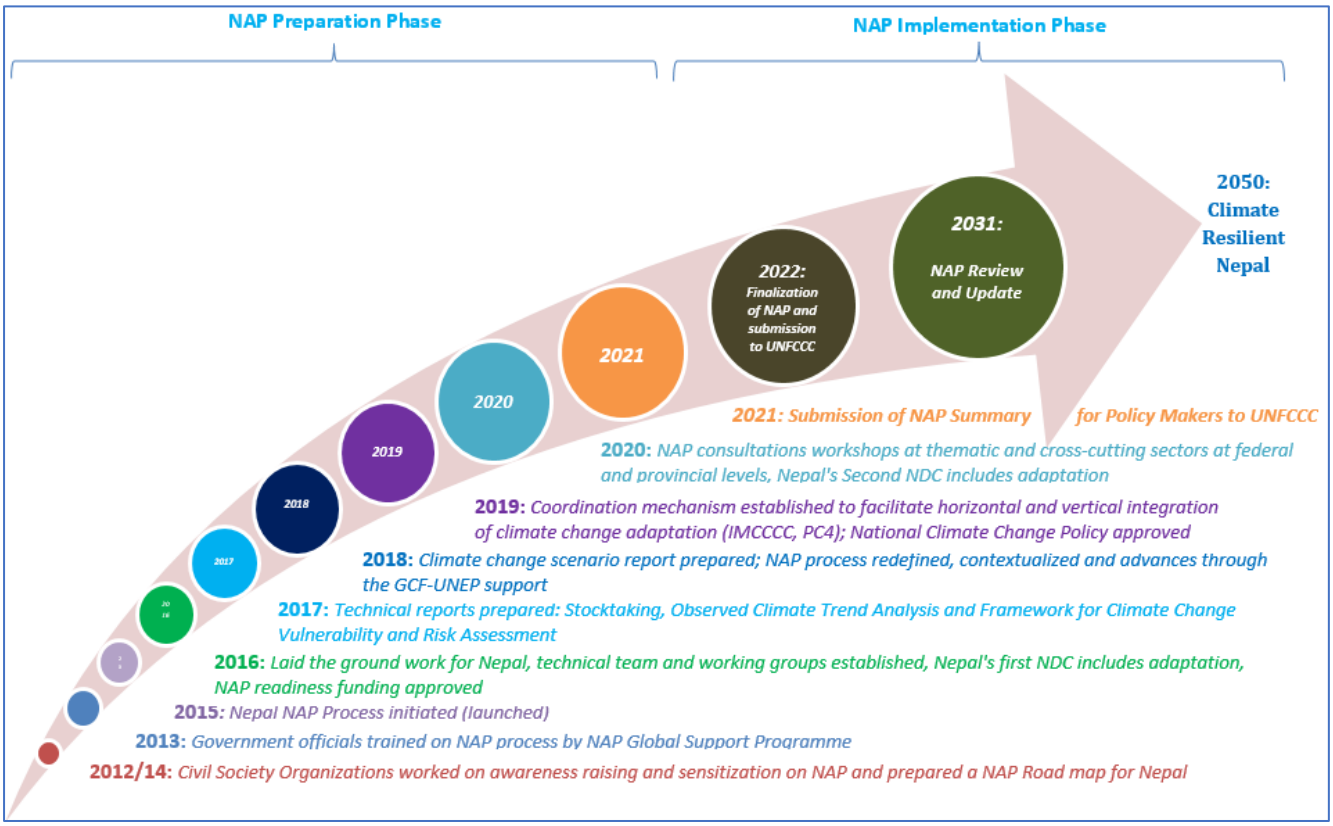


Figure 9: Nepal's NAP process, progress and milestone

The process to formulate the NAP included eight steps, (i) Desk mining and review of all literature and documents pertaining to climate change adaptation, (ii) Multi-stakeholder consultations in each province, (iii) Collection and synthesizing the long list of adaptation actions, (iv) Thematic Working Group coordinators conclave and write-shop with thematic leaders, (v) Round-Table discussion with thematic experts, (vi) Sharing the draft NAP at a province-level stakeholders' forum and collecting feedback on the institutional framework and implementation modalities, (vii) Sharing the penultimate draft of the NAP with central level stakeholders for feedback and review, and (viii) NAP finalization and submission (Figure 10).

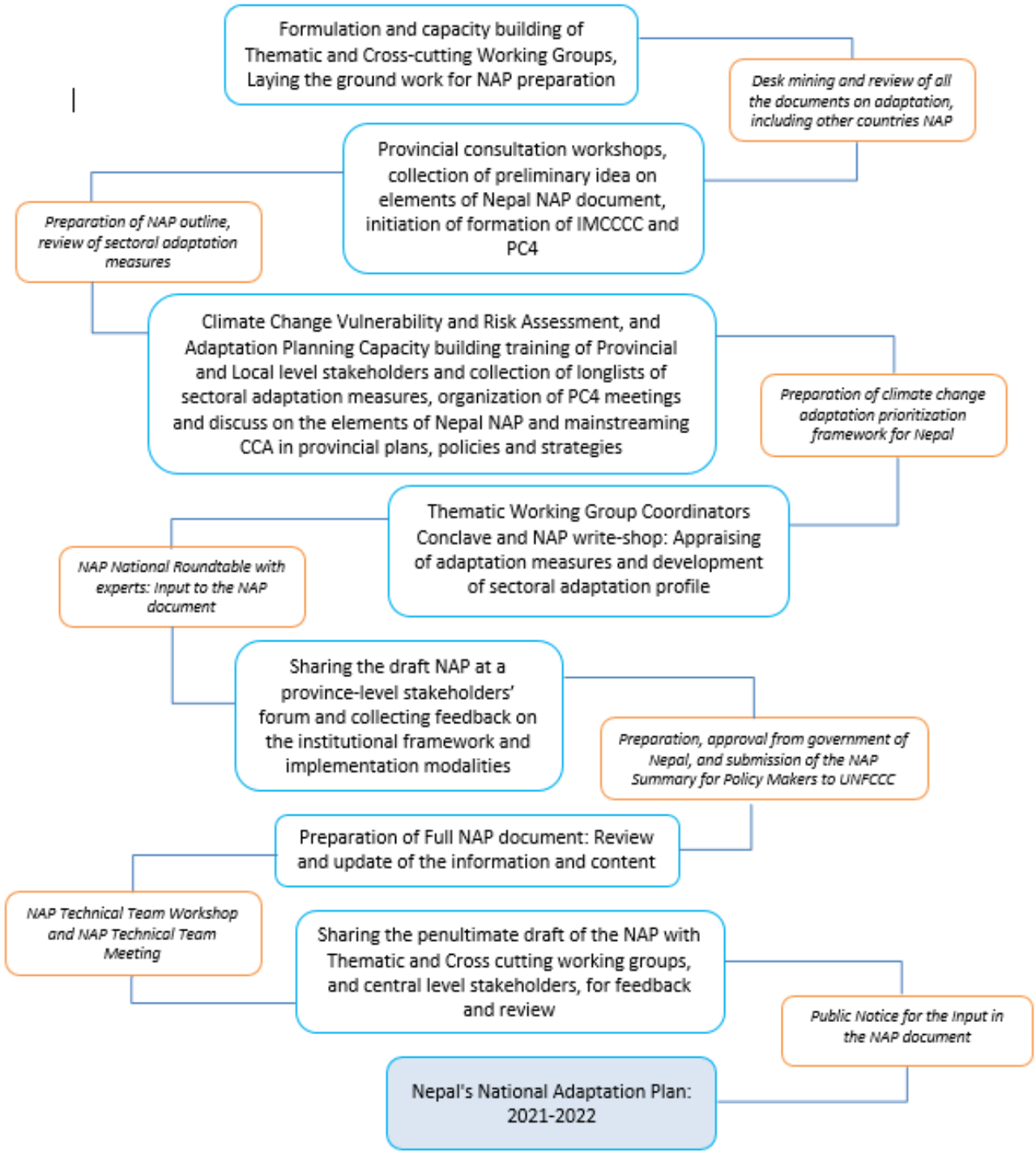


Figure 10: Nepal NAP development process

6. NEPAL NAP: VISION, GOALS, PRINCIPLES AND OUTCOMES

The Nepal NAP aims to help the country achieve the objectives of the NAP process that have been agreed under the UNFCCC. These objectives are:

- To reduce vulnerability to the impacts of climate change, by building adaptive capacity and resilience.
- To facilitate the integration of climate change adaptation, in a coherent manner, into relevant new and existing policies, programmes and activities, in particular development planning processes and strategies, within all relevant sectors and at different levels, as appropriate (UNFCCC, 2012, decision 5/CP.17, paragraph 1).

This NAP has been formulated to help the country adapt to the effects of climate change over the short term (until 2025), medium term (until 2030), and long term (until 2050); and will:

- Inform the planning, coordination, and implementation of adaptation actions needed at all levels of government and across society and ecosystems.
- Provide guidance on integrating adaptation considerations into policies, programmes, and activities.

Vision

To contribute to the socio-economic prosperity of the nation by building a climate-resilient society and reducing the risk of climate change impacts on people and ecosystems through the integration of adaptation across sectors and levels of government.

Goals

The over-arching goals are informed by the National Climate Change Policy (2019), and the Nepal NAP aims to:

- Build the adaptive capacity and resilience of key natural, social, and economic sectors vulnerable to and at risk of climate change, and service providers.
- Integrate climate change issues into policies, strategies, plans, and programmes of all sectors and at local, provincial, and federal levels emphasizing Gender Equality, Social Inclusion, Livelihoods and Governance (GESILG) concerns.
- Ensure equitable resource mobilization and distribution of resources for climate change adaptation through national and international financing, research, technology, and extension services related to climate change adaptation.

Principles

The Nepal NAP is guided by the following principles that will help the country achieve adaptation action that simultaneously advances economic and sustainable development objectives

- **Responsiveness** to the actual adaptation needs through the identification of actions that reduce the adverse impacts of climate change and maximize resilience, informed by a robust body of research and analysis undertaken through the NAP process.
- **Policy coherence** with:
  -National policies, strategies, plans, development goals, and priorities; and
  -International commitments under the UN conventions including the UNFCCC, Paris Agreement, SDGs, Sendai Framework for Disaster Risk Reduction, UNCCD, and UNCBD.

- **Integration** of climate change adaptation in the planning, budgeting, and implementation of actions at the three levels of government - federal, provincial, and local.
- **Gender responsive and social inclusive** actions to ensure that people of all genders are engaged in all stages of climate adaptation planning, budgeting, implementation, and monitoring and evaluation.
- **Multi-stakeholder engagement, coordination, and cooperation** to promote transparency, better decision making, and enhanced implementation of adaptation.
- **Ecosystem integrity** to maintain naturally biodiverse, healthy, and resilient ecosystems.
- **'Leave-No-One-Behind'** through commitment to an inclusive NAP process that prioritizes planning and implementation of adaptation actions by identifying who is left behind, identifying measures to meet their needs, and generating evidence and data to monitor progress.

Implementation Outcomes

The NAP is an overarching strategic instrument that specifies prioritised adaptation programmes in the eight thematic and four cross-cutting sectors outlined in the National Climate Change Policy 2019 for 2025 (short term), 2030 (medium term) and 2050 (long term). Implementation of these priority programmes will support Nepal to achieve the goal of the climate change policy of building a climate-resilient society.

Enhanced adaptation planning and implementation of adaptation actions will help to reduce loss and damage due to climate change impacts in key natural, social and economic sectors.

Actions to 2025 will lay the foundation for long-term adaptation outcomes, and will result in enhanced adaptation planning capacity and the integration of adaptation across sectors and at all levels of government. The establishment and operationalization of early warning systems in the provinces, climate change data management systems and an adaptation monitoring and review mechanism at the federal level will lay the foundation for implementing the urgent adaptation actions. The institutional structures will be established to implement the NAP and deliver the aims of the National Climate Change Policy; and improved understanding of climate risk and vulnerability assessments and climate projections will support Nepal's efforts in regard to post-pandemic economic recovery and graduation from LDC status by 2026. Implementation of adaptation actions will support Nepal's efforts to achieve the SDGs and the Sendai Framework for Disaster Risk Reduction.

Building on the outcomes of the short-term adaptation actions, by 2030, Nepal will develop resilient agro-ecosystems for sustainable production, and food sufficiency and nutrition. The actions will help to maintain ecosystem health and functionality, restore critical habitats and protected area networks; implement nature-based solutions, and promote a green and circular economy. The resilience of health, drinking water and sanitation systems and services will be enhanced for continuous functionality and water supply. In addition, the resilience of energy systems will be enhanced leading to an uninterrupted supply of electricity that supports the constant operation of industries. Likewise, actions will lead to robust physical infrastructure that can withstand climate

change-induced disasters, shocks and stresses. Implementation of adaptation actions will help to maintain functionality of key economic sectors including tourism, transport, industry, and agriculture. Climate-sensitive land-use planning and implementation will assist rural and urban settlements dealing with climate impacts. Furthermore, the livelihoods of marginalized and vulnerable people and communities will be diversified and enhanced through GESI-responsive adaptation programmes.

The adaptation actions to 2025 will lay the foundations of a climate-resilient society, while the actions to 2030 will emphasize implementing actions that reduce vulnerability and increase adaptative capacity. A review of the implementation of the NAP will take place in 2031. The results of the review will inform the identification of long-term adaptation programmes that will contribute to the achievement of the national goal of *"Prosperous Nepal, Happy Nepali-2043"* by building a climate-resilient society and reducing the risk of climate change impacts on people and ecosystems.

7. PRIORITY ADAPTATION PROGRAMMES

This section describes the priority actions in the nine adaptation themes prioritized in Nepal's NCCP (2019) and NDC (2020). A long list of actions (Annex 3) was identified through a review of government documents and stakeholder engagement, including consultations at the provincial level. A prioritization process was undertaken, drawing on the inputs and expertise of the TWGs, to identify the priority actions described in this section. The final list of 64 prioritized adaptation progrmmes processed and passed through the series of methodological process is given in Annex 8. The prioritization process considered actions that are best able to address critical climate vulnerabilities and climate risks in the short, medium, and long term; as well as actions that contribute to the achievement of national economic and development priorities. The methodology of the prioritization process is described in Annex 2.

7.1 Agriculture and Food Security (AFS)

The Constitution of Nepal, 2015 guarantees the right to food and identifies increasing investment in the agricultural sector as a basic need. The Constitution includes policy statements about the need for agriculture and land reform in order to modernize the sector and increase productivity. The Constitution promotes the development of a sustainable and dependable irrigation system, and increasing investment in the sector to ensure sustainable food productivity that suits soil and climate conditions (GoN, 2015). In line with these national aspirations, the Fifteenth Plan (Fiscal Year 2019/20 - 2023/24) aims to "achieve inclusive and sustainable economic growth through the transformation of the agriculture sector into a competitive, climate-resilient, self-reliant, and export-oriented industry" (GoN, 2020a).

The agriculture sector - including crops, livestock, and fisheries - is a major economic sector in Nepal, being a main source of incomes and livelihoods in rural areas and providing important revenues through agricultural exports. The sector contributed about 27.65% of Nepal's GDP in 2019/20 (Nepal Rastra Bank, 2020), and about 66% of the country's population worked in the agricultural sector in that same year (GoN, 2021). Increasing agricultural productivity in a changing climate is critical to achieving national agriculture and food security goals, including modernizing the sector, increasing smallholder productivity, and ensuring adequate and affordable food.

Climate change has the potential to prevent the achievement of national goals by negatively impacting agricultural production and nutrition security. Rising temperatures, changes in precipitation, and increases in the occurrence of extreme weather events have negatively impacted productivity in the agriculture sector. The sector is vulnerable to climate impacts because of a high reliance on small-scale, rain-fed agriculture and dry land farming (Paudel, 2016). Climate change impacts livestock production including increased incidence of diseases and pests, depleted grass and feed, heat stress, appetite loss and reduced milk production, and death of animals (Shrestha & Baral, 2018). Temperature increase has reduced the productivity of freshwater aquaculture, with negative impacts for fishing communities (Wagle et al., 2011). The MoFE (2021c) reported that climate change was responsible for 10% to 30% of production losses in the agriculture sector (crops, livestock, and fisheries combined), with drought being the most serious hazard. The direct economic cost of climate vulnerability in the agriculture sector in 2020 was equivalent to 1.5% to 2% of the country's GDP (MoFE, 2021).

Future climate change is expected to continue to impact agricultural productivity. The Ministry of Agriculture and Livestock Development (MoALD, 2019a) identified that the most severe climate impacts on agriculture and food security will be "the loss of already limited arable land from flash floods and landslides, accelerated soil degradation and loss of soil fertility, outbreaks of new pests and diseases, shortages of water for crop production and uncertainty of precipitation that will directly affect rain-fed agriculture, particularly in the mountains

Climate vulnerability in the sector results from a high reliance on rain-fed agriculture; fragmentation of arable lands; limited access to agricultural extension services; high levels of poverty among farmers; limited resources; and lack of access to markets, loans, insurance, and technology (FAO, 2021). Most farmers are ill equipped to cope with climate change because they have limited technical knowledge of the impacts of climate change and lack knowledge of adaptation measures and practices (MoALD, 2019a). Women-headed households are highly dependent on subsistence level agriculture and remittances from men.

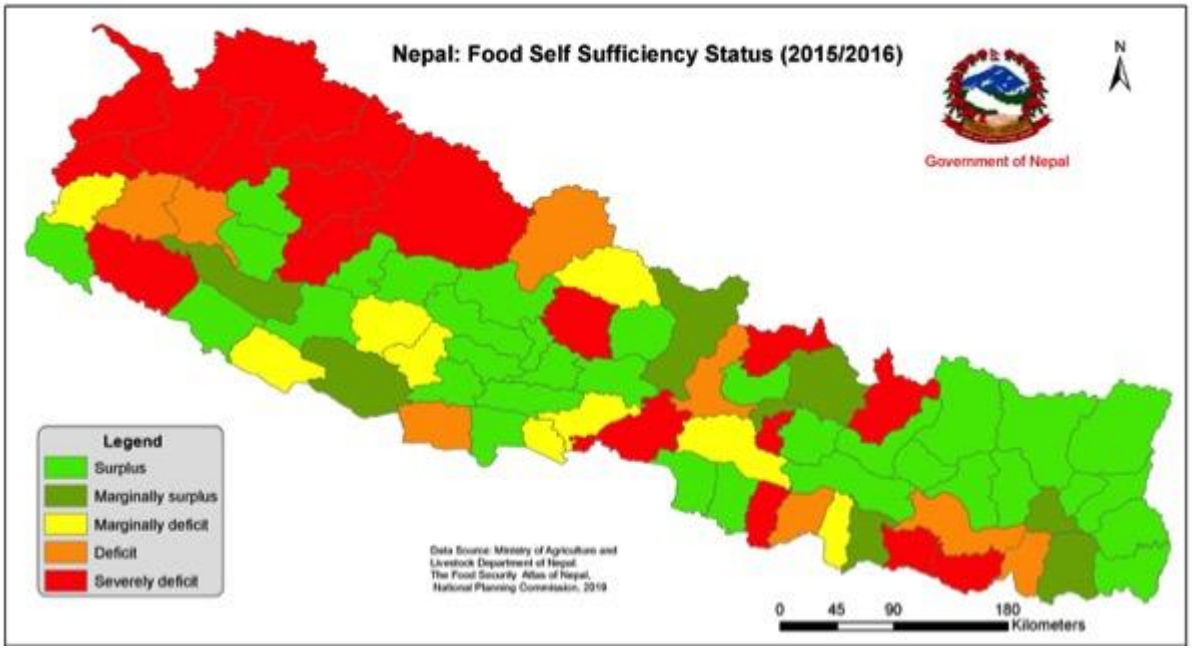


Figure 11: Map showing food insecure areas, 2015/2016

A total of nine priority adaptation programmes with a budget of USD 11.2 billion to 2050 are included in the Agriculture and Food Security sector. Implementation of these programmes will help transform the agriculture sector by building the resilience of agroecological systems through the enhancement of agricultural productivity, preserving genetic resources, building national capacities and information systems, adopting clean energy, and introducing peasant-friendly climate induced risk-sharing models.

1: *National Capacity Building of Agriculture and Livestock Institutions on Climate Change Adaptation Research, Planning and Implementation*	**2025, 2030**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, National Food Safety Policy 2019, Agrobiodiversity Policy 2007, Gender and Social Inclusion Strategy and Action Plan on Climate Change 2020-2030, Agriculture Development Strategy 2015-2035, Sustainable Development Goals: Status and Roadmap 2016-2030*	

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Reduced crop productivity and production associated with heat and drought stress, extreme precipitation and inundation, flooding and landslides, hailstorm and snowstorms*
- *Risk of crop failure, risk of limited food access and quality*

Objectives:	**Expected Outcomes:**
1. *To enhance the capacity of agriculture and livestock technicians to understand climate and climate change associated risks and vulnerabilities.* 2. *To strengthen the adaptive capacity of local agriculture based institutions to address climate risks.*	**1.** *By 2030, at least 70% of 753 local levels' institution capacity on CCA planning implementation, M&E increased.* **2.** *By 2030, at least 70% of Agriculture Knowledge Center and Veterinary Hospital and Livestock Service Expert Centers' institution capacity on climate change adaptation planning implementation, M&E increased.* **3.** *By 2030, agriculture and livestock institutions at federal and provinces' capacity on CCA planning implementation and M&E increased.* **Impact:** *Climate risks in agriculture sector reduced through enhanced institutional capacity.*

Summary of the Actions:

1. *Develop capacity building package on climate vulnerability and risk assessment, and adaptation planning in agriculture and livestock sector.*
2. *Provide climate change capacity building and trainings to agriculture and livestock technicians at all tiers of governments.*
3. *Provide technical support on the assessment of climate change vulnerabilities and risks in the agriculture and livestock sector to revitalize Agricultural Cooperatives.*
4. *Promote Information and Communication Technology (ICT) service on climate change risk to agriculture and livestock service providers, farmers and other related stakeholders.*
5. *Introduce and promote Weather Index-based Risk Transfer Services (Insurance).*
6. *Strengthen the service delivery capacity of provincial plant protection, seed and soil testing laboratories of priority municipalities to improve their ability to consider climate vulnerabilities and risks.*
7. *Develop a catalogue of low cost, climate-resilient technologies and practices, and promote their adoption through strengthening farmer's field schools.*
8. *Establish Agriculture Adaptation Learning Platforms at Rural Municipalities in each ecological zone.*
9. *Promote knowledge development and transfer across agroecological zones through Agriculture Adaptation Learning Platforms and farmers field schools.*
10. *Establish Agriculture Volunteers at the local government level to support in agriculture and livestock extension services.*

Scope:

Capacity Building, Technology Development and Information (ICT)

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Service delivery personnel/Agriculture and livestock technicians; Farmers and farmer's institutions (Cooperatives), Government institutions that provide Agriculture and Livestock Service.	*National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Agriculture and Livestock Development*	**Supporting Agency/Institutions/Groups:** *Ministry of Land Management, Agriculture and Cooperative (Province), Ministry of Federal Affairs and General Administration, development partners, NGO/INGOs*

2: *Strengthening Climate Services and Agriculture Information System*	**2030**

Alignment with/Contribution to National Development Goals:

15th Periodic Plan 2019/20-2023/24, Agriculture Development Strategy 2015, National Agriculture Policy 2004, National Climate Change Policy 2019, Second Nationally Determined Contribution 2020

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Reduced crop productivity and production associated with heat and drought stress, extreme precipitation and inundation, flooding and landslides, hailstorm and snowstorm,*
- *Risk of crop failure, risk of limited food access and quality*

Objectives:	**Expected Outcomes:**
1. *To establish and operationalize early warning systems and localized weather stations for precise climate services.* 2. *To provide a package of climate services (weather information, soil moisture condition, incidence of extreme events etc.) directly to the farming communities.* 3. *To provide timely and accurate information regarding agriculture services.*	**1.** *By 2030, 50% additional small holders received timely and reliable package of climate and agro-advisory services.* **2.** *By 2030, 50 % crop production increased through reliable climate services and agriculture information.* **Impact:** *Livelihood enhanced thorough ensured food security*

Summary of the Actions:

1. *Establish agro-meteorological weather stations network at the local governments level to address the prevailing weather-related data gap.*
2. *Establish community based early warning systems.*
3. *Develop model and strengthen forecasting system (flood, drought, dry spell, erratic rainfall).*
4. *Establish crop growth forecasting mapping and yield prediction through the use of Remote Sensing tools and technologies and disseminate information to concerned stakeholders and farmers.*
5. *Capacitate the local communities/farming systems for improved monitoring of localized weather stations, interpretations of climate services, and development of contingencies plans.*
6. *Develop a catalogue and promote Gender Friendly Agriculture Tools and Technologies.*
7. *Simulate cropping system under different water and nitrogen regimes.*

Scope:

Research and Innovation, Technology Development and Information (ICT), Physical Infrastructure, Capacity Building

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Farmers and other agriculture stakeholders	*National*
Duration/Timeframe:	**Total Cost:**
10 years	*USD 1,000 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**
Ministry of Agriculture and Livestock Development	*Ministry of Land Management, Agriculture and Cooperatives, Department of Hydrology and Meteorology, Nepal Agriculture Research Center, Agriculture Cooperatives, Development Partners, NGOs/INGOs*

3: Integrated Soil and Nutrient Management for Resilient Agriculture	**2025, 2030**

Alignment with/Contribution to National Development Goals:

National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, National Land Use Policy 2015, National Land Use Act 2019, National Fertilizer Policy 2009, National Food Safety Policy 2019, Second Nationally Determined Contribution 2020

Climate Risks and Vulnerabilities Addressed by the Action:

Moisture loss, nutrient loss due to different extreme events such as flooding, landslides, dry-spell, drought, and soil erosion.

Objectives:	**Expected Outcomes:**
1. *To increase productivity by improving soil fertility through adaptive agriculture interventions.* 2. *To improve soil nutrient to increase agriculture production by quality and quantity.*	**1.** *By 2030, Soil Organic Matter increased to 3.95%* **Impact:** *Enhanced resilience to climate risks in agriculture sector.*

Summary of the Actions:

1. *Promote legume integration and crop rotation in farming systems.*
2. *Build capacity on and promote composting and farmyard management at local level.*
3. *Promote Integrated Plant Nutrient Management System through field school at Municipalities.*
4. *Promote Sloping Agriculture Land Technology in hilly areas.*
5. *Promote conservation agriculture practices: Minimum tillage, counter farming, hedge row promotion, zero tillage, intercropping.*
6. *Promote sustainable crop production system through organic agriculture practices and permaculture.*
7. *Develop a catalogue on Good Agriculture Practices (GAP) in three ecological regions and provide support to implement GAP.*
8. *Conduct Soil Nutrient Mapping in agroecological zones to support soil nutrient management.*
9. *Scale up green manure across different physiographic regions.*
10. *Establish organic and biofertilizers plant in two provinces.*
11. *Manage biogas slurry to sustain soil fertility.*
12. *Develop model villages at three ecological zones with all above interventions.*

Scope:

Capacity Building, Technology development and Information (ICT), Physical Infrastructure, Research and Innovation

Targeted Community/Beneficiaries: *Farming Communities*	**Geographic Coverage:** *All ecological regions (300 Municipalities)*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 1,200 million (USD 100,000/Municipality/year for 10 years) (USD 100,000/plant establishment @two Provinces)*
Lead Institution: *Ministry of Agriculture and Livestock Development*	**Supporting Agency/Institutions/Groups:** *Ministry of Land Management, Agriculture and Cooperative (Province), development partners, NGOs/INGOs*

4: *Enhancing Agriculture Productivity through Building Climate-Resilient Water Management Systems*	**2050**

Alignment with/Contribution to National Development Goals:

15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Irrigation Policy 2013, Agricultural Development Strategy 2015-2035, National Agriculture Policy 2004

Climate Risks and Vulnerabilities Addressed by the Actions:

Productivity loss and reduced production due to increase in extreme events (Flood, Dry spell, Landslides, Drought, Infestation of pest and diseases)

Objectives:	**Expected Outcomes:**
1. *To improve irrigation facilities.* 2. *To increase the coverage of irrigated area through efficient water use technologies.*	**1.** *By 2035, crop intensity or crop diversity increased by 200%.* **2.** *By 2050, food crop production increased by 20%.* **Impacts:** *Food security increased through climate-resilient water management systems.*

Summary of the Actions:

1. *Develop and promote efficient water use technology and practices.*
2. *Promote snow/frost harvesting initiatives in high hills and mountains.*
3. *Promote rainwater harvesting in water deficient areas.*
4. *Adopt water saving adaptation technologies in the Tarai: micro irrigation (sprinkler, drip, sub surface, shallow tube-well).*
5. *Promote solar powered irrigation systems.*
6. *Conserve existing springs and water ponds.*
7. *Modify small traditional irrigation schemes (Kulesa, paini maintenance).*
8. *Increase multiple uses of water systems (drinking, kitchen gardening, integrated aquaculture).*
9. *Promote water saving crop production technologies: systems of rice intensification, direct seeded rice, and alternate wetting and drying in strategic locations.*
10. *Adopt and promote stress tolerant crops and varieties.*

Scope: *Technology Development and Information (ICT), Physical Infrastructure, Research and Innovation, Capacity Building*	
Targeted Community/Beneficiaries: *All rural, marginal and commercial farmers*	**Geographic Coverage:** *All ecological regions (150 at-risk municipalities by 2035 and 300 at risk municipalities.*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 1,500 million*
Lead Institution: *Ministry of Agriculture and Livestock Development*	**Supporting Agency/Institutions/Groups:** *Nepal Agriculture Research Council, Food and Agriculture Organization, development partners, I/NGOs*

5: Genetic Resource Conservation and Development Programme for Climate-Resilient Agriculture in Nepal	**2030**
Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, Agriculture Development Strategy 2015-2035, National Agriculture Policy 2004, Agro-biodiversity Policy 2013, Multisector Nutrition Plan 2018-2022, National Climate Change Policy 2019*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Genetic loss due to increase in climate extreme events such as dry spells, floods, cold waves, and pests and diseases.*	
Objectives: 1. *To strengthen the national gene bank to conserve landraces and improved animal breeds.* 2. *To strengthen biotechnology laboratories to develop climate-resilient crop varieties.* 3. *To strengthen and establish community seed banks and seed storage facilities.*	**Expected Outcomes:** 1. *By 2030, at least five climate-stress crop varieties and animal breed developed by the national biotech lab.* 2. *By 2030, seed multiplication center and animal breed center strengthened, and established in each Province.* 3. *By 2030, 30% of farm families provided with seed storage bags/container.* 4. *By 2030, Community Seed Banks established by 40% of local governments.* **Impact:** *Conservation, expansion and sustainable utilization of resilient genetic resources for improved food and nutritional security.*
Summary of the Actions: 1. *Collect and conserve local and indigenous landraces of crops and animals.* 2. *Assess, map and promote nutritious and under-utilized crop varieties.* 3. *Develop climate stress tolerant varieties and breeds.* 4. *Produce and disseminate climate-resilient crops and breeds.* 5. *Establish community seed bank for seed sufficiency.* 6. *Establish seed storage facilities (super grain bags, seed bunker) at Municipalities for food security.* 7. *Establish Seed Gene Store (Seed Vault) in the permanent snow cover area.*	
Scope: *Research, Technology Development and Transfer, Food Security and Nutrition*	
Targeted Community/Beneficiaries: *Farming Communities and agriculture stakeholders*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Agriculture and Livestock Development*	**Supporting Agency/Institutions/Groups:** *Provincial and local governments, Nepal Agriculture Research Center, International Rice Research Institute, Local Initiatives for Biodiversity, Research and Development, Farmers Cooperative, Private Seed Companies, Academic Institutions, etc.*

6: *Programme on Sustainable Agriculture, Food and Nutrition Security and Climate-Resilient Health and Hygiene*	**2025, 2030, 2050**
Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, Agriculture Development Strategy 2015, National Agriculture Policy 2004, Agro-biodiversity Policy 2013, Multisector Nutrition Plan 2018-2022, National Climate Change Policy 2019*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Compromised health and nutrition due to reduced crop productivity and production associated with heat and drought stress, extreme precipitation and inundation, flooding and landslides, hailstorm and snowstorm*	
Objectives: **1.** *To promote nutrition security for healthier livelihoods.* **2.** *To increase crop production through identification and adoption of good, climate-resilient and sustainable agriculture practices.* **3.** *To develop and promote disease management technologies.*	**Expected Outcomes:** **1.** *By 2030, food availability and nutrition security ensured in food deficient districts.* **2.** *By 2035, health status improved through increased food quality and nutrition regime.* **3.** *By 2045, increased of practices of sustainable and efficient agriculture throughout Nepal by 50%.* **Impact:** *Improved quantity, quality and availability of food, nutrition and health.*
Summary of the Actions: *1. Promote suitable climate-resilient agriculture crops across agroecological zone.s* *2. Cultivate perennial crops in sloped areas.* *3. Conduct monitoring and research of fungal, bacterial, viral and nematological diseases of major agricultural commodities.* *4. Promote biocontrol agents against plant and animal diseases.* *5. Identify, explore and promote effective and sustainable disease management technologies.* *6. Establish food storage facilities in each of the food deficient districts.* *7. Assess maps of and promote of nutritious and under-utilized crop varieties.* *8. Promote healthy consumption and dietary practices in food deficient districts and municipalities.*	
Scope: *Research, Technology Development and Transfer, Physical Infrastructure*	
Targeted Community/Beneficiaries: *Farming Communities and Farmers and Agriculture stakeholders*	**Geographic Coverage:** *National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 2,000 million*
Lead Institution: *Ministry of Agriculture and Livestock Development*	**Supporting Agency/Institutions/Groups:** *Provincial and local governments, NARC, IRRI, LIBIRD, Farmers Cooperative, World Food Programme (WFP)*

7: *Commercial Animal Husbandry for Climate-Resilient Rural Livelihoods (753 Model Demonstration Project)*	**2025, 2030**
Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, Agriculture Development Strategy 2015, National Agriculture Policy 2004, Agro-biodiversity Policy 2013, National Climate Change Policy 2019*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Reduced livestock productivity associated with heat and drought stress, extreme precipitation and inundation, flooding and landslides, hailstorm and snowstorm, pest and diseases*	
Objectives: *1. To explore the feasibility of landraces for developing climate-resilient improved breed.* *2. To diversify rural livelihoods and increase income through commercial and integrated livestock programme.* *3. To promote a circular economy for resilient rural livelihoods.*	**Expected Outcomes:** *By 2030, a circular economy approach is adopted to build climate-resilient rural livelihoods at all 753 local levels.* **Impact:** *Enhanced local economies through resilient livelihoods.*

Summary of the Actions:

1. *Construct climate-resilient sheds for model commercial livestock farming communities in three eco-regions.*
2. *Develop and promote livestock insurance schemes targeting large-scale commercial farmers.*
3. *Develop value chains and promote market access for livestock products.*
4. *Promote nutritious fodder/grass species for model demonstration.*
5. *Introduce improved animal breeds.*
6. *Promote integrated farming practices (Apiculture, Sericulture, Aquaculture, Agriculture, Horticulture, Piggeries, Poultry, Goat farming).*

Scope:

Research and Innovation, Technology Development and Transfer, Physical Infrastructure

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Farming Communities and Farmers, Livestock rearing communities	*National*
Duration/Timeframe:	**Total Cost:**
10 years	*USD 2000 million*
Lead Institution:	**Supporting Agency/Institutions/Groups:**
Ministry of Agriculture and Livestock Development	*Provincial and local governments, NARC, IRRI, LIBIRD, Farmers Cooperative, Private Seed Companies, Academic Institutions, CEAPRED,* International Maize and Wheat Improvement Center *(*CIMMYT*), Agro-enterprise Center*

8: *Development of Insurance, and Community and Peasant-Friendly Climate Induced Risk Sharing Model and Expansion in both Agriculture and Livestock*	**2025, 2030**

Alignment with/Contribution to National Development Goals:

15th Periodic Plan 2019/20-2023/24, Agriculture Development Strategy 2015, National Agriculture Policy 2004, Agro-biodiversity Policy 2013, Multisector Nutrition Plan 2018-2022, Third National Communication to UNFCCC 2021, National Climate Change Policy 2019, Second Nationally Determined Contribution 2020

Climate Risks and Vulnerabilities Addressed by the Actions:

Loss of production due to climate extreme events: drought, flood, landslide, cold wave, and pests and diseases

Objectives:	**Expected Outcomes:**
1. *To build the capacity of local peasants and local governments to cope with climate risks.* 2. *To create an enabling environment for the promotion and expansion of a climate induced risk sharing model.*	**1.** *By 2030, climate risk sharing model developed and used by 80% farmers of all municipalities* **2.** *By 2030, 80% of the local governments and farmers' associated have increased awareness of climate risks, vulnerabilities and adaptation strategies in agriculture and livestock sector* **3.** *By 2030, innovative insurance and financing strategies for private sector engagement in the agriculture sector developed and promoted* **Impact:** *Agriculture produce insured to against losses due to climate related risks.*

Summary of the Actions:

1. *Develop capacity building packages on climate risk, vulnerability and adaptation strategies for local peasants, 753 local governments and private sector entities involved in agriculture*
2. *Conduct capacity building packages on climate risk, vulnerability and adaptation strategies for peasants, 753 local governments and private sector entities involved in agriculture*
3. *Develop innovative insurance schemes for peasants*
4. *Develop guideline on Climate Risk sharing module for agriculture and livestock*
5. *Develop and implement innovative climate financing mechanism for climate-resilient agriculture practices*

Scope:

Capacity building, Research, Technology Development and Transfer

Targeted Community/Beneficiaries: *Farming Communities and Farmers, Agriculture and Livestock Private Sector, Insurance providers*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Agriculture and Livestock Development*	**Supporting Agency/Institutions/Groups:** *Provincial and local governments, NARC, Farmer Cooperatives, National Commercial Banks, Nepal Agriculture Development Bank, National Insurance Corporation*

9: *Climate Smart Collective Agriculture Promotion in Hills and Mountains*	2030, 2050
Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, Agriculture Development Strategy 2015-2035, National Agriculture Policy 2004, Agro-biodiversity Policy 2013, Multisector Nutrition Plan 2018-2022, National Climate Change Policy 2019*	
Climate Risks and Vulnerabilities addressed by the actions: *Reduced crop production in hills and mountains due to extreme events, increased risk of food insecurity*	
Objectives: 1. *To explore, assess and promote climate smart agriculture technology.* 2. *To increase crop production and benefits to farmers through collective farming.*	**Expected Outcomes:** 1. *By 2030, 7 collective farming model developed in the hills and mountains.* 2. *By 2030, climate smart agriculture technology innovation and promotion center established and operationalized in a public private model.* **Impact:** *Increased food production and reduced poverty*
Summary of actions: 1. *Establish, promote and expand agriculture cooperatives.* 2. *Identify agro-ecological zones and establish collective farming through forming agriculture cooperatives.* 3. *Delineate pocket areas for agriculture commodities and products and expand collective farming in each of the specialized areas.* 4. *Establish community agriculture learning center in each of the local level.* 5. *Promote Climate Smart Agriculture Practices (Organic Agriculture, Permaculture, Climate smart farm/village, hydroponics, etc.).* 6. *Use and promote biological pest management approach.* 7. *Develop and implement strategy for reducing land fragmentation of farmlands/agriculture lands.* 8. *Promote snow harvesting and cloud forest practices in high mountains.* 9. *Establish and strengthen community seed bank.* 10. *Establish seed storage means (super grain bags, metal bins and bunkers for flood prone areas).*	
Scope: *Research, Technology Development and Transfer*	
Targeted Community/Beneficiaries: *Farming Communities, Agriculture Stakeholders, Agriculture Enterprises*	**Geographic Coverage:** *National*
Duration/Timeframe: *15 Years*	**Total Cost:** *USD 2,000 million*
Lead Institution: *Ministry of Agriculture and Livestock Development*	**Supporting Agency/Institutions/Groups:** *Provincial and local governments, Farmers Cooperative, Private Seed Companies, Academic Institutions*

7.2 Forests, Biodiversity and Watershed Conservation (FBWC)

Sustainable management of forests, protection of biodiversity, and conservation of watersheds are priorities in Nepal. The Constitution of Nepal, 2015 directs the State to pursue a policy of making sustainable use of biodiversity through the conservation and management of forests, as well as to pursue a policy to keep necessary landmass as forest area (GoN, 2015). The Fifteenth Plan (Fiscal Year 2019/20 - 2023/24) notes that forests, biodiversity, and watersheds are directly linked to livelihoods, and the sustainable management of these areas can make significant contributions to Nepal's prosperity (GoN, 2020a).

The National Forest Policy and the National Agroforestry Policy identify forests and trees as extremely important for adaptation, and the policies place a strong emphasis on local and landscape-scale action to build climate resilience (GoN, 2019b). The Forestry Sector Strategy aims to make forests, biodiversity, plant resources, wildlife, watersheds, and other eco-systems and their communities resilient to climate change (MoFSC, 2016). The National Biodiversity Strategy and Action Plan (2014-2020) promotes climate-resilient approaches for ecosystems and biodiversity management, including assessing the vulnerability of species and ecosystems to the impacts of climate change (MoFSC, 2014). The forest area in Nepal increased from 39.6% of total area of the country in 1987/88 to 44.74% in 2019/20 (NPC, 2020b). The increase was a result of forest protection programs, migration from rural areas, and active participation of the community in the protection of forests (NPC, 2020b). Forests offer water catchments, biodiversity, and conservation functions; and are home to forest resource users and provide goods and services that support the livelihoods of communities. Forests provide wood fuel as an energy source, timber for building construction and furnishings, medicinal and aromatic plants, fodder for livestock, and water for multiple purposes. Forests are also a major destination for ecotourism.

Forests underpin the livelihoods of rural people in Nepal, with about 80% of rural householders deriving some or their entire livelihoods from the forestry sector (MoFSC, 2015). About 64% of Nepali households use fuelwood as their main source of energy (CBS, 2014). The forestry sector provided an average annual revenue of about NPR 550 million (US$ 5.4 million) to the national economy in 2013 (Subedi, 2014).

Climate change has impacted forests and ecosystems in the Himalayas, mountains, hills, lowland Tarai and fragile Chure- Siwalik (MoFE, 2021c). Local livelihoods have been negatively impacted by changes in the availability and regeneration pattern of forests and non-timber forest products, which has contributed to a decline in the productivity of some economically viable forest products such as medicinal plants, herbal fruits, mushrooms, rattan, and bamboo (GoN, 2021). Climate change has intensified dryness, which has contributed to an increase in the number of forest fires and the area burned. The government's Forest Monitoring and Detection System recorded 5,626 forest fires incidents across the country from November 2020 to April 2021 (Mandel, 2021) (Figure 11).

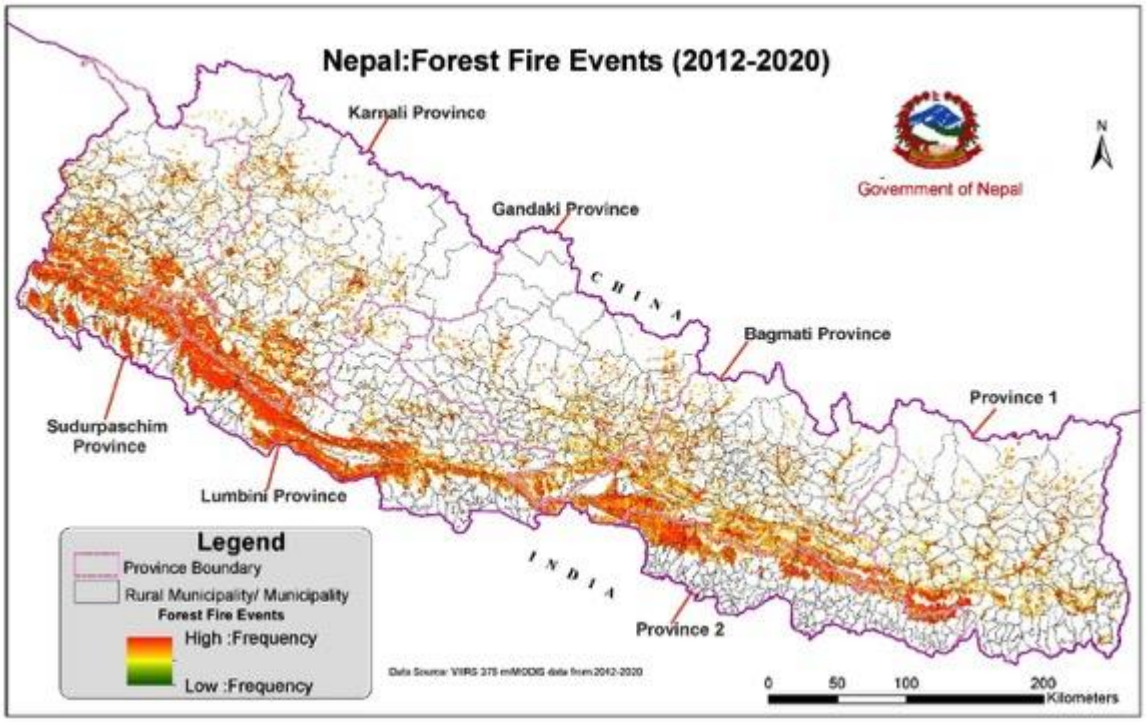


Figure 12: Forest fire events in Nepal at municipal level observed between 2012 and 2021

Future climate change will continue to degrade, damage, and transform forest areas in Nepal, including a large span of mountainous and hilly physiography that is vulnerable to climate change (Chitale et al., 2018). These changes in forest distribution and composition will adversely affect ecosystem services, biodiversity, and watersheds. The negative impacts are expected to include reduced access to forest products that include food, household energy (fuelwood), and water. A decrease in the availability of non-timber forest products will impact the communities that are dependent on these resources for their livelihoods (MoPE, 2017b). In addition, a large proportion of forest species are at increased risk of extinction (IPCC, 2014).

Women are particularly vulnerable to the impacts of climate change in the forestry sector because they play a major role in the collection of various forest products and are considered the primary users of forests in Nepal (IUCN, 2020). Poor Dalits, because of poverty and caste-based discrimination are more vulnerable (MoFSC, 2015). Forests under community-based management made up 42.7% of the forest areas in Nepal in 2019 (NPC, 2020b) meaning that these groups have an important role to play in mainstreaming adaptation in forest management plans. Success will require focused interventions that recognize the important role of women as primary land, water, and natural resource managers (IUCN, 2020).

The 11 priority adaptation programmes in the forests, biodiversity and watershed conservation sector contribute to the development of climate-resilient ecosystems; the sustainable management and conservation of forests, eco-systems and watersheds; enhanced food and water security; enhanced hydrological ecosystem services such as regulation of rain and storm water; improved livelihoods of forest communities; healthy wildlife populations and viable tourism operations; and improved opportunities for non-timber forest products. The estimated budget for the 11 priority programmes is USD 8.7 billion to 2050.

10: *Forests Fire Preparedness, Prevention and Control (In Multi-Stakeholder Partnerships)*	**2025, 2030**

Alignment with/Contribution to National Development Goals:
Forest Act 2019, National Forest Policy 2019, 15th Periodic Plan (2019/20-2023/24), Second Nationally Determined Contribution 2020, National Climate Change Policy 2019, Third National Communication 2021

Climate Risks and Vulnerabilities Addressed by the Actions:
Increased incidences of forest fire associated with extreme temperature leading dry spell, drought and heat waves

Objectives:
1. *To prevent and manage forest fire through enabling policy implementation.*
2. *To capacitate forest-based institutions through technology development and transfer.*
3. *To build resilience of forest ecosystem, biodiversity and rural livelihoods.*

Expected Outcomes:
1. *By 2030, 50% of fire incidence is reduced.*
2. *By 2035, 80% of forest ecosystem and biodiversity loss caused by forest fires is reduced.*

Impact:
* *Improved health of forest ecosystems*
* *Increased capability of forest-based institutions and communities to respond to forest fires in the immediate and long terms.*

Summary of Actions:
1. *Revise and formulate the Forest Fire Management Strategy and action plan for the Federal and Provincial levels.*
2. *Establish real time forest fire early warning systems throughout the country.*
3. *Map and assess forest fire climate risk districts.*
4. *Establish and capacitate Joint Rapid Response Teams that include security forces and communities for districts at high risk of forest fires.*
5. *Conduct Forest Fuel Management activities (early controlled burning, weeding).*
6. *Construct and manage forest fire lines in Tarai, Chure foothills, and Mid-hills.*
7. *Develop communication, education, participation and awareness materials for wider outreach and dissemination.*
8. *Develop insurance packages for forest fire responders.*
9. *Capacitate Division Forest Offices and forest-focused institutions with remotely controlled aerial vehicles and other firefighting equipment.*

Scope:
Policy Law and Regulation, Capacity Building, Technology Development and Information (ICT), Physical Infrastructure, Research and Innovation

Targeted Community/Beneficiaries:
50 Forest Division Offices, 2,500 forest dependent communities, Protected Areas of Tarai and Mid-hills

Geographic Coverage:
National

Duration/Timeframe:
10 years

Total Cost:
USD 1,000 million

Lead Institution:
Ministry of Forests and Environment

Supporting Agency/Institutions/Groups:
Provincial and Local Governments, Forest Users' Committee, Department of Hydrology and Meteorology, I/NGOs, CBOs, User groups, Security

<table>
<tr><td colspan="2">11: Karnali Watershed Management Programme for Reducing Climate Risks and Vulnerabilities and Promoting Irrigation Facilities in the Downstream</td><td>2025, 2030</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, Second Nationally Determined Contribution 2020, Land Use Policy 2015</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Flood incidence and river bank erosion</td></tr>
<tr><td colspan="2">Objectives:
1. To build resilience to climate vulnerabilities and risks of the Karnali watershed community and people.
2. To secure river-and forests-based watershed resources.
3. To enhance adaptive capacity of Indigenous Peoples (IPs) and local communities (LCs) and engage them in watershed conservation.
4. To promote upstream- downstream linkages to reduce downstream climate risk.</td><td>Expected Outcomes:
1. By 2030, 50% of IPs and LCs adopt watershed adaptation tools/technique.
2. By 2032, 60% of the riverbank cutting and flood risk reduced.
Impact:
Secured lives and livelihoods of IP and LCs and vulnerable communities through Improved and conserved watershed resources and enhanced adaptive capacity to climate risks.</td></tr>
<tr><td colspan="3">Summary of Actions:
1. Assess and undertake mapping of river cutting areas, and design appropriate interventions to protect farmland and community land.
2. Identify indigenous people, document their Indigenous and Traditional nowledge for watershed resources management and support to upscale appropriate interventions for watershed management.
3. Strengthen and diversify livelihood strategies focusing on crop, livestock and agro-forestry for vulnerable livelihood zones and marginalized communities.
4. Strengthen the existing community early warning systems and improve technology for large area coverage.
5. Support climate-resilient infrastructure for local households (high rise toilet, high rise taps) and communities (women-friendly shelter houses).
6. Promote plantations in degraded riverbank and soil areas, and establish interventions.
7. Formulate, capacitate and functionalize upstream and downstream institutions.</td></tr>
<tr><td colspan="3">Scope:
Policy Law and Regulation, Capacity Building, Technology Development and Information (ICT), Physical Infrastructure, Research and Innovation</td></tr>
<tr><td>Targeted Community/Beneficiaries:
2,500 Households (HHs), IP and LCs (Tharu, Sunar, Marginalized communities) and local communities
2,500 ha degraded area restoration</td><td colspan="2">Geographic Coverage:
Lumbini Province, Karnali Province, Sudurpaschim Province</td></tr>
<tr><td>Duration/Timeframe:
10 years</td><td colspan="2">Total Cost:
USD 500 million</td></tr>
<tr><td>Lead Institution:
Ministry of Forests and Environment</td><td colspan="2">Supporting Agency/Institutions/Groups:
Provincial and Local Governments, Development Partners, I/NGOs, CBOs, User Groups</td></tr>
</table>

12: *Restoration of Habitats and Strengthening Ecological Connectivity for Wildlife and Biodiversity*	**2025, 2030**
Alignment with/Contribution to National Development Goals: *Second Nationally Determined Contribution 2020, National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, National Parks and Wildlife Conservation Act (seventh amended, National Forests Policy 2019*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Flood risk, infestation of new pest and diseases exacerbated by increasing temperatures, emergence of invasive alien species, and loss of biodiversity*	
Objectives: 1. *To safeguard wild fauna from climate extreme events.* 2. *To establish climate-resilient safe wildlife passage in selected corridors and connectivity between protected areas.* 3. *To manage and restore ecological connectivity.*	**Expected Outcomes:** 1. *By 2035, 80% reduction of wildlife roadkill incidence on major highways.* 2. *By 2035, 80% of degraded ecosystems restored and managed to maintain ecological integrity.* **Impact:** *Enhanced ecological integrity to secure the existence of flagship species through conservation of wildlife in meta-population level.*
Summary of Actions: 1. *Construct safe refuge island and species-specific sites in flood prone area (sites within and outside protected areas (PAs)).* 2. *Construct overpasses (at least 1) and underpasses (at least 1) for wildlife crossing in Tarai Arc Landscape areas* 3. *Maintain and construct of waterholes and ponds in strategic locations.* 4. *Provide continuous support for management of different ecosystems (forests, grasslands, wetlands) management within landscape to maintain ecological connectivity.* 5. *Prevent and Control climate-induced wildlife diseases.* 6. *Identify and Manage Climate Refuge for wildlife.* 7. *Undertake critical habitat management in PAs and outside PAs.* 8. *Strengthening Rapid Response Teams for rescue and relief operation for wildlife.* 9. *Strengthen trans-boundary coordination to secure faunal species.*	
Scope: *Capacity Building, Physical Infrastructure, Research and Innovation*	
Targeted Community/Beneficiaries: *Local communities residing within buffer zones*	**Geographic Coverage:** *Eastern to Western Nepal (Province 1, Province 2, Bagmati, Gandaki, Lumbini, Sudurpaschim)*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 200 million*
Lead Institution: *Ministry of Forests and Environment*	**Supporting Agency/Institutions/Groups:** *Provincial and local government, I/NGOs, Development Partners, Community based organizations (CBOs)*

13: *Integrated Sub-Watershed Management for Climate Resilience*	**2030, 2050**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, National Parks and Wildlife Conservation Act (seventh amended), National Forests Policy 2019, National Irrigation Policy 2004*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Loss of agricultural land area due to soil erosion, landslides and increased incidences of flash floods, increase in incidences of extreme temperatures, dry spells and drought leading to drying of water resources and springs, increased incidences of forest fire*	
Objectives: 1. *To promote watershed management for conservation of soil fertility and enhanced productivity* 2. *To support local livelihoods through watershed management*	**Expected Outcomes:** 1. *By 2035, water availability is increased to 50% in sub-watersheds.* 2. *By 2050, 80% of sub-watersheds are climate-resilient.* **Impact:** *Increased water availability and agriculture productivity*

Summary of Actions:

1. *Assess climate vulnerability and risk in two sub- watersheds.*
2. *Develop sub-watersheds health cards for continuous monitoring with respect to climate variables.*
3. *Promote continuous support for management of ecosystems within sub-watersheds to increase water availability.*
4. *Support for climate-resilient infrastructure (embankment, dyke) to prevent flooding to secure agriculture land.*
5. *Promote farmyard/organic manure to maintain soil fertility within sub-watersheds.*
6. *Map and conserve water sources, and springs within the sub-watersheds.*
7. *Map and restore degraded areas within the sub-watersheds.*
8. *Promote soil erosion control techniques in upstream of the sub-watersheds.*
9. *Strengthen and establish Flood Early Warning Systems in strategic locations of two sub-watersheds.*
10. *Install hydro-met stations at strategic location of the two sub-watersheds (in collaboration with Department of Hydrology and Meteorology).*

Scope:
Capacity Building, Technology Development and Information (ICT), Physical Infrastructure, Research and Innovation

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Upstream and downstream communities, climate vulnerable communities	*Bagmati and Eastern Rapti River Basin*
Duration/Timeframe:	**Total Cost:**
15 years	*USD 1,000 million*
Lead Institution:	**Supporting Agency/Institutions/Groups:**
Ministry of Forests and Environment	*Provincial and local governments, I/NGOs, Development Partners, CBOs*

14: *Improvement of Forest Health and Restoration of Rare, Endangered, Endemic, and Threatened Species for Building Resilient Forest Ecosystem*	**2030, 2050**

Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, National Parks and Wildlife Conservation Act (seventh amended), National Forest Policy 2019, Forests Sector Strategy 2016-2025, National Environment Policy 2019

Climate Risks and Vulnerabilities Addressed by the Actions:
Infestation of new pest and diseases exacerbated by rising temperature, increase in invasive alien species, Landslide and Flood risks, Soil Erosion, Dry Spell and Drought

Objectives:	**Expected Outcomes:**
1. *To control invasive species of forest, wetlands and rangelands.* **2.** *To conserve, promote and restore Rare, Endangered, Endemic, and Threatened (REET) species.*	**1.** *By 2050, 80% of forest invasive species controlled.* **2.** *By 2050, forest health maintained by 80%.* **3.** *By 2050, 50% REET species are restored.* **Impact:** *Ecological integrity of forests secured*

Summary of Actions:

1. *Prepare a database and mapping of REET species throughout the country*
2. *Identify pest and diseases in REET species*
3. *Strengthen and establish pest and disease control lab across all provinces.*
4. *Promote massive mechanical uprooting of major forest invasive species on a regular basis.*
5. *Promote germplasm conservation of major tree species (in-situ and ex-situ).*
6. *Strengthen and establish Breeding Seed Orchards (BSO) of REET species.*
7. *Develop innovative actions for the use forest invasive species.*
8. *Develop guidelines to conserve and manage REET species for resilient forest ecosystem.*
9. *Encourage afforestation in degraded forest patches.*
10. *Develop indicators for resilient forest and actions for enhancing forest health.*

Scope:
Capacity Building, Technology Development and Information (ICT), Physical Infrastructure, Research and Innovation

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Community Forests Users Group members	

	Eastern to Western Nepal (Province 1, Bagmati, Gandaki, Lumbini, Sudurpaschim)
Duration/Timeframe: *15 years*	**Total Cost:** *USD 1,000 million*
Lead Institution: *Ministry of Forests and Environment*	**Supporting Agency/Institutions/Groups:** *Provincial and local government, I/NGOs, CBOs, Federation of Community Forest User Groups Nepal (FECOFUN), IUCN*

15: *Promotion of Multiple Uses of Protected Areas and Natural Heritage and Generation of Climate Adaptation Services by Maximizing the Utility of Protected Areas (PAs)*	**2030, 2050**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, National Park and Wildlife Conservation Act (seventh amended), National Forests Policy 2019, Forests Sector Strategy 2016-2025*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Infestation of new pest and diseases exacerbated by rising temperature, increase in invasive alien species, increase in occurrence of landslide and flood risks, Soil Erosion, Dry Spell and Drought*	
Objectives: **1.** *To assess the commercial feasibility of the protected areas.* **2.** *To increase the climate adaptation services from the protected area resources.*	**Expected Outcomes:** **1.** *By 2035, adaptation services increased to 50% in selected PAs* **2.** *By 2035, PAs benefits maximized to 80%* **Impact:** *Economic gains in PAs through maximized benefits of climate adaptation services*
Summary of Actions: **1.** *Promote the use of robust climate models that use GIS and remote sensing to make predictions on climate change in the PAs of Himalayas.* **2.** *Integrate climate-resilient livelihoods in management plan of Pas.* **3.** *Explore, design, and implement climate adaptation services from selected Pas.* **4.** *Explore sustainable financing mechanisms to ensure adaptation services in these Pas.* **5.** *Develop and implement strategies to increase the resilience of natural heritage sites within PAs to withstand climatic shocks and climate induced disasters.* **6.** *Scale up Ecosystem-based Adaptation (EbA) approaches in high mountain PAs.*	
Scope: *Capacity Building, Technology Development and Information (ICT)*	
Targeted Community/Beneficiaries: *Local communities residing in the Buffer Zone*	**Geographic Coverage:** *PAs of Himalayas (Api Nampa, Khaptad, Shey Phoksundo, Rara, Langtang, Shivapuri, MakaluBarun)*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Forests and Environment*	**Supporting Agency/Institutions/Groups:** *Provincial and local government, I/NGOs, Development Partners, CBOs, WWF, UNDP, Zoological Society of London (ZSL)*

16: *Reduce the Impact of Climate Induced Disasters and Extend Forest Networks for Resilient Ecosystems*	**2030, 2050**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, National Parks and Wildlife Conservation Act (seventh amendment)*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Infestation of new pest and diseases exacerbated by rising temperature, increase in invasive alien species, increased occurrence of landslide and flood risks, soil erosion, dry spells and drought*	
Objectives: **1.** *To strengthen landscape/arc level connectivity and build capacity to respond to climate-induced disasters.* **2.** *To explore, assess and implement physical and biological means of disaster management in forest ecosystems.*	**Expected Outcomes:** **1.** *By 2035, 80% of forests ecosystem is restored to respond to climate-induced disasters.* **2.** *By 2035, habitat and connectivity are conserved and maintained in 50% of degraded forest ecosystems.* **Impact:** *Ecological integrity of forest ecosystems maintained and Environmental Goods and Services increased.*
Summary of Actions: 1. *Provide continuous support for forest ecosystems to maintain ecological integrity* 2. *Prepare a data base and mapping of climate-induced hazards in forest areas.* 3. *Simulation/modelling of climate impacts on highly vulnerable forest area to inform proper management.* 4. *Support restoration of degraded forest areas to strengthen landscape connectivity* 5. *Build resilient infrastructure (bioengineering, earthen dykes) to control climate-induced disasters.*	
Scope: *Physical Infrastructure, Research and Innovation, Capacity Building*	
Targeted Community/Beneficiaries: *Forest dependent communities*	**Geographic Coverage:** *All Provinces (strategic locations)*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 1,000 million*
Lead Institution: *Ministry of Forests and Environment*	**Supporting Agency/Institutions/Groups:** *Provincial and local government, NGOs, CBOs*

17: *Conserve and Restore Ponds/Lakes in Community Forests for Climate-Resilient Biodiversity (One Community Forest-One Wetland)*	**2025, 2030**
Alignment with/Contribution to National Development Goals: *National Climate change Policy 2019, 15th Periodic Plan (2019/20-2023/24, National Parks and Wildlife Conservation Act (seventh amended), National Wetland Policy 2012*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Shrinking of water resources such as springs and ponds due to an increase in incidences of dry spells and prolonged drought, increase in the growth of the invasive alien species, increased incidence of extreme events such as floods, landslides and forest fires causing loss and damage of the wetlands.*	
Objectives: 1. *To conserve and maintain water sources for continuous availability.* 2. *To enhance biodiversity through forest health and sustainability regimes.*	**Expected Outcome:** *By 2030, 80% ponds/lakes restored in 80% of community forests* **Impact:** *Healthy forest ecosystem and enhanced biodiversity conservation.*
Summary of Actions: 1. *Undertake mapping of water resources, springs, and wetlands across community forests.* 2. *Maintain existing wetlands/ponds for water augmentation to withstand the increasing temperature and evapotranspiration.* 3. *Explore and construct wetlands in new areas of Community Forests that are hard hit by the changing climate.* 4. *Encourage plantations in degraded areas of the Community Forests.*	

5. *Support the management of wetlands/ponds (silt removal/invasive species removal/water abstraction) for in Community Forests.* 6. *Support the integration of climate-resilient initiatives in operational plan of community forests.* 7. *Facilitate the implementation of Community Forest Operational Plans by providing technical capacity.* 8. *Promote the sustainable use of the wetland's goods and resources.* 9. *Promote traditional and indigenous knowledge, skills and wetland practices inclusive to the wetland dependent community and promote gender equality in planning and management of wetlands.*
Scope: *Physical Infrastructure, Research and Innovation, Capacity Building*

Targeted Community/Beneficiaries: *Community Forest User Group members*	**Geographic Coverage:** *Mid-hills areas (All Province)*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Forests and Environment*	**Supporting Agency/Institutions/Groups:** *Provincial and local government, I/NGOs, CBOs, FECOFUN*

18: *Wetland Development and Conservation along the Chure*	**2030, 2050**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, National Parks and Wildlife Conservation Act (seventh amended), President Chure-Tarai Madhesh Conservation and Management Master Plan 2017, National Wetland Policy 2012, National Ramsar Strategy and Action Plan 2018-2024*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Drying of wetlands, shrinkage of wetlands, encroachment of wetlands due to increase invasive alien species, loss of wetlands due to increase incidences of landslides and soil erosion, and flooding*	
Objectives: 1. *To maintain healthy wetlands and conserve biodiversity.* 2. *To sustain ground recharge in Chure region.*	**Expected Outcome:** *By 2050, 80% of wetlands at the foothills of Chure conserved and restored.* **Impact:** *Increased water availability in the Chure and Bhawar Areas and enhanced wetland services.*
Summary of Actions: 1. *Undertake mapping of wetlands in Chure region and assess wetlands health.* 2. *Construct wetlands and ponds in strategic locations of the Chure range using small earthen dams, retaining streams, waterholes, ponds and lakes.* 3. *Conserve wetlands as refuge for plants and flagship species.* 4. *Support for the protection of springs in the Chure range.* 5. *Manage Invasive Alien Species in wetlands.* 6. *Develop a network of wetland along the Chure region to increase buffering capacity.*	
Scope: *Physical Infrastructure, Research and Innovation, Capacity Building*	
Targeted Community/Beneficiaries: *Local communities/Indigenous Peoples/Disadvantaged Groups/Marginalized communities*	**Geographic Coverage:** *Eastern to Western Nepal (All Chure range districts)*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 1,000 million*
Lead Institution: *Ministry of Forests and Environment*	**Supporting Agency/Institutions/Groups:** *Provincial and local government, President Chure-Tarai Madhesh Conservation Development Committee, I/NGOs, CBOs*

<table>
<tr><td colspan="2">19: Integrated Green Economy Promotion through Sustainable Forests Management and Non-Timber Forest Products Management, and Circular Economy in the Hills and Mountains</td><td>2025, 2030, 2050</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, National Forest Policy 2019, Non-timber Forests Products Policy 2009</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Loss of forest productivity and biodiversity leading to loss of employment and exacerbated poverty.</td></tr>
<tr><td colspan="2">Objectives:
1. To explore, assess, and promote green jobs for forest-based entrepreneurship.
2. To enhance livelihoods of forest dependent communities through diversifying income sources and promoting the circular economy in the forest sector.
3. To build resilience of forest ecosystem through participatory Sustainable Forest Management.</td><td>Expected Outcomes:
1. By 2035, 40% green job secured through Sustainable Forest Management
2. By 2045, 40% of livelihoods of hill and mountain communities secured through circular economy
Impact:
Resilient livelihoods of hills and mountain forest dependent communities ensured</td></tr>
<tr><td colspan="3">Summary of Actions:
1. Undertake mapping of pocket areas of medicinal and aromatic plants species and varieties, non-timber forest products, technology needs, and access to market.
2. Capacitate and facilitate on resource allocation and introduce climate-resilient technology for upscaling women-led enterprises.
3. Explore and access forest-based green jobs in hills and mountains.
4. Develop guidelines for green jobs based on a public-private partnership model in mountains.
5. Capacitate Community Forests User Group members (climate vulnerable/marginalized/IPs) to uptake green jobs as part of their livelihood support.
6. Strengthen the capacity of community-based forests institutions on gender integration, skill development and technology interventions.
7. Develop elements of a circular economy for the forest sector to diversify incomes of mountain communities.
8. Support the development of a model of forest-based circular economy in 10 Community Forests
9. Support Community Forests to implement resilient Sustainable Forest Management practices in hills and mountains.</td></tr>
<tr><td colspan="3">Scope:
Capacity Building, Technology Development and Information (ICT), Research and Innovation</td></tr>
<tr><td colspan="2">Targeted Community/Beneficiaries:
Climate vulnerable mountain communities, Community Forest User Groups</td><td>Geographic Coverage:
Hills and Mountains (Province 1, Bagmati, Gandaki, Lumbini, Karnali, Sudurpaschim)</td></tr>
<tr><td colspan="2">Duration/Timeframe:
15 years</td><td>Total Cost:
USD 1,000 million</td></tr>
<tr><td colspan="2">Lead Institution:
Ministry of Forests and Environment</td><td>Supporting Agency/Institutions/Groups:
Provincial and local governments, Nepal Tourism Board, Development Partners, I/NGOs, Forests-related stakeholders</td></tr>
</table>

<table>
<tr><td colspan="2">20 : Upland Conservation and Climate-Resilient Livelihoods Programme in High Mountains</td><td>2025, 2030, 2050</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, National Park and Wildlife Conservation Act (seventh amended), National Forests Policy 2019, Forestry Sector Strategy 2016-2025, National Wetland Policy 2012</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Increase in the incidences of landslides, increase in invasive alien species, landslide and flood risks, soil erosion, dry spells and drought</td></tr>
<tr><td colspan="2">Objectives:
1. To conserve, promote, and increase uses of highland high value forest products for climate-resilient livelihoods.
2. To conserve pasture and meadows for high value through community led control of grazing and animal husbandry.</td><td>Expected Outcomes:
1. By 2050, 80% of degraded ecosystems are restored and managed to maintain ecological integrity.
2. By 2050, volume of highland high value forest products is increased by 50%.
Impact:
Climate-resilient livelihoods secured in the high mountains.</td></tr>
<tr><td colspan="3">Summary of Actions:
1. Explore and promote high value forest products for climate-resilient livelihoods.
2. Develop guidelines for private sector engagement for the use of high value forest products for livelihood.s
3. Support capacity building of local communities to conserve, promote and increase the use of high value forest products.
4. Develop a climate-resilient strategy and action plan for the conservation and management of pastures and meadows in high lands.
5. Support and catalogue ethnobotanical practices of upland areas and capacitate local grazers/herders/healers with respect to address climate change, pasture management and transhumance.
6. Support to ensure community-led pasture management in highlands for resilient livelihoods.
7. Promote livelihood diversification in uplands through private sector engagement.
8. Conserve high altitude wetlands to sustain wetlands-based livelihoods.
9. Develop management practices to rejuvenate highland rocky and barren areas.</td></tr>
<tr><td colspan="3">Scope:
Physical Infrastructure, Research and Innovation and Capacity Building</td></tr>
<tr><td colspan="2">Targeted Community/Beneficiaries:
Vulnerable mountain communities, Indigenous People and Local Communities</td><td>Geographic Coverage:
Mountain areas (Province 1, Bagmati, Gandaki, Karnali and Sudurpaschim)</td></tr>
<tr><td colspan="2">Duration/Timeframe:
15 years</td><td>Total Cost:
USD 1,000 million</td></tr>
<tr><td colspan="2">Lead Institution:
Ministry of Forests and Environment</td><td>Supporting Agency/Institutions/Groups:
Provincial and local government, Nepal Tourism Board, I/NGOs, Development Partners, CBOs</td></tr>
</table>

7.3 Water Resources and Energy (WRE)

The Constitution of Nepal, 2015 directs the State to pursue a policy of prioritizing national investment in water resources based on people's participation and the multi-utility development of water resources (GoN, 2015). The Constitution promotes the development and production of renewable energy that is cheap, readily available, dependable and meets the basic needs of citizens (GoN, 2015). In line with these national aspirations, the Fifteenth Plan (Fiscal Year 2019/20 - 2023/24) highlights the proper management of water resources as essential to maintain adequate access to water for drinking, irrigation, and hydropower generation (GoN, 2020a).

The proper management of water resources is essential to maintain adequate access to water for drinking, irrigation, and hydropower generation. Nepal's annual renewable water availability is 7,173 m^3 capita-1 yr-1 (2014 value) (FAO- AQUASTAT, 2019), which is well above the global average. However, a large section of the population and potentially irrigable lands lack adequate access to water, and only about 7% of Nepal's total water potential has been utilized for socio-economic purposes (WECS, 2011). Ensuring adequate water resources for hydro- electricity generation is a priority for Nepal where over 90% of total electrical power generated in Nepal in 2019/20 was from hydroelectricity (MoF, 2020). The 2019 Irrigation Master Plan reported that water availability, its spatio-temporal distribution, and the hydrological cycle had been altered by climate change and variability (DWRI, 2019). Climate change has accelerated the melting of glaciers, led to the formation of glacial lakes in the mountain valleys, and expanded existing glacial lakes (Salerno et al., 2012). This retreat of glaciers and associated changes in hydrology affects availability of water resources and has subsequent impacts on energy generation. Substantial areas of different land use and land cover have been reported to be exposed to potential GLOFs. Electricity generated by the Nepal Electricity Authority declined by 6.9% in 2020/21 compared to 2019/20 because of reductions in rainfall that affected river discharge (National Electricity Authority, 2021).

Future climate change is expected to increase annual water availability parameters in most districts, while decreasing in others in the medium term (the 2030s) and long term (2050s); reflecting spatial imbalances and temporal variations in water availability (DWRI, 2019). Future temperature change scenarios and population projections for 2100 indicate that the annual renewable water availability in Nepal will be above the critical line of water stress (Chaulagain, 2015). Some river flows in the dry season will be insufficient to operate run-of-river hydropower plants, and this situation will worsen as a result of climate change. In addition, floods, landslides, snowstorms, and other hazards damage the electricity grids, transmission lines, and powerhouses. The economic costs of the impacts of climate change on hydroelectricity production could be equivalent to 0.1% of GDP per year on average, and 0.3% in extremely dry years (MoSTE, 2014). The main climate risks in the sector are water stress and lower water availability during the winter season; damage to energy infrastructure including dams, hydropower generating stations, and transmission lines; water shortages in rural and urban areas; and GLOFs.

The eight priority adaptation programmes in the WRE sector will lower the risk of GLOFs, improve water availability, promote a clean energy mix system that emphasizes hydroelectricity, and build capacity to improve the enabling environment. These adaptation programmes have an estimated cost of USD 5.35 billion to 2050.

21: ***Promoting Climate-informed Decision Making, and Developing Climate-Smart Design and Guidelines for Water Resource Infrastructure***	**2030**

Alignment with/Contribution to National Development Goals:

Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Drying up of water resources, and decreasing surface water flow and ground water recharge affecting water availability and access.*
- *Reduced hydropower generation potential due to drying up of water resources and increased siltation in the rivers.*
- *Reduced water discharge in rivers thus affecting irrigation and energy production.*
- *Damage to hydropower plants, solar plants, and their transmission lines, due to water induced disaster events such as floods and landslides.*
- *Increased snow retreat, formation of new glacial lakes and probability of Glacial Lake Outburst Floods.*

Objectives:

1. *To build resilient water resources infrastructure that can withstand extreme climatic events.*
2. *To enhance access to climate information for climate informed decision-making.*

Expected Outcome:

1. *By 2025, National Framework for Climate Services is enforced to enhance the access to climate information.*
2. *By 2030, climate-smart designs and guidelines for water resources infrastructure enforced.*
3. *By 2030, 200 national meteorological and hydrological professional capacitated in downscaled weather, climate and hydrological scenario forecasting services.*

Impact:

Strengthened weather and climate services for better forecasting and early warnings that improve the ability of communities to cope with weather events and climate hazards.

Summary of the Actions:

1. *Formulate national meteorological and hydrological act/regulations and policy frameworks regarding hydro-met services including establishment and operation of hydro-met stations and data sharing protocols/mechanisms.*
2. *Formulate and implement climate-smart designs and guidelines for water resources infrastructure.*
3. *Establish/strengthen hydro-met observation stations in the middle and high mountainous regions.*
4. *Develop hydro-met service decision support system based on impact-based forecasting.*
5. *Develop sector-specific weather and climate information packages and develop a mechanism for sharing of such information.*
6. *Establish modern technology and infrastructure for localized weather, climate, and flow forecast*
7. *Establish monitoring, nowcasting, forecasting and early warning systems for climate-induced hazards (floods, landslides, drought, forest fires, increased crop disease prevalence and its spread, heat waves, cold waves, lightning, storms, etc.).*
8. *Develop the capacity of the National Meteorological and Hydrological Service, policy makers, users and end-use for integration of climate information in decision making.*
9. *Develop and implement the National Framework on Climate Services for enhanced weather and climate services.*
10. *Develop/conduct education and awareness programs about climate change and its impact, and adaptation and resilience in water resource and energy sector.*

Scope:

Policy, law and regulation, Capacity Building, Technology development and Infrastructure Development, Research and Innovation

Targeted Community/Beneficiaries:	**Geographic Coverage:**
All population group, Energy sector stakeholder-producer, private sector, End-users, Agri-business companies	*National*
Duration/Timeframe:	**Total Cost:**
10 years	*USD 50 million*
Lead Institution:	**Supporting Agency/Institutions /Groups:**
Ministry of Energy, Water Resource and Irrigation, Department of Hydrology and Meteorology	*Nepal Electricity Authority, Ministry of Forests and Environment, Independent Power Producer Association Nepal, Multilateral Development Banks*

22 : *Promoting Energy Mix System for Industrial Sustainability and Climate-Resilient Livelihoods*	**2030**
Alignment with/Contribution to National Development Goals: *Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Drying up of water resources, and decreasing surface water flow and ground water recharge affecting water availability and access.* • *Reduced hydropower generation potential due to drying up of water resources and increased siltation in the rivers.* • *Reduced water discharge in rivers thus affecting irrigation and energy production.* • *Damage to hydropower plants, solar plants, and their transmission lines, due to water induced disaster events such as floods and landslides.* • *Increased snow retreat, formation of new glacial lakes and probability of GLOFs.*	
Objectives: **1.** *To increase energy mix in the national energy system.* **2.** *To build climate-resilient livelihood through enhanced energy security.*	**Expected Outcomes:** **1.** *By 2030, renewable energy contribution in the national energy system increased by 50%.* **2.** *By 2030, energy generation from solar increased to 30%.* **Impact:** *Enhanced energy security and resilience through appropriate energy mix and energy diversification.*
Summary of Actions: 1. *Revise and reform national policy documents to promote renewable energy sources in the national energy system mix.* 2. *Assess climate change vulnerability and risk in the electricity generating power plant locations.* 3. *Build the climate resilience of the vulnerable electricity generating power plants.* 4. *Establish a medium scale solar power plant in each province.* 5. *Promote renewable energy and strengthen energy security in industrial operations.* 6. *Promote the use of non-conventional energy sources to increase the share of non-conventional energy in the national energy system.* 7. *Establish biogas plants, distribute improved cooking stoves, and establish solar power-based mini grids in off-grid areas.* 8. *Expand rural electrification in off-grid areas to support livelihoods.*	
Scope: *Policy, Law and Regulation, Capacity Building, Technology Development and Infrastructure Development, Research and Innovation*	
Targeted Community/Beneficiaries: *All population group, Energy sector stakeholder- producer, private sectors*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 2,000 million*
Lead Institutions: *Ministry of Energy, Water Resource and Irrigation, Alternative Energy Promotion Center, Department of Electricity Development*	**Supporting Agency/Institutions /Groups:** *Nepal Electricity Authority, Ministry of Forests and Environment, Solar Power developer, Independent Power Produce Association Nepal, Multilateral Development Bank (MDB)*

23: *Reduce Glacial Lake Outburst Flood (GLOF) Risks in Gandaki, Koshi and Karnali River Basins to protect livelihoods and assets*	**2030**

Alignment with/Contribution to National Development Goals:
Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030

Climate Risks and Vulnerabilities Addressed by the Actions:
Increased risk of GLOFs due to melting of the snow and ice

Objectives:

1. *To reduce the risk of GLOFs, to save infrastructure, lives and property of peoples/communities living in downstream.*
2. *To build capacity of the federal, provincial and local level public emergency operations center*

Expected Outcomes:

1. *By 2030, four glacial lakes flow in the Gandaki, Karnali and Koshi river basins regulated and GLOF Early Warning System (EWS) strengthened and established.*
2. *By 2030, real time monitoring system of the Glacial Lakes in Nepal established at Federal level.*

Impact:
Saved life, properties and infrastructure

Summary of the Actions:

1. *Study and research to reveal climate change trends and impacts on glaciers and glacial lakes in the Himalayan region.*
2. *Assess potentially dangerous glacial lakes based on increasing temperature, lake expansion, moraine dam structure, and geo-morphological structures.*
3. *Assess hazards and communities in the downstream of glacial lakes that are vulnerable to potential GLOF events.*
4. *Establish research wings for the study of fresh water and glacial lakes at the federal level.*
5. *Establish infrastructure for glacier lake water lowering.*
6. *Establish and operate EWS with collaboration and cooperation in emergency response.*
7. *Quantify the freshwater storage and the impact of climate change on glaciers and snow coverage.*
8. *Establish and operate adequate hydro-meteorological stations and early warning equipment and systems for continuous monitoring and dissemination of information to the local level.*
9. *Design and develop environmentally friendly, climate-resilient structures for lowering of water levels in the lakes.*
10. *Build capacity for operation of the early warning systems and early actions in community at the federal, provincial and local levels.*
11. *Develop glacier and snow modelling systems to evaluate the freshwater availability in the glacial lakes for its optimum utilization.*

Scope:
Technology Development and Infrastructure Development, Research and Innovation, Capacity Building

Targeted Community/Beneficiaries:
Local communities, farmers, hydropower developers, infrastructure developed at the downstream of Glacial Lake, government and non-government organization working in the emergency response and rescue activities in glaciated river basin

Geographic Coverage:
Gandaki, Karnali and Koshi River Basin of Nepal

Duration/Timeframe:
10 years

Total Cost:
USD 1,000 million

Lead Institutions:
Ministry of Energy, Water Resource and Irrigation, Department of Hydrology and Meteorology

Supporting Agency/Institutions /Groups:
Ministry of Forests and Environment, Independent Power Producer Association Nepal, United Nations Development Program, World Bank, Agriculture Development Bank, ICIMOD, Kathmandu University, Tribhuvan University

<table>
<tr><td colspan="2">24: Promoting Water Pumping Technologies in Water Scarce Areas</td><td>2030</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030, Irrigation Policy</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Drying up of water resources, and reduced water discharge in rivers thus affecting irrigation and energy production</td></tr>
<tr><td colspan="2">Objectives:
1. To enhance climate resilience capacity of rural vulnerable people.
2. To improve access to water for drinking and irrigation purpose.</td><td>Expected Outcomes:
1. By 2030, 200 water lifting system to support rural livelihoods established.
2. By 2030, improved health and hygiene of the rural livelihoods.
Impact:
Enhanced climate resilience and improved socio-economic conditions of rural communities through an improved ability to cope with climate change.</td></tr>
<tr><td colspan="3">Summary of the Actions:
1. Undertake mapping of water scarce areas and feasibility of water pumping technologies.
2. Develop a prototype of the climate-resilient low carbon water lifting system and establish in water scarce areas.
3. Construct climate smart irrigation system to effectively utilize the water available from the water lifting system.
4. Establish Multiple Water Use system at the local level for easy access to drinking water and irrigation.
5. Develop/conduct education and awareness programs of climate change and its impact, adaptation, resilience, health and hygiene.
6. Promote solar water pumps to improve access to drinking water and irrigation water requirement.</td></tr>
<tr><td colspan="3">Scope:
Technology development and Infrastructure Development, Research and Innovation, Capacity Building</td></tr>
<tr><td colspan="2">Targeted Community/Beneficiaries:
All population group including marginalized group and community of Province 1, Bagmati, Karnali and Sudurpaschim Province</td><td>Geographic Coverage:
Areas of Province 1, Bagmati, Karnali and Sudurpaschim</td></tr>
<tr><td colspan="2">Duration/Timeframe:
10 years</td><td>Total Cost:
USD 1,000 million</td></tr>
<tr><td colspan="2">Lead Institutions:
Ministry of Energy, Water Resource and Irrigation, Ministry of Water Supply, Ministry of Education, Science and Technology</td><td>Supporting Agency/Institutions /Groups:
Ministry of Forests and Environment, Private Sector, Academia, TU, KU, IPPAN, World Bank, Agriculture Development Bank, UN agencies, User groups, I/NGOs</td></tr>
</table>

25: *Promoting Climate-Resilient Renewable Energy in Rural Vulnerable Settlements and Institutions*	**2050**
Alignment with/Contribution to National Development Goals: *Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Drying up of water resources, and reduced water discharge in rivers thus affecting irrigation and energy production.* • *Reduced hydropower generation potential due to drying up of water resources and increased siltation in the rivers.* • *Damage to hydropower plants, solar plants, and their transmission lines, due to water induced disaster events such as floods and landslides.* • *Increased snow retreat, formation of new glacial lakes and probability of GLOFs.*	
Objectives: **1.** *To fulfill energy demand in vulnerable rural settlements.* 2. *To improve the socioeconomic condition of vulnerable rural communities through diversifying livelihoods options.*	**Expected Outcomes:** **1.** *By 2025, 800 bio-gas plants established, 2,000 improved cooking stoves distributed, 3 MW solar energy plants with mini-grid in off grided areas installed, and 50 MW grid solar plant connected with the national grid system.* **2.** *By 2030, an additional 800 bio-gas plants established, 3,000 improved cooking stoves distributed, 12 MW solar energy plants with mini-grid in off-grided areas installed, and 100 MW grid solar plant connected with the national grid system.* **Impact:** *Improved energy access and enhanced sustainable socio-economic development of the vulnerable rural settlements enhanced.*
Summary of Actions: 1. *Establish biogas plants, distribute improved cooking stoves, and establish solar power mini grids in off grid areas.* 2. *Establish solar power plants in each of the provinces considering the current and future climate change scenario and impacts in the power plant locations.* 3. *Build capacity of the local communities and local governments on climate change risk, adaptation strategies and the use of non-conventional energy sources.* 4. *Equip and enable rural institutions to meet basic needs (health care and education) through improved access to energy.* 5. *Promote non-conventional energy (biogas, solar energy, wind energy and hydropower), and fuel-efficient technologies to reduce firewood demand and enhance energy resilience.* 6. *Promote productive end use of energy to enhance rural livelihoods.*	
Scope: *Technology Development and Infrastructure Development*	
Targeted Community/Beneficiaries: *Vulnerable Rural Settlements*	**Geographic Coverage:** *National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 500 million*
Lead Institutions: *Ministry of Energy, Water Resource and Irrigation, Alternative Energy Promotion Center, Department of Electricity Development*	**Supporting Agency/Institutions /Groups:** *Nepal Electricity Authority, Ministry of Forests and Environment, Solar Power developer, Independent Power Producer Association Nepal, MDBs*

26: *Climate-Resilient Flood Control to Protect Livelihoods and Assets at Risk from Climate Induced Flooding*	**2050**

Alignment with/Contribution to National Development Goals:

Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Drying up of water resources, and reduced water discharge in rivers thus affecting irrigation and energy production.*
- *Reduced hydropower generation potential due to drying up of water resources and increased siltation in the rivers.*
- *Damage to hydropower plants, solar plants, and their transmission lines, due to water induced disaster events such as floods and landslides.*
- *Increased snow retreat, formation of new glacial lakes and probability of GLOFs.*

Objectives:	**Expected Outcomes:**
1. *To control soil erosion and reduced flood incidences.* **2.** *To increase efficiency of hydropower plant operation.*	**1.** *By 2025, 50 climate-resilient river check dams constructed in river stretches that are prone to flooding.* **2.** *By 2035, additional 200 climate-resilient river check dams constructed in river stretches that are prone to flooding.* **Impact**: *Vulnerable settlements and assets protected from flooding that is exacerbated by climate change.*

Summary of Actions:

1. *Undertake climate and disaster risk assessments to understand the river catchment areas' susceptibility to different hazards such as landslides and soil erosion.*
2. *Conserve river catchment areas through peoples' participation and building of networks of upstream and downstream communities to forge collaboration.*
3. *Undertake study and research on river sediment, soil erosion and debris flow to determine the health of the check dams.*
4. *Extract aggravated riverbed materials to maintain river channels and sustain the life of the check dams.*
5. *Construct multiple use check dams that enable the various uses of the water, including for irrigation and hydropower generation.*

Scope:

Infrastructure Development, Research and Innovation

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Vulnerable settlements, Farmers, Hydroelectricity developers	*National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 200 million*
Lead Institutions: *Ministry of Energy, Water Resource and Irrigation, Department of Electricity Development, Department of Water Resources and Irrigation, Ministry of Urban Development*	**Supporting Agency/Institutions /Groups:** *Nepal Electricity Authority, Ministry of Forests and Environment, Solar power developers, Independent Power Producer Association Nepal, MDBs*

27: *Sustainable Run-of-River Systems at Feasible Locations Supported by Reservoir Systems*	**2030, 2050**
Alignment with/Contribution to National Development Goals: *Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Drying up of water resources, and reduced water discharge in rivers thus affecting irrigation and energy production.* • *Reduced hydropower generation potential due to drying up of water resources and increased siltation in the rivers.* • *Damage to hydropower plants, solar plants, and their transmission lines, due to water induced disaster events such as floods and landslides.* • *Increased snow retreat, formation of new glacial lakes and probability of GLOFs.*	
Objective: **1.** *To increase operability of the run-of-river based hydropower plants.*	**Expected Outcome:** **1.** *By 2025, climate-resilient hydropower development strategic guideline operationalized.* **Impact:** *Continuous electricity generated through establishment of climate-resilient run-of-river systems.*
Summary of Actions: 1. *Undertake climate and disaster risk assessment to understand the operability and energy generation potential of the run-of-river hydropower plants in the business-as-usual and climate extreme situations.* 2. *Undertake study and research on river sediment, soil erosions and debris flow to determine the health of the reservoirs and hydropower plants.* 3. *Extract aggravated riverbed materials to maintain river channels and sustain the life of the check dams.* 4. *Build capacity of the hydropower developers on climate change vulnerability and risks, adaptation and resilience strategies.* 5. *Review and develop climate-resilient hydropower development guidelines to integrate climate change adaptation into run-of-river hydropower plant design and operation.*	
Scope: *Capacity Building, Technology Development and Infrastructure Development, Research and Innovation*	
Targeted Community/Beneficiaries: *Hydroelectricity developers*	**Geographic Coverage:** *National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 100 million*
Lead Institutions: *Ministry of Energy, Water Resource and Irrigation, Department of Electricity Development*	**Supporting Agency/Institutions/Groups:** *Nepal Electricity Authority, Ministry of Forests and Environment, Independent Power Producer Association Nepal, MDBs*

28: *Clean and Efficient Energy Technology Development, and Build Resilient Systems and Infrastructure*	**2030**
Alignment with/Contribution to National Development Goals: *Nationally Determined Contribution- 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Energy Crisis Reduction and Electricity Development Decade 2015, Water and Energy Sector White Paper 2018, Water Resource Policy 2020, Sustainable Development Goals: Status and Road Map 2016-2030*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Drying up of water resources, and reduced water discharge in rivers thus affecting irrigation and energy production.* • *Reduced hydropower generation potential due to drying up of water resources and increased siltation in the rivers.* • *Damage to hydropower plants, solar plants, and their transmission lines, due to water induced disaster events such as floods and landslides.* • *Increased snow retreat, formation of new glacial lakes and probability of GLOFs.*	
Objective: **1.** *To build resilience of energy systems and infrastructure.*	**Expected Outcome:** **1.** *By 2025, climate-resilient energy production and distribution systems are integrated into the power generation sector through research and innovation, formulation of guidelines and strategies.* **Impact:** *Improved climate resilience of the electricity generating systems and infrastructure.*
Summary of the Actions: **1.** *Catalogue climate-resilient energy efficient technologies pertinent to Nepal's geography and use these technologies in energy generation and distribution.* **2.** *Develop guidelines to build climate-resilient energy systems.* **3.** *Undertake climate and disaster risk integrity assessments of hydropower plants and other energy systems.* **4.** *Design and develop retrofitting energy system to withstand climate extreme events and promote continuous generation and distribution of energy.* **5.** *Promote research and innovation for the development and promotion of climate-resilient technology development.*	
Scope: *Technology Development and Infrastructure Development, Research and Innovation*	
Targeted Community/Beneficiaries: *Hydroelectricity developers, local communities, research institutions, private sectors, industry operators*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institutions: *Ministry of Energy, Water Resource and Irrigation, Department of Electricity Development*	**Supporting Agency/Institutions /Groups:** *Nepal Electricity Authority, Ministry of Forests and Environment, Independent Power Producer Association Nepal, MDBs*

7.4 Rural and Urban Settlements (RUS)

The Fifteenth Plan calls for cities and human settlements to be inclusive, safe, sustainable, and resilient; and highlights that losses to disasters need to be reduced (GoN, 2018). The National Urban Development Strategy, 2017 recognized climate change as a major risk factor, particularly in the context of urban poverty and the likelihood of increased numbers of people moving to urban areas due to disasters. The strategy regarded resilience as a guiding principle for achieving balanced and prosperous urban future, and emphasized integration of resilience into urban systems and the preparation of community plans for building disaster resilient cities and communities (MoUD, 2017).

Nepal's urban population has grown rapidly over the past two decades (MoFALD, 2017); and for the period 2014 to 2050, Nepal is expected to be among the top ten fastest urbanising countries in the world (UN DESA, 2014). Urbanization in Nepal is primarily fuelled by rural-to-urban migration. Cities offer diverse economic opportunities, which attract rural migrants including the poor. Cities have been hailed as drivers of economic growth, but urbanization in Nepal has been mostly haphazard (Rimal et al., 2017). There are wide deficits and geographical disparities in the availability of basic urban infrastructure (MoUD, 2017).

Rural and urban settlements are primarily impacted by floods, landslides, droughts, epidemics, heat waves, cold waves, and fire events. Many settlements in Nepal are built in areas, such as steep slopes and riverbanks, that are prone to climate risks such as landslides and flooding. The increased occurrence of heavy rainfall has increased the risks of landslides in the high mountains, landslides and floods in the middle mountains, and floods and debris flow in the Tarai. The consequences of climate change include loss of lives; damage to property, physical and social infrastructure, and cultural heritage; impacts on markets; and increased economic burdens. The observed impacts on physical infrastructure include damage to and destruction of buildings, transport systems, communication systems, among others. In urban areas, the urban heat island effect has increased electricity use for cooling purposes and increased heat-related health impacts (MoPE, 2016). Impacts on social infrastructure include disruption to and lack of access to health and education services. These social impacts tend to be higher for children, women, the elderly, expectant mothers, people with chronic health problems, and disadvantaged population groups.

Climate risks and vulnerabilities in the sector include inadequate infrastructure and services for increasing rates of urbanization, including insufficient drainage that contributes to urban flooding; and a failure to integrate climate change in municipal policies and plans, and to adopt sustainable land-use planning. An increase in informal settlements, often located in risk-prone areas, and inadequate and non-compliance with standards, regulations, and building codes during infrastructure construction increases vulnerability to climate hazards. The priority adaptation programmes in the Rural and Urban Settlements sector will mainstream adaptation in land use planning, integrated settlement planning, and urban and rural development planning; improve the enabling environment to promote climate- resilient building design and construction; and assist vulnerable settlements to cope with climate impacts. The three adaptation programmes for RUS sector have an estimated cost of USD 2.85 billion to 2050.

29: *Promoting Circular Economy for Sustainable Urban Development*	**2025, 2030**

Alignment with/Contribution to National Development Goals:

Second Nationally Determined Contribution-2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy-2019, Third National Communication-2021, Land Use Policy-2015, Land Use Act-2019, National Urban Policy 2007, National Urban Development Strategy-2017, Habitat III National Report 2016, Sustainable Development Goals: Status and Roadmap 2016-2030

Climate Risks and Vulnerabilities Addressed by the Actions:

1. *Due to increased climate induced hazards and extreme events, lead to increased risk of;*
   - *damage to rural and urban buildings, mostly of the rural as the buildings are comparatively less resilient to urban buildings*
   - *damage to public infrastructure*
   - *disturbance in the social harmony and fabric*
   - *damage to human settlements*
   - *increased risk of injury or death and displacement of population*
   - *imbalance in migration leading to low populations in rural settings and dense population in the urban areas with increased urban sprawl*
2. *Disturbance in the rural-urban linkage and nexus due to climate extreme events.*
3. *Acute disturbance in life and livelihood of the rural and urban population due to shortage of water supply due to drought, increasing temperatures and erratic precipitation.*

Objectives:	**Expected Outcomes:**
1. *To pilot and promote climate-resilient city planning.* **2.** *To build national capacity on adaptive urban development.*	1. *By 2030, climate smart and climate resilience concept adopted in 7 cities.* 2. *By 2030, capacity on adaptative urban planning developed in all cities.* **Impact:** *Sustainable, prosperous and healthy cities for quality urban life.*

Summary of Actions:

1. *Mapping of the climate and disaster risks at the settlement level in seven cities in each of the seven provinces.*
2. *Promote non-motorized modes of transportation through construction of climate-resilient infrastructure that is inclusive and safe.*
3. *Support municipalities to develop and implement green growth strategies and plans.*
4. *Strengthen institutional capacity for coordination, planning, monitoring, and reporting of concerned agencies.*
5. *Integrate climate change in educational curriculum within the schools and colleges of municipalities.*
6. *Align urban planning and development of infrastructure to avoid ecological imbalances, increased risk of exposure to new pathogens, and the emergence of new diseases.*
7. *Promote water retention systems – expanded rainwater harvesting, water storage, and conservation techniques, water reuse, and water use.*
8. *Enforce land-use planning and provisions of subsidy to effective implementation of land use plans to control the construction in the risk-prone area.*
9. *Revise building codes so that they integrate climate risk factors.*
10. *Ensure provision of insurance system for populations and livelihood assets that are at risk of climate impacts.*
11. *Identify and promote social protection measures and alternatives for people living in slum and squatter areas, along the banks of the river.*
12. *Promote urban planning that considers the specific needs of children, women, differently abled people, and old age people.*
13. *Establish a database system to record and monitor the exposure of buildings and their sensitivity to climate extreme events and disasters.*
14. *Establish accessible multipurpose open spaces and community centers at the settlement level.*
15. *Promote urban forests and develop urban forest corridors connecting settlements.*
16. *Promote rooftop farming, aquaponics, hydroponics, roadside plantations and vertical agriculture in urban centers.*
17. *Construct new and improve existing drainage system considering a 100-year return period.*
18. *Promote, improve and use local materials and traditional technology for the construction of the building (bamboo house, mud house, stone etc.), via a municipal tax incentive system.*

19. *Increase the human resources capacity of the local government by creating compulsory designated posts of urban planners, architects, and engineers.*
20. *Integrate rainwater harvesting and ground recharge systems via recharge pits in the building permit system.*
21. *Develop regulatory mechanisms on groundwater extraction, and the inclusion of recharge pits and ponds concept before extraction.*
22. *Design and maintain road infrastructure with side drainage that gives due consideration to the runoff system and flooding.*

Scope:
Physical Infrastructure, Technology Development and Information, Capacity Building

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Urban population	*Cities vulnerable to climate change impacts in each the province*
Duration/Timeframe:	**Tentative Cost:**
10 years	*USD 350 million*
Lead Institutions:	**Supporting Agency/Institutions /Groups:**
Ministry of Urban Development, Provincial ministry on Urban Development and Physical Infrastructure, Local governments	*Ministry of Federal Affair and General Administration, UN agencies, MDBs*

30: *Developing Integrated Settlements and Urbanization Models for Climate Risk Reduction and Supplying Climate Adaptation Services through Nature-based Solutions*	2030, 2050

Alignment with/Contribution to National Development Goals:
Second Nationally Determined Contribution-2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy-2019, Third National Communication-2021, Land Use Policy-2015, Land Use Act-2019, National Urban Policy 2007, National Urban Development Strategy-2017, Habitat III National Report 2016, Sustainable Development Goals: Status and Roadmap 2016-2030

Climate Risks and Vulnerabilities Addressed by the Actions:
1. *Due to increased climate induced hazards and extreme events that increase the risk of;*
   - *damage to rural and urban buildings, mostly of the rural buildings that are comparatively less resilient to urban building*
   - *damage to public infrastructures*
   - *disturbance in the social harmony and fabric*
   - *damage to human settlements*
   - *increased risk of injury or death and displacement of population*
   - *imbalance migration leading to low population in the rural settings and dense population in the urban areas with increased urban sprawl*
2. *Disturbance in the rural-urban linkage and nexus due to climate extreme events.*
3. *Acute disturbance in life and livelihood of the rural as well as urban population due to shortage of water supply due to drought, increasing temperature and extreme precipitation.*

Objectives:	**Expected Outcomes:**
1. *To develop integrated safer settlements in rural and urban areas r* **2.** *To ensure climate adaptation services through nature-based solutions for vulnerable populations that are forced to relocate because of climate related disasters.*	1. *By 2040, 300 highly vulnerable settlements relocated to safe areas.* 2. *By 2040, 300 existing compact settlements upgraded to cope with climate and disaster risk.* 3. *By 2040, 293 municipalities and 460 rural municipalities develop and implement integrated land use plans.* **Impact:** *Sustainable, safe and climate-resilient integrated settlement across Nepal.*

Summary of Actions:
1. *Study and identify vulnerable settlements in three ecological zones and seven provinces.*
2. *Identify safer locations for resettlement and relocation as part of rural municipal-level strategic spatial plans.*
3. *Resettle/relocate climate and disaster vulnerable population in safe areas.*
4. *Undertake mapping of compact settlements.*

5. *Prepare Integrated Urban/Rural Development Plans emphasizing low carbon and climate-resilient urban and rural settlements in all municipalities.*
6. *Identify key potential areas for development of integrated settlements.*
7. *Develop climate and disaster resilient social and physical infrastructure*
8. *Establish community based early warnings and disaster information at the local level*
9. *Promote home gardening for supporting food security.*
10. *Promote cottage and local agro-industrial activities through installation of required technologies and equipment.*
11. *Build capacity of the local population on income generating activities that help to diversify income sources.*
12. *Implement climate-resilient physical development plans using GIS and hazards mapping techniques.*

Scope:
Physical Infrastructure

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Climate and disaster vulnerable groups/settlement	*National (focus on climate and disaster vulnerable areas)*
Duration/Timeframe:	**Total Cost:**
15 years	*USD 2,000 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**
Ministry of Urban Development, Provincial Ministries of Urban Development and Physical Infrastructure, Local governments	*Ministry of Federal Affairs and General Administration, Ministry of Forests and Environment, Ministry of Land Management, Cooperatives, UN-HABITAT*

31: *Upgrading and Promoting Climate-Resilient Building Designs, Codes, Practices and Construction Technologies, and National Capacity Building for Implementation*	2025, 2030

Alignment with/Contribution to National Development Goals:
Second Nationally Determined Contribution-2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy-2019, Third National Communication-2021, Land Use Policy-2015, Land Use Act-2019, National Urban Policy 2007, National Urban Development Strategy-2017, Habitat III National Report 2016, Sustainable Development Goals: Status and Roadmap 2016-2030

Climate Risks and Vulnerabilities Addressed by the Actions:
1. *High temperatures leading to weakening of the building materials (thermoelastic effect).*
2. *Increased climate-induced hazards and extreme events increase risk of:*

- *damage to rural and urban buildings, mainly rural buildings that are comparatively less resilient than urban buildings*
- *loss and damage to public infrastructure and buildings*
- *disturbance in the social harmony and fabric*
- *damage to human settlements*
- *injury or death and displacement of population.*

Objectives:
1. *To prepare/revise climate risk-informed urban and rural development plans.*
2. *To design, pilot and demonstrate climate and disaster-resilient construction technology.*
3. *To promote climate-resilient building practices.*
4. *To explore and identify environment friendly building materials and construction technologies.*
5. *To disseminate information about and raise awareness of climate-resilient building practices.*

Expected Outcomes:
1. *By 2025, a catalogue on climate-resilient building design, practices, construction material technology developed and disseminated.*
2. *By 2030, 15 climate-resilient building information and demonstration center in seven provinces and five physiographic zones established and operationalized.*

Impact:
Safe, attractive, cost-effective, resilient and environment friendly buildings.

Summary of Actions:
1. *Explore and prepare local construction materials, responsible sourcing and preparation of material guide.*
2. *Conduct study on climate responsive attributes of local architecture in three ecological regions.*
3. *Improve and or enhance the characteristics and use of the building materials and technologies in the context of climate and disaster risk.*

4. *Explore and identify innovative building technology for climate-resilient buildings.* 5. *Undertake study and prepare catalogue on cost effective, climate friendly and disaster resilient construction materials and technology.* 6. *Develop climate-resilient design guidelines for critical infrastructure such as roads, bridges, dams, and public buildings such as schools and hospitals.* 7. *Design a guideline to incorporate child friendly, disable friendly, old age, and women friendly factor to upgrade existing infrastructure as well as in new construction.* 8. *Develop incentive mechanism for the promotion of improved, climate friendly construction materials and technology.* 9. *Retrofit existing buildings through use of climate-resilient building technology (greening of the multistoried building through usage of low carbon and climate-resilient construction materials and building technology).* 10. *Prepare capacity building packages and promote the skill development activities through tailor-met trainings, hands on exercises, and establishment of learning center at seven provinces.*	
Scope: *Policy Laws and Regulation, Capacity building, Physical Infrastructure*	
Targeted Community/Beneficiaries: *Local communities, public buildings and private housing developers*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institutions: *Ministry of Urban Development, Provincial Ministries of Urban Development and Physical Infrastructure, Local governments*	**Supporting Agency/Institutions/Groups:** *Ministry of Federal Affair and General Administration, UN-HABITAT, Institute of Engineering, Tribhuvan University, Kathmandu University*

7.5 Industry, Transport and Physical Infrastructure (ITPI)

The Constitution of Nepal calls for balanced, environmentally friendly, qualitative, and sustainable physical infrastructure development that prioritizes under-developed regions (GoN, 2015). The NCCP 2019 calls for the use of environmentally friendly and climate friendly technology during the development of industries, transportation systems and infrastructure; and the mainstreaming of climate risks in infrastructure design and construction (GoN, 2019). A total of 8,212 industries were registered in Nepal in 2020, including 1,162 large industries, 1,846 medium industries, and 5,204 small industries (MoF, 2020). The industries, however, were unevenly distributed across physiographic zones and the country's seven provinces. Industry and transport together consumed over 1,500 kton of energy, and the largest energy supply for industries was biomass in 2016 (ADB, 2017b).

The observed climate change impacts on industry, transport and physical infrastructure vary widely across geography and location. Floods, landslides, mass wasting, debris flow, rock falls, mudflows, sedimentation, erratic rainfall, windstorms, glacial floods, and rise in groundwater levels, are found to damage infrastructure. These climate hazards lead to the collapse of industrial buildings and properties, impact the integrity of infrastructure, increase the instability of land through the weakening of riverbanks and hill toes and land subsidence, damage road drainage structures, breach road embankments, scour bridge foundations, block the flow of traffic, and create washouts and inundation that can submerge infrastructure (UNECE, 2019). In general, the main impacts on infrastructure observed in Nepal's rural and urban areas are damage to houses, buildings, communication systems, bridges and roads, transmission lines, and water. Flooding has damaged water and sewer systems; overwhelmed drainage systems, caused traffic

congestion, and polluted water. Drought has contributed to the failure of water and irrigation schemes in rural areas (MoFE, 2021).

Transport systems are critical for effective disaster response and access to health, education, and agricultural extension services. Heavy monsoon rains in 2019 demonstrated that transport infrastructure is highly vulnerable to flooding and landslides, with major highways blocked or destroyed, including the Koshi-Kamala section of the East-West Highway (WB, 2020). Out of the 488 landslides reported in 2020, 59 occurred along roadsides and 62 occurred on roads and obstructed vehicular flow (MoF, 2020). Disruptions to road and aviation systems can have negative economic impacts for the industrial sector. The ITPI sector is vulnerable to the impacts of climate change because of development practices such as rampant construction of buildings, expansion of unplanned settlements, and the rapid development of physical infrastructure and social infrastructure in disaster-prone municipal areas. Sensitivity to climatic hazards is further increased by fragile and feeble road networks, and maladaptive water schemes (MoFE, 2021). Only 46 municipalities have implemented building codes, and these codes were not necessarily developed in a manner that mainstreamed climate risks.

The five priority adaptation programmes in the Industry, Transport and Physical Infrastructure sector will improve the enabling environment to encourage infrastructure and industrial development that accounts for climate risks, diversity the energy supply mix to scale up clean energy to meet industrial demand, and encourage electric modes of transport. The five programmes have an estimated cost of USD 3.05 billion to 2050.

<table>
<tr><td colspan="2">32: Strengthening Institutions, Technologies, Policies and Resources (Databases), and Building Capacity and Awareness for Climate-Resilient Industry, Transport and Physical Infrastructure</td><td>2030, 2050</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
15th Periodic Plan 2019/20-2023/24, Environmentally Sustainable Transport Strategy 2014, Second Nationally Determined Contribution 2020, National Climate Change Policy-2019, Third National Communication 2021, Land Use Policy 2015, Land Use Act 2019, Foreign Investment and Technology Transfer Act 2019, Industry Policy 2011, National Mineral Policy 2017, Sustainable Development Goals: Road Map for Nepal, 2016-2030</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Increased climate-induced hazards and extreme weather events increases the risk of:
1) damage to industries and its physical infrastructure affecting in the operation of the industries.
2) damage to the water and energy supply systems for industry.
3) disturbances in transport services affecting the supply of materials that in turn impacts industrial production.
4) loss of employment due to disturbances in industrial operation.
5) reductions in availability of raw materials for industries.</td></tr>
<tr><td colspan="2">Objectives:
1. To strengthen institutions and upgrade technologies to build climate-resilient industry, transport and physical infrastructure.
2. To develop, update and provide easier and early weather climate information.
3. To build capacity and resources in maintenance and operation of climate-resilient ITI.</td><td>Expected Outcomes:
1. By 2030, real time weather and climate information systems developed, and information disseminated to encourage climate-resilient industries and infrastructure
2. By 2035, adaptive capacity of the ITPI sector enhanced through strengthening of institutions and upgrading to new state-of-the-art technologies.
Impact:
Climate and disaster-resilient industries, transport and infrastructure.</td></tr>
<tr><td colspan="3">Summary of Actions:
1. Establish early warning system for preparedness against extreme weather events and climate hazards</td></tr>
</table>

2. *Disseminate early warning information to industrial facilities that covers industry value and supply chain mechanisms*
3. *Build capacity and increase awareness on climate-resilient industry and infrastructure operations to ITPI stakeholders and service providers*
4. *Conduct periodic monitoring and review as necessitated by standards.*
5. *Develop and amend climate-resilient infrastructure design guides, climate friendly guidelines (including environmental impact assessment, strategic environmental assessment, and climate impact assessment), land use planning, construction and building codes, relocation strategies, international standards, green certificates (such as Leadership in Energy and Environmental Design), and provision of insurance and subsidy mechanisms.*

Scope:
Policy law and Regulation, Research and Innovation, Capacity Building, Technology development and Information, Physical Infrastructure

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Industries, entrepreneur, small and medium enterprises, local communities	*National*
Duration/Timeframe:	**Total Cost:**
10 Years	*USD 200 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**
Ministry of Industry, Commerce and Supplies, Ministry of Physical Infrastructure and Transport	*National Planning Commission, Ministry of Land Management, Cooperatives and Poverty Alleviation, Ministry of Forests and Environment, Asian Development Bank, World Bank, Provincial government, UN agencies, I/NGOs, Private Sector*

33: *Developing and Promoting Resilient, Clean Energy-based Transportation Systems*	**2025, 2030**

Alignment with/Contribution to National Development Goals:
15th Periodic Plan 2019/20-2023/24, Environmentally Sustainable Transport Strategy 2014, Second Nationally Determined Contribution 2020, National Climate Change Policy-2019, Third National Communication 2021, Land Use Policy-2015, Land Use Act 2019, Foreign Investment and Technology Transfer Act 2019, Industry Policy 2011, National Mineral Policy 2017, Sustainable Development Goals: Road Map for Nepal, 2016-2030

Climate Risks and Vulnerabilities Addressed by the Actions:
Due to increased climate induced hazards and extreme events increased risk of;
1) *damage to industries and its physical infrastructures affecting in the operation of the industries*
2) *damage to water and energy supply systems for the industry*
3) *disturbances in the transport service affecting in limited supply of and damage in industrial production*
4) *Loss of employment due to disturbances in industrial operation*
5) Reduction in availability of raw materials for the industries

Objectives:	**Expected Outcome:**
1. *To reform policies to promote climate-resilient and low carbon transport system* 2. *To establish infrastructures for promoting low carbon climate-resilient transport system*	*By 2030, low carbon, climate and disaster resilient and safer transport, system established* **Impact:** *People centric, safe, reliable, resilient and clean transport system established and operationalized*

Summary of Actions:
1. *Undertake climate vulnerability and risk hazard mapping of the road sector.*
2. *Promote and use climate-resilient and environment friendly tools, technologies and inclusive measures (e.g., green belt, avenue plantation, bioengineering, bypass, distance shortening, electric vehicles, waterways, railways, charging stations, etc.) in roads and transport.*
3. *Develop Decision Support System on Transportation System to enable understanding of the unfolding climate vulnerability and risks in the transport sector.*
4. *Promote nature-based solutions to building resilience of the road sector.*

Scope:
Physical Infrastructure

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Urban population (primary), rural population	*National with a focus on the urban centers*

Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institutions: *Ministry of Industry, Commerce and Supplies, Ministry of Physical Infrastructure and Transport*	**Supporting Agency/Institutions/Groups:** *National Planning Commission, Ministry of Land Management, Cooperatives and Poverty Alleviation, Ministry of Forests and Environment, MDBs, Provincial governments, UN agencies, I/NGOs, private sectors*

34: *Developing Climate-Resilient Community Infrastructures to address Climate Risks, Hazards and Pandemics*	**2030, 2050**
Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, Environmentally Sustainable Transport Strategy 2014, Second Nationally Determined Contribution 2020, National Climate Change Policy-2019, Third National Communication 2021, Land Use Policy-2015, Land Use Act 2019, Foreign Investment and Technology Transfer Act 2019, Industry Policy 2011, National Mineral Policy 2017, Sustainable Development Goals: Road Map for Nepal, 2016-2030*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Increased climate induced hazards and extreme events increase risk of:* *1) damage to industries and its physical infrastructures affecting in the operation of the industries.* *2) damage to water and energy supply systems for the industry.* *3) disturbances in the transport service affecting in limited supply of and damage in industrial production.* *4) Loss of employment due to disturbances in industrial operation.* *5) Reduction in availability of raw materials for the infrastructure.*	
Objectives: *To build community infrastructure that can withstand climate hazards; with a co-benefit of helping communities address disaster risks and pandemics.*	**Expected Outcomes:** **1.** *By 2030, XXX climate- and disaster resilient open spaces, community shelters and holding centers strengthened and developed.* **2.** *By 2030, XXX helipads, warehouse developed and strengthened.* **Impact:** *Communities are equipped to deal with climate and disaster emergencies.*
Summary of Actions: *1. Assess and develop and strengthen community shelters and holding centers open spaces, and helipads in each municipality.* *2. Develop guidelines for accessible, safe and resilient shelters, based on the needs, vulnerabilities and preferences of vulnerable groups.* *3. Develop a pool of climate-resilient technologies for building robust infrastructures.*	
Scope: *Physical Infrastructure, Policy Law and Regulation, Capacity Building*	
Targeted Community/Beneficiaries: *Population most at risk of climate change impacts and disasters at urban populations including women, children, marginalized groups, senior citizens, persons with disabilities and youth.*	**Geographic Coverage:** *National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 350 million*
Lead Institution: *Ministry of Physical Infrastructure and Transport*	**Supporting Agency/Institutions /Groups:** *Provincial and local government, UN agencies, MDBs, I/NGOs, CBOs, private sectors*

35: *Up-Grading, Maintaining and Relocating Vulnerable Industries and its Physical Infrastructures to Increase Resilience to Climate Risks*	**2050**
Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, Environmentally Sustainable Transport Strategy 2014, Second Nationally Determined Contribution 2020, National Climate Change Policy-2019, Third National Communication 2021,*	

Land Use Policy-2015, Land Use Act 2019, Foreign Investment and Technology Transfer Act 2019, Industry Policy 2011, National Mineral Policy 2017, Sustainable Development Goals: Road Map for Nepal, 2016-2030
Climate Risks and Vulnerabilities Addressed by the Actions: *Increased climate-induced hazards and extreme weather events increase risk of:* ***1)*** *damage to industries and its physical infrastructures affecting the operation of the industries.* ***2)*** *damage to water and energy supply systems for industry.* ***3)*** *disturbances in the transport service affecting supply of material and delays in industrial production* ***4)*** *Loss of employment due to disturbances in industrial operation.* ***5)*** *Reduction in availability of raw materials for the industries.*

Objectives:	**Expected Outcome:**
1. *To strengthen/ promote/construct climate smart (resilient) and eco-friendly Industries and infrastructure.* 2. *To relocate at risk-industries to safer locations.*	**1.** *By 2035, 40% of industries at risk to climate extremes are equipped, strengthened and relocated.* **Impact:** *Climate friendly and resilient industries and infrastructure maintained safeguarding environment, climate and socio-economy.*

Summary of Actions:
1. *Map and assess current and potentially climate vulnerable industries* **2.** *Identify climate-resilient measures for relocation, upgrading and maintenance of industries and their infrastructure* **3.** *Support to relocate identified vulnerable industries* **4.** *Amend, plan, develop climate-resilient infrastructure design, climate friendly guidelines (EIA, SEA and Climate Impact Assessment), proper land use planning, relocation strategy, green certificates (Leadership in Energy and Environmental Design), and provision of insurance and subsidy mechanisms.* **5.** *Incorporate climate- resilient technologies and inclusive measures against climate risk while maintaining/upgrading the industries.*
Scope: *Physical Infrastructure*

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Vulnerable communities and industries	*National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 1000 million*
Lead Institutions: *Ministry of Industry, Commerce and Supplies, Ministry of Physical Infrastructure and Transport*	**Supporting Agency/Institutions /Groups:** *Provincial and local governments, UN agencies, MDBs, I/NGOs/CBOs, private sectors, FNCCI*

36: *Diversifying the Energy Supply for Industrial Districts*	**2030, 2050**

Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, Environmentally Sustainable Transport Strategy 2014, Second Nationally Determined Contribution 2020, National Climate Change Policy-2019, Third National Communication 2021, Land Use Policy-2015, Land Use Act 2019, Foreign Investment and Technology Transfer Act 2019, Industry Policy 2011, National Mineral Policy 2017, Sustainable Development Goals: Road Map for Nepal, 2016-2030*
Climate Risks and Vulnerabilities Addressed by the Actions: • *Increased climate induced hazards and extreme events increase risk of;* ***1)*** *Damage to industries and its physical infrastructure.* ***2)*** *damage to water and energy supply systems for industry.* ***3)*** *Interruption of the electricity supply causing closure of the industrial manufacturing activity.* • *Reduced availability of water for industrial purposes due to interrupted supply of electricity* • *Loss of employment due to no work at the industries caused by limited power supply.*

Objectives:	**Expected Outcomes:**
1. *To promote divers, energy smart and climate-resilient energy system to improve access for industries.*	1. *By 2030, energy mix system in the supply of energy to the industrial sector set up by 20%.* 2. *By 2030, energy efficient industrial corridor established and operationalized.* **Impact:**

2. *To develop and implement energy mix approach in special economic zones and industrial districts.*	*Continuous supply of electricity to industries that is increasingly comprised of renewable energy sources that promotes industrial growth and the country's economy.*

Summary of Actions:

1. *Undertake mapping and prioritization of climate impact on industries and develop a list of climate vulnerable industries.*
2. *Plan, develop, and promote climate resilient industrial design, climate friendly guidelines (EIA, SEA and Climate Impact Assessment), land use planning, construction and building codes, international standards, green certificates (LEED).*
3. *Implement provision of insurance and subsidy mechanism for the small, medium and large-scale industries to absorb, transfer climate and disaster risk.*
4. *Promote nature-based solutions in industry and infrastructure sector ensuring circular economy*
5. *Establish renewable energy centers and power hubs at each of the XX Special Economic Zones to provide with energy as and when required uninterrupted*
6. *Promote One Special Economic Zone at the renewable energy hub*
7. *Promote the concept of net-metering to facilitate increase in renewable energy generation.*

Scope:
Physical Infrastructure

Targeted Community/Beneficiaries: *SMEs and large industries*	**Geographic Coverage:** *National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 1,000 million*
Lead Institutions: *Ministry of Industries, Commerce and Supplies, Ministry of Energy, Water Resources and Irrigation*	**Supporting Agency/Institutions /Groups:** *National Planning Commission, Provincial and local governments, MDBs, I/NGOs/CBOs, private sectors, FNCCI, Alternative Energy Promotion Center (AEPC)*

7.6 Tourism, Natural and Cultural Heritage (TNCH)

Tourism represents a small but expanding industry in Nepal. The Fifteenth Plan notes that tourism is a foundation of economic prosperity in Nepal and identifies the need to make the tourism climate resilient, which includes identifying climate risks for sensitive tourism destinations and cultural heritage and taking action to protect them from the risks (GoN, 2019). While the number of tourists dropped dramatically in 2020 and 2021 because of COVID-19, the sector has the potential for significant growth and could be a driver of economic and sustainable human development (UNDP, 2020). Tourism accounted for 7.5% of national GDP in 2017 (MoF, 2017a) when 940,218 international tourists visited Nepal, an increase of 25% over the previous year (MoCTCA, 2018). The tourism sector is a key contributor to the national economy as it is one of the sources of foreign exchange in Nepal. However, the sector also possesses some threats to wild areas and natural and cultural heritage of Nepal (Figure 12).

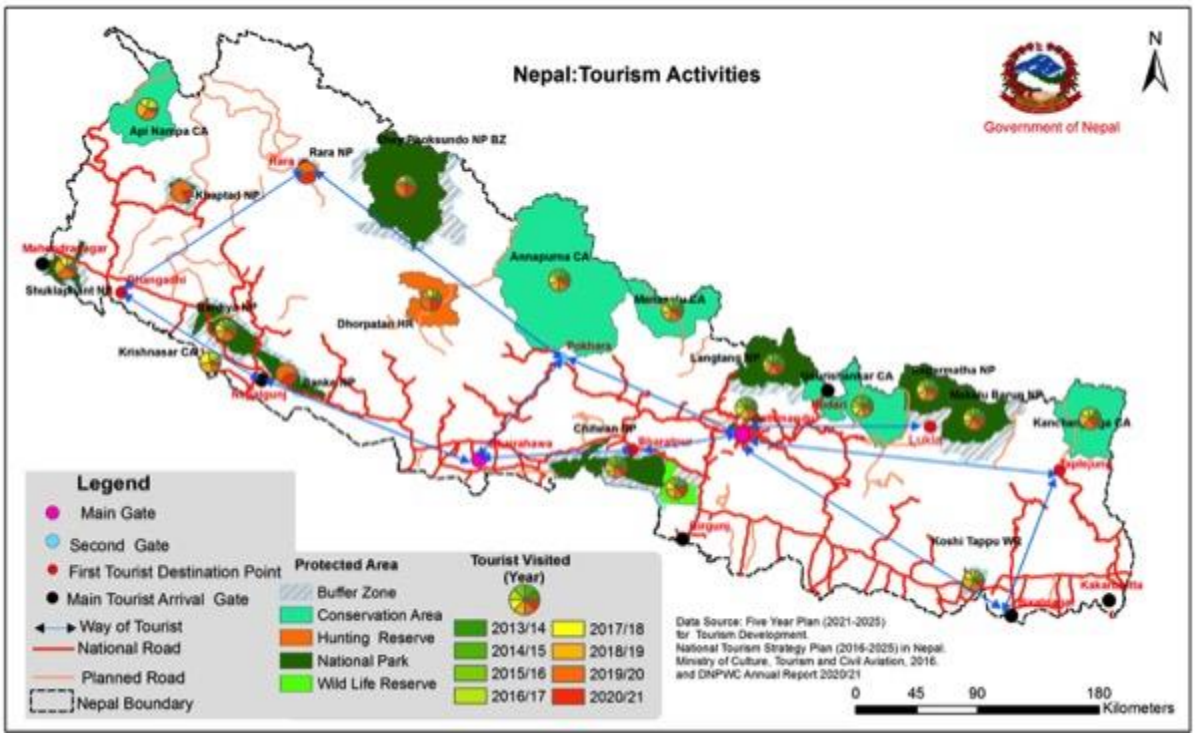


Figure 13: Tourist and wild areas (protected areas) map of Nepal

Nepal's tourism industry is primarily focused on nature; and most of the nature-based tourism activities are climate sensitive. Trekking and mountaineering in Nepal are concentrated in Protected Areas that are at high risk of floods, landslides, glacier melt, avalanches, and GLOFs (ICIMOD, 2021). Changing monsoon patterns have impacted tourism activities, such as trekking, mountaineering, and safari (Nyaupane and Chhetri, 2009). The abrupt changes in climatic variables and extreme events are a major threat to the health and safety of tourists and people directly involved in tourism activities. Climate change and inclement weather have put the lives of trekkers, mountaineers, and associated human resources at threat. Between 2005 and 2014, a total of 235 tourists lost their lives due to inclement weather in the country, including avalanches and snowstorms (MoHA & DPNet- Nepal, 2015).

Other climate impacts on the tourism sector include loss of biodiversity, reduced landscape aesthetics, and infrastructure damage including cultural heritage sites.

Many cultural heritage sites are located near rivers and could be destroyed or heavily damaged by rising river waters, flash floods and landslides (MoSTE, 2014). Flash floods are particularly dangerous for museums and archives. In Mustang, the decrease of snow in winter and the increase in rainfall after the winter months have affected the traditional construction of mud and stone flat-roofed houses (MoFE, 2021c). The main climate risks in the sector are socio-economic losses due to disruptions to tourism businesses; and damage to and destruction of physical property and tourism infrastructure due to landslides, floods, fires and extreme weather. The reliance on nature-based tourism means that the sector is highly vulnerable to climate change and its impacts. Women are the de facto managers of many hospitality businesses, including homestays, restaurants, hotels, and teashops; and may experience declines income or increases in workload (e.g., water scarcity in tourism areas) (Tenzin et al., 2019).

The 8 priority adaptation programmes in the Tourism, Cultural and Natural Heritage sector will identify climate sensitive areas, establish emergency preparedness and rescue teams for immediate action in climate-related disasters, establish a digital information centre, strengthen sustainable climate-resilient tourism practices, and promote the diversification of tourist products and destinations. The eight adaptation programmes have an estimated cost of USD 1.13 billion to 2050.

<table>
<tr><td colspan="2">37: Climate-Resilient Tourism for Ecological Sustainability and Economic Prosperity</td><td>2030</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Damage and destruction of cultural heritage and archeological sites due to climate extremes events such as blizzards, landslides, avalanches, GLOFs, extreme precipitation, hailstorms, windstorms, and extreme temperatures</td></tr>
<tr><td colspan="2">Objectives:
1. To diversify and promote tourism destinations and products for sustainable tourism.
2. To promote agro-tourism, eco-tourism and tourism value-chains considering payment for ecosystem and climate-resilient practices.
3. To facilitate private and foreign direct investments to improve the climate resilience of tourism infrastructure.</td><td>Expected Outcomes:
1. By 2025, tourism infrastructure of key tourism destination (trails, bridges, buildings) assessed for climate risk and vulnerabilities.
2. By 2030, 20% of the key/prioritized tourism destinations enhanced through interventions.
3. By 2030, the contribution of the tourism sector to national GDP increased by 5% from the share of XX% of GDP in 2020.
Impact:
Improved resilience and enhanced prosperity through an increase in the contribution of the tourism sector in national GDP and increased investment in tourism sector.</td></tr>
<tr><td colspan="3">Summary of Actions:
1. Identify and promote new and alternative destinations and tourism products.
2. Promote green trails and nature-based tourism mostly focused on local resources, local products, and sustainable methods of hospitality management.
3. Promote agro-tourism, eco-tourism for resilient livelihoods.
4. Establish, develop and promote high altitude sports and adventure tourism.
5. Build capacity of tourism related stakeholders on climate change vulnerability, risk and adaptation options in tourism sector.
6. Promote and enhance the local and traditional knowledge and skill to diversify tourism products and services.
7. Identify and diversify complementary/alternative employment and income sources for and particularly involve marginalized groups and women through skill development training (bakery, local cuisine, homestay, nature guide, handicrafts, cooking) for youth, both female and male.</td></tr>
</table>

8. *Develop domestic tourism package for people irrespective of age including senior citizen, differently abled persons, and students.* 9. *Tourism value chain analysis, marketing and integration that considers climate-resilient technologies.* 10. *Promote local customs and traditions to link local economy to the tourism industry.* 11. *Develop provision of climate change adaptation tariff and expenditure framework in tourism sector.* 12. *Encourage private sector investment/involvement in climate-resilient infrastructures through subsidies and insurance mechanisms.* 13. *Promote Foreign Direct Investment to enhance climate change resilience in tourism domain through policy easing, information access, and co-ordination.*
Scope: *Capacity Building, Physical Infrastructure, Technology Development and Information*

Targeted Community/Beneficiaries: *Tourism enterprises, communities involved in the tourism sector, private sectors, foreign investors, domestic and international tourists*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 50 million*
Lead Institution: *Ministry of Culture, Tourism and Civil Aviation*	**Supporting Agency/Institutions /Groups:** *Nepal Tourism Board, Tourism Stakeholders and agencies, Development Partners, private sectors, I/NGOs, MDBs*

38: *Climate Risk and Tourism Information System for Resilient, Safe and Sustainable Tourism*	2030
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Losses and damage due to climate extreme events such as blizzard, landslides, avalanches, GLOFs, extreme precipitation, hailstorm, windstorm and extreme temperature*	
Objectives: **1.** *To develop and install hi-tech digital forecast information systems.* **2.** *To provide accurate, timely and geo-specific meteorological information.* 3. *To develop disaster preparedness plans for the high-altitude area destinations by 2030.*	**Expected Outcomes:** 1. *By 2030, climate and disaster preparedness strategy and action plan for high altitude destination developed and implemented* 2. *By 2030, a system for forecasting weather and climate information to tourism sector developed and implemented.* 3. *By 2030, a decision support system for tourism sector resilience building established and implemented.* **Impact:** *Safe and reliable tourism information system that promotes sustainable tourism growth contributing to national GDP*
Summary of Actions: 1. *Increase the capacity of hydrological and metrological stations, particularly in mountainous regions to monitor the change in glaciers and patterns of a snowstorm, for example.* 2. *Establish emergency communication channels (hotlines) for tourists and operators to deal with emergencies during the major disasters.* 3. *Support a tourism-based real time national weather, cryosphere and disaster information system and enable its access to tourism operators as well as tourists (software based).* 4. *Establish a national system of weather and disaster information dissemination using relevant scientific tools such as mobile, TV, Radio, Apps, Web pages for timely alert (national) that are also accessible and feasible to people from marginalized communities.* 5. *Develop a climate induced disaster preparedness plan in mountainous districts incorporating the shift in seasons due to climate change and develop an all-season-tourism master plan.* 6. *Establish an integrated tourism facility center in each district that furnishes weather and climate information, risk mapping information, and information related to culture, local products, and souvenirs (such as locally produced handicrafts by women/ethnic group).*	
Scope:	

Capacity Building, Technology Development and Information, Physical Infrastructure	
Targeted Community/Beneficiaries: *Tourists, communities and private sectors involved in tourism, aviation, and related transport industries; tourism related stakeholders.*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 20 million*
Lead Institution: *Ministry of Civil Aviation, Culture and Tourism*	**Supporting Agency/Institutions /Groups:** *Department of Tourism, Department of Hydrology and Meteorology, Ministry of Home Affairs, UN Agencies, Development Partners, Nepal Tourism Board*

39: *Develop Climate-Resilient Infrastructure, and Explore and Enhance Knowledge and Capacities for Resilient Mountain Tourism*	2030, 2050
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025*	
Climate Risks and Vulnerabilities Addressed by the Actions: *Loss and damage of cultural heritage and archaeological sites due to an increase in climate extreme events such as hailstorms, blizzards, windstorms, snowstorms that disturb tourism operations in mountain regions.*	
Objectives: 1. *To identify, conserve and restore at risk cultural historical, archaeological sites.* 2. *To promote archaeological and heritage tourism.* 3. *To catalogue, conserve and promote indigenous and traditional knowledge contributing to climate-resilient tourism sector.*	**Expected Outcomes:** **1.** *By 2030, sustainable and climate-resilient tourism strategy and action plan developed for mountain tourism.* **2.** *By 2030, catalogue of all the cultural, historical, archaeological sites that are at risk of climate change induced hazards prepared for decision making.* **Impact:** *Enhanced climate-resilience of mountain tourism.*
Summary of Actions: **1.** *Promote local and indigenous culture, food, and products (e.g., handicrafts) that directly benefit local communities.* **2.** *Conserve the most vulnerable and at-risk cultural heritage sites through community and Indigenous People's participation.* **3.** *Conduct regular maintenance of cultural heritage sites and develop mechanisms to allocate resources for repair and maintenance.* **4.** *Develop climate-resilient and environmentally friendly guidelines and standards for the protection of cultural heritage sites.* **5.** *Implement disaster risk reduction measures to protect the cultural heritage sites* **6.** *Retrofit and reinforce the physical infrastructures in the cultural heritage sites to make them climate resilient without disturbing their original state (2 in each province).* **7.** *Develop and implement climate resilient and disabled, gender, children and senior citizen friendly (extreme temperature, precipitation, windstorm/blizzard proof) infrastructure design and structure guidelines.* **8.** *Identify and map at-risk cultural sites for further planning and implementation of cultural site protection and preservation action.* **9.** *Establish rescue centers, shed houses, and cooling houses at appropriate locations and on specific trekking routes, climbing routes.* **10.** *Establish centers to collect, archive, share and promote indigenous and traditional knowledge for building climate resilience in the tourism sector (7 centers as pilot).*	
Scope: *Physical Infrastructure*	
Targeted Community/Beneficiaries:	**Geographic Coverage:** *National*

Ethnic, minority, disabled, women, children, senior-citizens, tourists, researchers and tourism entrepreneurs.	
Duration/Timeframe: *15 years*	**Tentative Cost:** *USD 60 million*
Lead Institutions: *Ministry of Culture, Tourism and Civil Aviation*	**Supporting Agency/Institutions /Groups:** *Department of Archaeology, Department of Tourism, Ministry of Home Affairs, UN Agencies, Development Partners, National Disaster Risk Reduction and Management Authority, Nepal Tourism Board*

40: *Promotion of Community-based Adaptation through Eco-and Cultural Tourism*	**2025, 2030**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Damage to cultural and religious sites and heritage due to extreme weather events.* • *Reduced number of trekkers and mountaineers due to extreme weather-related events such as windstorms, hailstorms, excessive rain, excessive heat, blizzards, and snowstorms.* • *Damage to tourist infrastructures and destinations due to climate extreme events.* • *Loss of traditional dress and activity, rituals, and language due to climate-induced migration and shifting of location.* • *Loss in national GDP induced by loss in tourism activity due to extreme climate events.*	
Objectives: 1. *To develop climate-resilient community-based eco-tourism and cultural tourism.*	**Expected Outcome:** **1.** *By 2030, climate-resilient tourism livelihood developed and enhanced in major touristic destinations.* **Impact:** *Increased contribution of tourism sector to national economy*
Summary of Actions: **1.** *Assess the homestay sites in major touristic destination.* **2.** *Build capacity and awareness on local communities including women and marginalized population on the impacts of climate change on tourism services.* **3.** *Promote and enhance the local and traditional knowledge and skills to diversify tourism products and services.* **4.** *Upgrade existing and build 500 new climate-resilient homestays (nationwide).* **5.** *Develop and operationalize 'One Province- One Home Stay' circuit.* **6.** *Promote GESI inclusive tourism employment at the local level and develop women's leadership.* 7. *Develop a strategic plan for the establishment of rescue centers at appropriate locations and in specific trekking routes and climbing routes.*	
Scope: *Physical Infrastructure, Capacity building, Technology Development and Information, Research and Innovation*	
Targeted Community/Beneficiaries: *Local level communities, tourists, women, ethnic groups, marginalized communities, and youth.*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 100 million*
Lead Institution: *Ministry of Culture, Tourism and Civil Aviation*	**Supporting Agency/Institutions /Groups:** *Department of Tourism, UN Agencies, Development Partners, I/NGOs, Tourism sector stakeholders, private sectors, NTB*

41: *Diversifying and Promoting Alternative Tourism Destinations and Products for Climate-Resilient Tourism Business*	2030, 2050

Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Damage to cultural and religious sites and heritage due to extreme weather events*
- *Reduced number of trekkers and mountaineers due to extreme weather-related events such as windstorm, hailstorm, excessive rain, excessive heat, blizzard, snow-storm etc.*
- *Damage in tourist infrastructures and destination due to climate extreme events*
- *Loss of traditional dress and activity, rituals, language due to climate-induced migration and shifting of the location*
- *Loss in national GDP induced by loss in tourism activity due to extreme events*

Objectives:	**Expected Outcomes:**
1. *To develop climate smart and diversified tourism products.* 2. *To promote climate smart and eco-friendly tourist circuits, routes and sites.*	**1.** *By 2030, climate smart and diversified tourism products developed in new tourism destinations.* 2. *By 2035, climate-resilient circuits, routes and sites developed.* **Impact:** *Increased climate-resilient tourism activity*

Summary of Actions:

1 *Develop climate smart and diversified tourism products.*
1.1 Identify climate smart and eco-friendly tourism products.
1.2 Develop diversified tourism products and services so as to minimize the losses from climate hazards particularly in the mountaineering tourism, trekking tourism.
1.3 Train/aware human resource related to tourism sector at local level on climate change impacts and its consequences; and adaptation measures.
1.4 Capacitate tourism value chain actors in developing climate smart tourism schemes.
2. *Promote climate smart tourism circuits and routes.*
2.1 Identify climate disaster hotspots in the potential tourist circuits, routes and sites, and delineate the area
2.2 Establish tourist information centers at strategic places.
2.3. Train trekking guides and other personnel on safety and security including first aid.
2.4. Ensure insurance of guides, porters etc.
2.5. Collaborate with concerned authorities to establish rescue centers with trained, equipped and dedicated human resource at strategic places.
2.6. Establish emergency communication channels (hotlines) for tourists and operators to deal with emergencies during the major disasters.
2.7. Identify and improve alternative trekking trails so that tourists can use the trails in case of emergency.
3. *Promote climate smart and eco-friendly tourism destinations.*
3.1 Enforce building codes in the tourism infrastructures along the circuits, routes and in the sites.
3.2 Develop and promote tourism packages integrating local knowledge and traditions, and local food.
3.3 Support the development of eco-friendly hotels and homestays.
3.4 Conserve cultural practices, tradition and cultural sites through community participation
3.5 Manage solid waste in partnership with the private sectors.

Scope:
Physical Infrastructure, Capacity building, Information, Research and Innovation

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Local level communities, tourists, tourism, entrepreneurs, private sectors	*National*
Duration/Timeframe: *15 years*	**Tentative Cost:** *USD 100 million*
Lead Institution: *Ministry of Culture, Tourism and Civil Aviation*	**Supporting Agency/Institutions /Groups:** *Department of Tourism, Nepal Tourism Board, UN agencies, I/NGOs, Development Partners, Tourism Service Providers, private sectors*

42: *Establishment and Operation of Emergency Relief and Rescue Services in Adventure Tourism*	2030
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025, National Disaster Risk Reduction and Management Strategy and Action Plan 2018-2030*	
Climate Risks and Vulnerabilities Addressed: • *Reduced number of trekkers and mountaineers due to extreme weather-related events such as windstorms, hailstorms, excessive rain, excessive heat, blizzards, and snow-storms, etc.* • *Damage to tourist infrastructures and destination due to climate extreme events*	
Objectives: 1. *To develop emergency rescue centers at appropriate strategic locations* 2. *To promote insurance that covers climate risks in the tourism sector.*	**Expected Outcome:** **1.** *By 2030 emergency relief and rescue service in adventure tourism established and operationalized at each of the strategic adventure and tourism strategic locations.* **Impact:** *Reduced number of casualties resulting from extreme weather through timely and effective emergency relief and rescue service.*
Summary of Actions: 1. *Assess climate vulnerability and risks in the adventure tourism sub-sector.* 2. *Explore suitability of the rescue center locations.* 3. *Formulate a strategic plan to establish climate-resilient relief and rescue centers at appropriate locations and in specific trekking and climbing routes that are women, child, senior citizen, and differently able people friendly.* 4. *Raise awareness in the local community, including with women and marginalized groups, on the impacts on climate change and its consequences.* 5. *Build accommodation facilities with insulation to address temperature extremes at higher altitudes.* 6. *Establish a tourism information system that is integrated with weather and climate forecasts, and prepare a dissemination plan.*	
Scope: *Physical Infrastructure, Capacity Building, Technology Development and Information, Research and Innovation*	
Targeted Community/Beneficiaries: *Local level communities, national and international tourists*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Culture, Tourism and Civil Aviation*	**Supporting Agency/Institutions /Groups:** *Department of Tourism, Ministry of Home Affairs, UN Agencies, Development Partners, National Disaster Risk Reduction and Management Authority, Nepal Tourism Board, NDRRMA, Department of National Parks and Wildlife Conservation, Local government, Tourism service operators*

43: *Capacity Building for Resilient Tourism in Nepal*	2030
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025, National Disaster Risk Reduction and Management Strategy and Action Plan 2018-2030, Gender Strategy and Action Plan on Climate Change 2020-2030*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Damage to cultural and religious sites and heritage due to extreme weather events* • *Reduced number of trekkers and mountaineers due to extreme weather-related events such as windstorms, hailstorms, excessive rain, excessive heat, blizzards, and snowstorms* • *Damage to tourist infrastructures and destinations due to extreme climate events* • *Loss of traditional dress and activity, rituals, and language due to climate-induced migration and shifting of location*	

• *Loss in national GDP induced by loss in tourism activity due to extreme climate events.*	
Objectives: **1.** *To build the capacity of tourism entrepreneurs and tourism service providers.* **2.** *To mainstream climate resilience in tourism sector plans, policies, strategies and programs.* **3.** *To encourage and support to implement climate-resilient programme and activities by tourism service providers.*	**Expected Outcomes:** **1.** *By 2030, climate change adaptation is integrated into tourism sector plans, policies, and strategies.* **2.** *By 2030, 1,000 tourism sector stakeholders capacitated on climate change vulnerabilities and risks and adaptation planning in the tourism sector.* **Impact:** *Increased climate and disaster resilience of the tourism sector.*
Summary of Actions: 1. *Review and assess policy framework on tourism sector considering climate change risk context in the tourism sector.* 2. *Facilitate in integration of climate change adaptation into sectoral plan, policies and programs.* 3. *Develop and deliver tourism stakeholder-based capacity building packages on climate change vulnerability and risk and adaptation strategies in tourism sector.* 4. *Build capacity of government officials, service providers, operators and private sector on climate change risk and vulnerability and adaptation strategies in tourism sector.* 5. *Develop curricula on climate change vulnerability and risk, adaptation planning and integrate into to school, colleges and universities.*	
Scope: *Policy, Laws and Regulation, Capacity Building and Awareness*	
Targeted Community/Beneficiaries: *Tourism Service Providers, Private Sector, Tourist, Local Communities*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 200 million*
Lead Institution: *Ministry of Culture, Tourism and Civil Aviation*	**Supporting Agency/Institutions /Groups:** *Department of Tourism, Nepal Tourism Board, Local governments, Tourism service providers, private sectors, I/NGOs, UN agencies, Development Partners*

44: *Promotion of Climate-Resilient 'One Local Level-One Tourism Destination*	**2030**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, 15th Periodic Plan 2019/20-2023/24, Sustainable Development Goals: Road map for Nepal 2016-2030, Tourism Strategic Plan 2016-2025, National Disaster Risk Reduction and Management Strategy and Action Plan 2018-2030, Gender Strategy and Action Plan on Climate Change 2020-2030*	
Climate Risks and Vulnerabilities Addressed: • *Damage to tourist infrastructures and destination due to extreme climate events.* • *Loss of traditional dress and activities, rituals and language due to climate-induced migration and shifting of locations.* • *Loss in national GDP induced by loss in tourism activity due to extreme climate events.*	
Objectives: **1.** *To promote climate-resilient local tourism to improve livelihoods.*	**Expected Outcome:** **1.** *By 2030, 753 local level tourism destinations identified.* **Impact:** *Increased climate-resilient local tourism activity across Nepal.*
Summary of Actions: 1. *Assess climate vulnerability and risks in the tourism sector at the local level* 2. *Identity key tourism destinations in each of the local levels and develop plans to make the destinations safe, reliable, and resilient to climate risks* 3. *Establish local, regional, and national weather and climate forecasting, as well as an early warning system information dissemination platform at local tourism destinations* 4. *Build capacity of the local people and local tourism service providers on safe, climate-resilient, and sustainable tourism services and products*	

5. Build accommodation facilities with insulation to address temperature extremes at higher altitude.	
Scope: *Physical Infrastructure, Capacity Building*	
Targeted Community/Beneficiaries: *Local level Communities, national and international tourists*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 100 million*
Lead Institution: *Ministry of Culture, Tourism and Civil Aviation*	**Supporting Agency/Institutions /Groups:** *Department of Tourism, Nepal Tourism Board, Local governments, Tourism service providers, private sectors, I/NGOs, UN agencies, Development Partners*

7.7 Health, Drinking Water and Sanitation (HDWS)

Health, drinking water and sanitation are critical elements of balanced development and the promotion of healthy lifestyles. The Fifteenth Plan highlights the importance of mainstreaming climate change impacts in the design and construction of drinking water and sanitation facilities (GoN, 2019). At COP 26, Nepal committed to develop climate-resilient and sustainable low carbon health systems, which included a commitment to conduct climate change and health vulnerability and adaptation assessments, and a commitment to develop a health NAP (H-NAP) (World Health Organization, 2021). The Ministry of Health led the preparation of Nepal's H-NAP for the period 2017-2021 (GoN, 2017a), and this plan requires updating to meet the COP26 health commitment. The Ministry of Health and Population launched a climate change and health website in 2019 (see https://climate.mohp.gov.np/).

Water availability and quality are impacted by climate change in Nepal. Springs are the primary source of drinking water in the mid- hill region, and spring discharge has declined by 30% over the last 30 years. The increase in temperature also causes melting and thawing of glaciers, snow, and frozen ground leading to changes in the seasonality of river flows and a reduction in water availability in summer (MoFE, 2021c). An increase in precipitation and severe weather has caused flooding, pollution of wells, inaccessibility of water sources, flooding of latrines, damage to infrastructure, landslides around water sources, sedimentation and turbidity, challenges to the sustainability of sanitation and hygiene behaviour, and water-borne diseases (MoFE, 2021). Floods and landslides over a six-year period caused damage to WASH systems that amounted to almost USD 196 million (MoWS/ DWSS, 2019). Rising temperatures, fluctuating precipitation, and extreme weather events have significant impacts on the seasonal and temporal trends of vector-borne diseases, water-borne diseases, respiratory diseases, cardiovascular disease, food-borne diseases, nutrition-related diseases, injuries, and mental illnesses (NPC, 2020a).

Nepal's national adaptation plan (H-NAP) in the health sector indicated that vulnerability in the health sector is linked to the availability of local resources, institutional good governance, quality of public health infrastructure, and the access to relevant local information regarding extreme weather threats. The spatial distribution of these factors is not uniform, with vulnerable populations being impacted by varying degrees. For example, the mid and far western districts were found to be more exposed to climate risks that increase the incidence of diarrhoea, respiratory disease, and malaria. Climate change can significantly worsen health conditions of poor people and communities that are living

below the poverty line (GoN, 2017b). The Tarai region of Nepal is particularly vulnerable because it is prone to flooding and experiences health and hygiene issues during disasters. Floods and landslides damage and disrupt water and sanitation infrastructure and services, resulting in poorer sanitation conditions, contamination of water sources, and limited access to water for hygienic practices that could lead to health impacts and potential outbreaks. Many health facilities are located near rivers or on steep slopes and are vulnerable to damage during floods and landslides. For example, 30 out of 51 (59%) of health facilities in Ramechhap have suffered damage from landslides (MoFE, 2021).

The seven priority adaptation programmes for the HDWS sector will enhance the public health system to address critical climate vulnerabilities and risks through improved research and surveillance of diseases linked to climate change; and the establishment of early warning systems, emergency preparedness, and prompt responses to epidemics and pandemics. The actions will improve the enabling environment for the sector, work to integrate climate risks in all infrastructure projects, and improve the conservation of water sources along with watershed management to ensure sustainable water supply. The proposed programmes have an estimated cost of USD 4.75 billion to 2050.

<table>
<tr><td colspan="2">45: 'Health Promoting Cities': Health, Environment and Life (Heal)</td><td>2030, 2050</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy-2019, Second Nationally Determined Contribution, SDG Road Map for Nepal, NHSSP, National Health Policy-2019, Long term (Water Supply and Sanitation) Sectoral Development Plan 2017-2030, National Health Infrastructure Development Standards 2017, National Disaster Risk Reduction and Management Strategy and Action Plan-2017, Third National Communication, National Health Sector Support Programme (NHSSP), 15th Periodic Plan 2019/20-2023/24</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
• Compromised health care facility system due to extreme events.
• Increase in mental health problems, owing to extreme climatic events such as floods and landslides.
• Greater risk of injury, disease and death, owing to more intense heat waves, cold waves and fires (forest).
• Increased risk of vector-borne, waterborne and foodborne diseases, especially in mountain areas, and leading to perennial occurrence in the lowlands.
• Increase in cardiorespiratory diseases, owing to higher ambient air pollution and haze in urban areas, resulting from climate change.
• Increase in morbidity and mortality related to extreme cold waves as well as heat waves in the southern Terai lowlands.</td></tr>
<tr><td colspan="2">Objectives:
1. To improve the health and quality of life of all urban and rural dwellers.
2. To ensure adequate open spaces and parks for healthy behaviors.
3. To improve environmental health services (water supply, sanitation, solid waste management, food safety, and pollution monitoring and control).
4. To increase urban forests coverage and conserve ecosystem that are stable and sustainable.
5. To promote clean, safe physical environment of high-quality including housing.</td><td>Expected Outcomes:
1. Environmental/Child/ Nutrition Friendly Local governance (E/C/NFLG) is promoted at the local level.
2. By 2030, 100 additional parks established at the major urban centers.
3. By 2040, an additional 100 air quality pollution monitoring system established at strategic locations.
4. By 2050, all urban cities and rural centers adopt the concept of 'Health Promoting Cities': Heal.
Impact:
Healthy urban and rural population that contributes to a sustainable economy, environment and society</td></tr>
<tr><td colspan="3">Summary of Actions:
1. Awareness raising and capacity building on the concept of 'Health Promoting Cities: Heal'.
2. Designate areas for open spaces and parks to ensure health behaviors</td></tr>
</table>

3. *Plant suitable urban tree species and develop urban forestry corridor linking settlements (evergreen, fruit bearing, carbon absorbing etc.)*
4. *Install air quality monitoring stations.*
5. *Improve payment for ecosystem services for control and conservation mechanism*
6. *Built cycling and walking infrastructures around the cities*
7. *Promote waste management with a concept of 'zero waste' and circular economy*
8. *Promote renewable energy to power city lights and city centers, public offices and household level*
9. *Develop and implement climate-resilient health care facility design guidelines.*

Scope:
Policy, Law and Regulation, Capacity Building, ICT, Physical Infrastructure, Research and Innovation, Technology Development

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Population and assets in all the urban cities and rural centers in all provinces	*All urban cities and rural centers of all provinces*
Duration/Timeframe:	**Total Cost:**
15 years	*USD 500 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**
Ministry of Health and Population, Ministry of Water Supply, Ministry of Urban Development, Ministry of Forests and Environment, Ministry of Federal Affairs and General Administration, Ministry of Home Affairs, Metropolitan, Sub-Metropolitan, Rural and urban municipalities	*Municipality Association Nepal, UNICEF, WHO, UNDP, UN-HABITAT, CSOs, Development Partners, Academia, I/NGOs*

46: *Strengthening Climate Sensitive Disease Surveillance System with Emergency Preparedness and Response*	**2030**

Alignment with/Contribution to National Development Goals:
National Climate Change Policy-2019, Second Nationally Determined Contribution, SDG Road Map for Nepal, NHSSP, National Health Policy-2019, Long-term (Water Supply and Sanitation) Sectoral Development Plan 2017-2030, National Health Infrastructure Development Standards 2017, National Disaster Risk Reduction and Management Strategy and Action Plan-2017, Third National Communication, National Health Sector Support Programme (NHSSP), 15th Periodic Plan 2019/20-2023/24, H-NAP 2017-2021

Climate Risks and Vulnerabilities Addressed by the Actions:
- *Compromised health care facilities due to losses and damage of health sector infrastructure due to extreme events such as floods, landslides, forest fire, hailstorms, and snowstorms.*
- *Increased risk of injuries, disease and death, owing to more intense heat waves, cold waves, and prevalence of vector-borne diseases*
- *Risk of emergence of new diseases that are sensitive to climate change.*

Objectives:
1. *To operationalize disease surveillance system through adoption of appropriate technology and tools.*
2. *To generate evidences and support for evidence-based decision making in particular to climate sensitive diseases.*
3. *To integrate climate change and health issues in academic curriculum.*
4. *To strengthen and equip public health laboratories to considering climate sensitive diseases.*
5. *To prevent and control life losses and disabilities to due to emergency situation (climate induced extreme events).*
6. *To enhance capacity of the health services and responder to act swiftly in the case of climate emergencies.*
7. *To strengthen multisector collaboration and cooperation in emergency response*

Expected Outcomes:
1. *By 2030, existing public health surveillance system strengthened to reduce morbidity and mortality due to climate sensitive diseases*
2. *By 2030, more evidence generated on climate sensitive diseases and health risks.*
3. *By 2030, 8 public health laboratories, at least one in each province, equipped and strengthened to consider climate sensitive diseases and health risks.*
4. *By 2030, all Health Emergency Centers capacitated in the functioning in extreme climate emergency situations.*
5. *By 2030, system of multisector collaboration and cooperation strengthened and operationalized at the federal, provincial, and local levels.*
6. *Federal, provincial and local level governments are capable of preparing for and responding to climate risks and their impacts on public health.*

Impact:

8. *To build the capacity of the federal, provincial and local level public health emergency operations center.*	*Reduce morbidity and mortality through timely Information of prevalence and incidence on climate sensitive disease and climate extremes.*

Summary of Actions:

1. *Develop an operationalization plan to strengthen national and subnational health emergency operation centers*
2. *Strengthen the integrated surveillance system for climate sensitive diseases (vector borne, water borne, food borne, other infectious).*
3. *Make all surveillance and health information system interoperable.*
4. *Strengthen research centers dedicated to climate sensitive diseases.*
5. *Strengthen public health laboratories for climate sensitive diseases surveillance*
6. *Promote and facilitate academia and researchers for evidence-based learning and research on the public health impacts of climate change.*
7. *Capacity building of health professionals on climate sensitive diseases and health risks and on climate change health risks research.*
8. *Establish or operationalize trauma centers/services and emergency service centers at strategic sites in each province.*
9. *Establish, operationalize, and strengthen rapid response teams (Health and WASH) at federal, provincial and local levels.*
10. *Establish, operationalize, and strengthen EMDT and hub satellite networks*
11. *Digitalize the Health Emergency Operation Center to enhance operability of the Centre at all levels of government.*
12. *Build awareness, community engagement, and capacity of WASH sector stakeholders at federal, provincial and local levels.*

Scope:
Capacity Building, Physical Infrastructure, Technology Development, Research and Innovation

Targeted Community/Beneficiaries: *General public and health professionals*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Health and Population*	**Supporting Agency/Institutions/Groups:** *Provincial Governments, Local Governments, Ministry of Home Affairs, Ministry of Physical Infrastructure and Transport, Ministry of Education, Science and Technology, Department of Hydrology and Meteorology, Academia, UN agencies, Development Partners, National Health Research Council*

47: *Research and Innovation of Climate-Resilient Water Supply System and Sanitation Technologies.*	**2030, 2050**

Alignment with/Contribution to National Development Goals:
National Climate Change Policy-2019, Second Nationally Determined Contribution, SDG Road Map for Nepal, NHSSP, National Health Policy-2019, Long-term (Water Supply and Sanitation) Sectoral Development Plan 2017-2030, National Health Infrastructure Development Standards 2017, National Disaster Risk Reduction and Management Strategy and Action Plan-2017, Third National Communication, National Health Sector Support Programme (NHSSP), 15th Periodic Plan 2019/20-2023/24, H-NAP 2017-2021

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Damage to and destruction of health sector infrastructure and water supply and sanitation systems due to extreme events such as floods, landslides, forest fires, prolonged dry spells, and incidences of drought.*
- *Compromised health care facility systems due to extreme events and emergence of new diseases.*
- *Compromised access to safe water and sanitation leading to diseases and long term impacts among the most vulnerable groups, including children, women, disabled-persons and elderly people.*
- *Increased risk of vector-borne, water-borne and foodborne diseases, especially in mountain areas, and leading to perennial occurrence in the lowlands.*

Objectives:	**Expected Outcomes:**

1. *To explore climate-resilient technologies for water and sanitation suitable for the local context.* 2. *To explore resources and partnership for scaling up identified climate-resilient WASH technologies and businesses (supply to service) through engagement of the private sector and industries* 3. *To build capacities of service providers, WASH practitioners, and local governments in adapting innovative technologies.* 4. *To develop EWS for water source (surface and ground) yield, demand, and quality.*	1. *By 2030, climate-resilient WASH technologies explored and piloted for at least 300 local level vulnerable households, communities and systems.* 2. *By 2030, partnership established with academic and research institutions, innovators, scholars, private sectors, industries etc. to develop and promote climate-resilient WASH technologies including human resource.* 3. *By 2050, early warning system established for WASH sector in vulnerable areas.* **Impact:** *Smart and cost-effective climate-resilient WASH systems built and maintained.*
Summary of Actions: 1. *Build climate-resilient water supply systems and services focusing on gender, children, youth, and overall social inclusion.* 2. *Build climate-resilient and inclusive sanitation service facilities focusing on gender, children, youth, and overall social inclusion.* 3. *Promote multiple water use systems focusing on gender and social inclusion.* 4. *Enhance operationalization of a national WASH MIS system that is integrated with hydro-meteorological and land use data.* 5. *Promote climate-resilient and smart WASH technologies (low water use technologies, flood resilient technologies supporting water reuse, automation/pumping, etc.).* 6. *Promote and develop hybrid water supply systems (impounding reservoirs, solar lifting etc.).* 7. *Establish and strengthen water quality monitoring systems that support climate-resilient water safety planning.* 8. *Conserve traditional water sources and promote rainwater harvesting.* 9. *Promote and support watershed management for sustainable water supply delivery.* 10. *Promote water recharge and flood management/ retention systems.*	
Scope: *Research and Innovation*	
Targeted Community/Beneficiaries *WASH Service providers and users, governments, WASH entrepreneurs etc.*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 500 million*
Lead Institution: *Ministry of Water Supply*	**Supporting Agency/Institutions/Groups:** *Universities/ Scholars/research institutions/private sectors-industries, UN Agencies and Development Partners*

48: *Promotion and Conservation of Water Sources along with Watershed Management for Sustainable Water Supply Service*	**2030**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy-2019, Second Nationally Determined Contribution, SDG Road Map for Nepal, NHSSP, National Health Policy-2019, Long term (Water Supply and Sanitation) Sectoral Development Plan 2017-2030, National Health Infrastructure Development Standards 2017, National Disaster Risk Reduction and Management Strategy and Action Plan-2017, Third National Communication, National Health Sector Support Programme (NHSSP), 15th Periodic Plan 2019/20-2023/24, H-NAP 2017-2021*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Damage to and destruction of health sector infrastructure and water supply and sanitation systems due to extreme events such as floods, landslides, forest fires, prolonged dry spells, and incidences of drought.* • *Compromised health care facility systems due to extreme events and emergence of new diseases.* • *Compromised access to safe water and sanitation leading to diseases and long term impacts among the most vulnerable groups, including children, women, disabled persons and elderly people.* • *Increased risk of vector-borne, water-borne and foodborne diseases, especially in mountain areas, and leading to perennial occurrence in the lowlands.*	

Objectives:	**Expected Outcomes:**
1. *To support local government in conservation of water sources (surface and ground).* **2.** *To promote and support watershed management in coordination with MoFE for sustainable water supply service delivery.* **3.** *To promote and support water recharge and retention activities.*	1. *By 2030, water sources along the Chure region protected to conserve the ecosystem.* 2. *By 2030, water supply services enhanced in at least 500 local level villages.* 3. *By 2030, 30% of villages/settlements have ponds allowed collecting rainwater and ground recharging.* 4. *By 2030, 15% of total households in the country adopted rainwater water harvesting technology.* **Impact:** *Ensured water supply through protection of water sources*
Summary of Actions: 1. *Conserve traditional water sources and promote rainwater harvesting* 2. *Promote and develop water recharge and flood management/ retention systems.* 3. *Promote and develop hybrid water supply systems (impounding reservoirs, solar lifting etc.).* 4. *Promote and facilitate academia and researchers for evidence-based learning and research on the public health impacts of climate change.*	
Scope: *Physical Infrastructure, Technology development and Information (ICT) and Capacity building, Land Cover/Land Use Management*	
Targeted Community/Beneficiaries *Service providers, vulnerable communities, water users including women, children and social marginalized groups.*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 1,000 million*
Lead Institutions: *Ministry of Water Supply, Ministry of Forests and Environment, Local Governments.*	**Supporting Agency/Institutions/Groups:** *Ministry of Federal Affairs and General Administration, Forest user groups, NGO, CBOs, UN agencies, Development Partners*

49: *Capacity Building of Health and Hygiene Service Providers (Institution and Personnel) on Climate-Resilient Health Hygiene Service Planning and Implementation*	**2025, 2030**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy-2019, Second Nationally Determined Contribution, SDG Road Map for Nepal, NHSSP, National Health Policy-2019, Long term (Water Supply and Sanitation) Sectoral Development Plan 2017-2030, National Health Infrastructure Development Standards 2017, National Disaster Risk Reduction and Management Strategy and Action Plan-2017, Third National Communication, National Health Sector Support Programme (NHSSP), 15th Periodic Plan 2019/20-2023/24, H-NAP 2017-2-021*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Compromised health care facilities due to loss and damage of health sector infrastructure due to extreme events such as floods, landslides, forest fires, hailstorms, and snowstorms.* • *Increased risk of injury, disease and death owing to more intense heat waves, cold waves, and prevalence of vector-borne diseases.* • *Risk of emergence of new diseases that are sensitive to climate change.*	
Objectives: **1.** *To empower and inform health care providers to respond to climate risk and vulnerabilities.* **2.** *To ensure sustainable and safe management of water, sanitation, and health care waste services.* **3.** *To ensure use of sustainable renewable energy in health care facilities and services.* **4.** *To develop and promote climate-resilient infrastructure to enable efficient functioning of health care facilities during extreme weather events.*	**Expected Outcomes:** 1. *By 2030, 80% of the health care services providers trained and capacitated on climate change risks on health care facilities and services.* 2. *By 2030, 2,000 Health Care Facilities across Nepal are resilient to climate risks and maintained their operation during extreme events.* 3. *By 2030, 2,000 Health Care Facilities improved and environment friendly WASH services integrated into their facilities and operation.* **Impact:**

	Climate-resilient WASH and health care facilities across Nepal.
Summary of Actions: 1. *Assessment of health care facilities and undertake climate change vulnerability risk assessment in the facilities (climate risk screening that essentially covers all disaster and extreme events risk).* 2. *Explore innovative and climate-resilient technologies and implement (integrate) them in each of the health are facilities.* 3. *Build capacity of the health care professionals through development of robust training modules.* 4. *Provide support to improve and develop climate-resilient and environment friendly health care facilities.* 5. *Explore and develop strategic actions on addressing cardiorespiratory diseases, and other diseases induced through the climate related hazards.*	
Scope: *Capacity Building, Physical Infrastructure, Technology Development, Innovation*	
Targeted Community/Beneficiaries: *General public: Per day 100000 people/Health Care Service Providers*	**Geographic Coverage:** *Focus on at risk areas (with priority in Sudurpaschim province, Karnali province and Province 2)*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 50 million*
Lead Institutions: *Ministry of Health and Population, Provincial Governments, Local Governments, Ministry of Water Supply*	**Supporting Agency/Institutions/Groups:** *All line ministries of federal and provincial governments, UN Agencies, I/NGOs, Private sectors, academia*

50: *Climate Change Resilience Development through Capacity Building, Innovation, Improvement and Construction of WASH Services and Facilities*	**2030, 2050**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy-2019, Second Nationally Determined Contribution, SDG Road Map for Nepal, NHSSP, National Health Policy-2019, Long term (Water Supply and Sanitation) Sectoral Development Plan 2017-2030, National Health Infrastructure Development Standards 2017, National Disaster Risk Reduction and Management Strategy and Action Plan-2017, Third National Communication, National Health Sector Support Programme (NHSSP), 15th Periodic Plan 2019/20-2023/24, H-NAP 2017-2021*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Damage to and destruction of health sector infrastructure and water supply and sanitation systems due to extreme events such as floods, landslides, forest fires, prolonged dry spells, and incidences of drought.* • *Compromised health care facility systems due to extreme events and emergence of new diseases.* • *Compromised access to safe water and sanitation leading to diseases and long term impacts among the most vulnerable groups, including children, women, disabled persons, and elderly people.* • *Increased risk of vector-borne, water-borne, and foodborne diseases, especially in mountain areas, and leading to perennial occurrence in the lowlands.*	
Objectives: 1. *To capacitate and raise awareness of stakeholders on climate-resilient WASH interventions.* 2. *To explore, pilot and implement climate-resilient water supply, systems and sanitation services.* 3. *To develop climate-resilient water supply system and sanitation services and facilities focusing on Gender, Youth and overall social inclusion.* 4. *To design and implement climate proofing of WASH services.* 5. *To promote adaptive water, sanitation and hygiene practices to reduce the impact on the environment and climate.* 6. *To support local governments to establish and operationalize water-quality monitoring mechanisms through various local and national initiatives.*	**Expected Outcome:** 1. *By 2030, 20% of existing water supply scheme become climate-resilient ensuring the medium level water supply service.* 2. *By 2030, 40% of the population including women, children and socially marginalized benefit from CR higher and medium Water supply services.* 3. *By 2030, 50% of the population including women, children and socially marginalized benefit from CR and safely managed sanitation services.* **Impact:** *Climate-resilient Water Supply Systems*

7. *To develop national guideline on climate-resilient water supply system and services.*	

Summary of Actions:

1. *Build climate-resilient water supply systems and services focusing on gender, children, youth, and overall social inclusion.*
2. *Promotion of multiple water use systems focusing on gender and social inclusion.*
3. *Support local governments on the integration and implementation of climate change adaptation in WASH plans.*
4. *Enhance operationalization of a national WASH MIS system that integrates hydrometeorological and land use data.*
5. *Promote climate-resilient and smart WASH technologies (low water use technologies, flood resilient, technologies supporting water reuse, automation/pumping etc.).*
6. *Promote hybrid water supply systems (impounding reservoirs, solar lifting etc.)*
7. *Establish and strengthen a water quality monitoring system that supports climate-resilient water safety planning.*
8. *Conserve traditional water sources and promote rainwater harvesting.*
9. *Promote and support watershed management for sustainable water supply delivery.*
10. *Promote water recharge and flood management/ retention systems.*
11. *Build climate resilient and inclusive sanitation service facilities.*
12. *Promote water supply and sanitation system insurance schemes.*

Scope:
Capacity Building, Physical Infrastructure, Technology Development and Information, Capacity Development

Targeted Community/Beneficiaries *Vulnerable communities, water and sanitation service users including women, children, disabled persons and socially marginalized groups.*	**Geographic Coverage:** *National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 2,000 million*
Lead Institutions: *Ministry of Water Supply, Provincial governments, local governments*	**Supporting Agency/Institutions/Groups:** *Department of Water Supply and Sewage Management, Ministry of Forests and Environment, MDBs, UN agencies, I/NGOs, CBOs, Nepal Health Research Council*

51: *Integration and Implementation of Climate Change Adaptation in Health and WASH sector through Policy Reform, Strategy Development and National Level Awareness*	**2030**

Alignment with/Contribution to National Development Goals:
National Climate Change Policy-2019, Second Nationally Determined Contribution, SDG Road Map for Nepal, NHSSP, National Health Policy-2019, Long term (Water Supply and Sanitation) Sectoral Development Plan 2017-2030, National Health Infrastructure Development Standards 2017, National Disaster Risk Reduction and Management Strategy and Action Plan-2017, Third National Communication, National Health Sector Support Programme (NHSSP), 15th Periodic Plan 2019/20-2023/24

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Damage to and destruction of health sector infrastructure and water supply and sanitation systems due to extreme events such as floods, landslides, forest fires, prolonged dry spells, and incidences of drought.*
- *Compromised health care facility systems due to extreme events and emergence of new diseases.*
- *Compromised access to safe water and sanitation leading to diseases and long term impacts among the most vulnerable groups, including children, women, disabled persons and elderly people.*
- *Increased risk of vector-borne, water-borne and foodborne diseases, especially in mountain areas, and leading to perennial occurrence in the lowlands*

Objectives:	**Expected Outcomes:**
1. *To reform and formulate policies to promote climate-sensitive WASH, health plans and programmes.* 2. *To support local governments to integrate and implement climate change adaptation in local WASH and health plans and programmes.*	1. *By 2030, 753 local government integrate climate change adaptation in local WASH and health plans and programmes.* 2. *By 2030, national guidelines and strategies prepared and implemented to support local governments to integrate multiple uses of*

<table>
<tr><td colspan="2">3. To develop national guidelines and strategies to support local governments to integrate multiple uses of water, water quality improvement systems, insurance, and hybrid technologies.
4. To operationalize the National Health and WASH Management Information System that integrates hydro-meteorological and land-use data for climate sensitive planning, implementation and monitoring.</td><td colspan="2">water, water quality improvement systems, insurance and hybrid technologies.
3. By 2030, National Health and WAH Management Information System established and operationalized.
Impact:
Improved adaptation based health care and WASH services.</td></tr>
<tr><td colspan="4">Summary of Actions:
1. Undertake review of the existing plan, policies, strategies and guidelines and integrate climate change adaptation considering the current and future climate risks.
2. Build capacity on climate-resilient water supply system and services.
3. Support local government on integration and implementation of climate change adaptation.
4. Enhance operationalization of NWASHMIS system integrating with hydrometeorological, land use data
5. Promote climate-resilient and smart WASH technologies (low water use technologies, flood resilient, technologies supporting water reuse, automation/pumping etc.).
6. Establish and strengthen water quality monitoring system that supports climate-resilient water safety planning.</td></tr>
<tr><td colspan="4">Scope:
Policy, Laws and Regulation, Capacity Building</td></tr>
<tr><td colspan="2">Targeted Community/Beneficiaries
Vulnerable communities, water and sanitation service users including women, children, disabled persons, socially marginalized groups.</td><td colspan="2">Geographic Coverage:
National</td></tr>
<tr><td colspan="2">Duration/Timeframe:
10 years</td><td colspan="2">Total Cost:
USD 200 million</td></tr>
<tr><td colspan="2">Lead Institutions:
Ministry of Water Supply, Provincial governments, Local governments</td><td colspan="2">Supporting Agency/Institutions/Groups:
Department of Water Supply and Sewage Management, Ministry of Forests and Environment, Ministry of Health and Population, MDBs, UN agencies, I/NGOs, CBOs</td></tr>
</table>

7.8 Disaster Risk Reduction and Management (DRRM)

The Constitution of Nepal has adopted the policy of early warning, preparation, rescue, relief and rehabilitation to reduce the risk of natural disasters. The Fifteenth Plan notes that climate change is one factor impacting Nepal's high incidence of natural disasters. Nepal has signed the Sendai Framework and established a national framework including The National Policy for Disaster Risk Reduction, 2018; Disaster Risk Reduction National Strategic Plan of Action; National Disaster Risk Financing Strategy; and the establishment of the of National Disaster Risk Reduction and Management Authority. From an adaptation perspective, it is important that disaster risk evaluation and plans take account of expected climate risks, vulnerabilities and impacts.

Nepal's diverse typography, complex geology and highly varying climate means that the country is exposed to many natural and human- induced hazards that are impacted by climate change. The hilly areas of Nepal are prone to landslides and the Tarai plains are prone to floods, while the higher Himalaya and middle- mountains experience debris flow and GLOFs. The middle-mountains and Tarai are affected by forest fires, and the higher mountains by landslides and avalanches. On average, 647 people die from climate-induced disasters in Nepal each year which is about 65% of the total deaths from all disaster events except road accidents (MoHA, 2018). Floods, landslides, epidemics, and fires are the most devastating climate-induced disasters in Nepal in regard to deaths, affected population, and economic losses (MoFE, 2021). Floods are most damaging, causing over 50% of deaths and 30% of economic losses (UNISDR, 2015). An example is the

2017 flooding that affected 80% of the Tarai region and some surrounding districts and caused USD 584.7 million in damages (NPC, 2017b). In the future, it is expected that flooding will cause 82.93% of the Average Annual Loss (UNISDR, 2015). As drought, changes in precipitation patterns, snow cover changes, glacier retreat, and GLOFs, are expected to intensify.

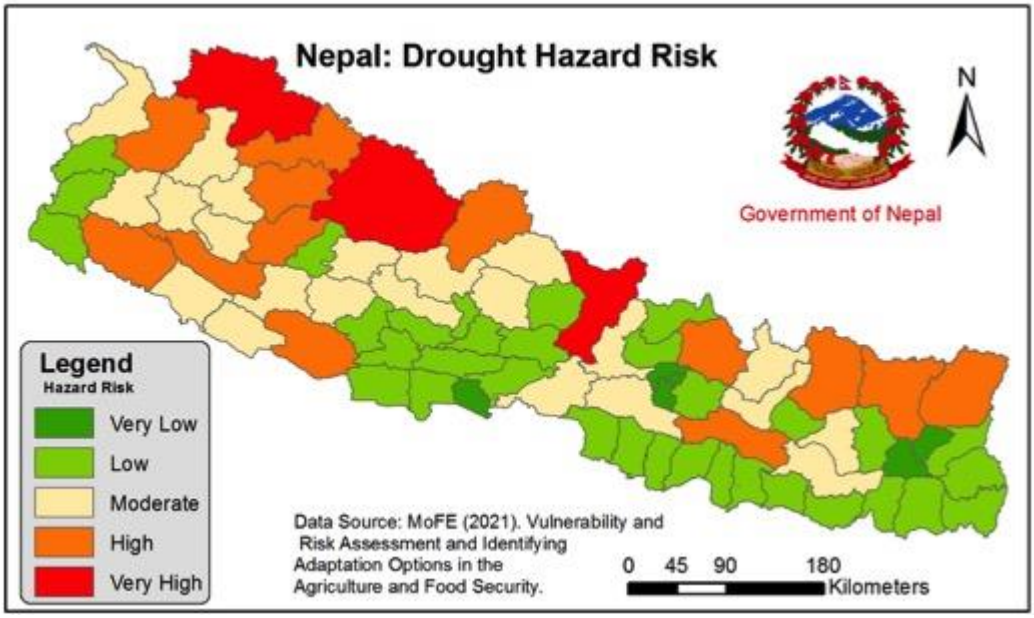


Figure 14: Drought map in Nepal

The impacts of climate-related disasters are felt at the household level through food insecurity, damage to property, and increased prices of food and fuel; and at the national level, where scarce government resources are re-allocated to address the impacts of disasters at the expense of other programmes. Demographic factors such as rapid population growth, human encroachment into the vulnerable lands, poverty, and limited awareness about the sustainable use of natural resources increase vulnerability to the impacts of climate-induced disasters and increase the risk of increased damages.

Disaster Risk Reduction and Management (DRRM) is a concurrent function of the federal, provincial, and local governments. The DRRM Act (2017) addresses disaster risk management with a comprehensive approach, focusing on the different stages of the disaster management cycle from preparedness, to mitigation response, to rehabilitation. However, collecting and managing disaster- and climate-related data remains inadequate, and it is not accessible to many local level planners and to the private sectors. Given that local actors are usually the first responders, the success of immediate rescue often correlates with available data and equipment and their capacity to instigate operations. The priority adaptation actions promote a proactive, rather than reactive, approach to climate-related disasters; and aim to reduce risks to communities and infrastructure resulting from climate-related disasters. The programmes work to ensure that disasters are curtailed, do not result in emergencies, and build the capacity of people to cope with the impacts of climate change.

Six priority adaptation programmes in the DRRM sector will help to empower provincial and local governments to assume effective and efficient roles in leading DRRM activities in their respective localities. The enabling environment will be improved through actions to harmonize DRRM and climate adaptation plans, policies, and guidelines; to develop

climate risk sensitive land use planning, and to develop actions plans to address climate-induced disasters. The programmes will improve and strengthen early warning systems and multi-hazards monitoring, and integrate adaptation considerations into social protection systems. The adaptation programmes have an estimated cost of USD 8.05 billion to 2050.

52: *Building Climate Resilience by Developing and Harmonizing DRRM and CCA in Federal to Local Levels through Policy Reforms (Integration of DRR in Local Adaptation Plans).*	**2030, 2050**

Alignment with/Contribution to National Development Goals:

Second Nationally Determined Contribution 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Disaster Risk Reduction and Management Act 2017, National Disaster Risk Reduction and Management Policy 2018, National Disaster and Risk Reduction Management Strategy and Action Plan 2018-2030, Land Use Policy 2015, Sustainable Development Goals Status and Road Map: 2016-2030, Local Government Operationalization Act 2017, National Land Policy 2019

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Displacement caused by climate-induced hazards.*
- *Loss of lives, property and assets, physical infrastructure, livelihoods, shelter, education, water, sanitation, and food due to climate-induced hazards such as landslides and flooding due to extreme precipitation, forest fires, dry spells and drought incidences due to extreme temperatures, and heatwaves and cold waves.*
- *Increased vulnerability of women, children, people with disability, senior citizens, poor and marginalized groups as associated with an increase in the magnitude, intensity, and frequency of climate extreme events: landslides, Dam Outburst Floods, GLOFs, emergence of new pests and vector borne diseases, and pandemics.*

Objectives:

1. *To formulate integrated guidelines on Disaster Risk Reduction Management (DRRM) and Climate Change Adaptation (CCA) at the local level.*
2. *To harmonize DRR and CCA plans, policies and guidelines at federal, provincial and local level and mainstream into sectoral periodic and annual plans and budgets.*
3. *To develop and implement GESI-responsive Local Disaster and Climate Resilience Plans.*
4. *To increase participation and involvement of vulnerable groups in climate and disaster risk governance.*
5. *To foster an enabling environment for inclusive climate and disaster risk governance.*

Expected Outcomes:

1. *By 2030, DRR and climate adaptation plans, policies and guidelines are harmonized at all levels of the government.*
2. *By 2030, all 753 local governments have developed GESI responsive LDCRPs, and integrated DRR and climate adaptation in their periodic plans and annual plans and budgets.*
3. *By 2030, meaningful participation of women, children, youth, senior citizens, indigenous groups, perons with disabilities, other marginalized and vulnerable groups in all stages of the planning and implementation process at federal to local level (climate and disaster risk governance) increased by 80% in comparison to last 10 year's period.*
4. *DRR priorities and goals are incorporated in the existing legal instruments and frameworks e.g., child friendly governance, Environment friendly local governance, Comprehensive School Safety Framework, etc.*
5. *Age, gender and disability centric physical infrastructure, early warning, communication, and rescue and relief materials increased.*

Impact:

Reduced damage and loss from climate-induced disasters in every sectors.

Summary of Actions:

- *Harmonize DRR and climate adaptation in the federal, provincial, and local level policy landscape.*
- *Support and capacitate all 753 local governments to develop and effectively implemented GESI responsive Local Disaster and Climate Resilient Plans.*
- *Integrate DRR and climate adaptation in federal, provincial and local level development planning guidelines, periodic plans, Medium-term Expenditure Frameworks and local level plans.*
- *Formulate and implement guidelines to promote community-based disaster risk reduction and management, child-centered disaster risk reduction, climate change adaptation and minimum characteristics of resilient communities (including indigenous knowledge and technologies) to promote resilience.*

- *Promote mechanisms to ensure meaningful participation of vulnerable people including women, children, youth, persons with disabilities, senior citizens, indigenous people and other marginalized groups in planning, capacity building and implementation processes on DRR and climate adaptation from the local to federal level.*
- *Strengthen coordination among DRR and climate adaptation institutional actors and other stakeholders.*
- *Integrate GESI in DRR plans, policies and programs and mobilize women, children, youth and senior citizens for adaptation activities.*
- *Enhance capacity building on adaptation related GESI issues, solutions, and gaps at all levels of government.*
- *Promote research and knowledge management on GESI, DRR and adaptation.*

Scope:
Policy Law and Regulation, Capacity Building

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Government institutions at all levels, vulnerable people in general and women, children, teacher and parents, marginalized groups, senior citizens, disabled persons, people with chronic diseases, etc. in particular.	*National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 1,000 million*
Lead Institutions: *Ministry of Home Affairs, National Disaster Risk Reduction and Management Authority, Ministry of Federal Affairs and General Administration, Ministry of Women, Children and Senior Citizen*	**Supporting Agency/Institutions / Groups:** *All line ministries at the federal level, provincial governments, local governments, MDBs, Bilateral and multilateral organizations, UN agencies, I/NGOs, Private sectors*

53: *Strengthening Adaptive Social Protection/Shock Responsive Practices Initiatives for Transferring Climate Risk.*	**2050**

Alignment with/contribution to National Development Goals:
Second Nationally Determined Contribution 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Disaster Risk Reduction and Management Act 2017, National Disaster Risk Reduction and Management Policy 2018, National Disaster and Risk Reduction Management Strategy and Action Plan 2018-2030, Land Use Policy 2015, Sustainable Development Goals Status and Road Map: 2016-2030, Local Government Operationalization Act 2017, Disaster Financing Strategy 2021

Climate Risks and Vulnerabilities Addressed by the Actions:
Exacerbated poverty and poverty gap in the society associated with increase in climate extreme events, loss of property and assets, displacement of community, disturbance in the social fabric, increased risk of loss of development gains.

Objectives:	**Expected Outcomes:**
1. *To develop and operationalize adaptive shock responsive social protection frameworks, guidelines, mechanisms, and institutional arrangements at all levels of the government.* **2.** *To develop shock responsive social protection for risk transfer and implement at all levels of government.*	**1.** *By 2040, developed and operationalized adaptive shock responsive social protection framework, guideline, mechanism, and institutional arrangements at all levels of the government.* **2.** *Insurance companies adhere to adaptive social protection based on government plans and policies.* **3.** *Disaster Information Management System established at federal level and in all 7 provinces, integrating existing DIMS and Sutra.* **4.** *Rolled out risk transfer mechanism established by government at all levels.* **5.** *Increased access and registration to and usage of adaptive social protection schemes of beneficiaries and eligible people, especially those most marginalized and vulnerable.* **Impact:** *Increased resilience of community and people and reduced displacement caused by climate-induced hazards*

Summary of Actions:
- *Develop a centrally managed and accessible disaster management information system that is linked to shock-related indicators and digitalization of data that provides updated information to support better targeting.*

- *Develop and implement Adaptive /Shock Responsive Social Protection guidelines, framework, mechanism, and institutional arrangements at all levels of the government*
- *Promote risk transfer mechanisms (insurance) for communities displaced by disasters and communities at risk at federal, provincial and local level.*
- *Enhance coordination among stakeholders that are part of social protection and disaster response to ensure equity and coverage to the communities most in need.*
- *Enhance involvement of private sector organizations in risk transfer, encourage banking and financial institutions, especially the insurance companies, to adopt climate responsive (insurance) schemes.*
- *Generate knowledge products and continuously monitor and evaluate appropriate and accessible banking systems for beneficiaries, especially during disasters causing mobility constraints.*

Scope:
Policy Law and Regulation, Capacity Building, Research and Information

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Corporate sector, Financial and Insurance companies, cooperatives, Women, Children, Marginalized groups, senior citizen, Person with disabilities, Youth, and disaster affected and displaced communities.	*National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 2,000 million*
Lead Institutions: *Ministry of Home Affairs/National Disaster Risk Reduction and Management Authority*	**Supporting Agency/Institutions/Groups:** *Relevant federal line ministries, Ministry of Finance, all Provincial governments, local governments, UN agencies, MDBs, Bilateral and Multilateral Organizations, NGOs/NGOs/CBOs, Private sectors, Cooperatives, SMEs, Insurance Companies*

54: *Maintaining and Strengthening Early Warning Systems and Multi-Hazard Monitoring Systems to Facilitate Climate Adaptive Function of Key Economic Service Sectors*	**2030, 2050**

Alignment with/Contribution to National Development Goals:
Second Nationally Determined Contribution 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Disaster Risk Reduction and Management Act 2017, National Disaster Risk Reduction and Management Policy 2018, National Disaster and Risk Reduction Management Strategy and Action Plan 2018-2030, Land Use Policy 2015, Sustainable Development Goals Status and Road Map: 2016-2030, Local Government Operationalization Act 2017, National Early Warning Strategic Action Plan 2013

Climate Risks and Vulnerabilities Addressed by the Actions:
- *Loss of lives and properties associated with increase in the intensity, magnitude and frequency of climate induced hazards.*
- *Damage to physical infrastructures and disturbances in its operations.*
- *Loss of forests area, agricultural fields due to an increase in the incidences of flash floods, landslides, potential risk from GLOFs.*

Objectives:	**Expected Outcomes:**
1. *To establish timely, effective, appropriate, people-centered and GESI sensitive early warning systems that easily outreaches hazard-affected communities including the most vulnerable.* **2.** *To provide lead time to prepare for and respond to disasters.*	**1.** *By 2030 National Common Alert Protocols developed and disseminated for effective Early Warning Systems.* **2.** *By 2030, established and effectively operationalized at least 30 new GESI responsive multi-hazard early warning systems in all 7 provinces and major river basins of Nepal.* **3.** *By 2030, now-casting system at federal level established and implemented* **4.** *By 2050, 100% of the population covered with real time EWS.* **5.** *By 2050,human loss and damage minimized by 80 % and enhanced resilience of communities, including those most vulnerable.* **Impact:** *Strengthened resilience of the people and community through timely, effective, appropriate, and people-centered and GESI-sensitive early warning systems.*

Summary of Actions:

- *Install now-casting system at the federal level.*
- *Establish and strengthen real-time/forecast-based early warning system including monitoring in all 7 provinces (in major river systems), and efficient and people-centric communication channels through appropriate medium (e.g., radio, television, briefing note, SMS and social media) and use of local language(s).*
- *Install at least one radar station and lightening detection system within Nepal's major river basins for the monitoring of precipitation and lightning.*
- *Research, pilot and establish landslide early warning systems in major landslide prone areas of Nepal.*
- *Strengthen and promote research on hydro-meteorological modelling, forecasting and future climate risks and GESI-transformative early warning systems.*
- *Design early warning and response plans and guidelines taking into account the needs, capabilities, and preferences of vulnerable groups, including women, children, youth, person with disability, elderly, and indigenous groups, by ensuring their participation.*

Scope:
Policy, Law and Regulation, Capacity Building, Research and Information, Technology

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Insurance companies, cooperatives, women, children, marginalized groups, senior citizens, persons with disabilities, youth, chronic patient and disaster-prone areas.	*Federal, provincial, local and community level*
Duration/Timeframe:	**Tentative Cost:**
15 years	*USD 1,500 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**
Ministry of Home Affairs, National Disaster Risk Reduction and Management Authority, Department of Hydrology and Meteorology	*All Provincial governments, Local governments, UN Agencies, MDBs, Bilateral and Multilateral Organizations, I/NGOs, Private sectors, Cooperatives, international institutions*

55: *Develop Regulatory Framework for Domestic and Industrial Fire Control and Mitigation, and Implementation Strategy and Build National Capacities* | **2030**

Alignment with/Contribution to National Development Goals:
Second Nationally Determined Contribution 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Disaster Risk Reduction and Management Act 2017, National Disaster Risk Reduction and Management Policy 2018, National Disaster and Risk Reduction Management Strategy and Action Plan 2018-2030, Land Use Policy 2015, Sustainable Development Goals Status and Road Map: 2016-2030, Local Government Operationalization Act 2017

Climate Risks and Vulnerabilities Addressed by the Actions:
- *Increase in incidences of fire associated with extreme temperature and heat waves, dry spells, and drought*

Objectives:	**Expected Outcomes:**
1. *To reduce and control the magnitude and frequency of domestic and industrial fires.* 2. *To build capacity of relevant authorities and stakeholders on the use of domestic and industrial fire control tools and technique.*	1. *By 2030, established policy, guidelines and institutional mechanisms at federal, provincial and local level for fire prevention and management.* 2. *By 2030, improved capacities of human resources and equipment for fire risk reduction/mitigation and response management at fire stations at local municipal and CFUG levels.* 3. *By 2030, training institution for fire control service established to provide services to all 7 provinces.* **Impact:** *Reduced loss and damage lives and assets*

Summary of Actions:
- *Develop fire policy and guideline at federal to local level to CFUG level.*
- *Enhance the capacity of provincial and local governments, community based organizations (CBOs) (e.g., forest user groups) and other relevant stakeholders through awareness raising, training and human resource mobilization and provision of tools and technologies.*
- *Carry out research and monitoring, develop and maintain database on fire management actors and stakeholders.*
- *Develop response plans and early warning systems.*

Scope:
Policy, Law and Regulation, Capacity Building, Research and Information, Technology Development

Targeted Community/Beneficiaries:	**Geographic Coverage:**

Forest user groups, fire station workers, women, children, marginalized groups, senior citizen, Persons with disabilities, youth, and disaster affected and displaced communities	*National*
Duration/Timeframe: *10 years*	**Total Cost:** *USD 1,000 million*
Lead Institutions: *Ministry of Home Affairs, /Ministry of Federal Affairs and General Administration /Ministry of Forests Environment/National Disaster Risk Reduction and Management Authority*	**Supporting Agency/Institutions /Groups:** *All provincial governments, local governments, UN Agencies, MDBs, Bilateral and Multilateral Organizations, I/NGOs/CBOs, Private Sectors, Insurance Companies, Security Forces (Nepal Army, Armed Police Force, Nepal Police)*

56: *Promote Culture of Safety and Build Climate Resilience through Climate Risk Sensitive Land Use Plan (RSLUP) Guideline and Standards*	**2050**
Alignment with/Contribution to National Development Goals: *Second Nationally Determined Contribution 2020, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, Third National Communication 2021, National Disaster Risk Reduction and Management Act 2017, National Disaster Risk Reduction and Management Policy 2018, National Disaster and Risk Reduction Management Strategy and Action Plan 2018-2030, Land Use Policy 2015, Sustainable Development Goals Status and Road Map: 2016-2030, Local Government Operationalization Act 2017*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Loss of life and property due to climate extreme climate events in location, which are highly sensitive and vulnerable to these events.* • *Damage to physical infrastructures, agriculture land and settlement area due to improper planning of the land use coupled by increasing climate extreme events.*	
Objectives: 1. *To formulate climate risks and sensitive land use plan.* 2. *To develop and implement Risk Sensitive Land Use Plan (RSLUP) guideline and standards at the federal, provincial, and local level covering all the ecological zones.*	**Expected Outcomes:** 1. *By 2030, climate risk sensitive areas in major settlements mapped and RSLUP prepared at federal level.* 2. *By 2035, RSLUP implementation guidelines prepared and implemented at 753 local level.* 3. *By 2050, more than 80% of physical infrastructure and settlement are climate resilient.* **Impact:** *Reduced loss of human life, and reduced damage to physical assets and the environment due to climate change impacts.*
Summary of Actions: • *Collect, digitalize and manage data at the federal level for infrastructure, land cover and use, demographic data, and hazard risk areas,.* • *Develop Risk Sensitive Land Use Plan (RSLUP) guidelines and standards* • *Implement RSLUP at the federal level and support the implementation of RSLUPs at the provincial and local level, including capacity building.* • *Map multi-hazard risk areas in each local level and use high resolution satellite images and socio economic data to develop a single geodatabase of each hazard.* • *Conduct suitability analysis for safer settlements* • *Enhance capacity from federal to local level on geospatial data management.* • *Establish national standards on natural hazard data collection and management and a data sharing system.*	
Scope: *Policy, Law and Regulation, Capacity Building, Technology Development*	
Targeted Community/Beneficiaries: *Communities, settlements and population (women, children, marginalized groups, senior citizen, people with disabilities, youth) at risk to climate and disasters*	**Geographic Coverage:** *National*
Duration/Timeframe: *15 years*	**Total Cost:** *USD 50 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**

Ministry of Land Management, Cooperatives and Poverty Alleviation, Ministry of Federal Affairs, and General Administration, Ministry of Urban Development, Ministry of Forests and Environment	*All Provincial governments, Local governments, UN Agencies, MDBs, Bilateral and Multilateral Organizations, I/NGOs*

57: *Development of Federal and Provincial Strategies and Action Plans on Control of Climate Induced (Primarily water borne) Disasters in the Forests Areas of Nepal and Phase-wise Implementation under the leadership of Forest Authorities*	**2025, 2030, 2050**
Alignment with/Contribution to National Development Goals: *15th Periodic Plan 2019/20-2023/24, National Climate Change Policy 2019, National Land Use Policy 2015, Sustainable Development Goals Status and Road Map: 2016-2030, Local Government Operationalization Act 2017, Forest Sector Strategy 2016-2025, National Forest Policy 2019, Forest Act 2019*	
Climate Risks and Vulnerabilities Addressed by the Actions: • *Forest land cutting due to soil erosion, flooding in plains and landslides in the hills due to intense rainfall* • *Increase in temperature leading to dry spell and drought*	
Objectives: 1. *To assess and analyze climate induced disasters in forest areas.* 2. *To implement DRRM schemes in phase wise manner to control disasters.* 3. *To build resilience of the forest sector to climate-induced disasters.*	**Expected Outcomes:** 1. *By 2030, climate-induced disasters and their impacts on forests assessed and mapped for strengthened resilience of the forests.* 2. *By 2030, federal and provincial strategy and action plan on climate-induced disasters formulated.* 3. *By 2030, forest health improvement measures identified and implemented through Divisional Forest Offices throughout Nepal primarily in climate-induced disaster prone and hardest hit areas.* 4. *By 2030, climate-induced disaster management guideline incorporated in all Community Forests Operational Plans.* 5. *By 2030, Ecosystem-based Adaptation approaches incorporated in all Community Forests Operational Plans.* **Impact:** *Reduced loss and damage of forest and increased productivity of forests for improved livelihood and ecosystem sustainability*
Summary of the Actions: • *Assess forest health from the climate-induced hazards perspective and identify the forests with immediate interventions to improve forest health for greater resilience* • *Develop a catalogue of actions on forest health improvement and climate risks management in forest through review and analysis of Indigenous, and traditional knowledge and practices* • *Build capacity of forest officers at the local level on climate change risks in the forest sector and adaptation planning* • *Develop a forest health improvement and resilience building guideline at federal to local level.* • *Enhance capacity of provincial and local government, CBOs (e.g., forest user groups) and other relevant stakeholders through awareness raising, training and human resource mobilization.* • *Carry out research and monitoring on climate risks on forest* • *Develop response plans and early warning systems at appropriate locations* • *Develop climate risk management buffer zone within the forest areas such as river flooding channelization, aquifers for storage of flood water, and landslides prevention in the forest areas.*	
Scope: *Capacity Building, Research and Innovation, Physical Infrastructure*	
Targeted Community/Beneficiaries: *Forest user groups, Forest dependent communities, Women, Children, Marginalized groups, Senior Citizen, Person with Disabilities, Forest sector*	**Geographic Coverage:** *National: Federal, provinces, local and community level*

government officials in federal, provincial and local governments, private sectors, Indigenous groups	
Duration/Timeframe: *15 years*	**Total Cost:** *USD 2,500 million*
Lead Institution: *Ministry of Forests and Environment*	**Supporting Agency/Institutions /Groups:** *Ministry of Home Affairs, National Disaster Risk Reduction and Management Authority, All Provincial governments, Local governments, Forests User Groups, Academia*

7.9 Gender Equality and Social Inclusion (GESI), Livelihood and Governance (GESILG)

The Constitution of Nepal, with the commitment to end gender discrimination, has guaranteed the equal right to property, right to safe motherhood and reproductive health rights, right to ensure proportional representation at all concerned levels as well as the right to enjoy fundamental human rights for all women. The constitution guarantees rights to equality, encourages the formulation of gender-friendly acts and laws, encourages the political participation of women in the three tiers of state, and works toward a 50% representation of women at all levels of government. The Fifteenth Plan notes that inclusion of all disadvantaged groups is a means of maximising national development, and calls for inclusive participation in decision-making processes at all levels of government.

Nepal, being a signatory to various international conventions, is legally committed to gender, equality, and social inclusion (GESI). GESILG is a guiding principle of this NAP, which takes a dual approach of both mainstreaming GESI considerations into policies, and programmes; and by targeting excluded and vulnerable groups (MoUD, 2013), where needed, through GESI-specific actions and projects. The NAP formulation process included GESILG analysis across the key sectors, which guided the identification and design of priority adaptation actions that are participatory, transparent, and gender and socially inclusive. This approach provides a solid basis for addressing GESILG in an informed and practical way that supports inclusive economic development and livelihood opportunities.

Disasters impact different groups differently: children, women and girls, men and boys, pregnant women, the elderly, and people with disabilities, the LGBTIQ+ community, and socially marginalized groups have higher levels of mortality and morbidity due to climate change impacts (MoFE, 2018). Marginalized or indigenous groups, particularly *Majhi, Raute, Chepang, Satar*, are more vulnerable to food insecurity and are more likely to suffer from disasters like floods, landslides, and fire. Heat and cold waves impact those working outside, including the poor, women, children, and the elderly. Extreme climatic events such as droughts and floods increase the prevalence of water-borne diseases like typhoid, cholera, and other diarrhoeal diseases, which mostly impact children below the age of 5 (Eriksson et al., 2008). Flood-related fatalities are higher for girls and women than boys and men (Bartlett et al., 2008).

Women are particularly vulnerable to climate change because of lack of income, limited ownership of land and property, limited access to credit and markets, and lack of capacity for diversification of livelihoods. They are particularly vulnerable to the impacts of climate change in the forestry sector because they play a major role in the collection of various forest products and are considered the primary users of forests in Nepal (IUCN, 2020). Women in Nepal make up about 73% of the agricultural work force and the country is experiencing a trend of "feminization of the agricultural sector" because of male out-migration. This climate vulnerability is exacerbated because women farmers do not have the same access to land, water, seeds, agricultural extension, training, and credit as men. Only 10% of the farms of Nepal are owned by women or jointly owned by men and women (IUCN, 2020), and female- headed households are more vulnerable to climate shocks because they grow fewer crop types (MoFE, 2021c).

Figure 15: Women are particularly vulnerable to climate change impacts

Nepal's REDD+ Strategy reported that decisions and resources are controlled by male elites, hindering the poor, Dalits, and women from exercising leadership (MoFSC, 2015). There is a strong correlation showing households with fewer years of schooling and lower wealth are considerably more likely to be affected, experience higher casualties, and incur livelihood losses because of floods and landslides (Shrestha et al., 2016). Climate impacts tend to have a disproportionate effect on the poorest and most vulnerable communities who have limited options or resources to diversify their livelihoods (Goodrich et al., 2017). Addressing these vulnerabilities requires increased access to training and capacity building for women and marginalized groups, the collection of sex-disaggregated climate change data, and the implementation of specific actions to improve the livelihoods of women. Similar to gender equality, a more robust approach to collecting and analysing data on social exclusion is required to better understand and identify actions (MoFE, 2020b).

The four priority adaptation programmes in the GESILG Sector enhance resilience to climate change through GESI-responsive livelihood programmes; integrate GESI and climate foresight in social protection and development interventions; and establish and functionalize climate change aware gender focal desks in all state and non-state institutions. The proposed programmes have an estimated cost of USD 700 million to 2050.

58: *Strengthening Gender Equality and Social Inclusion (GESI) Responsive Climate Change Adaptation Planning and Implementation*	**2030**

Alignment with/Contribution to National Development Goals:

National Climate Change Policy 2019, Second Nationally Determined Contribution 2020, 15th Periodic Plan 2019/20-2023//24, Gender Strategy and Action Plan on Climate Change 2020-2030, Sustainable Development Goals: Status and Roadmap for Nepal 2016-2030, Framework on Local Adaptation Plans for Actions 2019

Climate Risks and Vulnerabilities Addressed by the Actions:

1. *Increase in incidences of extreme climate events leading to impacts on vulnerable groups (people of all genders, children, youth, senior citizens, people living with disability, indigenous people and local communities and other marginalized groups):*

a. *Drying of water resources that increases the workload and drudgery of vulnerable people and communities*
b. *Loss of access to vital services, such as education, health facilities, medicine, water, sanitation, and hygiene affecting in the development and quality of human capital.*
c. *Food and nutrition insecurity affecting in the development of human capital and thereon to the national economy.*
d. *Loss of shelter, and enhanced displacement, separation of families, forceful migration, discrimination, violence and trafficking, during and after climate disasters.*
e. *Mental and psychosocial health problems.*
f. *Enhanced risk of spreading of vector borne diseases affecting the well-being of vulnerable groups.*

Objectives:

1. *To capacitate and sensitize policy makers, institutions, communities, public, and the private sectors on GESI integration in climate change adaptation to compliment sectoral goals through an informed process*
2. *To increase quality of qualitative and quantitative research on GESI and climate change impacts, risks and adaptation for evidence-based planning and implementation of climate change adaptation projects.*

Expected Outcomes:

1. *By 2030, at least 30% of the communities and public institutions implement GESI responsive adaptation actions.*
2. *By 2030, gender responsive climate change adaptation actions are integrated into adaptation plans at 753 local level.*

Impact:

GESI responsive informed planning and decision making on CCA interventions

Summary of Actions:

1. *Conduct and promote quantitative and qualitative research involving vulnerable communities on GESI and climate change adaptation.*
2. *Strengthen, establish, and functionalize climate change sensitized gender focal desks in all state and non-state institutions*
3. *Identify, recognize, and promote GESI responsive indigenous skills, practices, knowledge and resources for enhancing adaptive capacity and socio-economic empowerment.*
4. *Develop GESI-based knowledge products on climate change impacts, risks and adaptation.*
5. *Develop an accessible knowledge hub for management of research outputs, best practices, information and other knowledge products, and promote its usage in decision-making.*
6. *Disseminate knowledge and information using inclusive and appropriate language and means of communication, and build knowledge of wider stakeholders including media on the importance of GESI considerations in climate change adaptation actions.*
7. *Enhance the technical and institutional capacity on GESI and climate change at all levels of the government, for their effective participation in key policymaking and implementation processes.*
8. *Implement federal, provincial and local programs/projects through a bottom-up approach with meaningful representation of vulnerable people including children, in climate change adaptations plans and processes.*
9. *Enhance GESI disaggregated data collection, monitoring and evaluation, documentation, and dissemination of information at an institutional level.*

Scope:

Policy, Laws and Regulation, Capacity Building

Targeted Community/Beneficiaries:

Climate vulnerable groups, including women, children, senior citizens, persons with disability, youth, indigenous groups, people from

Geographic Coverage:

National

marginalized communities, government institutions, and researchers.	
Duration/Timeframe: *10 years*	**Total Cost:** *USD 100 million*
Lead Institutions: *Ministry of Women, Children and Senior Citizen, Ministry of Forests and Environment*	**Supporting Agency/Institutions/Groups:** *Ministry of Federal Affairs and General Administration, Ministry of Education Science and Technology, Research institutions and universities, UN agencies, I/NGOs, women groups, youth networks, CBOs, CSOs, Child clubs.*

59: *Building Human Capital for Inclusive Climate and Disaster Resilient Society*	**2050**
Alignment with/Contribution to National Development Goals: *National Climate Change Policy 2019, Second Nationally Determined Contribution 2020, 15th Periodic Plan 2019/20-2023//24, Gender Strategy and Action Plan on Climate Change 2020-2030, Sustainable Development Goals: Status and Roadmap for Nepal 2016-2030, Framework on Local Adaptation Plans for Actions 2019*	
Climate Risks and Vulnerabilities Addressed by the Actions: **1.** *Increase in incidences of extreme climate events leading to impacts on vulnerable groups (people of all genders, children, youth, senior citizens, people living with disability, indigenous peoples and local communities, and other marginalized groups):* ***a.*** *Drying of water resources that increases the workload and drudgery of vulnerable people and communities* ***b.*** *Loss of access to vital services, such as education, health facilities, medicine, water, sanitation, and hygiene affecting in the development and quality of human capital* ***c.*** *Food and nutrition insecurity affecting the development of human capital and thereon to the national economy.* ***d.*** *Loss of shelter, and enhanced displacement, separation of families, forceful migration, discrimination, violence and trafficking, during and after disasters* ***e.*** *Mental and psychosocial health problems* ***f.*** *Enhanced risk of spreading of vector borne diseases affecting the well-being of vulnerable groups.*	
Objectives: 1. *To promote safe and equitable access to Climate and Disaster Risk Reduction (DRR) response services* 2. *To capacitate the frontline service providers and community networks in providing Gender Equality and Social Inclusion (GESI) responsive support during emergency situations.*	**Expected Outcomes:** **1.** *By 2050, GESI integrated and operationalized in 753 local level plans and actions implemented for climate induced DRR preparedness and responses.* **2.** *By 2050, the number of cases of injury, deaths, discrimination and violence during emergency situation reduced by 60%* **3.** *By 2050, 80% of the community level frontline service providers and community networks capacitated to respond immediately during climate induced disaster emergency situations considering GESI aspects.* **Impact:** *Equitable access to DRR response services and decreased incidences of violence during emergency situations.*
Summary of Actions: **1.** *Strengthen current information management systems by enhancing mapping and identification of vulnerable people and communities in disaster prone areas to facilitate effective and equitable preparedness and response interventions.* **2.** *Ensure operationalization of mechanisms supporting collection of GESI disaggregated data of people affected and reached in emergency response interventions, to inform preparedness and response interventions, and monitoring and evaluation.* **3.** *Establish and strengthen GESI responsive early warning systems, preparedness and response at all levels of the government, including meaningful participation of vulnerable people including children in the processes, and with efficient, accessible and inclusive emergency communication channels using appropriate mediums (radio, television, SMS, social media, posters etc.) and language(s).* **4.** *Construct and ensure existence of GESI responsive, safe and accessible spaces including WASH facilities and climate-resilient shelters at local level, designed to the specific needs of women, LGBTQI+, children,*	

people with disability, elderly and highly marginalized indigenous groups, to ensure their protection and safety as preparation for disasters (including minimizing risks of discrimination and violence).

5. *Ensure prepositioning of, and access to, emergency kits and supplies for vulnerable groups including children during emergencies, sensitive to the different needs and preferences of various vulnerable groups.*
6. *Implement gender based violence and discrimination prevention mechanisms and response, which includes increased leadership of vulnerable groups in the development and implementation process.*
7. *Ensure equitable access to drinking water, sanitation, hygiene, safe transportation, legal and psychosocial support, security/police and health services for vulnerable groups including children.*
8. *Develop a roster of service providers (community psychosocial workers and counselors, police, health care provider, etc.) and community groups such as woman-, indigenous- and youth groups, that can be immediately mobilized during disasters, and build their capacity on how to respond during emergency situations from a GESI perspective.*

Scope:
Policy, Laws and Regulation, Capacity Building, Physical Infrastructure

Targeted Community/Beneficiaries:	**Geographic Coverage:**
People living in disaster-prone areas, and vulnerable groups including women, children, youth, senior citizens, people living with disability, and other marginalized groups	*National*
Duration/Timeframe:	**Total Cost:**
15 years	*USD 500 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**
Ministry of Home Affairs, Ministry of Women, Children and Senior Citizen	*Ministry of Forests and Environment, Provincial and local government, UN agencies, donors, INGOs, CBOs, CSOs, service providers (e.g., WASH, health and security), and women-, child-, indigenous- and youth-networks*

60: *Economic Empowerment through the Usage of GESI Responsive, Climate-Resilient and Smart Technologies*	**2030**

Alignment with/Contribution to National Development Goals:
Second Nationally Determined Contribution 2010, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy-2019, Gender Strategy and Action Plan on Climate Change 2021, Sustainable Development Goals Status and Roadmap: 2016-2030, Local Government Operationalization Act 2017, Framework on Local Adaptation Plans for Action 2019

Climate Risks and Vulnerabilities addressed by the Actions:

- *Increased workload and subsequently affect the health and well- being of women children, marginalized population, indigenous groups in the rural context of Nepal due to drying of water resources, extreme weather events, loss of productivity, loss and damage of livelihoods assets.*
- *Increase in (likely) social disturbances due to shocks and stress on natural resources due to extreme weather and climate events.*
- *Imbalanced migration creating more pressure on women, children, marginalized population, and indigenous groups.*
- *Losses and damage of developmental infrastructure leading to shrinking access to vital services such as education, health facilities, medicine, water, sanitation and hygiene.*

Objectives:	**Expected Outcomes:**
1. *To identify and promote GESI responsive climate-resilient technologies in all thematic sectors.* 2. *To capacitate and increase access of vulnerable people to the use of climate-resilient technologies for income generation.* 3. *To involve both the private and public sectors in creating climate-resilient employment opportunities for vulnerable people.*	**1.** *By 2030, GESI responsive and climate-resilient technologies are up-scaled and out-scaled in vulnerable areas.* **2.** *By 2030, increased productivity and income generation of excluded and vulnerable people by at least 30% through public-private partnerships.* **Impact:** *Economic empowerment through the usage of GESI responsive, climate-resilient technologies.*

Summary of Actions:

1. *Promote GESI responsive climate-resilient technologies in all eight thematic sectors identified by the National Climate Change Policy (2019) and GESI and climate change strategy.*
2. *Build capacity of the policymakers, government officials specially tasked to develop plans and formulate budgets, women groups, CSOs, and youth on equitable approaches of adaptation planning*
3. *Conduct gap assessments and situational analyses at provincial and local levels on GESI and climate adaptation technology needs, challenges, and opportunities, including policy and institutional gaps. Based on the outcomes and in adherence to existing federal level plans and policies, develop, revise and implement policies and plans to integrate GESI-responsive technologies in sectoral programs and projects on climate change adaptation.*
4. *Strengthen information sharing and establish physical information centers on climate-resilient technology options and opportunities at local level, targeting and making accessible to vulnerable and socially excluded groups.*
5. *Build capacity of vulnerable people to enable them to use those technologies for production, commercialization (e.g., food processing), DRR, water and energy solutions etc., to enhance their livelihoods by working together with value-chain organizations and micro enterprise development organizations like MEDEP, MEDPA, HVAP etc.*
6. *Capacity building on entrepreneurship development through the use of climate-resilient technologies for vulnerable groups.*
7. *Provide seed money to support vulnerable people to start up climate-resilient business opportunities for livelihood enhancement.*
8. *Promote public-private partnerships for introducing climate-resilient technologies in both the private and public sectosr and create employment opportunities with a focus on vulnerable people.*
9. *Develop and implement policies and plans to integrate GESI-responsive technologies in sectoral programs and projects on climate change adaptation.*

Scope:
Policy Law and Regulation, Capacity Building, Research and Innovation, Physical Infrastructure

Targeted Community/Beneficiaries:	**Geographic Coverage:**
Vulnerable people and communities	*National*
Duration/Timeframe:	**Total Cost:**
10 years	*USD 50 million*
Lead Institutions:	**Supporting Agency/Institutions/Groups:**
Ministry of Women, Children and Senior Citizen, Ministry of Federal Affairs and General Administration	*Provincial and local governments, MDBs, UN organizations, INGOs/NGOs, CSOs, private sectors, CBOs and networks*

61: *Enhancing Resilience to Climate Change through GESI Responsive Livelihood Programs*	**2050**

Alignment with/Contribution to National Development Goals:
Second Nationally Determined Contribution 2010, 15th Periodic Plan 2019/20-2023/24, National Climate Change Policy-2019, Gender Strategy and Action Plan on Climate Change 2021, Sustainable Development Goals Status and Roadmap: 2016-2030, Local Government Operationalization Act 2017, Framework on Local Adaptation Plans for Action 2019

Climate Risks and Vulnerabilities Addressed by the Actions:

- *Increase in incidences of extreme climate events leading to impacts on vulnerable groups (people of all genders, children, youth, senior citizens, people living with disability, indigenous peoples and local communities, and other marginalized groups):*

a. *Drying of water resources that increases the workload and drudgery of vulnerable people and communities*
b. *Loss of access to vital services, such as education, health facilities, medicine, water, sanitation, and hygiene affecting in the development and quality of human capital*
c. *Food and nutrition insecurity affecting in the development of human capital and thereon to the national economy.*
d. *Loss of shelter, and enhanced displacement, separation of families, forceful migration, discrimination, violence and trafficking, during and after disasters*
e. *Mental and psychosocial health problems*
f. *Enhanced risk of spreading of vector borne diseases affecting the well-being of vulnerable groups*

<table>
<tr><td>Objectives:
1. To develop, implement and operationalize a GESI responsive budgetary system at all tiers of government
2. To promote community level financial safety nets for vulnerable groups to adapt to climate change impacts
3. To identify and promote climate-resilient alternative businesses for livelihood enhancement especially for vulnerable groups.</td><td>Expected Outcome:
1. By 2040, GESI responsive budgetary system effectively implemented at all tiers of government.
2. By 2040, financial safety nets identified and institutionalized at community level.
Impact:
Enhanced climate resilience and livelihood of vulnerable people.</td></tr>
<tr><td colspan="2">Summary of Actions:
1. Develop climate and GESI responsive budget at federal, provincial and local level, ensuring its effective implementation with meaningful participation of vulnerable people including children, to improve their livelihoods.
2. Develop technologies and increase access of vulnerable groups.
3. Invest, promote, and increase access to social/financial safety nets/social protection such as: cooperative, saving and credit, grain banks groups with special focus on women and marginalized groups and ensure that it reaches economically and socially vulnerable groups, such as single mothers, children, and persons with disabilities by providing capacity building opportunities.
4. Identify and promote alternative businesses that are less vulnerable to climate change extremes.
5. Strengthen the social protection mechanism for vulnerable communities (such as cash grants).
6. Promote livelihood diversification (farm/non-farm) for women/youth, Indigenous People and Local Communities, and vulnerable people through increased access to skills and formal markets to bridge the gap between production and productivity.</td></tr>
<tr><td colspan="2">Scope:
Policy law and regulation, capacity building, research and innovation, physical infrastructure</td></tr>
<tr><td>Targeted Community/Beneficiaries:
Vulnerable people, communities of climate change affected areas</td><td>Geographic Coverage:
National</td></tr>
<tr><td>Duration/Timeframe:
15 years</td><td>Total Cost:
USD 50 million</td></tr>
<tr><td>Lead Institutions:
Ministry of Women, Children and Senior Citizen, Ministry of Federal Affairs and General Administration</td><td>Supporting Agency/Institutions/Groups:
Ministry of Forests and Environment, provincial and local governments, MDBs, UN agencies, INGOs, NGOs, CSOs, community networks.</td></tr>
</table>

8. ENABLING ACTIONS

The implementation of adaptation programmes will be supported by enabling actions that cut across all the sectors. These actions aim to equip government and stakeholders with the knowledge, skills, technologies, and financing needed to deliver and report on adaptation actions.

8.1 Programmes to implement Enabling Actions and Budgets

The tables below set out three programmes that will allow MoFE to deliver on the priority enabling actions. The first action will provide the necessary supports for research and implementation of Nepal NAP. The second programme focuses on capacity building and building the capabilities across the three levels of government to mainstream adaptation in plans and budgets, including the development of LAPAs. The third measures accommodates MR&R system that aids on establishing the systems to collect data and information on adaptation, and to meet national and international reporting requirements, including periodic monitoring, reporting and update of the NAP.

<table>
<tr><td colspan="2">62: Implementation of Nepal NAP including Research on Climate Risks and Vulnerabilities, and Capacity Building of Actors and Stakeholders on Climate Change Issues</td><td>2025, 2030</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, Sustainable Development Goals: Status and Road Map for Nepal 2016-2030, Second Nationally Determined Contribution 2020</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Overall risks posed by climate change to the development gains of the country including in the sectors where capacity gaps have prevented an effective response to climate change impacts</td></tr>
<tr><td>Objectives:
1. To build capacity of climate change stakeholders to implement the NAP
2. To undertake research on climate change to support the updating of the Climate Change Vulnerability and Risk Assessment (CCVRA).</td><td colspan="2">Expected Outcomes:
1. By 2026, updated (second) national level climate vulnerability and risk assessment published.
2. By 2030, a pool of trained human resources developed from different sectors.
3. By 2030, informed policy makers and stakeholders at each of the sectors on climate change vulnerability and risk assessment to further adaptation planning.
Impact:
Climate risks reduced through NAP implementation and adaptation action taken in various sectors.</td></tr>
<tr><td colspan="3">Summary of Actions:
• Develop and implement climate change adaptation capacity building packages for different stakeholders and actors.
• Undertake climate change vulnerability and risk assessment research and capacity building.
• Develop a system to undertake periodic climate change vulnerability and risk assessment.</td></tr>
<tr><td colspan="3">Scope:
Capacity Building, Research and Innovation</td></tr>
<tr><td colspan="2">Targeted Community/Beneficiaries:
Federal, Provincial and Local governments, Youth, Vulnerable women groups, IPs and marginalized communities, private sectors</td><td>Geographic Coverage:
All Provinces</td></tr>
<tr><td colspan="2">Duration/Timeframe:
10 years</td><td>Total Cost:
USD 100 million</td></tr>
<tr><td colspan="2">Lead Institution:
Ministry of Forests and Environment</td><td>Supporting Agency/Institutions/Groups:
All sectoral line ministries, UN agencies, I/NGOs</td></tr>
</table>

<table>
<tr><td colspan="2">63: Strengthen Capacities of Federal Thematic Ministries and Provincial and Local Governments on Nepal NAP Implementation</td><td>2025, 2030</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, Sustainable Development Goals: Status and Road Map for Nepal 2016-2030, Second Nationally Determined Contribution 2020</td></tr>
<tr><td colspan="3">Climate Risks and Vulnerabilities Addressed by the Actions:
Overall risks posed by climate change to the development gains of the country including in the sectors where capacity gaps have prevented an effective response to climate change impacts</td></tr>
<tr><td colspan="2">Objectives:
1. To develop capacities to integrate the adaptation in policies, plans, and budgets at both the provincial and federal level (thematic ministries)
2. To build capacity to implement the NAP at thematic ministries at federal and provincial level</td><td>Expected Outcomes:
1. By 2030, capacity of the thematic ministries and provincial governments enhanced on NAP implementation.
2. By 2030, a pool of climate experts at the sectoral ministries at federal and provincial level developed.
3. By 2030, all 753 local government have developed LAPAs.
Impact:
Enhanced capacity of the sectoral ministries for sectoral adaptation planning and integration</td></tr>
<tr><td colspan="3">Summary of Actions:
• Prepare capacity building package on sectoral climate change vulnerability and risk assessment and facilitate in climate change adaptation integration through National Capacity Building Program
• Prepare and localize the NAP Implementation Plan by supporting the development of LAPAs.
• Build the capacity for effective climate finance management.</td></tr>
<tr><td colspan="3">Scope:
Capacity Building</td></tr>
<tr><td colspan="2">Targeted Community/Beneficiaries:
Government officials, policy makers and authorities from thematic ministries and provincial and local governments</td><td>Geographic Coverage:
Federal level ministries and all provinces</td></tr>
<tr><td colspan="2">Duration/Timeframe:
10 years</td><td>Total Cost:
50 million USD</td></tr>
<tr><td colspan="2">Lead Institution:
Ministry of Forests and Environment</td><td>Supporting Agency/Institutions/Groups:
All sectoral, line ministries, UN agencies, I/NGOs</td></tr>
</table>

<table>
<tr><td colspan="2">64: Establish and Operationalize Climate Change Data Management, Monitoring and Reporting Center at Federal, Provincial and Local Level</td><td>2030</td></tr>
<tr><td colspan="3">Alignment with/Contribution to National Development Goals:
National Climate Change Policy 2019, 15th Periodic Plan (2019/20-2023/24, Sustainable Development Goals: Status and Road Map for Nepal 2016-2030, Second Nationally Determined Contribution 2020</td></tr>
<tr><td colspan="2">Objectives:
1. To establish a climate change data management and monitoring system at MoFE.
2. To build the capacity of sectoral and provincial ministries on the adaptation data management and monitoring system.
3. Develop and pilot a prototype MR&R system for one theme and extend at national level.</td><td>Expected Outcomes:
1. By 2030, sectoral level information on NAP implementation maintained at federal level (centralized information for effective reporting to national and international level).
2. By 2030, dedicated human resource developed for the data management and reporting at each of the sectoral ministries, provincial government and national level.
Impact:
Informed decision making on climate change adaptation planning</td></tr>
<tr><td colspan="3">Summary of Actions:
• Develop a prototype of the Climate Change Data Management and Monitoring and Reporting System (CCDMMRS).
• Establish Climate Change Data Management and Monitoring System and Reporting at Ministry of Forests and Environment.
• Increase operability of the CCDMMRS through capacity building of the government official involved in the data management process at federal, provincial and local level.</td></tr>
<tr><td colspan="3">Scope:
Capacity Building, Research and Innovation, Technology Development</td></tr>
<tr><td colspan="2">Targeted Community/Beneficiaries:
Government institutions at federal, provincial and local level</td><td>Geographic Coverage:
National</td></tr>
<tr><td colspan="2">Duration/timeframe:
10 years</td><td>Total Cost:
USD 10 million</td></tr>
<tr><td colspan="2">Lead Institution:
Ministry of Forests and Environment, Sectoral ministries</td><td>Supporting Agency/Institutions/Groups:
Provincial governments, local governments, UN agencies, I/NGOs</td></tr>
</table>

8.2 Policy, Legal and Regulatory Framework and Governance

Enabling actions include establishing the **policy, legal and regulatory framework** to encourage adaptation action. The process of developing a comprehensive policy and regulatory framework for adaptation is underway in Nepal as demonstrated by the National Climate Change Act, 2019. A priority is the continued emphasis on mainstreaming climate change in planning and budgeting at the three levels of government. Mainstreaming efforts can build on the work of MoALD that has piloted the integration of climate change in agricultural planning and budgeting at the national and sub-national levels (Kunwar, 2021a). Work is needed to ensure that adaptation is viewed as a core business in the new structures and systems that are being established at the Province and Local levels. LAPAs are a key mechanism to identify local adaptation priorities and integrate them into development planning.

To facilitate mainstreaming adaptation across all levels of government, work is needed to implement the climate resilient and budgeting guidelines. Consistent with the NDC, Fifteenth Plan and the National Climate Change Policy, a critical action is the preparation and implementation of LAPAs by all 753 local governments. At the national level, MoFE will lead the preparation of a national strategy on loss and damage, and update the climate risk and vulnerability assessment.

Table 8: Priority Policy, Legal and Regulatory Framework and Governance actions and expected results (progress indicators and timeline)

Cross-cutting Enabling Actions – Policy, legal and regulatory framework and governance	**Expected Results** **Timeline and Progress indicators**
Implement the climate resilient planning and budgeting guidelines.	By 2025 – MoFE and MoALD are mainstreaming adaptation in planning and budgeting by applying the guidelines. By 2030 – All relevant national sector ministries and provincial governments are mainstreaming adaptation in planning and budgeting by applying the guidelines.
Prepare and implement local level climate-resilient and gender-responsive adaptation plans.	By 2030 - All 753 local governments have prepared and implemented gender-sensitive local adaptation plans of action (LAPAs).
National strategy and action plan on Loss and Damage associated with climate change impacts.	By 2025 - National strategy and action plan on Loss and Damage prepared.
Coordinate adaptation implementation through Thematic Working Groups, Cross-cutting Working Groups and Provincial Climate Change Coordination Committee.	By 2025 - TWGs, CWGs and Provincial Climate Change Coordination Committee are established and meet on a regular basis to guide the NAP process.

8.3 Awareness Raising and Capacity Building

Awareness raising and capacity building is required at the national, provincial, and local levels to better understand the impacts of climate change and how to integrate adaptation in planning, budgeting, and implementation. Knowledge and capacities are required to support the implementation of the NAP process and the development of future NAPs and sectoral programs. Awareness raising is an important part of the NAP process because it helps to stimulate and increase support for action, and to mobilize local knowledge and resources. Awareness raising is required with the private sector, communities, and households (MoFE, 2020a), and a particular emphasis needs to be placed on outreach to youth, women and Indigenous Peoples.

Capacity building helps Nepal enhance capabilities to take effective adaptation action at the three levels of government and with stakeholders. Work is needed to increase the level of awareness and capacities of government agencies at the federal, provincial and local levels including improving their overall understanding of climate change discourse, increasing access to information on climate change variables, and improving cooperation and coordination amongst different stakeholders on the implementation of different climate change adaptation interventions.

MoFE has undertaken assessments of the capacity gaps and needs at the national and provincial levels (see MoFE, 2020a and 2020b), and identified key activities to address these needs, that include:

- Strengthen capacities of federal thematic ministries and provincial governments on developing and implementing the NAP process.
- Strengthen institutional support structures by building the capacities of members of the coordination mechanisms to provide oversight to the NAP process, and facilitating the meeting of the oversight and coordination bodies.

Table 9: Awareness raising and capacity building actions and expected results (progress indicators and timeline)

Cross-cutting Enabling Actions – Awareness raising and capacity building	**Expected Results** **Timeline and Progress indicators**
• Develop capacities to mainstream the adaptation in policies, plans and budgets at both the provincial and federal level (thematic ministries).	By 2025 – MoFE and MoALD are mainstreaming adaptation in policies, planning and budgeting. By 2030 – All relevant national sector ministries and provincial governments are mainstreaming adaptation in policies, planning and budgeting.
• Build capacity to implement the NAP process, including with community associations, youth groups and women's groups.	By 2025 - 2,000 climate change adaptation persons are mobilized locally

8.4 Research and Technology Development

Increasing adaptive capacity and implementing adaptation actions requires **research and technology development**. A lack of research and technology development constrains Nepal's efforts to adapt to climate change (MoFE, 2021b). Many of the adaptation actions identified in this NAP require enhanced research programs and appropriate and improved technology. An overall objective is to support research and technology development that helps the sectors to develop, identify and disseminate appropriate technologies that deliver adaptation actions. The IPCC (2000) defines technology development and transfer as a broad set of processes covering the flows of know-how, experience, and equipment for adapting to climate change amongst stakeholders, such as governments, private sector entities, financial institutions, civil society, and academia. Improved extension services for agriculture, nutrition, and health can help to support small farmers, communities, and households to adapt to climate change.

Nepal lacks technological innovations to ensure sustainability of initiated adaptation interventions. Scientific climatic information is limited to only a few institutions and is often inadequate, resulting in high uncertainty about climatic events and limited information on scenarios of different levels of temperature increase and its implications. The MoFE could work with universities and research institutions to identify an operational research agenda on climate adaptation and promote and coordinate funding for research and study on priority adaptation topics.

The lack of hydro-met stations in high altitude locations means that climate trends and predictions of future climatic conditions cannot be produced. In addition to limited technology, proper dissemination mechanisms are not in place for climate information. Extensive research, sharing of traditional knowledge, building on existing adaptation actions, information dissemination, and science-policy interface are necessary for effective climate adaptation in Nepal (KC, 2018).

Priority research and technology development needs in four critical sectors are:

- Forests, Biodiversity and Watershed Conservation sector - Climate change projections, modelling and emissions scenarios to help visualise climate impacts in the long term.
- Agriculture and Food Security - Improved extension services for agriculture, nutrition, and health can help support small farmers, communities, and households to adapt to climate change.
- DRRM - Early warning systems and forecast systems are required in each province.
- Health - Research and study to better understand the effects and impacts of climate change on people's health.

Priority areas for research include hydrology and meteorology, and the establishment of reliable weather forecasting and climate predictions and trend analysis through a Climate Information System (GoN, 2019c). Improved climate information services are important for farmers to manage risk, for preparing standards and regulations, and for assessing climate risks in infrastructure projects. Climate information is a critical element of early warning systems that help communities cope with climate hazards like floods and drought. Climate predictions provide critical information for updating climate risk and vulnerability assessments. The establishment of a Climate Change Research Centre would encourage continued research on climate change, climate change impacts and addressing vulnerabilities; and the centre could lead the updating of Nepal climate change risk and vulnerability assessment every five years (GoN, 2020b). The actions in the table below will

further the aim set out in the Climate Change Policy, 2019 to encourage climate change-related study, research, and technology development and expansion that help to deliver adaptation actions.

Table 10: Priority actions and expected results (progress indicators and timeline) - Research and technology development

Cross-cutting Enabling Actions – Research and technology development	**Expected Results** **Timeline and Progress indicators**
Update the national level Climate Vulnerability and Risk Assessment every five years.	By 2026 - Updated (second) national level climate vulnerability and risk assessment published. By 2031 - Updated (third) national level climate vulnerability and risk assessment published.
Prepare a strategy and action plan on gender-responsive climate-smart technologies and practices.	By 2025 - Strategy and action plan prepared.
Establish a Climate Change Research Centre to facilitate research, technology development and expansion in relation to climate adaptation system.	By 2025 – Business plan for climate change research centre developed and resources identified. By 2030 – Climate Change Research Centre established.
Establish and operationalize a Climate Information System	By 2025 - Plan for a Climate Information System is prepared. By 2030 - Plan for the Climate Information System is operationalized.
Conduct studies and research on hydrology, meteorology, and climate change in collaboration with research institutions. Enhance local capacities to prepare climate change projections.	By 2025 - MoFE undertakes and publishes five studies working in collaboration with local research institutions.
Expand the network of weather stations to improve the system of collection, analysis and dissemination of data related to climate change.	By 2030 - number of weather stations increased from XX in 2020 to XX in 2030, and the number of people accessing weather information increased from XX in 2020 to XX in 2030.

8.5 Climate Finance

Nepal has taken steps to mobilize, manage, and track climate finance. Recent efforts to mobilize finance for climate change, including adaptation, include the adoption of the Green, Resilient and Inclusive Development (GRID) approach that takes a proactive, coordinated approach that to align financial support (including climate finance) to address climate action, Covid-19 recovery, long-term green growth, and sustainable development for all (Shrestha, 2021).

The Government of Nepal has pursued a policy of integrating climate finance into national planning and budgeting processes by adopting the Climate Change Financing Framework (MoF, 2017b). In addition, since 2013-14, the government has included the climate change code in budget and expenditure tracking. The "highly relevant" climate budget has accounted for about 5% of the total national budget (MoF, 2017a). These efforts have assisted the Government of Nepal to allocate public funds for climate change based on economic development priorities (MoFE, 2020c), which is indicative of the importance placed on adaptation.

The Ministry of Finance (MoF) established the Climate Finance Unit to strengthen national capacity to absorb and manage climate financing. The work of the unit is mainly focused

on scaling up funding from the Green Climate Fund and Global Environment Facility. MoF is the Designated National Authority (DNA) to the GCF and received technical support and capacity building through the GCF readiness project from 2016 to 2018. MoF, as the DNA, has recommended two national institutions - Alternative Energy Promotion Centre (AEPC) and Nepal Trust for Nature Conservation - for GCF accreditation as National Implementing Entities. AEPC is mandated to promote alternative energy technologies while Nepal Trust for Nature Conservation is working in the field of nature conservation promoting Ecosystem-based Adaptation measures (Kunwar, 2021a).

Building on this good work to increase finance for adaptation will require actions that help the Government of Nepal mobilize, manage and track finance for adaptation. This includes building the capacity of MoF, NPC and MoFE to track and report on sources, applications and impacts of climate adaptation finance. Tracking of and reporting on climate finance by MoF will need to be aligned with the tracking of adaptation actions and impacts by MoFE and NPC. This alignment can help to improve analysis, including the identification of actions that provide value for money, and the amount of climate finance that reaches vulnerable groups and local communities. In addition, sectoral ministries require capacity building to implement the Climate Resilient Planning and Budgeting Guidelines 2020.

Work is also needed to develop the adaptation sections of the climate finance strategy that will consider how to mobilize resources for the priority actions identified in this NAP. The finance strategy for adaptation will need to be part of the GRID approach; and will require a strategic assessment of the best use of climate adaptation-related finance. Nepal will need an over-arching approach that identifies the most strategic use of grant funds from the GCF and bilateral donors, concessional loans from MDBs, and domestic spending at the national provincial and local levels.

Nepal will also need to identify resources for the coordination and management of the NAP process. Possible funding options are bilateral support similar to the Nepal Climate Change Support Programme Phase II that is supported by the Government of the United Kingdom, or the funding under the financial mechanism of the UNFCCC, such as the GCF and LDC Fund. The NAP Global Network or Government of Germany's International Climate Initiative could be funding avenues for relatively small, focused actions that help to coordinate and maintain the NAP process, such as improving the mainstreaming of GESI in adaptation action. The Capacity-building Initiative for Transparency that is managed by the GEF is a potential source of funds for improving MR&R of adaptation. The GCF and GEF provide funding for the development of project proposals, which could be accessed to move forward to further develop select priority short- and medium-term adaptation actions. Undertaking these actions will require increased capacity, including capacity to track climate finance, cost adaptation actions, assess costs and benefits of actions, and develop funding proposals.

The actions in the table below will further the aim of the set out in the Climate Change Policy, 2019 to identify national resources for the implementation of adaptation actions, to mobilize resources in a just manner, and to increase access to bilateral, multilateral, and international financial resources. Importantly, the actions will work toward the goal of 80% of mobilized resources being used to support the implementation of programs at the local level.

Table 11: Priority actions and expected results (progress indicators and timeline) - Climate Finance Management

Enabling Cross-cutting Actions – Climate Finance Management	Expected Results Timeline and Progress indicators
Build capacity to mobilize, manage and track finance for adaptation, including the development of funding proposals, and implementing the Climate Resilient Planning and Budgeting Guidelines 2020	By 2025 – MoFE and MoALD are mainstreaming adaptation in planning and budgeting by applying the guidelines; and capacity building sessions on proposal development are held. By 2030 – All relevant national sector ministries and provincial governments are mainstreaming adaptation in planning and budgeting by applying the guidelines.
Formulate the adaptation aspects of the Climate Finance Strategy and National Capacity on Climate Finance Management, that considers mobilization of resources for adaptation from domestic and international, public and private sources	By 2025 - Climate finance strategy is prepared that is aligned with the priority adaptation actions identified in the NAP.
Established a web-based tool to track flows of finance for adaptation	By 2025 - Climate finance tracking tool established by MoF, working with MoFE and NPC.
Establish a National Climate Fund	By 2025 - Modalities and implementation framework for a National Climate Fund are prepared. By 2030 - National Climate Fund is established.

8.6 Monitoring, Review and Reporting (MR&R)

Monitoring, Review and Reporting (MR&R) of adaptation is one of the four key elements of the NAP process as defined by the NAP Technical Guidelines (LDC Expert Group, 2012). An MR&R framework stimulates learning and ensures accountability and transparency by setting clearly defined indicators. A robust M&R framework is instrumental for stakeholders to be able to take appropriate decisions on adaptation priorities and actions; overcome any shortcomings observed in relation to the implementation of the NAP with apt solutions; regulate activities effectively and efficiently to achieve anticipated outcomes; and increase the visibility of the NAP throughout the implementation period by sharing its outcomes at different levels. The MR&R system also plays an important role in identifying the types of adaptation programs that are needed to build climate resilience across the three levels of government (MoFE, 2020b). In addition, the adaptation MR&R system generates information that enables meeting reporting requirements on adaptation at the national and international levels.

Nepal's MR&R system will be based on the principles of simplicity, having clear aims and objectives, being aligned with existing M&E systems, and using an incremental approach, and being cognizant of human and financial resources constraints (Box 6). The initial monitoring and reporting will focus on progress indicators. Overtime, the focus will shift to an MR&R system that demonstrates how adaptation actions improve the ability of people, communities, and systems to cope with climate change. For example, for infrastructure, MR&R needs to demonstrate how investments and actions to increase climate resilience (climate proofing) work to ensure that capital investments in infrastructure are not damaged by extreme weather events and climate hazards such as flooding and maintain their value over time. For agriculture, MR&R needs to explore how production is maintained or increased as the climate changes.

Box 6: The Right Approach for Effective Monitoring, Evaluation, and Learning Systems for the NAP Process

- **Simplicity -** National-level MR&R systems take years to develop and operationalize in the context of limited resources and capacity constraints. Simplicity helps ensure the longevity of adaptation MR&R systems. It is vital in the context of climate adaptation as it is difficult to predict if a particular intervention will support adaptation in the short term since climate change unfolds over a long timeline, and uncertainties are associated with its impacts.
- C**lear Aim and Objectives -** It is necessary to clarify the purpose and the objectives of the adaptation MR&R system, and to identify the type of information and the appropriate tools needed for data and information management before initiating data collection.
- **Alignment and Integration** - Instead of creating a standalone system, climate adaptation should be integrated into the existing system based on mapping of MR&R systems at the federal, provincial local and sectoral levels.
- **Incremental and learn by doing** - Piloting the approach and tools developed can help identify what works and what does not and adjust accordingly. The approach and tools used at the beginning can evolve with changes based on available resources and capacities. Using an incremental approach can help navigate the complexity of measuring climate adaptation efforts at the federal level by testing methods and gradually building ownership and capacities among key actors. Progress reporting can be a practical starting point to inform stakeholders about the MR&R system for climate adaptation through learning-by-doing.

Source: Leiter, 2021

The MR&R system can help the government track the participation of women and vulnerable groups in the NAP process, and identify opportunities to enhance their equitable access to resources and benefits from adaptation interventions. This will require a robust approach to collect gender-disaggregated data and data on social inclusion, and to use this data to demonstrate the different needs and priorities of men, women, and vulnerable groups (MoFE, 2020b).

The priority action in this sector is the establishment of an MR&R system for adaptation. The MR&R system will be developed in a phased approach up to 2030. Initial actions will include the development of sectoral MR&R frameworks, including the development of indicators and the collection of baseline information. Efforts will be made to incorporate gender-specific indicators and indicators of gender equality; and to include indicators and data will be disaggregated by age, gender, and specific groups to capture the different impacts of adaptation actions on women and men, children, elderly population, and other groups such as persons with disabilities. A Climate Change Data Management Monitoring and Reporting Centre will be established under the purview of MoFE to compile and analyze adaptation data and information. The collection of data through the centre will be aligned with M&E processes for Nepal's NDC, SDGs and the GRID strategic plan.

The first phase of the MR&R system will focus on one sector, and then be expanded to gather and analyze data from national sectoral ministries. As learning occurs, the system will be expanded to the provincial level. Actions also include reporting on the NAP and undertaking research to improve measurement and understanding of adaptation outcomes, including how the actions have improved the ability of Nepalis to cope with the impacts of climate change. MoFE will lead the updating of the NAP.

Table 12: Priority actions and expected results (progress indicators and timeline) - Monitoring, Review & Reporting

Enabling Cross-cutting Actions – MR&R	**Expected Results** **Timeline and Progress indicators**
Establish the Monitoring, Review and Report system for adaptation actions, to include: - Identification of adaptation indicators and data	By 2025 – Pilot MR&R system established

sources for the NAP actions (including collection of baseline data and collection of gender-disaggregated data). - Development of monitoring frameworks for adaptation programs at the national, provincial, and local levels. - Establishment and operationalization of a climate change data management system and programme monitoring centre at the federal and provincial levels.	By 2025 – Two national sector ministries are reporting annually on adaptation actions and outcomes By 2030 - MR&R system is fully functional, with all sector ministries and provincial governments reporting annually
Review the implementation of the NAP.	By 2026 - First review of the implementation of the NAP is completed. By 2030 - The second review of implementation of the NAP will be completed in 2030 so as to inform the updating of the NAP in 2031
Update the NAP every ten years.	By 2031 - Updated NAP document published.
Undertake research to improve measurement of adaptation outcomes.	By 2025 - Research undertaken in the agriculture sector, drawing on international best practices

9. INSTITUTIONAL ARRANGEMENT AND IMPLEMENTATION MODALITY FOR NAP IMPLEMENTATION

9.1 NAP Implementation

The NAP is designed to complement existing plans. It presents a strategic approach that will help the government achieve national development goals and the SDGs, including poverty alleviation, gender equality, transformation of the agricultural sector, and climate-resilient infrastructure. The short-term actions to 2025 are aligned with the national development priorities set out in the Fifteenth Plan and the Government of Nepal's Covid-19 recovery plan, including the Green Recovery Inclusive Plan (GRID). The medium-term actions to 2030 are aligned with the priority actions in Nepal's NDC and informed by the priorities set out in the SDG roadmap. The strategic vision guiding action to 2050 is aligned with the goals of the National Climate Change Policy 2019.

This NAP promotes actions to mainstream adaptation in the planning and budgeting processes at the provincial and local levels; and in the policies, plans and budgets of the sectoral ministries at the federal level. The NAP has drawn on and can be an input to strategies on the SDGs, biological diversity, combatting desertification, and DRR. The identification of common adaptation actions across these strategies helps provide consistent messaging to stakeholders and potential funders of adaptation priorities.

9.2 Institutional Arrangement

The effective implementation of the Nepal NAP requires a mix of institutional and behavioral responses, the use of technologies, and the design of climate-resilient plans and climate smart practices. These actions will need to consider a balance between economic development, social development, environmental sustainability, and disaster risk reduction. The main institutions involved in the implementation of the NAP process range from the Environmental Protection and Climate Change Management National Council (EPCCMNC), chaired by the Rt. Hon. Prime Minister to the Inter-Ministerial Climate Change Coordination Committee (IMCCCC) to the Thematic and Cross-cutting Working Groups (T/CWGs) and MoFE at the federal level.

At the provincial level, the institutions responsible for the effective implementation of the NAP include the Provincial Environmental Protection and Climate Change Management Council (PEPCCMC); the Provincial Climate Change Coordination Committee (PCCCC); the Provincial Policy and Planning Commission; the ministries related to forests, environment and climate change; and other sectoral ministries at the province level. The District Climate Change Coordination Committee provisioned under the chair of the District Coordination Committee chief and the Local-level Executive Board are crucial to implement the strategic adaptation interventions outlined in the NAP document.

The **EPCCMNC** chaired by the Rt. Hon. Prime Minister provides strategic guidance in mainstreaming of the NAP actions into policies, plans and programmes at all levels of government. The **IMCCCC**, chaired by the Forests and Environment Minister with participation of sectoral ministries and government and non-governmental institutions, is responsible for overall coordination of the technical aspects of NAP implementation, and communication of NAP priorities to the three levels of government.

The **MoFE** is responsible for the overall NAP process, and for policies, laws, and strategies for climate adaptation. MoFE provides guidance and technical support to provincial and local governments; monitoring, reporting and review of adaptation actions; reporting on adaptation actions on an annual basis; and approval of adaptation projects funded through international sources. The **Climate Change Management Division** (**CCMD)**, MoFE, is responsible for the development, coordination, and implementation of the NAP. As the convening agency on adaptation, CCMD engages with sector ministries at the federal level, and provincial and local governments. It is responsible for coordinating the NAP process within MoFE; mainstreaming adaptation in sectoral, provincial, and local policies, plans, and programmes; leading studies and research on adaptation; reporting annually on adaptation; serving as the focal point for the UNFCCC; coordinating all adaptation-related projects; and supporting coordination across working groups.
The **sectoral ministries** at the federal level are responsible for establishing climate change units to mainstream the NAP in sectoral policies, planning and activities. Relevant ministries are responsible for coordinating **Thematic Working Groups** and **Cross-cutting Working Groups**, and lead the mainstreaming of adaptation into sectoral policies and plans.

The **Ministry of Finance**, as the focal point to the Green Climate Fund and Global Environmental Facility, works to increase access to domestic and international financial resources related to adaptation and helps to coordinate climate finance through a dedicated climate finance unit within the ministry.

The **National Planning Commission** leads the federal government's planning process, coordinates efforts to achieve the SDGs, assists with the mainstreaming of climate change adaptation in planning processes, ensures that plans and programmes are climate-resilient, and assists MoFE in the monitoring and evaluation of the NAP.

Provincial Climate Change Coordination Committees (PCCCC) have been established in each of the seven provinces with responsibility to integrate and mainstream climate adaptation into policies, plans, strategies, programmes, and projects. This includes vertical linkages with the federal government, integrated approaches across provinces, and coordination of capacity building for provincial governments. The ministry related to forest, environment and climate change is the focal ministry for climate change affairs at the provincial level and is responsible for implementing and coordinating climate adaptation actions; sharing of adaptation information with sector ministries and local governments; and monitoring the implementation of adaptation planning and budgeting.

District Climate Change Coordination Committees (DCCCC) chaired by the DCC chief are to be established at the district level that helps to facilitate climate change Institutional framework for Nepal's NAP process adaptation and resilience work at the district level where the mayor/chairperson remains the member to roll out NAP implementation.

The Executive Board at the local level oversees and provides strategic guidance to coordinate implementation of climate change adaptation actions outlined in the NAP document at the local level. A **Forest, Environment and Disaster Management Section** at the local is responsible for facilitating climate adaptation activities; monitoring and review of adaptation action; raising public awareness on adaptation; implementing adaptation projects in areas under local jurisdiction (such as environmental conservation, biodiversity,

agriculture and livestock, watershed management, and wildlife) and integrating adaptation into local level services (such as health, sanitation, agricultural extension, and drinking water). The role of the development partners and agencies, international and national non-governmental organizations, private sector, academia, networks and associations is crucial in NAP implementation in Nepal. Cross-sectoral learning and experience sharing among all the stakeholders of the NAP will be periodically organized by MoFE, which will utilize the existing and new coordination mechanisms.

9.3 Financing the NAP

The National Climate Change Policy (2019) states that 80% of mobilized international climate resources will be used to support the implementation of programmes at the local level. Meeting this goal and financing the NAP process requires the identification of national and international resources for the implementation of adaptation actions, the establishment of a national Environment and Climate Fund, the preparation of a strategy to finance adaptation, and the establishment of an improved climate change budget code to track climate finance. NAP implementation requires financial resources for stand-alone adaptation programmes and projects, as well as financial resources to climate proof traditional development interventions.

Nepal will mobilize both national and international finance to implement its NAP. The following considerations will guide Nepal's efforts to scale up financial resources for adaptation.

- The country's International Development Cooperation Policy (2019), National Climate Change Policy (2019), GRID, and another relevant national financing strategies will guide the prioritization and financing of adaptation actions.
- Nepal will channel most of the externally accessed adaptation finance for NAP implementation through the government system, which will be reflected in the fiscal budget. However, the government will employ all types of modalities relevant to the nature of funding, such as On Budget - On Treasury; On Budget- Off Treasury and Off Budget – Off Treasury.
- The government of Nepal will use the Climate Change Budget Code (CCBC) at all levels to encourage the allocation of budget for climate change. Updating of the criteria, methods and processes as needed, to improve on the practices that have been implemented by the Nepal government since 2012.
- The country will allocate 80% of international climate finance, as guided by the National Climate Change Policy, to the local level while implementing NAP-related programmes and projects.
- Adaptation finance will be transparent and promote ownership among the stakeholders, focusing on climate-vulnerable populations.
- Adaptation actions will be gender-responsive and socially inclusive, and will prioritize the engagement of women, minority groups and marginalized sections.
- Adaptation finance will also promote research and development, capacity building and adaptation technology for efficient implementation of the NAP.

Nepal will rely primarily on international financial resources for financing its NAP. The sources include multilateral financial institutions, bilateral development cooperation agencies, the financial mechanism and funds under the UNFCCC, international private sector finance, and other sources of external finance coming from international organisations, foundations, climate dedicated funds, and innovative sources.

The total indicative cost of Nepal's NAP is USD 47.4 billion to implement priority programmes up to 2050. Nepal will contribute USD 1.5 billion until 2050; and external support totalling USD 45.9 billion is required to implement the NAP to 2050. The government requires USD 2.1 billion per year for the delivery of adaptation services through the implementation of NAP for medium term.

Table 13: Climate financing for Nepal NAP

Contributions	**Medium Term (2030)**	**Long Term (2050)**	**Total Costs**
External Support	USD 20.5 billion	USD 25.4 billion	USD 45.9 billion
National Contributions	USD 0.5 billion	USD 1 billion	USD 1.5 billion

The cost breakdown for each sector reveals that the highest cost (USD 11.2 billion to 2050) is required to implement the adaptation programmes in the Agriculture and Food Security sector, followed by the Forest, Biodiversity and Watershed Conservation sector (USD 8.7 billion to 2050) and the Disaster Risk Reduction and Management sector (USD 8.05 billion to 2050). The Tourism, Natural and Cultural Heritage sector is a smaller programme with a budget of USD 1.13 billion to 2050. GESILG and the enabling actions have adaptation programmes with an indicative cost of USD 0.23 billion to 2050.

The government of Nepal will transparently track the adaptation finance received from the various sources. A web-based tool will be developed and maintained to record the support received by the country. Similarly, the information will be used to communicate with development partners and to report to the UNFCCC Secretariat as a part of the transparency framework under the Convention and the Paris Agreement.

The current criteria and procedures used to allocate the climate change budget in the fiscal budget will be appraised as needed and promoted at all levels. Similarly, the Climate Finance Strategy and Road Map developed by the MoFE will also be considered to monitor and evaluate the work on adaptation finance that is expected to facilitate the NAP implementation further.

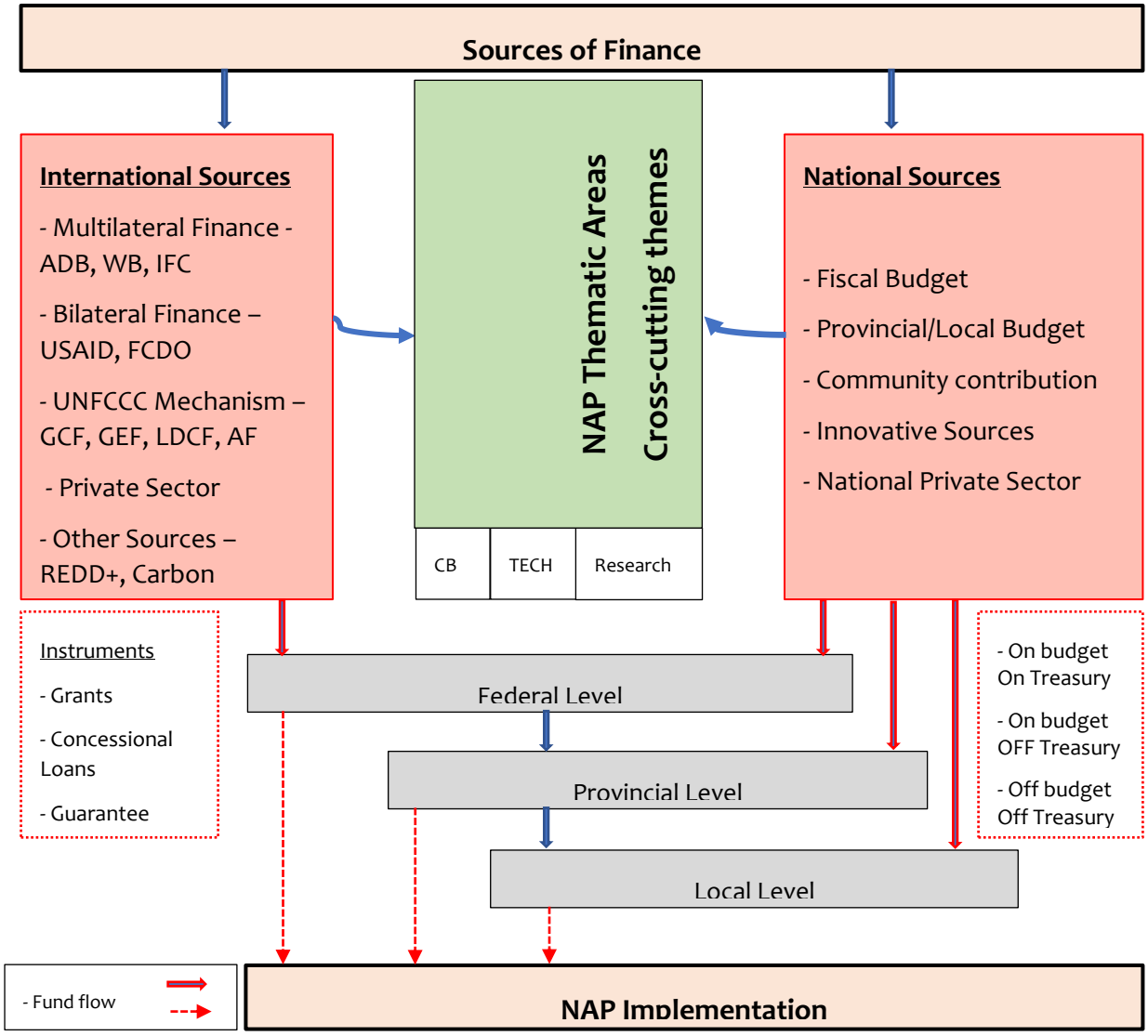


Figure 16: Climate change adaptation financing mechanism in Nepal

9.4 Ministry of Forests and Environment: Roles and Responsibilities

The Ministry of Forests and Environment is responsible for the coordination and implementation of the NAP. As the convening agency on adaptation, MoFE works through the Climate Change Management Division (CCMD) to engage with sector ministries at the federal level, and provincial and local governments. The 2019 National Climate Change Policy commits 80% of mobilized international climate finance for the "implementation of programmes at the local level", meaning MoFE will need to set up planning and reporting channels that enable effective coordination and communication across levels of government. Effective vertical integration requires intentional and strategic linkages between national, provincial, and local adaptation planning, implementation, and MR&R (Dazé, Price-Kelly & Rass, 2016). Moving forward will require identifying which adaptation actions and functions are best undertaken by officials at the three levels, as well as adaptation actions that can be undertaken by non-governmental actors such as civil society organizations and the private sector.

The National Climate Change Policy, 2019 provides guidance on the roles and responsibilities of the MoFE in regard to this NAP and the NAP process. MoFE, with the work being led by the CCMD, will:

- Prepare the NAP and oversee the implementation of adaptation actions.
- Update the NAP every ten years.
- Manage the NAP process, including functional coordination and coordination across working groups and levels of government.
- Lead studies and research on adaptation.
- Formulate and implement laws and standards that are required to incentivize adaptation action.
- Provide guidance and technical support to sector ministries, provincial governments, and local governments, including for the mainstreaming of adaptation in policies, plans, programmes, and budgets.
- Coordinate adherence to the country's international obligations on adaptation, including vulnerability and adaptation inputs to Nationally Determined Contributions, National Communications, and Adaptation Communications, and representing Nepal in international negotiations.
- Increase access to international financial resources for adaptation.
- Provide consent for the implementation of adaptation-related projects that are supported with international assistance.
- Develop a transparency and accountability framework to increase the participation of stakeholders in adaptation action and establish easy access to information on adaptation.
- Collect details of adaptation programs operated by government agencies and the non-governmental sector on an annual basis and publish a report.
- Lead MR&R of the NAP and adaptation actions, working with NPC.

MoFE will work in collaboration with national sectoral ministries, provincial governments, and local governments to develop strategies and coordinate actions to build resilience to climate change, and to optimise opportunities to increase financing for adaptation actions.

MoFE will establish a **Climate Change Data Management, Monitoring and Reporting Centre** (CCDMMRC) at the federal level to facilitate regular monitoring of the NAP process that is guided by the NPC, EPCCMNC, IMCCCC, PEPCCMC, PPPC, DCCCC. This centre will collect and compile all the data related to climate change adaptation implementation from sectoral ministries, intra-governmental agencies, development partners, non-governmental organizations, and private sector entities working at all tiers of government through a dedicated system that includes an online portal and a platform for data sharing. Periodic adaptation status reports and monitoring report will be prepared by this centre to improve understanding of the overall implementation of the NAP.

9.5 Monitoring, Review and Reporting

The adaptation monitoring, review and reporting (MR&R) system will be developed and implemented to generate information for national and international reporting requirements. MR&R needs to demonstrate how adaptation actions improve the ability of people, communities, and systems to cope with climate change. The MR&R system can help the government track the participation of women and vulnerable groups in the NAP process, and identify opportunities to enhance their equitable access to resources and benefits from adaptation interventions. This will require a robust approach to collect gender-disaggregated data and data on social inclusion, and to use this data to demonstrate the different needs and priorities of men, women, and vulnerable groups. The priority action in this sector is the establishment of an MR&R system for adaptation, which will be developed in a phased approach up to 2030. Initial actions will include the development of sectoral MR&R frameworks, including the development of indicators and the collection of baseline information.

9.5.1 Monitoring and Review

An MR&R framework stimulates learning and ensures accountability and transparency by setting clearly defined indicators. A robust M&R framework is instrumental for stakeholders to be able to take appropriate decisions on adaptation priorities and actions; overcome any shortcomings observed in relation to the implementation of the NAP with apt solutions; regulate activities effectively and efficiently to achieve anticipated outcomes; and increase the visibility of the NAP throughout the implementation period by sharing its outcomes at different levels.

Nepal's second NDC includes a priority of developing and operationalizing a NAP M&R and Reporting Framework by 2022 (GoN, 2020b). The NAP MR&R system is also guided by Nepal's 2019 Climate Change Policy that includes a statement of intent about Monitoring and Evaluation (M&E) and proposes the development of a new 'transparency and accountability framework'.

MoFE, in its capacity as climate change focal point, is responsible for reviewing and reporting on the implementation of the NAP. A review of the implementation of the NAP will take place every five years; and the NAP will be updated every 10 years (GoN, 2019c). The review will utilize reports from sector ministries, province governments, and local governments, as well as inputs from stakeholders. The review of the NAP will include reporting on progress indicators, but the emphasis will be on measuring the impacts of the adaptation actions - showing how taking action on adaptation leads to development benefits that are linked to the government's national priorities, including poverty alleviation. This will provide the evidence base for planning and implementing future adaptation programmes, for reporting on adaptation at the national and international levels, and for seeking financial support for adaptation programmes. The reporting and review of the NAP will be part of Nepal's adaptation MR&R system, and will be linked to the NPC's national M&E system and SDG reporting, as well as the system established for tracking of climate finance.

Nepal had undertaken actions to develop an adaptation M&E system before 2015, but these efforts did not result in a workable framework. Nepal was categorized as "NAP M&E development stalled before 2015" in a 2021 inventory of M&E systems (Leiter, 2021). An inventory of M&E systems undertaken in 2014 described Nepal's system as an "indicator

system using a harmonized results-based framework approach piloted for eight major climate change projects, which form the core of Nepal's Climate Change Program." and noted that efforts were underway to mainstream adaptation in the national M&E system (Hammill & Dekens, 2014). Nepal is listed in a UNFCCC (2020b) report as in the process of developing a national adaptation M&E system but independent evidence to verify that progress was made on an M&E system since 2014 could not be obtained (GoN, 2020b). The National Planning Commission (NPC), in 2018, developed a Result Based M&E guideline for the federal level which was designed particularly to track the programme as well as financial aspects of adaptation interventions and implemented Medium Term Expenditure Framework (2013) from 10th National Development Plan.

The National Planning Commission (NPC) developed a result-based M&E guideline for the federal level in 2018, which was designed to track the implementation of adaptation programs and the financial aspects of adaptation interventions (NPC, 2018). The government introduced a climate change budget code in FY 2012-2013 at national level that designated climate change-related financing based on a system using three indicators: "highly relevant," "relevant" and "neutral"[1] (NPC, 2012) and the government is continuing the use of budget code. Ministry of Finance (MoF) has adopted climate change financing framework for integrating climate change and climate finance into national planning and budget processing to ensure that climate finance reaches the vulnerable communities, particularly when climate programmes are directly implemented by line ministries (MoF, 2017). The climate budget code was introduced in the annual budget of fiscal year 2012/13 (NPC, 2013) to track climate public expenditure (NPC, 2013; Shrestha and Gurung, 2020).

On the programmatic front, data gaps, an inadequate legislative framework, not fully functional MR&R mechanisms and limited technical capacity and financial resources for data management are major challenges that impact the development of a national adaptation MR&R system. Nepal will need to address these challenges in order to establish an effective Adaptation MR&R system that monitors and reviews progress on adaptation programmes, on the coordination of the NAP process, and on amounts of financial flows for adaptation.

9.5.2 MRR Approach

Nepal's MR&R system will be based on the principles of simplicity, using an incremental approach, and being cognizant of human and financial resources constraints.

Sector frameworks - Nepal's approach will include the development of sector-wise monitoring and reporting frameworks that include outcome- and impact-level progress indicators for the NAP priority programmes and data sources to establish baselines and measure progress. The sector monitoring and reporting frameworks will help to, (ii) monitor and review the implementation of adaptation priorities and the NAP process, (i) evaluate the effectiveness of adaptation actions and adjust the course of future interventions that impact gender, age and socio-economic classes of peoples differently and (iii) track and report on adaptation finance in the sector. Monitoring and reporting plans will be developed for each adaptation programme to assess progress on the

[1] Sectoral ministries have to prepare typologies and activities leads to contributing climate change (climate change budget code) as developed by Ministry of Agriculture and Livestock Development.

implementation of activities, and adaptation results at the outcome and impact levels. These plans will be based on an agreed-upon format and will assess progress and impacts against the indicators that have been identified and agreed based on available data sources (means of verification). Initial work will focus on one or two priority sectors. As experience is gained, additional sector frameworks will be developed.

Indicator development - Process and outcome level indicators will be identified for the adaptation programmes in the NAP to help measure the results. Indicators will align with existing indicators and targets at the national level (NDC and National Development Plan, NDP) regardless of whether reporting on national goals or major international mechanisms (e.g., Paris Agreement, UN Sustainable Development Goals, Sendai Framework on Disaster Risk Reduction). Efforts will be made to incorporate gender-specific indicators and indicators of gender equality; and to include adaptation indicators that are disaggregated by gender, age, and specific groups to capture the different impacts of adaptation actions on women and men, children, elderly population, and other groups such as persons with disabilities, which will be done over time (using already available data too). Detailed baselines and targets for the performance indicators will be identified by the respective federal stakeholder (government or non-government or private sector). Initial work to develop indicators will be focused on one or two priority sectors where data is most readily available.

Data collection - Data collection methods will depend on the kind of indicators involved. In the context of Box 6, indicators will be based on available data on climate trends, vulnerabilities, economic and social dimensions, and the status of natural resources and land use from various sources (e.g., meteorological data, and vulnerability assessments) to avoid creating an unnecessary burden of data collection and reporting. Primary and secondary data will be collection, including from the National Planning Commission and management information systems (MIS) established in the education and health sectors. Data from censuses and surveys produced by the Central Bureau of Statistics will also be used to measure the indicators. Information obtained from evaluation reports, policy documents, development strategies, project activity reports, training reports and studies as well as research reports will be used as major data sources for monitoring and reporting. Gender data will be incorporated in the NAP MR&R framework to make the process gender-inclusive and the product gender-responsive.

Considering the challenges and gaps in the adaptation M&R system, and in line with indicators and data sources, the M&R team at NPC or MoFE as well as TWG or overarching committee established in the MoFE will decide what data and information to collect in order to measure and assess progress during the planning phase. Quantitative tools such as population censuses, household surveys, and semi-structured questionnaires as well as qualitative tools such as focus group discussions, key informant interviews, participant observation, SWOT analysis, case studies, and lessons learnt will be used.

Roles and responsibilities - The federal, province and local governments have responsibilities for M&E of adaptation (Box 7). The National Climate Change Policy (2019c,

Section 10) indicates that provincial and local governments are responsible for carrying out M&E of adaptation programs within their respective jurisdictions. The Inter-Ministerial Climate Change Coordination Committee will provide oversight and be responsible for reviewing progress against adaptation targets.

Box 7: Role of province and local levels

a. Province governments

- Formulate provincial policy, directives, standards and plans in conformity with this policy and implement or cause to be implemented them.
- Carry out or cause to be carried out M&E of climate change mitigation and adaptation programs conducted within the province.
- Coordinate with federal and local levels to formulate and implement programs and projects related to climate change

b. Local governments

- Formulate policies, directives, standards and plans at local level in conformity with this policy and implement or cause to be implemented them.
- Conduct climate change mitigation and adaptation programs in coordination and collaboration with the concerned agencies under the federal and provincial governments, NGOs, private sector, educational institutions and other stakeholders.
- Carry out M&E and documentation of programs and projects conducted at local level.
- Raise public awareness on climate change.
- Form and mobilize 'Youth Volunteer Committees' for climate induced disaster management.

As per Nepal's Government Business Allocation Regulation (2017), at the national level, the Climate Change Management Division (CCMD), MoFE is the designated focal ministry to coordinate affairs related to climate change under the facilitation of the Climate Change Management Division (CCMD). As such, MoFE is responsible for the MR&R framework and MR&R of NAP activities at the federal level. This includes establishing, managing and staffing the Climate Change Data Management Monitoring and Reporting Centre (CCDMMRC - described below). All national ministries and agencies (such as CCMD/MoFE, sectoral ministries, intra-government agencies, Department of Hydrology and Meteorology, and Department of Mines and Geology) will be responsible for monitoring, reporting and reviewing their respective adaptation projects and submitting reports to the CCDMMRC.

At the Provincial level, the Ministries for Forests and Environment will be responsible for monitoring and reporting on the implementation of adaptation activities. Sectoral ministries would share the data related to climate change to MoFE for data consolidation. The Science, Environment and Climate Change Division of these Ministries will compile data and information on adaptation projects/programs implemented by their ministry, relevant sectoral ministries, international and national NGOs, the private sector, UN agencies, and bilateral and multilateral agencies. They will also compile information submitted by local governments, and forward the report to the CCDMMRC.

At the local level; it is proposed that the Forest, Environment and Disaster Management Section[2] be responsible for monitoring of adaptation activities implemented at the local level by local government departments, user's groups (forest, agriculture and water), community-based organizations, the private sector, international and national NGOs, UN agencies, and bilateral and multilateral agencies. A Local Level Climate Change Coordination Committee (chaired by Mayor/Chairperson) will provide policy guidance to the local government. The District Climate Change Coordination Committee chaired by the District Coordination Committee Chief will compile all data about local level adaptation

[2] Or the section responsible for overseeing forest and environment related programs.

activities and forward the report to the provincial Science, Environment and Climate Change Division through the specified online platform.

Communication between the levels of government is guided by the Nepal's Government Business Allocation Regulation (2017), and MoFE will need to work within this regulation. MoFE has no direct line of communication with the province and local levels of government, and there is no established mechanism for the direct flow of information from the local level to the district, provincial and federal governments (except in the agricultural sector). As such, MoFE will need to form partnerships with relevant ministries to ensure that the transfer of information and data on adaptation can take place in a timely manner. MoFE will need to communicate with provincial ministries through the provincial Office of the Chief Minister and Council of Ministers; and can work through the federal Ministry of Home Affairs that has a mandate to communicate directly with district administration offices. In regard to communicating with local government, MoFE may need to work through the federal Ministry of Federal Affairs and General Administration, which has a mandate to communicate directly with local governments. At the provincial level, district coordination committees can communicate directly with municipalities, meaning that these committees can be a nodal agency to collect and compile information and data on adaptation from the local government level and then forward the information to provincial ministries responsible for climate change.

9.5.3 Climate Change Data Management Monitoring and Reporting Centre

The Climate Change Data Management Monitoring and Reporting Centre (CCDMMRC) will be established at the federal level, and will be responsible for compiling and analyzing adaptation data and information collected across the entire country (see Figure 17). This center will collect and manage climate change-related data and information, and ensure the data is publicly accessible using an online platform. The center will be responsible for compiling the monitoring reports on adaptation action submitted by the provincial ministries and technical working groups at the federal level. In addition, development partners will be encouraged to report on financial flows for adaptation, and the private sector will be encouraged to report on their adaptation actions. This center will only collect data and information on adaptation but not mitigation and GHG emissions related data. Until now, NPC is not collecting adaptation data from the provinces and local government. MoFE will work with NPC and collaborate with efforts to collect data and information on the SDGs, particularly of SDG13.

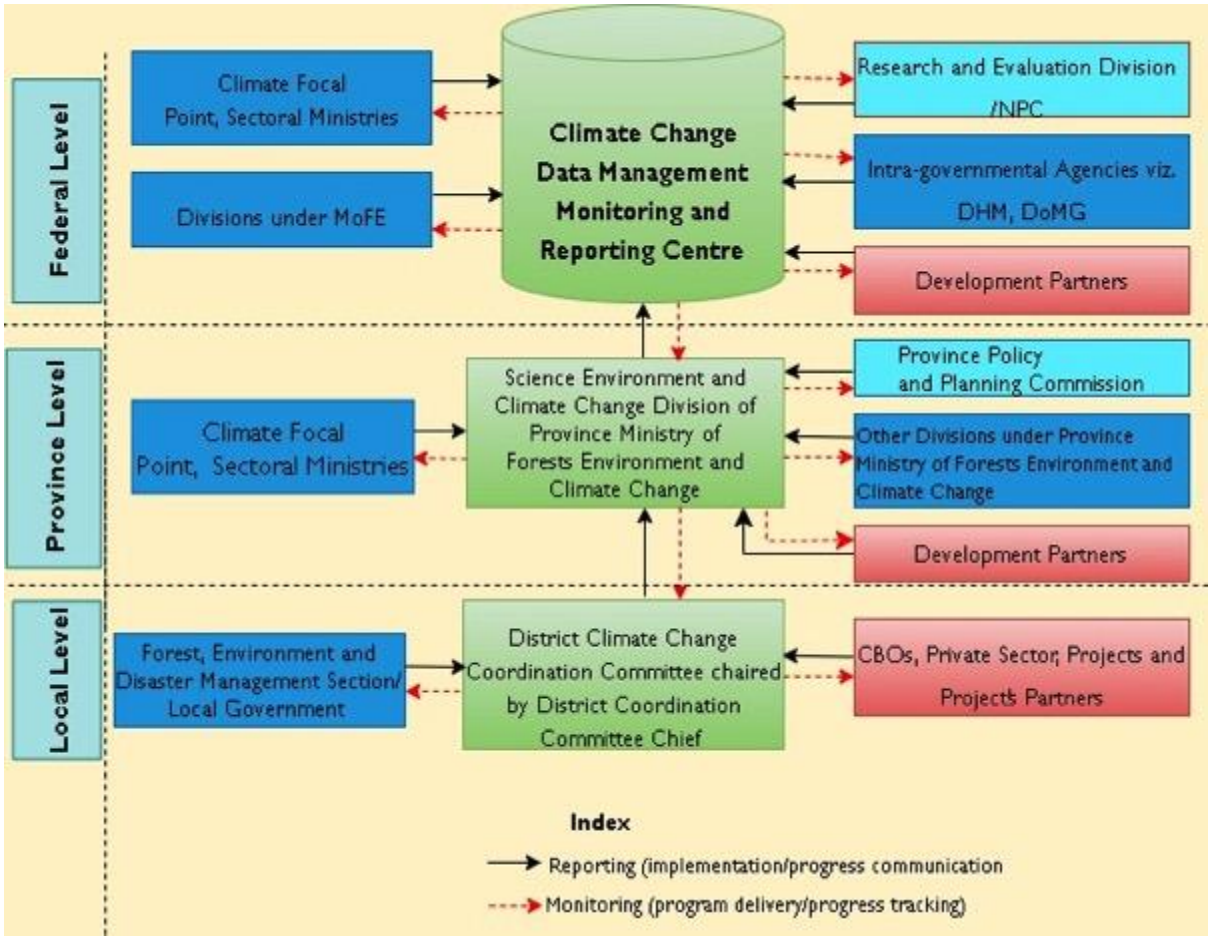


Figure 17: MRR framework for Nepal's NAP process

Note: The forests and environment ministry at the provincial level is denoted by "MoITFE" (Ministry of Industry, Tourism, Forest and Environment) in the chart. However, the exact name of the ministry varies with province. This applies for all provincial ministries.

The CCDMMRS online platform will be developed in a manner that can accommodate data with different structures and formats and pulled from different sources.

Online platform

The climate change data management monitoring and reporting system (CCDMMRS) online platform will be developed in a manner that can accommodate data with different structures and formats and pulled from different sources. In other words, it will have a database structure that is scalable to heterogeneous data sets of larger volumes. The database structure will be designed such that the requirements for the data catalog including metadata-based searching, various file formats, and compatibility with the existing data structure are supported. The bulk of the data processing will be done by the backend server, which will also be responsible for data validation and transforming existing data. The frontend interfaces will present visualizations with user interactions. It will include elements such as an interactive user dashboard with maps, visualizations, and filters; wide-ranging functionality; offline data retrieval service; layers that allow checking the values of parameters against the specification to detect misuse, and so forth. The entire process of development will also be driven by the quality control process. Unit testing, validation layers, code review, coverage and complexity check, and continuous feedback and fixes will be performed to ensure the product fulfills various functional requirements and is error-free with well-maintained code (Figure 18).

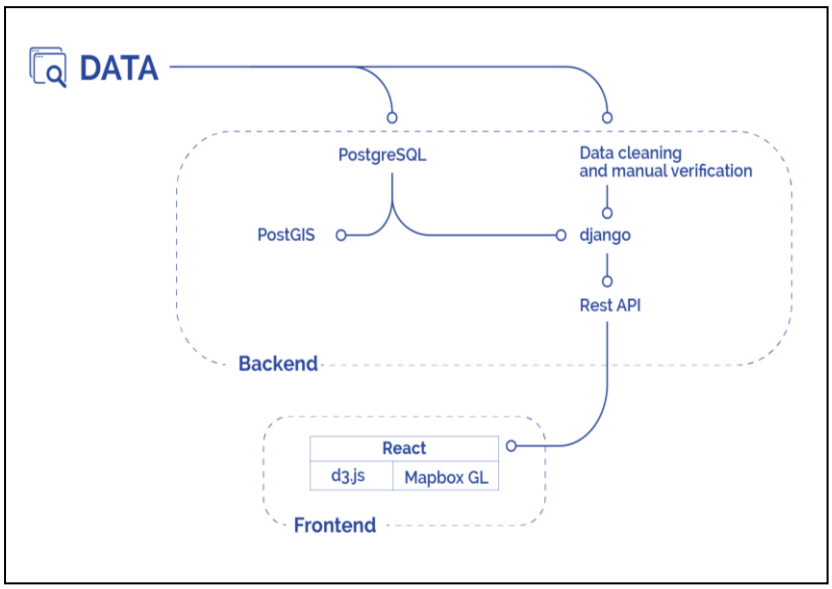


Figure 18: A Diagram of proposed online platform

9.5.4 Reporting on Adaptation

The data and information collected and compiled by the CCDMMRC will be used to prepare reports on adaptation that meet reporting obligations at the national and international level.

MoFE in its capacity as climate change focal point is responsible for reviewing and reporting on the implementation of the NAP. A review of the implementation of the NAP will take place every five years, and the NAP will be updated every 10 years. The review will utilize reports from sector ministries, provincial governments, and local governments, as well as inputs from stakeholders. Important stakeholders include women, youth, Indigenous Peoples, and other disadvantaged groups; private sector; and academia. To facilitate this mandated reporting, the following activities will take place:

- **Inception phase (end of 2022):** This first phase will focus on the identification of indicators and collection of baseline data for select priority adaptation programmes in the NAP, with an initial focus on one sector.
- **Mid Term Assessment (end of 2026):** The emphasis of the second phase will be monitoring and review of NAP adaptation programmes for the period 2022 to 2026. The report will include an assessment of progress, preliminary analysis of the impacts of adaptation actions with a focus on one sector, and recommendations on the design of the remaining tenure of NAP (2027-2031).
- **External Review (end of 2031):** This phase includes a review of the implementation of the NAP for the first 10-year period that will be undertaken by independent third parties. This report will inform the NDC and international reporting, and help to shape the second-generation NAP to be implemented from 2032 onward.

The collection of data and information on adaptation should be timed to facilitate meeting the reporting requirements of the UNFCCC and the enhanced transparency requirements set out in the Paris Agreement. Nepal, as an LDC, is not required to meet the UNFCCC submission timetables, but will strive to submit its national communications (that include a detailed section on adaptation) every four years, and its Adaptation Communication or a

Biennial Transparency Report with an adaptation section every two years beginning in 2024.

Resource Requirements

Human, technical and financial resources are required to operationalize the adaptation MR&R system. CCMD/MoFE will manage the staff of the CCDMMRC and will need to prepare a capacity building plan for new staff members that are engaged to implement the MR&R process. In terms of human resources, data officers and information officers working at all levels of governance need to be trained on data collection, data mining, synthesis and analysis of information from an adaptation perspective.

Hardware and software are required; and service providers will be procured to establish and run the MIS and software. The staff will need to prepare knowledge products, such as an MR&R manual and stepwise guidelines, to assist officers at all levels of government in using the system. To ensure financial security, there needs to be a provision of allocating at least 10% of the cost of each of the operational project under the NAP to prepare robust M&R and reporting systems.

10. NAP ACTION PLAN

Effective implementation of the 64-adaptation programmes is critical in building a climate resilient Nepal. Of the 64 adaptation programmes, there are 35 strategic adaptation programmes that are targeted to implement by 2030 and tagged as SM: Short (until 2025) and Medium (until 2030). Remaining 29 adaptation programmes are aimed for implementation between 2030 and 2050 and until 2050, and tagged as ML (Medium and Long) and SML (Short Medium and Long) respectively. In the case of the SML, the full-fledged programme development and resource allocation can start prior to 2030. The adaptation programmes mentioned in the NAP document are of multiyear nature. The time duration in the implementation of the adaptation programmes is mentioned as 10 years for SM programmes and 15 years for ML and SML programmes.

Implementation of the adaptation programmes could be through development of standalone project financed by international sources and or integration of adaptation programmes in the regular development plans or ongoing projects in the country and financed through both national and international, and public and private sources.

The following table presents a tentative timeline of action to further the implementation of the adaptation programmes.

Table 14: Timeline of Action (NAP Implementation)

<table>
<tr><th rowspan="2">Programmes</th><th rowspan="2">Time Frame (SML)</th><th colspan="13">Timeline of Action</th></tr>
<tr><th>2022</th><th>2023</th><th>2024</th><th>2025</th><th>2026</th><th>2027</th><th>2028</th><th>2029</th><th>2030</th><th>2031-2035</th><th>2036-2040</th><th>2041-2045</th><th>2046-2050</th></tr>
<tr><td>AFS1, AFS2, AFS3, AFS5, AFS7, AFS8, FBWC1, FBWC2, FBWC3, FBWC8, WRE1, WRE2, WRE3, WRE4, WRE8, RUS1, RUS3, ITPI2, TNCH1, TNCH2, TNCH4, TNCH6, TNCH7, TNCH8, HDWS2, HDWS3, HDWS4, HDWS5, HDWS7, DRRM4, GESILG1, GESILG4, EA1, EA2, EA3</td><td>SM (35) (until 2030)</td><td colspan="2">Concept scoping and internal approval (approval my lead ministry and ministry of finance)</td><td>Full project design, donor approved</td><td>Final Project approved by ministry of finance</td><td>Project inception</td><td colspan="5">Full fledge implementation</td><td></td><td></td><td></td><td></td></tr>
<tr><td>DRRM1, DRRM3, DRRM6, FBWC4, FBWC5, FBWC6, FBWC7, FBWC9, HDWS1, HDWS6, ITPI1, ITPI3, ITPI5, TNCH3, TNCH5, WRE7, RUS2,</td><td>ML (17) (between 2030-2050)</td><td colspan="3"></td><td colspan="2">Concept scoping and internal approval (approval by sectoral lead ministry and ministry of finance)</td><td>Full Project design,</td><td>Final project approval by ministry of finance</td><td>Project inception</td><td colspan="4">Full fledge implementation</td></tr>
<tr><td>AFS4, AFS6, AFS9, FBWC10, FBWC11, ITPI4, DRRM2, DRRM5, GESILG2, GESILG3, WRE5, WRE6</td><td>SML (12) (until 2050)</td><td colspan="6"></td><td>Concept design, (approval from sectoral lead ministry and ministry of finance</td><td>Full project design</td><td>Fund access, final project approval by ministry of finance</td><td colspan="3">Project Inception and full fledge implementation</td></tr>
</table>

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