Strengthening Climate Rationale: Enhancing Access to Climate Finance

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Preface

Why this Resource Book?

As a mountainous country with a relatively low level of development — and lying between two large and rapidly industrializing neighbours — Nepal is acutely vulnerable to climate change. Nepal needs to substantially increase the flow of financing to address its significant and growing climate challenges. Nepal's National Adaptation Plan (NAP) estimates that it will cost USD 21 billion to adapt to climate change by the end of this decade, rising to over USD 47 billion by mid-century, of which the Nepalese government has pledged USD 1.5 billion. Mobilizing such a large source of external funding requires going well beyond the usual consultancy-driven model of externally developed climate finance proposals, to one of broadly strengthening internal capacities and knowledge to internally develop fundable concept notes and proposals to the Green Climate Fund (GCF) and other multilateral funders, as well as to bilateral funders. Central to successful climate finance proposals is the development of a strong, evidence-driven climate rationale.

This resource book, *Enhancing Access to Climate Finance through Strengthening Understanding of the Climate rationale,* is designed to lessen the gap between the expectations and requirements of multilateral climate financiers and the knowledge and capacities of national and sub-national (government agencies from central, provincial to the local governments) stakeholders to develop an evidence-base case for funding adaptation and mitigation. The resource book begins with an overview of the need to align climate initiatives with Nepal's climate-change policy context. It then delves into key processes and data needs for developing a strong climate rationale for adaptation and mitigation, and provides examples of the use of climate rationals (strengths and weaknesses) in recent and ongoing Nepal climate projects. The resource book concludes with a review of climate rationale needs and priorities within Nepal's Nationally Determined Contributions (NDC) and National Adaptation Plan (NAP) policy frameworks.

The development of this resource book is supported by the Least Developed Countries *(LDC) University Leadership for Catalyzing Climate-Adaptation Finance* (UNI-LEAD) project, a GEF-funded, UNEP-administered, and START-executed project, in collaboration with Climate Analytics, the LDC University Consortium on Climate Change, and the LDC Group on Climate Change. This resource book was developed by the Nepal Climate Centre, a think-tank devised through the UNI-LEAD project and housed at Pokhara University in Kathmandu. The resource book development was made possible from contributions, within Nepal, of representatives

of academia, government, the private sector, non-government organizations, and individual experts. The process was iterative in drafting the chapters, outline of the contents and success stories of different climate change adaptation and mitigation processes. After agreeing upon the outline of the contents, individual or team of experts were allocated in writing the chapters. Periodic meetings were held at frequent intervals, with presentations of the chapters made in meetings (physical plus virtual hybrid), feedback was sought, incorporated and sent for respective expert reviewers (internal to the think-tank and from Climate Analytics). The resource book will undergo further validation (in late 2024 and early 2025) through trainings at central and provincial levels aimed at developing climate rationale to support climate finance concept notes and proposals. The learning from that process will inform subsequent further improvement of the resource book.

Acknowledgements

Nepal Climate Initiative (NCI) a dedicated Think Tank on climate change housed within the **School of Environmental Science and Management (SchEMS)**, affiliated to Pokhara University, is committed to advancing climate action by harnessing Nepal's domestic expertise. NCI provides technical, academic, and research support to climate-related programs, serving as a vital platform for addressing the nation's climate challenges.

The Think Tank's primary mission is to build Nepal's capacity to access climate finance and implement effective adaptation strategies. Departing from the reliance on consultancy-led project development dominated by expertise from northern countries, SchEMS–NCI prioritizes the development of endogenous capabilities. By fostering locally driven solutions, it aims to promote sustainable and self-reliant climate action, empowering Nepal to lead its journey toward climate resilience and adaptation.

The University Leardship for Catalyzing Climate Adaptation Finance (UNI-LEAD) Project, building on the foundations established by the United Nations Development Programme, and United Nations Environment Programme (UNDP-UNEP) National Adaptation Plan Global Support Programme (NAP-GSP) funded by the Global Environment Facility (GEF), stands as an initiative to strengthen climate adaptation capacities in Least Developed Countries (LDCs). Within this framework, SchEMS-NCI has emerged as one of the four think tanks supported under the framework of the LDCs Universities Consortium on Climate Change (LUCCC).

The UNEP-UNDP, GEF, START, and LUCCC have played an essential role in advancing our mission to promote locally driven and sustainable climate action through their invaluable support and collaboration. Furthermore, The START and Climate Analytics provided technical and editorial contributions in the preparation of this resource book under the UNI-LEAD Project.

We acknowlege to the Government of Nepal, Ministry of Forests and Environment for their guidance in preparing this resource book and for linking the inputs to Nepal's ongoing climate change initiatives. Moreover, the Ministry of Finance, Alternative Energy Promotion Center, World Wide Fund for Nature (WWF)-Nepal, Practical Action, Prakriti Resource Centre, International Union for Conservation of Nature (IUCN), and other institutions and individual experts had participated in workshops and contributed to prioritizing the issues addressed in this resource book.

Your contributions and collaboration have been invaluable in shaping this resource, which we hope will play a pivotal role in advancing Nepal's efforts toward climate resilience and sustainable development.

Acronyms and Abbreviations

ADB	Asian Development Bank
AE	Accredited Entities
AFOLU	Agriculture, Forestry, and Other Land Use
ARA	Adaptation Research Alliance
BASE	Building Approaches to Fund Local Solutions with Climate Evidence
BCM	Baseline and Credit Methodology
CBA	Cost Benefit Analysis
CCS	Carbon capture and storage
CEA	Cost Effectiveness Analysis
CEO	Chief Executive officer
CFM	Climate Finance Management
CFSC	Climate Finance Steering Committee
CO_2	Carbon dioxide
CO	Carbon monoxide
COP	Conference of Party
CSA	Climate Smart Agriculture
CSO	Civil society organizations
CVCA	Climate Vulnerability and Capacity Analysis
DFID	Department for International Development
DHM	Department of Hydrology and Meteorology
DRRM	Disaster Risk Reduction Management
EFC	Ethics and Finance Committee
EFs	Emission Factors
EVs	Electric Vehicles
ESS	Environmental and Social Standards
GCF	Green Climate Fund
GDP	Gross Domestic Products
GEF	Global Environmental Facility
GESI	Gender Equity and Social Inclusion
GHG	Greenhouse Gas

GIS	Geographic Information Systems
GLOFs	Glacial Lake Outburst Floods
GRB	Gandaki River Basin
HCF	Hydrofluorocarbon
IAMs	Integrated Assessment Models
ICB	Improved Cattle Breed
ICIMOD	Internation Center for Integrated Mountain Development
IECCD	International Economic Cooperation Coordination Division
IPCC	Intergovernmental Panel on Climate Change
IPPU	Industrial Processes and Product Use
ITAP	Independent Technical Advisory Panel
ITPI	Industry, Transport and Physical Infrastructure
IUCN	International Union for Conservation of Nature
KPI	Key Performance Indicators
LCA	Lifecycle Assessment
LCB	Local Cattle Breed
LDCF	Least Developed Countries Fund
LTS	Long-Term Strategies
MCA	Multi-Criteria Analysis
MoFE	Ministry of Forests and Environment
MOSTE	Ministry of Science, Technology and Education
MRV	Measurement, Reporting, and Verification
M&E	Monitoring and Evaluation
MW	Mega watt
NAP	National Adaptation Plans
NAP-GSP	National Adaptation Plan Global Support Programme
NAPA	National Adaptation Programmes of Action
NAMaSTE	Nepal Ambient Monitoring and Source Testing Experiment
NDA	National Designated Authority
NDC	Nationally Determined Contributions
NGOs	Non-Governmental Organizations
NGI	National Greenhouse Gas Inventory
NIE	National Implementation Entity
NO_x	Nitrogen oxides
O_3	Ozone

PES	Payment for Ecosystem Services
PFG	Programme Formulation Grant
PIF	Project Identification Form
PM	Particulate Matter
PPG	Project Preparation Grant
PPRC	Project and Programme Review Committee
RCP	Representative Concentration Pathway
REDD+	Reducing Emissions from Deforestation and Forest Degradation
RMF	Results Management Framework
SCCF	Special Climate Change Fund
SDG	Sustainable Development Goals
SIDS	Small Island Developing States
SSPs	Shared Socioeconomic Pathways
TC	Technical Committee
UNICEF	United Nations International Children's Emergency Fund
UNDP	United Nations Development Programme
UNEP	United Nations Environment Programme
UNFCCC	United Nations Framework Convention on Climate Change
UNI-LEAD	University Leardship for Catalyzing Climate Adaptation Finance
USAID	United States Agency for International Development
VOCs	Volatile Organic Compounds
VRA	Vulnerability and Risk Assessment
VOCs	Volatile Organic Compounds
WB	World Bank
WMO	World Meteorological Organization
WWF	World Wide Fund for Nature

Resource Book User Guide Questions

This resource book **Strengthening Climate Rationale** *Enhancing Access to Climate Finance* serves as a comprehensive resource to stakeholders interested in developing an evidence-base case for funding adaptation and mitigation interventions to address specific climate change challenges facing Nepal.

This resource book – accessible for all levels of exposure to and experience with climate rationale – is designed to progressively articulate the fundamentals and more intricate considerations for the design, development, and delivery of rationale that are well-aligned with the expectations and requirements of multilateral climate funders.

This User Guide aims to support readers in navigating and comprehending the extensive knowledge available in the resource book. The Guide is structured in the form of key questions that the resource book engages with, alongside a series of short answers and guidance towards where the topics are discussed in-depth in the resource book. Readers can therefore utilize this Guide as an initial resource for delving into the vast content covered in the accompanying resource book.

Key Guiding Questions:

1. How is climate change manifesting in the context of Nepal? what are the country's key priorities for addressing the effects of climate change?

Nepal is among the most climate-sensitive countries globally, with high exposure to extreme weather events and substantial vulnerability. Nepal's pronounced vulnerability stems from its diverse and complex climatic conditions, shaped by extreme elevation variations, monsoon patterns, westerly disturbances, and steep terrain. These factors create a challenging environment for managing climate impacts, further complicated by limited meteorological data, at useful scales, for analysing trends in temperature and precipitation.

The Himalayan region of Nepal is experiencing rapid warming, with temperatures rising by 0.3°C per decade since the 1970s (Thakuri et al. 2019). This warming is causing significant glacial melting, exemplified by a 15% mass loss in the Langtang Glacier between 2000 and 2015. The repercussions are widespread, affecting systems and sectors, including forests, biodiversity, agriculture, energy, and human health, and leading to severe climate-induced disasters such as

floods, landslides, droughts, and forest fires. Nepal's key adaptation and mitigation priorities for climate action, reflected in their Nationally Determined Contributions (NDC) and NAP frameworks, are aligned with these increasing vulnerabilities.

For further information about this topic: Chapter 1, in particular Section 1.1 further articulates the Nepal climate policy context, and Section 1.2 outlines key priorities – especially for adaptation – identified in Nepal's key climate change documents.

2. What is a climate rationale?

A climate rationale is an in-depth analysis and assessment of climatic, bio-physical, and social data and information that provides a logical and evidence-driven approach to concretely addressing climate adaptation and mitigation goals. The climate rationale is the cornerstone of justifying a climate change project's necessity and its effectiveness in addressing core impacts and threats. It essentially explains the "why" behind the initiative, linking specific climate threats faced by a community or region to proposed solutions for mitigation or adaptation (GIZ & World Bank, 2020).

The interventions aimed at addressing climate change needs to be grounded in robust and comprehensive evidence-based science. A climate rationale provides the scientific underpinning for evidence-based climate action decision-making, and development of the theory of change for activities related to climate finance. It ensures that the set of causal linkages between climate and climate impacts and between action and societal benefits is fully grounded in the best available climate data and science concerning the most relevant climatic factors (GCF, 2022).

For further information about this topic: The introduction in Chapter 2 details the fundamentals of a climate rationale and its importance in furthering evidence-based decision-making and interventions to address the vulnerabilities and emissions mitigation commitments identified in Nepal.

3. Why is a climate rationale important? how can in support efforts to respond to climate change in Nepal?

- Section 2.1 of the Resource Book details the benefits of developing robust climate rationale to inform project proposals and priorities. Among others, they include:
- Enhancing responsiveness to Nepal's climate vulnerabilities by directly aligning interventions to identified challenges;
- Alignment with national policies and priorities;
- Enhancing adaptation and resilience interventions by ensuring their grounding in scientific best-practices;
- Improving policy implementation by providing an evidence basis upon which identified gaps in current policies and strategies can be more effectively addressed; and

- Accessing international, multilateral, and bilateral climate funds to increase the funding base available to address climate needs in Nepal.

Figure 2.2 also outlines the broad elements and processes of a climate rationale that can ultimately lead to enhanced outcomes for climate change action.

4. What are the key steps and elements of a climate rationale for adaptation-specific interventions? what are the main challenges that can be expected when developing this type of rationale in the context of Nepal?

Climate rationale vary extensively based on their objectives and thematic focus, and accordingly the science underpinning adaptation- and mitigation-specific project proposals differs. Consequently, the content and approach of the rationale must be tailored accordingly.

There are four key elements for robust climate rationale oriented around adaptation activities. They are:

- Identification of vulnerabilities and risks of the climate impacts, including the systems, groups, sectors, and subregions at risk from these hazards;
- Explanation of how the proposed response will reduce risk exposure or vulnerabilities;
- Demonstration of how the proposed interventions (and identified vulnerabilities) align with national plans, policies, and targets identified in crucial documents such as National Climate Change Policies, Nationally Determined Contributions (NDCs), National Adaptation Plans (NAPs), and sector-specific plans;
- Articulation of Monitoring and Evaluation (M&E) arrangements to highlight how the impact of the proposed solutions will be assessed.

For further information about this topic Chapter 3 of the resource book provides more detailed explanations of these four elements, including the type of information and key considerations that should be covered under them when developing a climate rationale. Sections 3.1 to 3.5 cover each of the elements, while Sections 3.6 to 3.8 provide more details on the tools and concepts that are crucial for maintaining a science-based approach to adaptation climate rationale.

Section 3.9 goes into further details regarding the aforementioned four elements, disaggregating them into three key steps: i) desk research/literature review on climate impacts and vulnerabilities; ii) application of a Vulnerability and Risk Assessment (VRA); and iii) the prioritization of adaptation actions. The section provides extensive details on how to engage with each step, as well as the tools and potential resources that can support prospective climate rationale developers to engage in the process most robustly.

5. What are the key steps and elements of a climate rationale for mitigation-specific interventions? what are the main challenges that can be expected when developing this type of rationale in the context of Nepal?

Climate change mitigation focuses on reducing GHG emissions and their concentrations in the atmosphere through a variety of strategies. A rationale focused on mitigation interventions must therefore apply and evidence-based approach that robustly covers emissions-specific considerations. The four key elements of a climate rationale for mitigation interventions are:

- Formulation of the scientific basis for a climate rationale
- Identification of the emissions trajectory for the relevant sectors, and potential pathways to shift projected trajectories towards reduced emissions
- Identification and prioritization of mitigation interventions, including through tools such as multi-criteria analyses (MCAs)
- Integration of proposed interventions into wider policy and decision-making frameworks, including through alignment with existing plans and strategies

For further information about this topic: Section 4.3 of the Resource Book explores these elements in further detail, while Section 4.4 provides a list of guiding questions to further support prospective climate rationale developers in articulating the key elements of a mitigation-specific rationale. Lastly, Section 4.5 of the Resource Book articulates 10 key steps that provide extensive details on how the elements of a mitigation-specific rationale can be developed in a progressive and efficient manner.

6. What are the key considerations when developing a climate rationale for a project proposal (especially those submitted to multilateral climate funders)?

Multilateral climate funders such as the Green Climate Fund (GCF) explicitly require project proposals to integrate robust climate rationale. Approved and successful proposals must include rationale that meet the funders' stated minimum conditions.

For further information about this topic: Section 5.2 of the Resource Book provides a detailed summary of the different key conditions and considerations that are expected for proposals submitted to the GCF in particular. These include the development of vulnerability assessments, identification of historical climate impacts, alignment with the GCF's 8 Strategic Impact Areas, stakeholder engagement and Gender and Social Inclusion (GESI) considerations, alignment with Environmental and Social Safeguards (ESS), and articulation of quantified project benefits and co-benefits (for mitigation, adaptation, and sustainable development). There are a range of other conditions and elements shared in the Section, alongside details on what to include in them. This is complemented by Section 5.3, which details the steps for developing and submitting a GCF project concept note, alongside key considerations for enhancing climate rationale that are tailored to the GCF processes and minimum expectations. Section 5.3.6 and Section 5.4 share similar insights for proposals to be developed for the Global Environment Facility (GEF) and Adaptation Fund (AF).

7. Are there any strong examples of climate rationale within successful/approved funding proposals? What do they get right?

Chapter 6 of the Resource Book highlights project proposals that successfully received funding and had particularly noteworthy climate rationale. The three case studies selected primarily focus on adaptation interventions, including community resilience, flood management, and agricultural adaptation. The chapter notes various noteworthy elements that made the climate rationale successful, including the use of vulnerability and risk assessments (VRAs), leveraging of robust and diverse data sources (including models and stakeholder consultations), alignment with national policies and strategies, and the promotion of interventions that are inclusive and gender sensitive. Further details on the content of the rationale, as well as key constraints and common challenges faced by the respective projects have been covered in this chapter.

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Chapter 1

Nepal Climate Policy Context for Climate Rationale Development

Nepal is among the most climate-sensitive countries globally, with high exposure to extreme weather events and substantial vulnerability. This is reflected in its rankings on global indices such as the Global Climate Risk Index and the ND-GAIN index, which highlight both significant exposure and limited readiness to tackle climate impacts. The United Nations International Children's Emergency Fund (UNICEF) climate risk index also points to the heightened vulnerability of children, impacting their nutrition, education, and health. Nepal's pronounced vulnerability stems from its diverse and complex climatic conditions, shaped by extreme elevation variations, monsoon patterns, westerly disturbances, and steep terrain. These factors create a challenging environment for managing climate impacts, further complicated by limited meteorological data for analysing trends in temperature and precipitation.

The Himalayan region of Nepal is experiencing rapid warming, with temperatures rising by 0.3°C per decade since the 1970s (Thakuri et al. 2019). This warming is causing significant glacial melting, exemplified by a 15% mass loss in the Langtang Glacier between 2000 and 2015. The repercussions are widespread, affecting sectors such as forests, biodiversity, agriculture, energy, and human health, and leading to severe climate-induced disasters like floods, landslides, droughts, and forest fires.

This chapter explores key considerations for aligning climate projects with NDC and NAP policy priorities, provides a description of sectoral priorities within these two policy frameworks, and how the climate rationale is situated with the NDC and NAP.

1.1 Considerations for achieving alignment between policy and action

Aligning climate projects and initiatives with Nepal's national climate goals and priorities[1] is crucial for ensuring cohesive and effective climate action across the country. Climate change policies in Nepal are mostly adaptation-centric (Shrestha & Dhakal, 2019) and recently there are changes in policy paradigms to emphasize mitigation alongside adaptation (Baniya et al., 2021).

1 For example, the Environment Protection Act, 2017 (EPA, 2019), Climate Change Policy, 2019 (GoN, 2019), Sustainable Development Goals 2015-2030 (NPC, 2016), NDC and NAP.

This alignment not only ensures that efforts contribute meaningfully to national targets but also increases the likelihood of securing funding and support for implementation. The following guidance outlines key strategies for demonstrating this alignment, particularly with Nepal's NDCs and NAP.

Demonstrating alignment with Nepal's national climate goals and priorities requires a comprehensive approach that goes beyond superficial references to national documents. It involves a deep integration of national strategies into project design, clear linkages to specific targets and priorities, use of nationally recognized methodologies, engagement with relevant institutions, and contribution to national monitoring efforts. By following this guidance, projects can ensure they are not only aligned with but actively contributing to Nepal's climate action agenda, enhancing the country's overall response to the challenges of climate change.

Firstly, it is essential to establish a clear link between project objectives and the specific targets outlined in Nepal's NDC and NAP. This involves a thorough review of these national documents to identify relevant sectoral goals and priorities. For instance, if a project focuses on renewable energy, it should explicitly demonstrate how it contributes to Nepal's NDC target of generating 15,000 MW of clean energy by 2030. Similarly, adaptation projects should show alignment with the priority areas identified in the NAP, such as climate-resilient agriculture or water resource management. Project proposals should include a dedicated section that maps out these linkages, providing quantitative targets where possible and explaining how the project's outcomes will directly contribute to national goals.

Incorporating national climate strategies into project design is another crucial aspect of demonstrating alignment. This means going beyond simply referencing national documents and actually integrating their approaches and methodologies into the project's framework. For example, if Nepal's climate strategy emphasizes community-based approaches to adaptation, projects should incorporate this principle into their design, demonstrating how local communities will be engaged in planning and implementation. Similarly, if the national strategy prioritizes nature-based solutions, projects should show how they are supporting ecosystem services for climate resilience or mitigation. This integration should be evident throughout the project design, from the overall approach to specific activities and indicators.

Aligning with sector-specific climate policies and plans is equally important. Nepal has developed various sectoral strategies that complement its overarching climate goals, such as the National REDD+ Strategy, the National Energy Efficiency Strategy, and the Climate Change Health Adaptation Strategies and Action Plans. Projects should demonstrate how they align with and contribute to these sector-specific plans. This might involve referencing specific objectives or actions from these documents and explaining how the project will support their implementation. It's also important to show awareness of any recent updates or revisions to these sectoral plans, ensuring that the project aligns with the most current national priorities.

Demonstrating contribution to overall national climate resilience is another key aspect of alignment. This involves showing how the project fits into the broader context of Nepal's climate action and sustainable development efforts. Projects should articulate how their outcomes will enhance the country's overall adaptive capacity or contribute to long-term emissions reduction pathways. This could include explaining how the project addresses key vulnerabilities identified in national assessments, how it builds on existing initiatives, or how it fills critical gaps in the national climate response. It's also valuable to demonstrate how the project contributes to multiple national priorities simultaneously, such as addressing both mitigation and adaptation goals or contributing to both climate resilience and sustainable development objectives.

The use of nationally recognized methodologies and data sources is crucial in demonstrating alignment. Projects should utilize climate projections, vulnerability assessments, and emissions scenarios that are officially recognized or endorsed by the Nepal government. This might involve referencing national communications to the UNFCCC, government-approved climate models, or data from national meteorological and hydrological services. By using these nationally recognized sources, projects can ensure that their rationale and approach are consistent with the basis upon which national climate strategies have been developed.

Engagement with relevant national institutions is another important aspect of demonstrating alignment. Projects should show how they have consulted or plan to collaborate with key government bodies responsible for climate policy and implementation in Nepal. This might include the Ministry of Forests and Environment, the Climate Change Management Division, or sector-specific agencies. Demonstrating this engagement not only ensures alignment with national priorities but also facilitates coordination and potential scaling up of successful approaches.

Lastly, the projects should outline how they will contribute to Nepal's climate monitoring and reporting efforts. This involves aligning project indicators with national MRV systems for climate action. Projects should demonstrate how they will collect and report data in a manner that can feed into national climate tracking systems, contributing to Nepal's overall assessment of progress towards its NDC and NAP goals.

1.2 NDC and NAP priorities

1.2.1 Overview of quantified sectoral targets defined in 2020 NDC

Nepal's 2020 NDC represents a significant commitment to addressing climate change and aligning with the goals of the Paris Agreement (table 1.1). The NDC outlines ambitious targets across four key sectors: Agriculture, Forestry and Other Land Uses (AFOLU); Energy; Waste; and Industrial Processes and Product Use (IPPU). These sectoral targets form the backbone of Nepal's climate strategy, providing a roadmap for sustainable development and emissions reduction (MoFE, 2020).

Table 1.1 Comparison of targets of Nepal's first and second NDC

Source: (https://climateactiontracker.org/climate-target-update-tracker/nepal/)

NEPAL	Comparison of NDC targets			
		2016 NDC	2020 NDC	Change
2030 conditional target(s)	Country's formulation of the target	Activity-based targets and policy targets in key sectors,	including emissions reduction in some sectors. Nepal will Activity-based targets and policy targets unconditionally expand clean energy from 1.4 GW to 5 GW in key sectors. by 2030. All other targets in the NDC are conditional upon international support.	+
	Absolute emissions level [excl. LULUCF]	Not specified	69-76 MtCO2e in 2030 [CAT calculations]	+
	Emissions compared to 1990 and 2010 [excl. LULUCF]	Not specified	[159-188% above 1990 emissions by 2030] [60-77% above 2010 emissions by 2030]	+
	CAT rating	No rating	2°C Paris Agreement Compatible	+
	Net zero-emissions target	Not specified	Nepal's second NDC includes a statement from the government committing to formulate a long-term low greenhouse gas emission development strategy by 2021 which will include a net zero GHG emissions target by 2050.	+
	Alignment of NDC to long term target	Not specified	Alignment to 2050 target unclear, as the strategy is being developed this year.	+
	Sector coverage	Not specified	Energy, Industrial Processes (AFOLU), and Waste	+
	Separate target for LULUCF	Yes To maintain 40% of the total area of the country under forest cover.	Yes By 2030, maintain 45% of the total area of the country under forest cover and manage sustainably 50% of Tarai and Inner Tarai forests and 25% of middle hills and mountain forests.	+
	Gas Coverage	Not specified	Carbon Dioxide (CO_2), Methane (CH_4), Nitrous Oxide (N_20)	+
	Target type	Activity-based targets and policy targets in Key Sector	Activity-based targets and policy targets in key sectors	+
	Clarity of implementation plan	The NDC included a list of priority areas where bilateral and multilateral grant support would be needed to meet the targets.	The NDC includes a list of strategies, plans and actions to achieve the target in each sector, as well as indicators to measure progress on implementation. The NDC estimates a USD 25 billion budget needed for the successful implementation of its conditional targets.	+
	Explanation why the target is a fair contribution towards the global goal	Not included	Yes, based on its development status (Least Developed Country) and small historical responsibility and current contribution to global emissions.	+
	Followed guidance on information to facilitate clarity, transparency and understanding of NDCs in Decision 4/CMA.1	N/A	Yes	+

In the AFOLU sector, Nepal has set a bold target to maintain 45% of its total land area under forest cover by 2030, equivalent to 14.8 million hectares. This commitment underscores the country's recognition of forests' crucial role in carbon sequestration and biodiversity conservation. To achieve this, Nepal plans to implement sustainable forest management practices, expand its protected area system, and engage in Reducing Emissions from Deforestation and Forest Degradation (REDD+) initiatives. The agricultural component of this sector focuses on promoting climate-resilient practices and ensuring food security. Specific goals include establishing 500 climate-smart villages and promoting organic farming one million hectares of land by 2030. These measures aim to enhance agricultural productivity while minimizing environmental impact and increasing resilience to climate change.

The energy sector targets in Nepal's NDC are equally ambitious, reflecting the country's commitment to transitioning towards clean energy sources. The cornerstone of this effort is the goal to generate 15,000 MW of clean energy by 2030, with 5-10% coming from mini and micro-hydro power, solar, and wind sources. This includes plans to install 1,000 MW of solar energy systems, emphasizing mini-grids and stand-alone systems to improve energy access in remote areas. Energy efficiency is another key focus, with a target to reduce energy intensity by 20% by 2030 compared to 2010 levels. This will be achieved through initiatives such as replacing 3 million traditional cookstoves with improved versions and installing 200,000 household biogas plants. In the transportation sector, Nepal aims for 25% of private passenger vehicle sales to be electric by 2025, supported by the installation of 500 charging stations across the country.

Waste management forms another crucial component of Nepal's climate strategy. The country aims to reduce methane emissions from landfills by 50% by 2030 through the implementation of integrated solid waste management systems and the promotion of waste segregation and recycling. Waste-to-energy plants are planned for major municipalities, and source segregation will be implemented in 100 municipalities by 2030. In terms of wastewater treatment, Nepal has set a target to treat 380 million Liters per day of wastewater before discharge by 2030. This will involve constructing new centralized treatment plants in urban areas and implementing decentralized systems in rural regions.

The Industrial Processes and Product Use sector presents unique challenges and opportunities for emissions reduction. Nepal aims to reduce energy consumption in industries by 10% by 2030 through energy audits, efficiency improvements, and the introduction of energy management systems in large industries. In the cement industry, a major source of emissions, Thakuri et al. (2021) the goal is to reduce emissions by 30% by 2030 through the use of alternative fuels and raw materials and the implementation of best available technologies. Additionally, Nepal plans to phase down hydrofluorocarbon (HFC) use by 50% by 2030, promoting alternative, low-GWP refrigerants and training technicians in their handling.

These comprehensive sectoral targets demonstrate Nepal's holistic approach to addressing climate change. By setting specific, quantifiable goals across multiple sectors, Nepal has created a clear framework for action. However, achieving these targets will require significant investment, technological innovation, and capacity building (Laudari et al., 2021). The success of these efforts will not only contribute to global climate mitigation but also promote sustainable development and improve the quality of life for Nepal's citizens. The climate mitigation mainstreaming process employs a collaborative approach across sectors and multi-level governance (Baniya, Giurco, Kelly, et al., 2021).

1.2.2 Overview of priority adaptation programme defined in NAP

Nepal's NAP represents a comprehensive approach to addressing the country's vulnerability to climate change impacts. Recognizing the diverse challenges posed by changing climate patterns, the NAP outlines priority adaptation programmes across several key sectors, aiming to build resilience and adaptive capacity throughout the nation. Aligned with the United Nations Framework Convention on Climate Change (UNFCCC's) Adaptation process, provides a comprehensive framework for addressing climate change impacts across various time horizons: short-term (until 2030), medium-term (until 2040), and long-term (until 2050). The NAP outlines 64 priority programs spanning eight thematic sectors and four cross-cutting areas (GoN, 2021) as shown in table 1.2.

Table 1.2 Thematic areas of Nepal's NAP

A. 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)

B. Cross-cutting sectors

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

Agriculture and Food Security is the core sector of NAP (MoFE, 2021). The NAP prioritizes programmes aimed at enhancing the resilience of Nepal's agricultural systems to climate change impacts. Key initiatives include the development and promotion of climate-resistant crop varieties and livestock breeds. The plan emphasizes the importance of diversifying agricultural practices to spread risk and increase food security. Programmes focus on improving irrigation efficiency, promoting soil conservation techniques, and enhancing farmers' access to climate information and early warning systems. The NAP also stresses the need for research and development in climate-smart agriculture technologies, as well as efforts to strengthen agricultural value chains to improve farmers' adaptive capacity.

The Forest, Biodiversity and Watershed Conservation sector focuses on preserving Nepal's rich biodiversity and crucial ecosystem services in the face of climate change. Priority programmes include enhancing forest management practices to increase carbon sequestration and improve forest resilience. The NAP outlines strategies for protecting and restoring critical watersheds, promoting community-based forest management, and developing mechanisms to monitor and respond to climate-induced changes in ecosystems. Initiatives also include efforts to conserve endangered species and habitats, and to promote sustainable use of forest resources to support local livelihoods.

In the Water Resources and Energy sector, recognizing the vulnerability of water resources to climate change, the NAP prioritizes programmes for integrated water resource management. This includes initiatives to improve water storage capacity, enhance irrigation systems, and protect water sources. In the energy sector, the focus is on promoting renewable energy sources and improving energy efficiency to reduce dependence on climate-vulnerable hydropower. The plan also emphasizes the need for climate-resilient energy infrastructure and the development of decentralized energy systems in remote areas.

Adaptation programmes in the Rural and Urban Settlements sector focus on making both rural and urban settlements more resilient to climate change impacts. For rural areas, this includes initiatives to promote climate-resilient housing and infrastructure, improve access to basic services, and diversify livelihood options. In urban areas, programmes focus on enhancing urban planning to address climate risks, improving drainage systems, and promoting green infrastructure.

The NAP also emphasizes the need for climate-resilient public spaces and buildings.

The Industry, Transport and Physical Infrastructure sector addresses the need to climate-proof Nepal's industrial, transport, and infrastructure sectors. Priority programmes include developing climate-resilient design standards for infrastructure, promoting green technologies in industries, and enhancing the resilience of transport networks to extreme weather events. The NAP also emphasizes the importance of integrating climate considerations into industrial policies and promoting low-carbon transportation options.

Recognizing the importance of tourism to Nepal's economy, the NAP outlines programmes to make the Tourism, Natural and Cultural Heritage sector more resilient to climate change. This includes initiatives to diversify tourism offerings, protect natural and cultural heritage sites from climate impacts, and promote sustainable tourism practices. The plan also emphasizes the need to raise awareness among tourists and tourism operators about climate change impacts and adaptation measures.

The NAP prioritizes programmes to address the health impacts of climate change, including the spread of vector-borne diseases and heat-related illnesses. In the Health, Drinking Water and Sanitation sector, it emphasizes the need to strengthen health systems, improve disease surveillance, and enhance public health awareness. In the water and sanitation sector, programmes focus on ensuring climate-resilient water supply systems, promoting water conservation, and improving sanitation infrastructure to withstand extreme weather events.

Given Nepal's high vulnerability to natural disasters, which are expected to be exacerbated by climate change, the Disaster Risk Reduction and Management sector is crucial. The NAP outlines programmes to enhance early warning systems, improve disaster preparedness at community and national levels, and strengthen post-disaster recovery mechanisms. It also emphasizes the need for integrating climate change considerations into all disaster risk reduction strategies.

Cross-cutting sectors include Gender Equality and Social Inclusion, Livelihood and Governance (GESILG), Awareness Raising and Capacity Building (ARCB) Research, Technology Development and Extension (RTDE); and Climate Finance Management (CFM). The cross-cutting theme GESILG ensures that all adaptation programmes consider gender equality and social inclusion. It emphasizes the need to address the specific vulnerabilities of women, marginalized communities, and other vulnerable groups in climate adaptation efforts. Programmes focus on enhancing the participation of these groups in decision-making processes, ensuring equitable access to resources and benefits from adaptation initiatives, and promoting inclusive governance in climate action.

Recognizing the importance of public awareness and institutional capacity in effective climate adaptation, the ARCB theme focuses on education and skill development. Programmes include initiatives to integrate climate change into educational curricula, conduct public awareness

campaigns, and provide specialized training for policymakers, practitioners, and community leaders on climate adaptation strategies. The RTDE theme emphasizes the crucial role of science and technology in informing and implementing effective adaptation strategies. Priority programmes include promoting research on climate impacts and adaptation options specific to Nepal's context, developing and disseminating climate-resilient technologies, and strengthening the links between research institutions, policymakers, and communities to ensure that scientific knowledge informs adaptation practice. Recognizing the significant resources required for effective climate adaptation, this Climate Finance Management theme focuses on strategies to mobilize, manage, and effectively utilize climate finance. Programmes include initiatives to enhance Nepal's capacity to access international climate funds, develop innovative financing mechanisms for adaptation projects, and ensure transparent and efficient use of climate finance at all levels of government.

These eight thematic sectors and four cross-cutting areas form a comprehensive framework for Nepal's climate adaptation efforts. By addressing both sector-specific challenges and cross-cutting issues, the NAP aims to build a climate-resilient society and economy in Nepal, capable of withstanding and adapting to the diverse impacts of climate change. The success of these programmes will depend on effective implementation, coordination across sectors, and the active participation of all stakeholders, from national government agencies to local communities. The total finance required for NDC and NAP is given in table 1.3.

Table 1.3 Total finance required for NDC and NAP implementation in Nepal (Chauhan, 2023).

Policies	Finance need (in billion USD)		
	Total Need	National	International
NAP (2021-2050)	47.4	1.5	45.9
NDC (2021-2030)	33	3.4	29.6
Total	80.4	4.9	75.5

1.2.3 Common elements of a climate rationale framing in NDC and NAP projects

Defining a vigorous climate rationale is crucial for the success and credibility of climate change projects, particularly those identified in Nepal's NAP and NDCs. This process, however, comes with its own set of considerations and challenges (Figure 1.1). Understanding these can help in developing more effective and well-justified climate interventions. Both the NDC and NAP projects described above in Nepal share several common elements in their climate rationale. First and foremost is the use of scientific evidence to establish the link between the proposed intervention and climate change. This typically involves referencing observed climate trends and

future projections specific to Nepal or the relevant region. For instance, both types of projects often cite changes in temperature and precipitation patterns, increased frequency of extreme weather events, and long-term shifts in ecosystems.

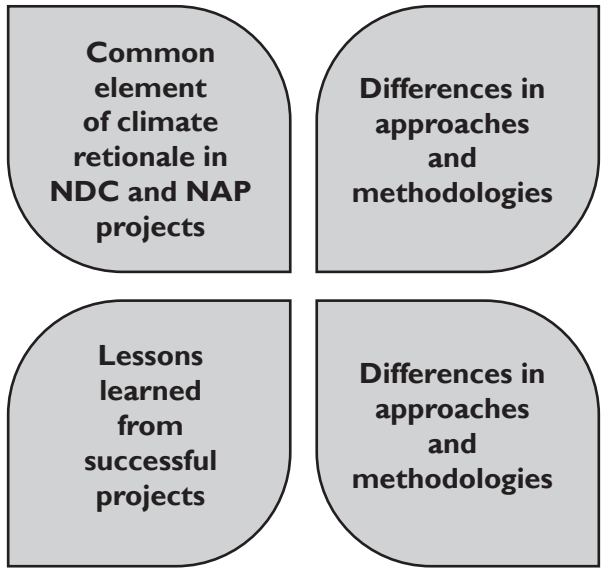

Figure 1.1 Key consideration for defining climate rationale

Another common element is the alignment with national development priorities. Climate rationale in both the NDC and NAP projects demonstrate how the proposed interventions contribute to Nepal's broader sustainable development goals, such as poverty reduction, food security, and economic growth. This alignment is crucial for ensuring political support and integration into national planning processes.

Vulnerability assessments form another key component of climate rationale in both NDC and NAP projects. These assessments identify the specific climate risks faced by different sectors, regions, or communities, providing a foundation for targeted interventions. For example, a water resource management project in both the NDC and NAP would typically include an assessment of how climate change affects water availability and quality in the target area.

Lastly, both types of projects emphasize stakeholder engagement in their climate rationale. This includes demonstrating how local communities, relevant government agencies, and other stakeholders have been involved in identifying climate risks and designing appropriate responses. This participatory approach enhances the legitimacy and local relevance of the proposed interventions.

1.2.4 Analysis of climate rationale of NDC projects

Criteria used in Nepal's NDC for defining mitigation projects

i. Relevant NDC targets

The NDC targets of Nepal aim to significantly reduce greenhouse gas emissions and enhance climate resilience. These targets are designed to align with global efforts to limit temperature rise and mitigate climate change impacts.

ii. Project activities

To achieve these targets, the NDC outlines various project activities across multiple sectors. In the energy sector, activities include the development of renewable energy projects such as micro-hydro, solar, wind, and bio-energy. In the transportation sector, the focus is on promoting electric vehicles and developing an electric rail network. In AFOLU, activities include afforestation, reforestation, and sustainable land management practices

iii. Monitoring reporting and verification indicators

The NDC includes robust MRV indicators to ensure transparency and accountability. These indicators track progress towards achieving the set targets and include metrics such as the amount of greenhouse gas emissions reduced, the number of renewable energy projects implemented, and the increase in forest cover. Regular reporting to international bodies like the UNFCCC is also part of the MRV process

iv. Responsible Government authority for project implementation

The NDC implementation plan has defined the primary government authority responsible for implementing the particular project. This authority coordinates with other relevant ministries, departments, and stakeholders to ensure the successful execution of the NDC targets and project activities. It also oversees the MRV process and ensures compliance with international climate agreements

v. Activity time frame

The NDC activities are planned to be implemented over a decade, from January 1, 2021, to December 31, 2030. This time frame allows for the gradual scaling up of activities and ensures that the targets are met in a sustainable manner. Mid-term reviews are scheduled for 2025 to assess progress and make necessary adjustments

vi. Estimated budget

The estimated budget for implementing the NDC is substantial, reflecting the scale of the activities and the ambition of the targets. The budget includes both domestic funding and international support. Specific figures are detailed in the NDC implementation plan, with a significant portion allocated to renewable energy projects, electric vehicle infrastructure, and afforestation programs. A sample of project description in Nepal's NDC for energy sector is given in table 1.4.

Table 1.4: A sample of project description in NDC implementation plan

Action Plan for Energy Production, Household Stoves, and Biogas Subsector

NDC Goals	Activities	Indicators for Measurement, Reporting, and Verification	Key Government Agencies	Activity Timeline (AD)	Estimated Cost (in million NPR)
Energy Production					
By 2030, approximately from 1,400 MW to 15,000 MW.	Suitable mixed production of (Run-of-the-River, Peaking RoR, and Reservoir-based plants) hydropower.	♦ By 2030, hydroelectric plants with a combined capacity of 14,300 MW will be established. ♦ By 2024, energy market regulatory policies will be implemented.	Ministry of Energy, Water Resources, and Irrigation; Electricity Regulatory Commission; Department of Electricity Development; Department of Hydrology and Meteorology	2023–2030	NPR 19,163.71 million

Source: NDC project plan for Energy Sector

Evaluation of climate rationale of projects outlined in Nepal's NDC project

Based on the principles and indicators of Green Climate Fund (GCF) mitigation projects, Nepal's Nationally Determined Contributions (NDC) demonstrate several strengths and gaps in their climate rationale. Among the 14 indicators used for evaluation of NDC projects against the GCF mitigation project principle, Nepal's NDC meets only 50% of the indicators (Table 1.5). The NDC effectively shows that projected Greenhouse Gas (GHG) emissions reductions will occur due to GCF-funded activities and aligns well with Nepal's national priorities, including its NDC and other climate strategies. This alignment ensures integration of country ownership

and targets areas of highest impact and need. Additionally, the NDC encourages the use of established methodologies like the Clean Development Mechanism and joint implementation under the Kyoto Protocol. Proposals use the most relevant methodologies for specific activities, including determining project impact boundaries, defining baselines, and showing additionality. Furthermore, the NDC describes the establishment of a MRV system for GHG emission reductions and removals.

Table 1.5 Evaluation of Nepal NDC's climate rationale based on the principle and indicators of GCF for mitigation projects[2]. white represents that the indicator is met while black color indicates that the indicator has not been indicated in the proposals/ projects.

Principles	Indicators		Status
Demonstration of GHG Emissions Reductions:	1	Proposals must show that the projected GHG emissions reductions or removals will occur.	
	2	These reductions should not happen without the GCF-funded activity.	
Alignment with Host Country Priorities:	3	Activities must align with the host country's priorities, including its nationally determined contribution (NDC) or other national climate strategies.	
	4	Ensures integration of country ownership and targets areas of highest impact and need.	
Methodological Approach for Quantification and Monitoring:	5	A methodological approach for quantifying and monitoring mitigation results must be selected and implemented.	
	6	Encourages the use of established methodologies like the Clean Development Mechanism and joint implementation under the Kyoto Protocol.	
Relevance of Methodology to Specific Activities:	7	Proposals should use the most relevant methodology for the specific activities proposed.	
	8	Steps include determining project impact boundaries, defining the baseline, and showing additionality (i.e., GHG reductions would not occur without GCF funding).	
Consistency with National GHG Reporting:	9	Quantification of mitigation impact should use consistent assumptions (e.g., emission factors) as those in national GHG reporting.	
	10	Ensures accurate quantification of support provided to countries in meeting their NDCs.	

2 Steps to enhance the climate rationale of GCF-supported activities. https://www.google.com/search?q=Steps+to+enhance+the+climate+rationale+of+GCF-supported+activities&oq=Steps+to+enhance+the+climate+rationale+of+GCF-supported+activities&gs_lcrp=EgZjaHJvbWUyBggAEEUYOdIBBzI4NGowajeoAgCwAgA&sourceid=chrome&ie=UTF-8

Establishment of MRV System:	11	Proposals should describe the establishment of an MRV system for GHG emission reductions and removals.	
	12	Facilitates assessment of whether the funded activity generated the projected mitigation results.	
	13	Includes all indicators, equations, input values, and assumptions used for quantification.	
	14	Provides projections of annual emission reductions or removals during the project's lifetime	

Gaps in NDC projects for defining climate rationale

There are notable gaps in the NDC projects for defining climate rationale. These include the fact that there is no indication that GHG emissions reductions would not happen without proposed project activities. A methodological approach for quantifying and monitoring mitigation results has not been selected or implemented. The quantification of mitigation impact does not use consistent assumptions as those in national GHG reporting, affecting the accurate quantification of support provided to countries in meeting their NDCs. Additionally, there is no facilitation assessment to determine if the funded activity generated the projected mitigation results. Indicators, equations, input values, and assumptions used for quantification are not included, and projections of annual emission reductions or removals during the project's lifetime are not provided. These gaps highlight areas where improvements are needed to ensure that Nepal's NDC projects are robust and effectively contribute to climate mitigation goals.

1.3 Analysis of climate rationale NAP projects

1.3.1 Criteria used in Nepal's NAP for defining projects

To ensure that the adaptation projects are effective and aligned with national goals, specific criteria are used to define and evaluate each project (Figure 1.2). These criteria help in organizing and implementing projects that not only address immediate climate risks but also contribute to long-term sustainable development. By clearly defining aspects such as project objectives, expected outcomes, and targeted beneficiaries, the NAP ensures that each project is well-structured, transparent, and capable of delivering tangible benefits to communities most affected by climate change.

The following criteria have been used by the NAP for defining the projects.

- *Project Name:* Identifies the project clearly and uniquely.
- *Alignment with/Contribution to National Development Goals:* Ensures the project supports broader national objectives and policies.

- *Climate Risks and Vulnerabilities Addressed by the Actions:* Highlights the specific climate-related issues the project aims to mitigate.
- *Objectives:* Defines the specific goals the project intends to achieve.
- *Expected Outcomes and Impacts:* Describes the anticipated results and their effects on the community and environment.
- *Summary of Actions:* Provides a concise overview of the planned activities and interventions.
- *Scope:* Outlines the extent and boundaries of the project, including its scale and reach.
- *Duration/Timeframe:* Specifies the period over which the project will be implemented.
- *Geographic Coverage:* Indicates the specific areas or regions where the project will be executed.
- *Targeted Community/Beneficiaries:* Identifies the primary groups or populations that will benefit from the project.
- *Lead Institution:* Names the main organization responsible for executing the project.
- *Supporting Agency/Institutions/Groups:* Lists other entities that will assist in the project's implementation.
- *Total Cost/Budget:* Estimates the financial resources required to complete the project.

<table>
<tr><td colspan="2">13. Integrated Sub-watershed Management for Climate Resilience</td><td>2035-2050</td></tr>
<tr><td colspan="3">Alignment with/contribution to national development goals: National Climate Change Policy 2019, 15 Plan (2019/20-2023/24). National Parks and Wildlife Conservation Act (1973). National Forests Policy 2019, National Irrigation Policy 2004</td></tr>
<tr><td colspan="3">Climate risks and vulnerabilities addressed by the actions:
Loss of agricultural land area due to soil erosion, landslides and increasincidences 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.</td></tr>
<tr><td colspan="2">Objectives:
1. To promote watershed management for conservation of soil fertility and enhanced productivity.
2. To support local livelihoods through watershed management.</td><td>Expected outcomes:
1. By 2035, water availability is increased to 50% insub-watersheds
2. By 2050, 80% of sub-watersheds are climate-resilient.
Impact:
Increased water availability and agriculture productivity.</td></tr>
</table>

Summary of actions: 1. Assess climate vulnerability and risk at sub-watershed level and develop sub-watersheds health cards for continuous monitoring with respect to climate variables. 2. Map and restore degraded areas within the sub-watersheds and support for management of those vulnerable ecosystems to increase water availability and forest productivity. 3. Support for climate-resilient infrastructure (embankments, dikes) to prevent flooding to secure agriculture land. 4. Promote farmyard organic manure to maintain soil fertility within sub-watersheds. 5. Map and conserve spring revival through spring-shed approach. 6. Promote soil erosion control techniques in upstream of the sub-watersheds using indigenous and traditional knowledge and local resources. 7. Strengthen and establish Flood EWS in strategic locations of Bagmati and Eastern Rapti River Basin. 8. Install hydro-met stations at strategic location of Bagmati and Eastern Rapti River Basin.	
Scope: Capacity Building, Technology Development and Information, Physical Infrastructure, Research and Innovation	
Geographic coverage: Bagmati and Eastern Rapti River Basin	**Targeted community/beneficiaries:** Upstream and downstream communities, climate vulnerable communities
Duration/timeframe: 25 years	**Lead institution:** Ministry of Forests and Environment
Total cost: USD 1.000 milion	**Supporting agency/Institutions/groups:** Provincial and Local Governments. NGOs, Development Partners, Community Based Organizations

Figure 1.2 Screenshot of one the NAP project, demonstrating how project descriptions has been included for the 64 priority projects outlined in NAP

1.3.2 Evaluation of climate rationale of Nepal's NAP projects

Among the 15 indicators used for evaluation of NAP projects against the GCF adaptation project principle, Nepal's NAP meets only 46% of the indicators (Table 1.6). The plan identifies systems at risk and the climate change hazards affecting them, ensuring a comprehensive understanding of the vulnerabilities. It also considers non-climatic factors that exacerbate risks and describes the interactions between climatic and non-climatic drivers, providing a holistic view of the challenges. Vulnerability assessments are used to identify and prioritize groups, sectors, and subregions most susceptible to climate change impacts, ensuring that the most vulnerable are targeted. The NAP confirms alignment with the host country's national plans and climate strategies, such as NAPs, NAPAs, and long-term climate strategies, which ensures country ownership and targets areas of highest potential need and impact. Additionally, the NAP quantifies the adaptation beneficiaries and informs the design of more impactful future adaptation options.

Table 1.6 Evaluation of Nepal NAP's climate rationale based on the principle and indicators of GCF for adaptation projects[3]. Green represents that the indicator is met while red colour indicates that the indicator has not been indicated in the proposals.

Principles	Indicators		Status
Evidence-based analysis	1	Proposals must provide an evidence-based analysis to show that the proposed activity is an effective adaptive response to a specific climate change hazard.	
Identification	2	Proposals should demonstrate how the activity addresses current or future climate change risks or impacts.	
	3	Identify systems at risk and the climate change hazards affecting them.	
	4	Consider non-climatic factors exacerbating the risk and describe interactions between climatic and non-climatic drivers.	
	5	Use vulnerability assessments to identify and prioritize groups, sectors, and subregions most susceptible to climate change impacts.	
Response	6	Explain how the activity will reduce exposure and/or vulnerability of people, systems, or ecosystems.	
	7	Justify the selection of the proposed activity over alternatives.	
	8	Address barriers to implementation (technical, social, institutional, regulatory) and describe how the project aims to overcome them.	
	9	Apply a methodological approach to quantify the number of beneficiaries.	
Alignment	10	Confirm alignment of the proposed activity with the host country's national plans and climate strategies (e.g., NAPs, NAPAs, long-term climate strategies, adaptation communications).	
	11	Ensure country ownership and target areas of highest potential need and impact.	
Monitoring and Evaluation	12	Include a description of the monitoring and evaluation system to assess the climate impact of the proposed activity.	
	13	Quantify the adaptation beneficiaries.	
	14	Facilitate assessment during implementation to determine if the activity generated the expected climate impact.	
	15	Inform the design of more impactful future adaptation options.	

3 Ibid.

1.3.3 Gaps in NAP projects for defining climate rationale

There are notable gaps in the NAP projects for defining a climate rationale. The NAP does not provide an evidence-based analysis to show that the proposed activity is an effective adaptive response to a specific climate change hazard. It also fails to demonstrate how the activity addresses current or future climate change risks or impacts. The plan does not explain how the activity will reduce exposure and/or vulnerability of people, systems, or ecosystems, nor does it justify the selection of the proposed activity over alternatives. Furthermore, it does not address barriers to implementation, such as technical, social, institutional, or regulatory challenges, and does not describe how the project aims to overcome them. The NAP lacks a methodological approach to quantify the number of beneficiaries and does not include a description of the monitoring and evaluation system to assess the climate impact of the proposed activity. Additionally, it does not facilitate assessment during implementation to determine if the activity generated the expected climate impact.

This chapter has provided a comprehensive overview of the climate rationale underpinning Nepal's NDCs and NAP projects. Through the analysis of sectoral targets, adaptation priorities, and specific project examples, several key findings have emerged. Firstly, Nepal has demonstrated a strong commitment to addressing climate change through its NDC and NAP, setting ambitious targets across multiple sectors including energy, forestry, agriculture, and transport.

Secondly, the analysis revealed that successful climate projects in Nepal share common elements in their climate rationale. These include a strong scientific basis, alignment with national development priorities, comprehensive vulnerability assessments, and meaningful stakeholder engagement. However, differences in approaches between NDC and NAP projects were also noted, with NDC projects generally focusing more on quantifiable emissions reductions, while NAP projects emphasize building adaptive capacity and resilience.

Third, the analysis of the climate rationale behind Nepal's NDC and NAP projects has revealed both strengths and gaps in their alignment with international best practices, as represented by the GCF's principles and indicators for mitigation and adaptation projects. While the NDC projects demonstrate a solid grasp of national priorities, the use of established methodologies, and some MRV considerations, there are notable shortcomings in areas such as proving additionality and providing comprehensive quantification and monitoring of mitigation impacts. Similarly, the NAP projects excel in identifying climate risks and vulnerabilities, as well as aligning with national strategies, but fall short in providing evidence-based analysis, quantifying adaptation beneficiaries, and establishing robust monitoring and evaluation systems.

Fourth, there are several challenges in defining robust climate rationale. These include limited availability of localized climate data, difficulties in attributing local changes to global climate change, capacity gaps in climate data interpretation, and the challenge of demonstrating short-

term impacts for long-term climate phenomena. These challenges underscore the need for continued investment in climate science, data systems, and capacity building. The importance of integrating robust climate rationale in climate-related projects cannot be overstated.

Fifth, gaps and challenges highlight the need for Nepal to further strengthen the climate rationale of its NDC and NAP projects to ensure they can effectively contribute to the country's climate change mitigation and adaptation goals. Addressing these issues will help Nepal secure international climate finance and deliver tangible, measurable benefits to the communities most vulnerable to the impacts of climate change.

Chapter 2

Developing a Climate Rationale

A climate rationale provides the scientific underpinning for evidence-based climate action decision-making, and development of the theory of change for activities related to climate finance. It ensures that the set of causal linkages between climate and climate impacts and between action and societal benefits is fully grounded in the best available climate data and science concerning the most relevant climatic factors (GCF 2022).

The interventions aimed at tackling climate change must be founded on a robust and comprehensive climate rationale. Such a rationale ensures that the proposed solution effectively addresses the specific challenges posed by climate change. Moreover, a strong climate rationale has become a prerequisite for accessing climate finance from international funding bodies. By basing interventions on a well-founded climate rationale, it is possible to enhance their efficacy and ensure that they align with the criteria established by those funding bodies.

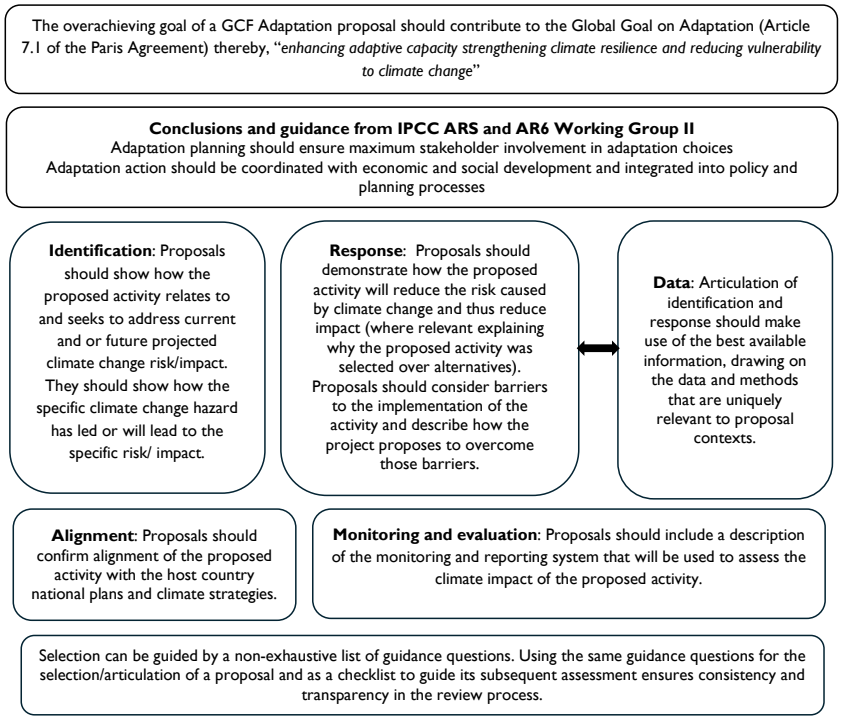

Figure 2-1: Figure: Guidance framework for selection and assessment of a GCF adaptation proposal (Green Climate Fund, 2022)

The climate rationale is the cornerstone of justifying a climate change project's necessity and its effectiveness in addressing core impacts and threats. It essentially explains the "why" behind the initiative, linking specific climate threats faced by a community or region to proposed solutions for mitigation or adaptation (GIZ & World Bank, 2020). By integrating the best available climate science, data, local knowledge, and development needs, it ensures that the project is evidence-based and aligns with the priorities of the affected population. This scientific underpinning is critical for securing funding, as it demonstrates to funding agencies that the project is a well-conceived response to a real and pressing climate challenge. In essence, a climate rationale provides a logical and data-driven approach to addressing climate change issues.

A robust climate rationale must be established for a successful climate finance proposal because it:

- Establishes a direct link between climate science and climate finance.
- Ensures that the project is tailored to directly tackle the challenges posed by climate change.
- Requires access to robust climate science and data for climate change projects/proposals.
- Thoroughly describes the climate change issues addressed by the proposals/projects.
- Serves as a scientific foundation for evidence-based decision-making regarding climate-related issues.
- Relies on diverse historical, current, and projected climate data, grounding proposed projects in reliable scientific knowledge.
- Ensures that projects are firmly anchored in the realities of climate change, enhancing their effectiveness and resilience.
- Is instrumental in ensuring the success of proposals by thoroughly elucidation targeted climate impacts and risks for mitigation.
- Demonstrates a deep understanding of climate challenges and helps lay out compelling mitigation strategies.
- Strengthens proposals and aligns them with the climate action goals, increasing their chances of approval and successful implementation.

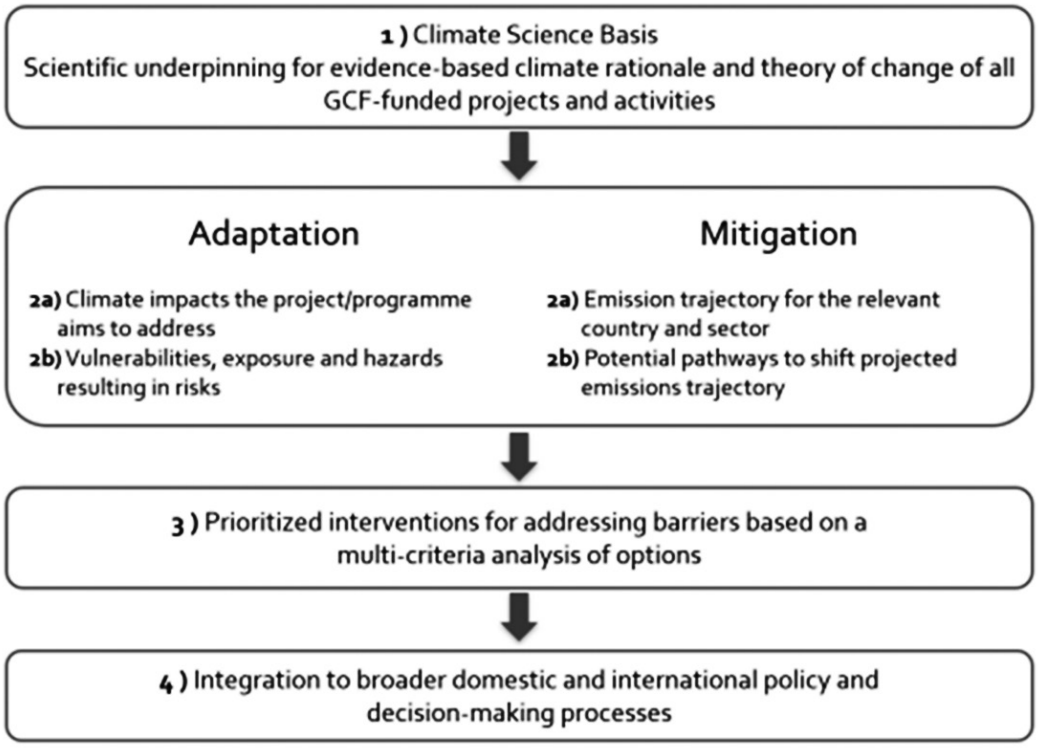

Figure2.2: Elements of climate rationale (Source: GCF, 2018))

2.1 Benefits of strengthening processes for developing climate rationale for Nepal

2.1.1 Vulnerability of Nepal to climate change

Nepal is one of the most vulnerable countries in the world to climate change, owing to its terrain and landscape features, the sensitivity of agriculture and other key sectors, and its economic impoverishment. The National Adaptation Programme of Action (NAPA) was established to address these urgent needs and secure funding for adaptation. Despite these efforts, challenges persist due to gaps in understanding climate impacts on species and ecosystems, inadequate capacity, and weak implementation of adaptation and mitigation programs. To build a climate-resilient society, Nepal requires effective strategies that integrate climate scenarios with forest, agriculture, water management, and disaster risk reduction systems.

2.1.2 Alignment with national policies

Developing a climate rationale ensures that climate actions are aligned with national strategies and policies, including NAPs and NDCs. This alignment helps in integrating climate considerations into broader development plans and ensuring coherence in climate finance, as described in Chapter 1.

2.1.3 Enhancing adaptation and resilience

By establishing a stronger nationally driven process for developing a climate rationale, Nepal can better identify risks and responses, develop sound climate finance concepts and proposals, and receive funding to implement adaptation measures that enhance resilience to climate impacts. This proactive approach supports long-term sustainability and reduces future vulnerabilities.

2.1.4 Improving policy implementation

Climate rationale help in providing an evidence basis upon which identified gaps in current policies and strategies can be more effectively addressed. This understanding can lead to more effective policy implementation and improved coordination among various stakeholders involved in climate actions.

2.1.5 Accessing the climate fund

A well-defined climate rationale strengthens proposals for international climate finance, such as the GCF. It can also be a central requirement for proposals submitted to other climate funds, such as the Adaptation Fund (AF) and Global Environmental Facility (GEF), both of which require some level of reasoning for the importance of a climate intervention to be articulated in funding proposals. It demonstrates that projects are grounded in a clear understanding of climate risks and priorities, increasing the likelihood of securing and effectively utilizing funds.

2.1.6 Evolving dynamics in climate finance

Governance of and access to the climate finance in Nepal

As a party to the UNFCCC, Nepal is eligible to access funding for climate actions. Specifically, for the GCF, Nepal can secure funding through both national and international accredited entities. The Government of Nepal (GoN) has designated the Ministry of Finance (MoF) as the National Designated Authority (NDA), with the International Economic Cooperation Coordination Division (IECCD) serving as the primary contact point for GCF-related activities. The NDA ensures that GCF-supported projects align with Nepal's strategic national policies and climate change priorities.

Within the MoF, a 3-tiered governance structure has been established to manage GCF engagement effectively:

a) The Climate Finance Steering Committee (CFSC), chaired by the Finance Secretary, oversees policy and national coordination.
b) The Technical Committee (TC), chaired by the Joint Secretary and Chief of IECCD, provides technical support.
c) The Interdivisional Climate Finance Unit, led by an Under Secretary, handles operational functions.

Developing countries like Nepal can access GCF funds through accredited entities, and proposals must be aligned with national policies and priorities, reflecting the country-driven nature of the process. The NDA is tasked with identifying and endorsing proposals that meet both GCF's six investment criteria and Nepal's strategic goals. Given the severe impacts of climate change on critical sectors such as agriculture, forestry, water resources, infrastructure, and hydropower, these areas are prioritized for GCF funding (MoF, 2017).

Despite having around 100 national and international development partners, including Department for International Development (DFID), United States Agency for International Development (USAID), UNDP-GEF, Asian Development Bank (ADB), World Bank (WB), and Germany, working on reducing climate vulnerabilities and enhancing adaptive capacities in Nepal, there has been a lack of effective collaboration with the government. This disconnect has led to the poor execution of many climate policies within the current institutional framework.

To address this issue, Nepal needs to shift from a reactive approach to climate change adaptation to a proactive one. Rather than focusing solely on disaster management after events occur, there should be a stronger emphasis on disaster preparedness and risk reduction. Proactive measures require urgent investment in research and the adoption of advanced technologies. The NAP process, which emphasizes collaboration among institutions, can play a critical role in strengthening Nepal's adaptation systems and ensuring more effective implementation of climate politics.

The climate finance landscape has consistently evolved to address the growing and multifaceted challenges posed by climate change. This evolution is marked by the diversification of funding sources, the development of innovative financial instruments, and the increasing involvement of both public and private sectors. Some of these developments are elaborated below:

- **Diversified funding channels:** Climate finance now flows through various channels, including bilateral, multilateral, public, and private sources. Countries have established bilateral funds to support global climate action, such as the Global Climate Change Initiative (US), the International Climate Fund (UK), and Norway's International Climate Forest Initiative. Multilateral initiatives like the GCF, Adaptation Fund, Clean Technology Fund, and GEF pool resources from multiple countries to finance extensive climate projects.

- **Innovative financial instruments:** New financial instruments, such as green bonds, sustainable investing, and climate-related financial disclosures, are mobilizing private capital for climate action. These instruments offer returns on investments that generate positive environmental impacts, attracting a broader range of investors.

- **Carbon pricing and blended finance:** Innovative mechanisms like carbon pricing and blended finance are being explored to mobilize additional resources for climate action. Carbon pricing incentivizes emissions reductions by placing a monetary value on carbon emissions, while blended finance combines public and private investments to de-risk projects.

- **Growing role of the private sector:** The private sector's role in climate finance is growing, driven by the realization that climate change poses significant risks to business operations and financial markets. Companies and investors are increasingly integrating climate risks into their decision-making processes and seeking sustainable investment opportunities.

- **Focus on developing countries:** A significant portion of climate finance is directed towards developing countries, which are often the most vulnerable to climate impacts but have the least capacity to respond. The GCF and other mechanisms aim to support these countries in building resilience and transitioning to low-emission development pathways.

- **Integration of scientific data and local knowledge:** The integration of scientific data and local knowledge into climate finance decisions ensures that funds are allocated effectively and efficiently. This approach helps to address the specific needs and priorities of different regions and communities, enhancing the overall impact of climate investments.

- **Alignment with global goals:** Climate finance is increasingly aligned with international goals such as the Paris Agreement and the Sustainable Development Goals (SDGs). This alignment ensures that climate investments contribute to broader objectives of sustainable development, poverty reduction, and global cooperation on climate action.

- **Emergence of new climate funds:** New climate funds and initiatives continue to emerge, reflecting the growing recognition of the need for diverse financial solutions. These new funds aim to fill gaps in existing finance mechanisms and address emerging climate challenges.

The evolving climate finance landscape demonstrates a growing commitment to addressing climate change through diversified and innovative funding mechanisms. By integrating scientific data, engaging various stakeholders, and aligning with global goals, climate finance can effectively support the transition to a sustainable and climate-resilient future.

2.2 IPCC an important foundation of climate science

The IPCC assessment process is a cornerstone of global climate science, widely recognized for their reliability and credibility. The IPCC assessments result from extensive collaboration among leading scientists, synthesizing the latest research to provide a comprehensive understanding of climate change's causes, impacts, and solutions. For a highly vulnerable country like Nepal, the IPCC reports are crucial for developing a climate rationale approach. For example, the IPCC's Sixth Assessment Report (AR6) highlights projected rising temperatures and increased extreme weather events in South Asia, with significant implications for Nepal (IPCC, 2021, 2022). Understanding these specific threats is essential for Nepal to develop targeted adaptation strategies.

A key focus of the IPCC is attributing climate change to human activities, particularly greenhouse gas emissions, with CO2 identified as the primary driver of global warming. The IPCC AR6 report presented robust evidence that human influence has unequivocally warmed the atmosphere, oceans, and land, with each of the last four decades being progressively warmer than the previous since 1980. The report also explored future climate scenarios through Shared Socio-economic Pathways (SSPs), using advanced climate models to predict temperature changes under varying levels of emissions.

Despite the complexity and uncertainty inherent in climate science, the IPCC plays a crucial role in guiding evidence-based approaches to mitigate climate risks, support adaptation strategies, and mobilize financial resources like the Green Climate Fund (GCF). Data science is essential in this process, enabling precise quantification of climate impacts and informing targeted interventions. Ongoing data collection and cross-disciplinary collaboration are vital for refining our understanding of climate dynamics and improving adaptation measures. By grounding adaptation efforts in robust scientific evidence, climate science effectively reduces the risks and costs associated with climate change, as emphasized by recent research.

2.3 Challenges related to developing a climate rationale

Developing countries like Nepal encounter numerous barriers in accessing climate finance, with the requirement to present a "climate rationale" being one of the most significant challenges. The climate rationale must demonstrate that a proposed project will either reduce greenhouse gas emissions, address climate change impacts, or contribute to climate-resilient development. For instance, proposals to the GCF must detail the climate change problem, provide a greenhouse gas emissions profile or adaptation needs, describe the likely scenario without the proposed interventions, present baseline information, and explain the methodologies used.

The Building Approaches to Fund Local Solutions with Climate Evidence (BASE) and Adaptation Research Alliance (ARA) studies in 2022 identified several technical, social, and capacity-related challenges faced by local actors in developing countries when developing a climate rationale:

- **Gaps in data and information:** There is often a lack of localized data, which is crucial for accurately assessing climate impacts and risks. This is compounded by difficulties in accessing decentralized data, language barriers in communicating data, and limited historical data availability.

- **Complexity of climate modelling:** Developing accurate climate models and scenarios is inherently complex, requiring advanced technical expertise and resources that may be lacking in some developing countries.

- **Varying capacity and resources:** Different countries and institutions have varying levels of capacity and resources to generate and utilize climate information. This disparity can hinder the effective development and application of climate rationale.

- **Limited understanding of climate impacts:** There is often insufficient understanding of how climate drivers and associated risks specifically affect local community livelihoods, which impedes the development of targeted and effective climate strategies.

- **Inadequate investment in climate information systems:** There is a general lack of public and private investment in climate information systems and high-quality data infrastructure, which further exacerbates the difficulties in developing a comprehensive climate rationale.

Other key challenges include

- **Distinguishing between development and adaptation efforts:** Interventions often serve multiple objectives, including both development and climate adaptation or mitigation. The challenge is to clearly differentiate between activities that address climate impacts and those that are primarily developmental. *The core distinction lies in explicitly linking adaptation and mitigation responses to observed or projected climate change impacts.*

- **Linking responses to climate impacts:** Effective climate change projects must explicitly connect proposed solutions to specific observed or projected climate impacts. This requires detailed knowledge of how climate change affects local conditions and how proposed interventions address these effects.

- **Data access and technical challenges:** Developing countries, especially Small Island Developing States (SIDS) and LDCs, frequently face difficulties accessing high-resolution climate data at the project level. Downscaling global climate models to local scales and interpreting this data into actionable insights involves significant technical expertise (Asian Development Bank, 2023).

- **Integrating scientific and local knowledge:** A robust climate rationale should incorporate not only scientific data but also local and traditional knowledge. This approach ensures that the social, economic, and cultural consequences of climate change are considered, enhancing the relevance and effectiveness of the proposed interventions (Global Center on Adaptation, 2023).
- **Alignment with policies and capacity constraints:** Demonstrating alignment with both national and international climate policies adds complexity to the proposal process. Additionally, developing countries often struggle with financial tracking and mobilizing climate finance due to limited capacity (Global Center on Adaptation, 2023; Asian Development Bank, 2023).

To overcome these challenges, proposals should integrate the latest scientific advancements in climate science, alongside local and traditional knowledge. This comprehensive approach will ensure that adaptation and mitigation strategies are grounded in both scientific evidence and local realities, facilitating more effective climate finance outcomes (Lemos & Rood, 2010). Addressing these barriers also requires enhancing data availability, improving climate modelling and analysis capabilities, building local capacity, and investing in robust climate information systems (as demonstrated in Figure 2.3 below). Understanding these challenges can enable developing countries to design relevant capacity strengthening efforts for modeling that address these challenges.

Table 2.1 Advantages and challenges of climate change projection methods

Method	Process-based modeling	Species distribution modeling	Climate analogue analysis
Advantages	♦ Understanding of system processes ♦ Performance projection possible ♦ Can be used in larger-scale models	♦ Only location data needed ♦ Several robust methods exist ♦ Suitability maps can be used for making recommendations	♦ No prior information needed ♦ Exploration of impacts in real-world context ♦ Facilitates identification of adaptation options
Specific challenges	♦ Understanding of tree-crop interactions ♦ High data requirement ♦ Modet complexity compounds error sources ♦ Modeling of all relevant system components with sufficient accuracy ♦ Temporal downscaling of climate projections	♦ Availability of distribution data ♦ Sampling bias ♦ Availability of environmental data at appropriate resolution ♦ Sub-populations with distinct habitat requirements? ♦ Reliability when dealing with novel climates	♦ Identification of relevant climate metrics for analogue search ♦ Non-climatic factors make marry analogues useless ♦ Ensemble methods are very costly ♦ Only provides specific projections for individual sites ♦ Reliability when dealing with novel climates
General challenges	♦ CO, impacts difficult to foresee (inclusion only possible in process-based models) ♦ Future climates are uncertain ensemble projections are needed ♦ Biotic factors (pests, weeds and diseases) are difficult to project Current Opinion in Environmental Sustainability		

Figure 2.3: Advantage and challenges of climate change projection methods for agro-forestry system (Source: Luedeling et al. 2013)

2.4 Basics of a climate rationale

A climate rationale provides the scientific foundation for evidence-based climate decision-making. It ensures that the connections between climate impacts, climate action, and societal benefits are firmly rooted in the best available climate data and scientific understanding. By offering a clear and data-driven justification for proposed interventions, a climate rationale helps to align actions with observed and projected climate risks, thereby enhancing the effectiveness and relevance of climate strategies.

Climate rationale FAQs

What are climate change-induced risks and vulnerabilities?

These are risks and vulnerabilities amplified by a more extreme climate. This process identifies the specific risks and vulnerabilities arising from climate change, detailing how they impact systems, communities, and sectors.

What is happening or will happen due to climate change?

This aspect considers current and projected impacts of climate change, including changes in climate patterns, extreme weather events, and their consequences. A climate rationale should build a case for the necessity of climate finance, and to clearly explain the climate impacts/risks being addressed, or the projected emissions mitigation outcomes

Why is it important to differentiate between a climate change response and a development action?

The line between adaptation and development can often be blurry, making it difficult to make a compelling case about the climate relevance of proposed interventions. It is therefore crucial to highlight specific climate impacts that an intervention responds to. It can also be useful to highlight the linkages between proposed adaptation action and broader development goals or outcomes as a co-benefit, while maintaining a focus and emphasis on the climate-related dynamics of the rationale and proposed interventions,

What is the additionality of the proposed interventions due to climate change?

This assesses the added value of the proposed interventions, specifically how they address climate change impacts beyond what would occur under normal conditions or without the intervention.

2.5 Main steps for developing a climaterationale

Establishing the climate case

- ***Identification of climate science basis (baselines and future scenarios):*** Select appropriate climate data, toolkits, and products to evaluate climatic stressors. This involves gathering and utilizing relevant datasets and analytical tools to establish current baselines and project future climate scenarios (as described in depth in chapters 3 and 4).

- ***Interpretation of data analysis*:** Analyse the climate data to assess current and anticipated risks, impacts, and vulnerabilities. This involves interpreting the data to understand how climate stressors will affect various systems and sectors both now and in the future.

Developing interventions

- ***Selection of best adaptation/mitigation options:*** Identify and choose the most effective policy actions from a range of plausible options to address and adapt to climate risks. This involves evaluating various strategies to determine which will best mitigate the impacts of climate change and enhance resilience.

- ***Assessment of adaptation/mitigation effectiveness:*** Monitor and evaluate the effectiveness of climate actions by measuring their impact on mitigating risks and delivering societal benefits. This includes tracking progress, assessing outcomes, and adjusting strategies as needed to ensure that the interventions are achieving their intended goals.

- ***Problem definition (conditions of vulnerability):*** Develop a Theory of Change to define the problem by identifying the connections between climate change and its impacts. This framework helps to map out how specific climate-related vulnerabilities lead to broader issues and how proposed interventions will address these challenges.

Figure 2.4: Steps in impact chain analysis (Source: RRC.AP.)

2.6 Differences in approaches and methodologies to the climate rationale

While there are commonalities, NDC and NAP projects in Nepal also exhibit some differences in their approaches to developing a climate rationale. NDC projects, being primarily focused on mitigation, tend to emphasize GHG emission reduction potential in their rationale. They often include detailed calculations of expected emissions reductions and use standardized methodologies for quantifying these impacts. On the other hand, NAP projects, which focus on adaptation, place greater emphasis on building resilience to climate impacts. Their climate rationale often involve more complex vulnerability assessments and scenario planning to account for the uncertainty inherent in climate projections. NAP project rationale may also give more weight to traditional knowledge and local perceptions of climate risks, complementing scientific data.

Methodologically, NDC projects often rely more heavily on quantitative approaches, using metrics like tonnes of CO_2 equivalent reduced or avoided. NAP projects, while still quantitative where possible, may incorporate more qualitative elements in their rationale, such as descriptions of enhanced adaptive capacity or improved ecosystem services.

2.7 Lessons-learned from successful projects

Several key lessons have emerged from successful climate projects in Nepal. One critical lesson is the **importance of robust baseline data**. Projects with well-established, and, where possible, quantified and disaggregated baselines for both climate and socio-economic indicators have been better able to demonstrate their impact and justify their climate rationale. Another lesson is the value of integrating both top-down and bottom-up approaches in developing climate rationale. Successful projects have combined national-level climate data and policies with local-level vulnerability assessments and community perspectives. This integration ensures that projects are scientifically sound while also being locally relevant and acceptable.

Flexibility and adaptive management have also proven crucial. Given the inherent uncertainties in climate projections, successful projects have built flexibility into their designs and rationale, allowing for adjustments based on emerging data and changing conditions. The projects that have effectively demonstrated co-benefits in their climate rationale have generally been more successful. By showing how climate interventions can also address other development priorities, these projects have garnered broader support and resources.

2.7.1 Challenges and gaps in current practices

Despite progress, several challenges and gaps remain in defining climate rationale for NAP and NDC projects in Nepal. One significant challenge is the **limited availability of high-resolution, localized climate data**. While regional climate projections are available, downscaling these to the local level where most projects operate remains difficult. This data gap can weaken the scientific basis of climate rationale, particularly for smaller-scale interventions.

Another challenge is the **difficulty in attributing specific local changes to global climate change**. This is particularly problematic for adaptation projects, where distinguishing between climate change impacts and other environmental or socio-economic factors can be complex. This attribution challenge can make it difficult to justify certain interventions solely on climate grounds. The long-term nature of climate change also poses challenges for project rationale. Many funding mechanisms require demonstrating short to medium-term impacts, which can be difficult for climate projects that may not show significant results for many years. **This mismatch between project timeframes and climate change timescales can lead to rationale that overemphasize short-term outputs at the expense of long-term resilience building.**

There is also a capacity gap in many institutions involved in climate project development. Many lack the technical expertise to interpret complex climate data and translate it into robust project rationale. This can lead to oversimplification of climate risks or misalignment between proposed interventions and actual climate threats. There is **often a disconnect between mitigation and adaptation in climate rationale**. While many interventions can address both, project rationale tend to focus on one or the other, missing opportunities to demonstrate and maximize co-benefits.

Addressing these challenges and gaps will be crucial for strengthening climate rationale in Nepal's NAP and NDC projects going forward. This may involve investing in better climate data systems, building institutional capacity for climate analysis, developing more flexible funding mechanisms, and promoting integrated approaches that bridge mitigation and adaptation. By doing so, Nepal can enhance the effectiveness and credibility of its climate interventions, ultimately improving its resilience to climate change and contributing to global mitigation efforts.

Chapter 3

Climate Rationale in the Context of Adaptation Related Projects

3.1 Elements for the climate rationale for adaptation

Adaptation proposals aimed at addressing climate change must be grounded in robust, evidence-based analyses. These analyses should clearly demonstrate how the proposed activities will effectively respond to specific climate change hazards. The strength of an adaptation proposal lies in its ability to articulate a clear climate rationale. This rationale should encompass four key elements to ensure comprehensiveness and relevance.

3.2 Identify vulnerabilities and risks of the climate impacts

The rationale must first identify the climate effects and the systems, groups, sectors, and subregions at risk from these hazards. These include:

- **Identify who or what is at risk**: Proposal should specify which ecosystems, economic sectors, vulnerable populations, or specific geographical areas are at risk. Vulnerabilities to climate impacts are shaped by local socio-economic and environmental contexts. Poor communities often lack the resources to effectively prepare for and respond to climate impacts.

- **Integrate Gender Equity and Social Inclusion (GESI) components into the climate rationale:** GESI ensures that climate actions are inclusive and equitable, that they address the specific needs of marginalized and vulnerable groups who are often disproportionately affected by climate change. Women, indigenous populations, and lower-income communities tend to face greater challenges due to limited access to resources, decision-making power, and adaptive capacities. By integrating GESI, climate strategies aim to ensure that these groups are not left behind, fostering participation in decision-making and tailoring climate interventions to their unique needs. GESI recognizes the different roles and responsibilities that men and women often hold in areas like agriculture, water management, and energy use, ensuring that climate actions are both gender-sensitive and contextually relevant. It also focuses on equal access to resources, breaking down social barriers, and challenging discriminatory practices, which enhances the effectiveness of

climate initiatives. Moreover, GESI empowers marginalized communities through education, capacity building, and leadership opportunities, promoting social justice and resilience. By addressing not just gender but also intersecting factors like age, disability, and ethnicity, GESI ensures that climate solutions are fair and impactful for all segments of society.

- **Describe the specific climate change phenomena that poses a threat**: Effective climate adaptation requires solutions tailored to specific local conditions and vulnerabilities, recognizing that different regions face distinct climate impacts. For example, Nepal's mountainous regions face glacial retreats due to rising temperatures, leading to increased risks of glacial lake outburst floods (GLOFs), extreme weather events, heavy rainfall, landslides, and flash floods.

- **Use of best available information**: The proposal should show how climate change has led or will lead to the specific risk or impact, using the best available data and research. For instance, the proposal can cite studies or models predicting increased frequency of extreme weather events in the region.

- **Consideration of non-climatic factors**: Address any non-climatic factors that may be causing or exacerbating the risk or impact and describe interactions between these and climate change. For instance, if deforestation is worsening flood risks, explain how this interacts with climate-induced rainfall changes.

- **Risk and vulnerability assessment to prioritize adaptation outcomes**: Utilize Risk and Vulnerability Assessments (VRA) to identify groups, sectors, and subregions most susceptible to climate change impacts, and thus provide information on selecting and prioritizing approach adaptation outcomes. For instance, if agricultural communities are identified as highly vulnerable, prioritize activities like drought-resistant crops or improved irrigation systems.

3.3 Explain the proposed response

The rationale must explain how the proposed response will reduce risk exposure or vulnerabilities. Additionally, it is important to provide a justification for the selection of the proposed activity over alternatives, and to address potential barriers to implementation. This involves:

- **Risk and vulnerability reduction** – Proposals should explicitly describe how the activity will decrease the exposure of the target population, systems, or ecosystems to climate change. This involves detailing the specific risks and vulnerabilities that the activity aims to mitigate. Activities might focus on enhancing the resilience of infrastructure, improving access to essential resources, or increasing awareness and preparedness among vulnerable populations. For instance, if the hazard is flooding, the proposal might include measures such as constructing flood defenses or improving drainage systems.

- **Consideration of barriers:** Proposal should identify potential barriers to the implementation of the activity. These barriers could be technical (lack of infrastructure), social (community resistance), institutional (lack of governance structures), or regulatory (restrictive policies.) Moreover, it should also outline strategies to overcome these barriers, ensuring the successful implementation and sustainability of the project. For example: if the project faces regulatory barriers, such as restrictive land-use policies, the proposal should describe how the project will work with local authorities to amend these regulations or navigate them to achieve the desired outcomes.

- **Quantification of beneficiaries:** Proposal should apply a methodological approach to estimate and quantify the number of beneficiaries expected to result from activity. This involves defining clear criteria for who qualified as a beneficiary and using data-driven methods to project the impact. If the project aims to provide clean drinking water, the proposal should detail the process for calculating the number of people who will gain access to safe water because of the project, including data sources and assumptions used in the estimation.

3.4 Demonstrate alignment with national plans

Demonstrating alignment with national plans, policies, and targets is crucial. This includes:

- **Consistency with national goals**: National plans, such as NAPs and National Adaptation Programmes of Actions (NAPAs), outline long-term climate goals and priorities, and adaptation communications such as those submitted as components of NDCs. Proposals that align with these goals contribute to a coherent and unified approach to climate adaptation. This consistency helps avoid duplication of efforts and ensures that various projects and initiatives complement each other, working towards common objectives.

- **Targeted interventions**: National plans and strategies are typically based on comprehensive assessments of the country's climate vulnerabilities and needs. By aligning with these documents, proposals can ensure that they address the most critical areas, providing targeted interventions where they are needed most. This maximizes the potential for significant and meaningful impact.

3.5 Monitoring and evaluation (M&E)

The rationale should highlight how the impact of the proposed solutions will be assessed. This includes:

- **Facilitate ongoing assessment: during the implementation** phase, the M&E system must allow for continuous evaluation of whether the funded activity is achieving the anticipated climate impact. It should outline the methods for assessing the effectiveness of the intervention, such as key performance indicators and monitoring frameworks.

- **Impact measurement**: Describe how success will be measured, ensuring that outcomes are tracked and reported accurately.
- **Enhancement of accountability**: A well-documented M&E system increases transparency and accountability. Stakeholders, including funders and beneficiaries, can clearly see the progress and impact of the project, fostering trust and support.
- **Supports evidence-based decision making**: The data collected through the M&E system enables evidence-based decision-making. Project managers can use this data to make informed decisions, allocate resources efficiently, and demonstrate the effectiveness of the project stakeholders.

While these components are essential to the entire funding proposal, the climate rationale does not need to explain each element in exhaustive detail. However, it is important to summarize these principles and considerations within the climate rationale to underscore their linkages in the Funding Proposal. This approach ensures that the adaptation proposal is comprehensive, well-aligned with national priorities, and capable of delivering measurable, effective responses to climate change hazards.

Table 3.1: Guiding questions to build the climate rationale

SN	Key elements	Guiding questions
1	Vulnerabilities and risks	• Does the proposal show how it will address current and future climate risks and impacts, and why the chosen method is effective? • Does the proposal consider non-climatic factors causing or exacerbating climate risks, and describe interactions between climate change and non-climatic factors? • Does the proposal identify groups, sectors, and subregions most susceptible to climate change impacts?
2	Proposed response	• What interventions are proposed to address climate change-related impacts? • Does the proposal justify why a proposed intervention was chosen over alternatives? • Does the proposal consider barriers (e.g., technical, social, regulatory) to implementation, and how these barriers will be overcome? • Does the proposal apply methodological approaches for quantifying beneficiaries expected to result from the activity?

3	National priorities	• Does the proposal align with the country's national plans and climate strategies (e.g., NAPs, NDCs, long-term strategies)?
4	M&E	• Does the proposal have a well-designed theory of change? • Does the proposal describe the M&E system used to assess the climate impact of the proposed project and quantify adaptation beneficiaries?

3.6 Distinguishing adaptation from development

A significant challenge is distinguishing between adaptation actions/projects and broader development initiatives. The line between adaptation and development can often be blurry, making it difficult to make a compelling case for the climate relevance of proposed interventions. This challenge manifests in several ways:

- ***Overlap of objectives***: Many development projects aim to improve resilience and reduce vulnerability, which are also key goals of adaptation. For example, improving water supply infrastructure in a drought-prone area can be seen both as a development and an adaptation initiative. The dual nature of such projects can obscure their primary intent, making it challenging to articulate their climate-specific impacts.

- ***Resource constraints***: LDCs often face significant resource constraints, leading to the integration of adaptation into broader development projects to maximize the use of limited funds. While this integration is practical, making it harder to demonstrate the adaptation benefits clearly.

- ***Institutional capacity***: Limited institutional capacity in LDCs can hinder the development of precise and targeted adaptation proposals. Without specialized knowledge and expertise, project proponents may struggle to identify and articulate the unique aspects of climate adaptation, leading to proposals that are too general or indistinguishable from regular development initiatives.

To address these challenges, it is crucial to highlight the specific climate impacts that an intervention responds to, using the following points:

- ***Clear definition of the climate-related problem*** that the intervention aims to address. This involves specifying the climate hazards and their direct impacts.

- ***Using robust data and evidence*** to justify the climate relevance of the proposed intervention. This might include climate projections, historical climate data, and vulnerability risk assessments to demonstrate how the intervention addresses specific climate risks.

- ***Distinguishing adaptation actions from broader development goals*** by emphasizing the unique aspects of climate change. For instance, while improving healthcare infrastructure is a development goal, enhancing healthcare facilities to withstand extreme weather events is a climate adaptation action. This differentiation helps clarify the adaptation intent and strengthens the climate rationale.

- *While integrating* adaptation into development projects is often necessary, ***it is essential to maintain a clear focus on climate impacts***. This can be achieved by explicitly stating how the development activities contribute to climate resilience and by setting specific adaptation-related outcomes and indicators.

3.7 Vulnerability and Risk Assessment (VRA) - climate rationale for adaption

The complexity of impact pathways complicates the development and implementation of effective adaptation strategies. Without clear, explicit climate rationale, it is challenging to evaluate the assumptions and logic underlying adaptation actions leading to potential inefficiencies and missteps. However, by grounding adaptation efforts in rigorous vulnerability and risk assessments, and by ensuring clear rationale and stakeholder engagement, we can navigate these complexities and develop robust, effective adaptation strategies that enhance societal resilience to climate change.

When formulating a climate rationale for the adaptation measure, it is essential to undertake VRA. It is recognized as a critical step in adaptation planning and implementation. According to the IPCC (2014), this assessment is essential for understanding and addressing the implications of potential changes in the frequency, intensity, and duration of weather and climate events that affect both human and natural systems.

Many climate change adaptation efforts aim to address the risks associated with these changing climate patterns. These efforts focus on reducing the negative impacts on communities and ecosystems by implementing strategies that enhance resilience and adaptive strategy.

It is also important to understand that vulnerable systems are at risk not only because they are exposed to hazards but also due to marginality, of everyday patterns of social interaction and organization, and access or lack of access to resources (Morrow,1999; Watts and Bohle, 1993).

3.7.1 Expected outcomes of the VRA

- ***Identify at-risk populations and systems***: The VRA helps to identify which populations and systems are most vulnerable to climate change. This includes understanding the specific hazards they face, such as extreme weather events, GLOFs, and changing precipitation patterns.

- ***Understand hazard exposure***: By understanding the types and magnitude of hazards, VRA provides insight into the immediate and long-term threats posed by climate change. This helps in prioritizing areas and sectors that require urgent attention.

- ***Analyze vulnerability dynamics***: VRA also explores how vulnerability is generated, how it increases, and how it builds up over time. This dynamic understanding is crucial for developing interventions that effectively reduce risk. Vulnerability is influenced by a combination of historical, cultural, social, environmental, political, and economic factors.

3.7.2 Key elements of the VRA

Initially, vulnerability and risk assessments primarily focused on the physical resistance of engineering structures. This early perspective emphasized the ability of buildings, bridges, and other infrastructures to withstand natural hazards. However, more recent views have expanded the concept of vulnerability to include characteristics of social and environmental processes. This broader understanding recognizes that vulnerability is not solely determined by physical structures but also by the interplay of various cultural, social and environmental factors (Cardona, et al., 2012). In the context of climate change, vulnerability is directly related to susceptibility, sensitivity, and lack of resilience or capacity of exposed systems to cope with and adapt to both extreme and non-extreme events.

Risks associated with climate change mean the potential harmful effects in the future, arising from a mix of social and environmental factors. These risks come from a combination of physical hazards, such as floods or heatwaves, and the vulnerabilities of the people and systems exposed to these hazards. To understand climate change risk, it is important to realize that hazard events do not cause all the harm. The level of negative effects is greatly influenced by how vulnerable and exposed societies and ecological systems are. By considering these broader aspects, we can develop more effective strategies to reduce vulnerability and enhance the resilience of societies and ecosystems in the face of climate change.

- **Vulnerability to climate change**

The concept of vulnerability in climate change has evolved from IPCC's 4th Assessment Report (AR4) in 2007 to the 5th Assessment Report (AR5) in 2014. Vulnerability to climate change was defined as the **degree to which a system (natural or social) is susceptible to, and unable to cope** with, the adverse impact of climate change. However, it was widely realized that this definition could not fully capture the complete picture of climate change impacts, therefore the IPCC introduced the concept of risk in the AR5 (which will be discussed in detail in the next section of this compendium).
Vulnerability is a function of a system's ***sensitivity*** and ***adaptive capacity***.
Thus, vulnerability index can be formulated as a function as:

- **Sensitivity analysis**

Sensitivity refers to the degree to which a system is affected, either adversely or beneficially, by climate variability or change. This concept encompasses both direct and indirect effects on natural and human systems.

- ***Direct effects*** are immediate and often easier to observe and measure. For example – a change in the mean, range, or variability of temperature can directly affect crop yields. Higher temperatures can accelerate crop maturation, potentially reducing yield. Conversely, warmer temperatures might extend the growing season in some regions, potentially benefiting certain crops.

- ***Indirect effects*** are more complex and often involve cascading consequences through various interconnected systems. For example, climate change can indirectly affect ecosystems by altering habitat conditions. Changes in precipitation and temperature can affect water availability, impacting plant growth and biodiversity. These changes can disrupt ecosystem services such as pollination, water purification, and carbon sequestration, which are vital for human well-being.

- **Adaptive capacity evaluation**

Capacity is a crucial element in most conceptual frameworks of vulnerability and risk. It refers to the positive characteristics of people and communities that may reduce the risk posed by a certain hazard. Enhancing capacity is often the target of policies and projects, based on the notion that strengthening capacity will eventually lead to reduced risk. This is especially relevant for mitigating the impacts of climate change.

Coping typically refers to ex-post actions, which are reactive measures taken after a hazard has occurred. Examples include emergency responses and short-term relief efforts. In contrast, adaptation is associated with ex-ante actions, which are proactive measures taken in anticipation of future hazards. These might include long-term strategies to modify systems and practices to better withstand or respond to future risks.

Adaptive capacity refers to the ability of a system or individual to adjust to climate change and can also be used in the context of disaster risk management. According to Lavell (1999), adaptive capacity determines "the ability of an individual, family, community, or other social group to adjust to changes in the environment guaranteeing survival and sustainability." This implies that in the context of uncertain environmental changes, adaptive capacity is of key significance.

Adaptive capacity is crucial for:

- ***Reducing vulnerability:*** It helps in lowering the susceptibility of systems and societies to climate-related hazards by enhancing their ability to withstand and recover from impacts.

- ***Enhancing resilience:*** By building adaptive capacity, societies can improve their resilience, ensuring they are better prepared for future changes and can recover more quickly from adverse events.

- ***Advancing sustainable development:*** Effective adaptive capacity supports sustainable development by ensuring that communities can maintain their livelihoods and well-being despite environmental changes.

Examples of adaptive capacity:

- In areas prone to flooding, enhancing adaptive capacity might involve building elevated housing, developing early warning systems, and educating the community about evacuation procedures.
- For farmers, adaptive capacity might include diversifying crops, adopting drought-resistant varieties, and utilizing efficient irrigation techniques to cope with changing rainfall patterns.

Capacity, particularly adaptive capacity, is a key component in managing vulnerability and risk. It encompasses the ability to anticipate, prepare for, and respond to climate-related hazards. By focusing on strengthening adaptive capacity, communities can reduce their vulnerability, enhance their resilience, and ensure sustainable development in the face of climate change.

3.8 Climate change risks

Risk is defined as the potential for adverse effects on a system, which is considered as the interaction of three factors – vulnerability, exposure, and hazard.
Climate Risk = Hazard x Exposure x Vulnerability

3.8.1 Climate change induced hazards/ extreme events

A hazard is the potential for a natural or human-induced physical event, trend, or impact that could cause adverse effects on life, health, property, infrastructure, livelihoods, service provision, ecosystems, and environmental resources. In the context of climate change, hazards generally refer to climate-related physical events or trends and their impacts. These hazards can be described in terms of their ***character***, ***magnitude***, and ***the rate*** at which they can affect a system.

- ***Character:*** Refers to the specific nature of climate change impacts, such as rising temperatures, changing precipitation patterns, or increased frequency of extreme weather events. Different regions and systems will experience unique climate-related challenges.

- ***Magnitude:*** indicates the severity or extent of climate change impacts. For instance, a 2°C rise in global temperatures can have significantly different consequences compared to a 1.5°C rise, as evidenced by numerous studies, including those by the IPCC.

- ***Rate:*** The speed at which climate change occurs affects the ability of systems to adapt. Rapid changes can overwhelm natural and human systems, reducing their capacity to cope and increasing their vulnerability.

Some of the examples of climate change hazards include:

- ***Extreme temperature events leading to heatwaves and cold spells:*** The IPCC AR6 report noted a significant rise in the frequency, duration, and intensity of heatwaves globally. This trend is particularly evident in Europe, Asia, and Australia. Each additional 0.5°C of global warming is expected to further increase the frequency and severity of heatwaves, leading to more pronounced health impacts, such as heat-related illnesses and deaths, as well as economic disruptions due to decreased labor productivity and increased energy demand for cooling (IPCC, 2021, AR6, WGI, Ch.11).

- ***Heavy precipitation events leading to floods and landslides:*** AR6 highlighted that heavy precipitation events have become more frequent and intense across most land regions. This is attributed to the increased moisture-holding capacity linked to a warming atmosphere. The frequency of such events is projected to continue increasing, leading to higher risks of flooding, infrastructure damage, and landslides. The report underscores the regional variability, with some areas experiencing more frequent and severe rainfall events, result in significant socio-economic impacts (IPCC, 2021, AR6 WG I, Ch. 8).

- ***Droughts:*** The report finds that droughts are becoming more frequent and severe, particularly in the Mediterranean, Southern Africa, and parts of the Americas. These changes are linked to altered precipitation patterns and increased evaporation rates due to high temperatures. The impacts of droughts include reduced water availability for agriculture, drinking, and industrial use, which exacerbate water scarcity and threaten food security (IPCC, 2021, AR6, WG I, Ch. 11).

- ***Sea-level rise:*** The AR6 confirms that the rate of sea-level rise has accelerated over recent decades, driven by thermal expansion of seawater and increased melting of glaciers and ice sheets. This ongoing rise poses significant risks to coastal communities through increased flooding, erosion, and saltwater intrusion. The report projects that sea levels will continue to rise throughout the 21st century and beyond, with the magnitude depending on future greenhouse gas emissions scenarios (IPCC, 2021, AR6 WG I, Ch. 9).

- ***Increased intensity of tropical cyclones:*** The IPCC notes that while the overall frequency of tropical cyclones may not increase significantly, the intensity and associated precipitation of these storms are expected to rise. This means more powerful storms with heavier rainfall and higher wind speeds, leading to greater potential for damage to infrastructure, agriculture, and ecosystems, and posing significant risks to human health and safety (IPCC, 2021, AR6 WG I, Ch. 11).

- ***Higher risk of wildfires***: The report identifies an increased risk of wildfires due to higher temperatures and prolonged dry periods. Regions such as North America, the Mediterranean, and Australia are experiencing more frequent and severe fire weather conditions, leading to widespread destruction of forests, grasslands, and communities, and significant impacts on air quality and public health (IPCC, 2021, AR6 WG I, Ch. 12).

3.8.2 Assessment of exposure

Exposure is the degree (extent) to which populations and systems are in contact with climate change hazards. Exposure refers to the inventory of elements in an area in which hazard events may occur as mentioned in (Cardona, et al., 2012). This process involves analyzing geographic areas and sectors prone to climate impacts, such as agriculture, water resources, and health. In a nutshell, exposure can be understood as the degree to which a system is exposed to climate hazards (*e.g.*, rising sea level, extreme weather events). Understanding exposure allows decision-makers to prioritize adaptation measures and allocate resources effectively to mitigate climate risks.

Exposure is determined by the areas of land that are vulnerable to climatic hazards or extreme events. According to the IPCC, exposure is defined as "the presence of people, livelihoods, species or ecosystems, environmental functions, services, and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected" (IPCC;, 2014). For instance, as the capital city, Kathmandu, has a high concentration of infrastructure, including residential buildings, commercial centers, government offices, roads, bridges, and others. This dense infrastructure increases Kathmandu's exposure to climatic hazards such as floods. On the other hand, Rupandehi and Kapilvastu districts have extensive agricultural land dedicated to cereal crops. This makes them highly exposed to climatic hazards, such as floods or droughts, which can devastate crops and impact food security. Therefore, exposure could be considered high if an area exposed to climate hazards or extreme events contains important and susceptible resources compared to another area exposed to similar hazards but lacking such resources.

Exposure is determined by the areas of land that are vulnerable to climatic hazards or extreme events (Cardona, et al., 2012). Exposure is considered high, if that area exposed to climate hazard/ extreme events, has important and susceptible resources, in compared to another area, that might have exposed to similar hazards/extreme event yet do not have such resources. For instance, Kathmandu, as the capital city, has a high concentration of infrastructure. This dense infrastructure increases the district's exposure to climatic hazards such as floods. Similarly, Rupandehi and Kapilvastu have extensive agricultural land for cereal crops, making these areas highly exposed to climatic hazard, such as flood or droughts, which can devastate crops and impact food security.

High exposure to climatic hazards or extreme events has implications (IPCC;, 2014). For instance, the destruction of infrastructure in Kathmandu can lead to substantial economic losses. Flooding can damage buildings, roads, and bridges, disrupting the functioning of the economy as well as requiring expensive repairs and reconstruction. Similarly, high exposure increases the risk of lives and health, especially in densely populated areas. Displacement of people and disruption of services can have long-term social implications such as increased poverty. Climatic hazards can lead to environmental implications as well such as soil erosion, loss of biodiversity, and degradation of natural resources. For example, frequent flooding can strip away fertile topsoil, reducing agricultural land quality and productivity.

3.9 Steps to design a climate rationale for adaptation projects

Understanding the steps to design a climate rationale for adaptation projects can be facilitated by examining the processes and procedures of funding agencies. For example, the Green Climate Fund (GCF) provides a robust framework for developing a climate rationale for projects seeking its funding. It is crucial to grasp the GCF's objectives in mandating a climate rationale to effectively determine which elements to incorporate.

According to the GCF, the climate rationale for adaptation project aims to:

- Establish credible climate science and evidence by preparing robust assessments of *exposure, impacts, vulnerability, and disaster risks* in the context of adaptation**.**
- Develop optimal interventions that can collectively and comprehensively address underlying climate risks and maximize sustainable development benefits.
- Integrate interventions into broader national and international policy and decision-making processes for long-term, low-emission, *climate-resilient development*, meeting commitments under the United Nations Framework Convention on Climate Change (UNFCCC) and related global agendas.

3.9.1 STEP 1: Desk research/literature review on climate impacts and vulnerabilities for adaptation projects

Conducting desk research and undertaking a literature review are essential first steps in developing a sound climate rationale. This process helps project proponents understand the climate impacts and vulnerabilities faced by the country or region, ensuring that the proposed interventions are based on a comprehensive and accurate understanding of the local context. Specifically, the research should:

- ***Gather and synthesize existing data and information on climate impacts*** relevant to the proposed project. The objective here is to compile a thorough overview of current knowledge and evidence related to climate risks and effects in the target area.

The outcome should be a clear outline of the specific climate-related issues that the intervention aims to address. This understanding forms the foundation of the project's rationale, ensuring that the proposed activities are grounded in documented needs and challenges.

- ***Defining the goals and scope of the proposed interventions*** based on gathered information. The objective is to ensure that the project's aims are directly aligned with the identified climate impacts and vulnerabilities. The outcome should be a well-defined set of objectives that clearly articulates how the project will address the specific issues identified. This alignment is crucial for the relevance and effectiveness of the intervention.

- The research should ***identify data gaps*** by highlighting any deficiencies in the current data and information that may affect the project's design and implementation. The objective is to pinpoint areas where additional data or research is needed to fully understand the climate context and ensure the project's success. The outcome should be a plan for additional data collection or research if necessary to fill these gaps, thereby strengthening the project's foundation and increasing its chances of achieving the desired outcomes.

- **Climate data trends**

Understanding historical and projected climate data trends is crucial for developing effective climate adaptation projects. These trends provide insights into how climate variables such as temperature, precipitation, and extreme weather events have changed over time and how they are expected to change in the future. This information forms the basis for assessing vulnerabilities, planning interventions, and setting realistic goals.

What to look for

- *Historical climate data* **–** Gather data on past climate conditions to understand the baseline from which changes are occurring. Include average temperature, seasonal temperature variations, precipitation levels, and the frequency and intensity of extreme weather events such as storms, droughts, and heatwaves. These data can be found in meteorological records, national climate reports, and academic research.

- *Projected climate data* **–** Obtain projections of future climate conditions based on different emissions scenarios and climate models. Projected changes in temperature and precipitation patterns, expected increases in the frequency and severity of extreme weather events. Climate projections are often available from national meteorological agencies, international bodies like IPCC, and climate research institutions.

Analysis of the specific trends

Temperature changes

- *Historical Trends:* Identify trends in average annual and seasonal temperatures over the past decades. Look for evidence of warming trends, increased frequency of heatwaves, and changes in temperature extremes.
- *Projected Changes:* Analyze model projections for future temperature changes under various emissions scenarios. Determine the expected rise in average temperatures, the likelihood of more frequent and severe heatwaves, and potential impacts on local ecosystems and human health.

Precipitation patterns

- *Historical Trends:* Examine past data on annual and seasonal precipitation levels. Identify trends such as shifts in rainy seasons, changes in the intensity and duration of rainfall events, and the occurrence of droughts or floods.
- *Projected Changes:* Review projections for future precipitation patterns, including changes in total annual rainfall, shifts in seasonal distribution, and the likelihood of more intense and frequent extreme precipitation events. Assess the implications for water resources, agriculture, and infrastructure.

Extreme weather events

- *Historical Trends:* Document the occurrence and impacts of extreme weather events such as storms, hurricanes, droughts, and floods. Analyze how their frequency, intensity, and geographic distribution have changed over time.
- *Projected Changes:* Evaluate projections for future extreme weather events, considering factors such as increased storm intensity, prolonged drought periods, and more frequent and severe flooding. Understand how these changes will impact vulnerable communities and sectors.

This data and information can be used to assess the risks posed by climate change to the target area. Identify the most significant threats and their potential impacts on people, ecosystems, and infrastructures. Moreover, this information will form the basis for designing adaptation interventions that specifically address the identified trends and risks. For example, if projections indicate increased flooding, propose flood defenses and improved drainage systems.

Sources of data and available tools for climate analysis

When undertaking a literature review, project proponents should seek out studies that provide robust and relevant climate data for the adaptation projects. For successful climate finance

proposals or projects, integration of stronger climate science based on the best available scientific evidence is necessary, thereby enhancing the effectiveness and sustainability of the proposed adaptation responses.

The IPCC is a critical repository for baseline and widely accepted climate science. As an authoritative body, it synthesizes the latest scientific research and provides comprehensive assessments of climate change, its impacts, and potential future risks. The IPCC's reports are essential starting points for understanding baseline climate science and assessing regionally relevant observations, projections, and analyses. The most recent IPCC report (6th Assessment Report, AR6) provides an exhaustive review of the current state of climate science, highlighting key findings and projections that are critical for understanding and addressing climate change globally.In addition, resources like the NDC Partnership Climate Toolbox serve as repositories of a range of databases and resources that can be disaggregated by region, country, sector, and other parameters to provide the most relevant information for informing the development of climate rationale and other elements of project proposals.

Historical climate data

Firstly, gathering historical climate data relevant to the area of focus is crucial. This data includes – precipitation, temperature trends, droughts, and rainfall patterns. The most reliable sources for historic climate data are National Meteorological and Hydrological Services, which are likely to have the most detailed and accurate country level climate data. In Nepal, the Department of Hydrology and Meteorology (DHM) under Government of Nepal is the primary source of such data, which maintains comprehensive records of observational data collected in the past, using standardized instruments and procedures.

Climate change projections - representative concentration pathways (RCP)

Next, it is essential to gather climate projection data relevant to the area of focus. This data provides insights into future climate conditions, allowing for more informed planning and decision-making. Understanding future climate conditions is crucial for developing effective adaptation and mitigation strategies. Climate projection data helps in:

- *Ris*k assessment to identify potential climate risks and vulnerabilities specific to the area of focus.
- *De*signing robust climate adaptation measures to protect communities, infrastructure, and ecosystems.
- *Infor*ming policies and strategies that address future climate impacts and reduce greenhouse gas emissions.

Some of the sources of climate projection data and tools are:

- *Gl*obal and Regional Climate Models: These models simulate future climate conditions based on various GHG emission scenarios.
- National and International Climate Research Institutions: Organizations such as IPCC, *na*tional meteorological agencies, and research universities often provide accessible climate projection data. Intergovernmental research agencies such as Internation Center for Integrated Mountain Development (ICIMOD) can also serve as crucial repositories for region-specific information.
- Specialized tools: Tools like the RegioClim, Local Sea level Rise tool, and other region-specific climate projection platforms offer detailed and localized projections.

The IPCC provides standardized scenarios, such as Representative Concentration Pathways (RCPs) which are used to project different levels of greenhouse gas concentrations and their impacts on global and regional climates. Scientists use computer models of the climate system to better understand these issues and project future climate changes.

Past and present GHG emissions will impact the climate far into the future. Many GHGs remain in the atmosphere for extended periods. Consequently, even if emissions stopped increasing, atmospheric GHG concentrations would continue to rise and remain elevated for hundreds of years. Moreover, even if we stabilized concentrations and kept the composition of today's atmosphere steady – which would require a dramatic reduction in current GHG emissions – surface air temperatures would continue to warm. This is because the oceans, which store heat, take many decades to fully respond to higher GHG concentrations. The ocean's response to these higher concentrations and temperatures will continue to influence the climate for the next several decades to hundreds of years.

Because projecting far-off future emissions and other human factors that influence climate is challenging, scientists employ a range of scenarios. These scenarios incorporate diverse assumptions about future economic, social, technological, and environmental conditions. By exploring various plausible pathways, scientists can better understand the potential range of climate outcomes. This approach helps policymakers and researchers prepare for uncertainties and develop strategies to mitigate climate change impacts effectively.

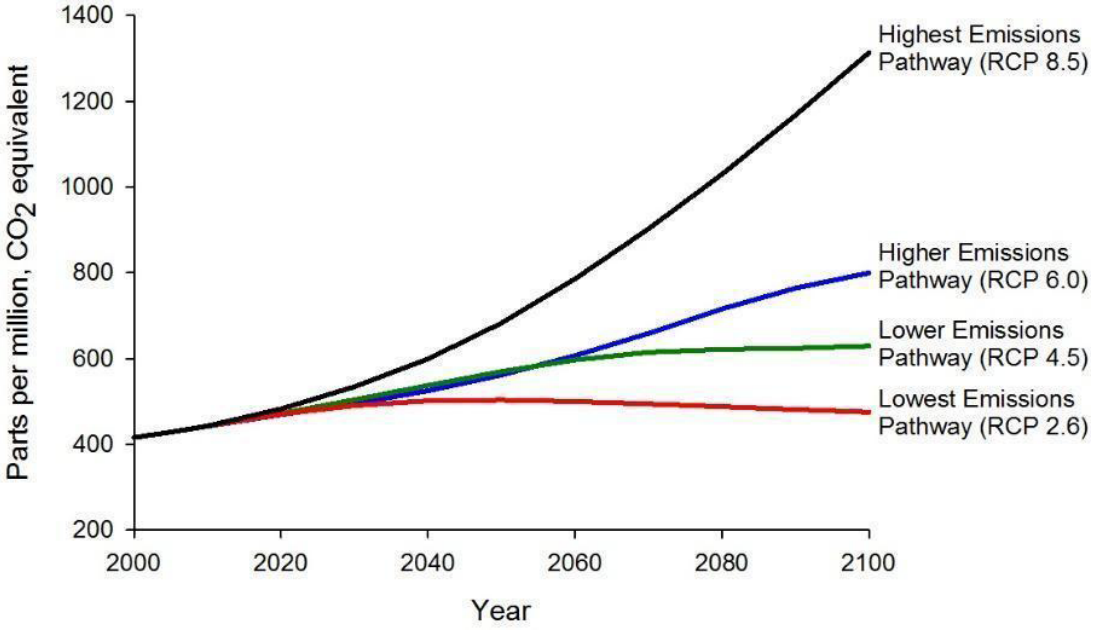

Figure 3.1: Projected surface temperature changes by the end of the 22nd century cross all RCP emissions scenarios (based on the average of all IPCC models). Stippling represents the areas of greatest model agreement.

Source: IPCC (2013)

This figure illustrates projected greenhouse gas concentrations based on four distinct emissions pathways. The top pathway assumes that greenhouse gas emissions will persistently increase throughout the current century. In contrast, the bottom pathway projects emissions reaching a peak between 2010 and 2020, followed by a decline thereafter. These scenarios provide a visual representation of potential future trends in greenhouse gas concentrations, offering insights into the varying impacts on climate and environment based on different emission trajectories. The Representative Concentration Pathways (RCPs) used in climate modeling to describe different climate futures, based on varying levels of GHG emissions and their radiative forcing (the change in energy flux in the atmosphere due to these emissions).

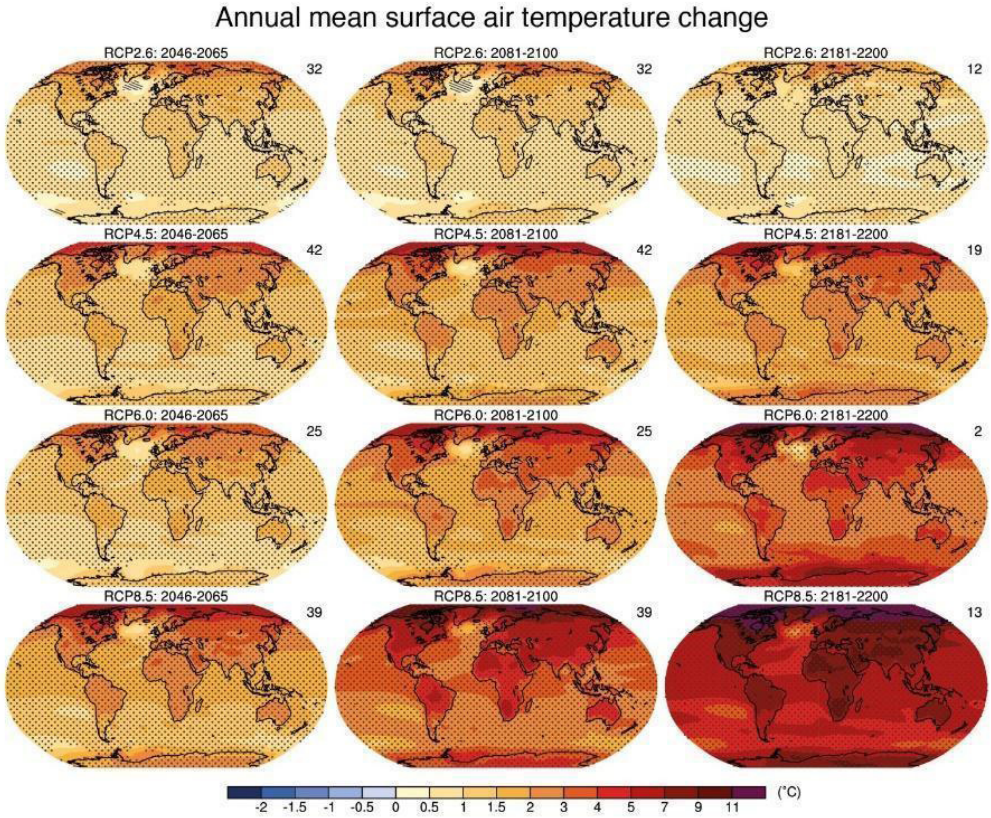

Figure 3-2: Predicted temperature changes under various RCP scenarios.

Source: IPCC (2013)

This figure depicts projected changes in global average temperatures relative to the 1986-2005 averages across four emissions pathways and three distinct time periods. The pathways are derived from the IPCC Fifth Assessment Report: RCP2.6 represents a very low emissions trajectory, RCP4.5 denotes a medium emissions scenario, RCP6.0 signifies a medium-high emissions pathway, and RCP8.5 depicts a high emissions pathway where emissions are projected to increase continuously throughout the century. This visual representation allows for comparisons of the potential temperature outcomes under different emission scenarios, aiding in understanding the varying impacts of climate change based on these trajectories.

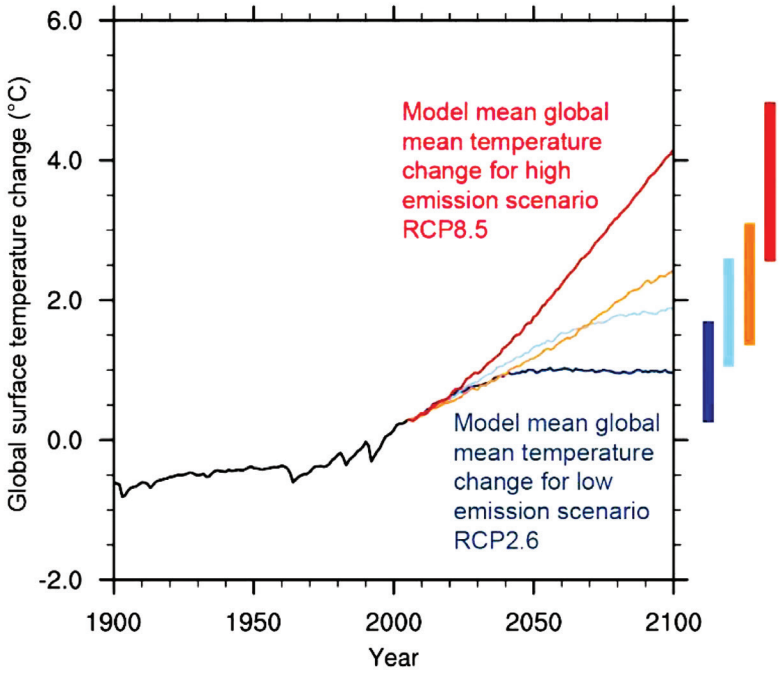

Figure 3.3 : Observed and projected changes in global average temperature under four emissions pathways (Dark Blue=RCP 2.6, Light Blue=RCP 4.5, Orange= RCP 6, and Red= RCP 8.5). The vertical bars at right show likely ranges in temperature by the end of the century, while the lines show projections averaged across a range of climate models Changes are relative to the 1986-2005 average.

Source: IPCC (2013)

Observed and projected changes in global average temperature under four emissions pathways are illustrated in this representation. The vertical bars on the right depict the likely ranges of temperature by the end of the century, indicating the potential variability in outcomes based on different scenarios. The lines within the graph represent projections averaged across a spectrum of climate models, offering a synthesized view of the expected temperature trends relative to the 1986-2005 average. This visual aids in understanding the range of possible future climate scenarios under various emissions pathways, highlighting the uncertainty and potential impacts associated with different levels of greenhouse gas emissions

Climate change scenario (Based on NAP)

In the following example, two potential climate scenarios, RCP 4.5 and RCP 8.5, were selected to represent extreme future conditions for the medium-term period (2016 – 2045) and the long-term period (2036 – 2065). These scenarios align with the 2030s and 2050s timeframes set in the NAP process, using 1981 – 2010 as the reference period.

The assessment in NAP analyzed various climatic variables, such as temperature and precipitation, across different administrative units and physiographic regions of Nepal. The results indicate that temperature and precipitation are expected to increase in the future. Specifically, temperature variables are projected to rise continuously throughout the century under both scenarios.

- For instance, average temperatures in Nepal are expected to increase by approximately 1.7°C under RCP 4.5, and by 3.6°C under RCP 8.5 by the 2050s.
- Annual precipitation is projected to increase overall, but this increase will not be uniform throughout the year. Seasonal variations are anticipated, with some seasons experiencing more significant changes in precipitation than others.

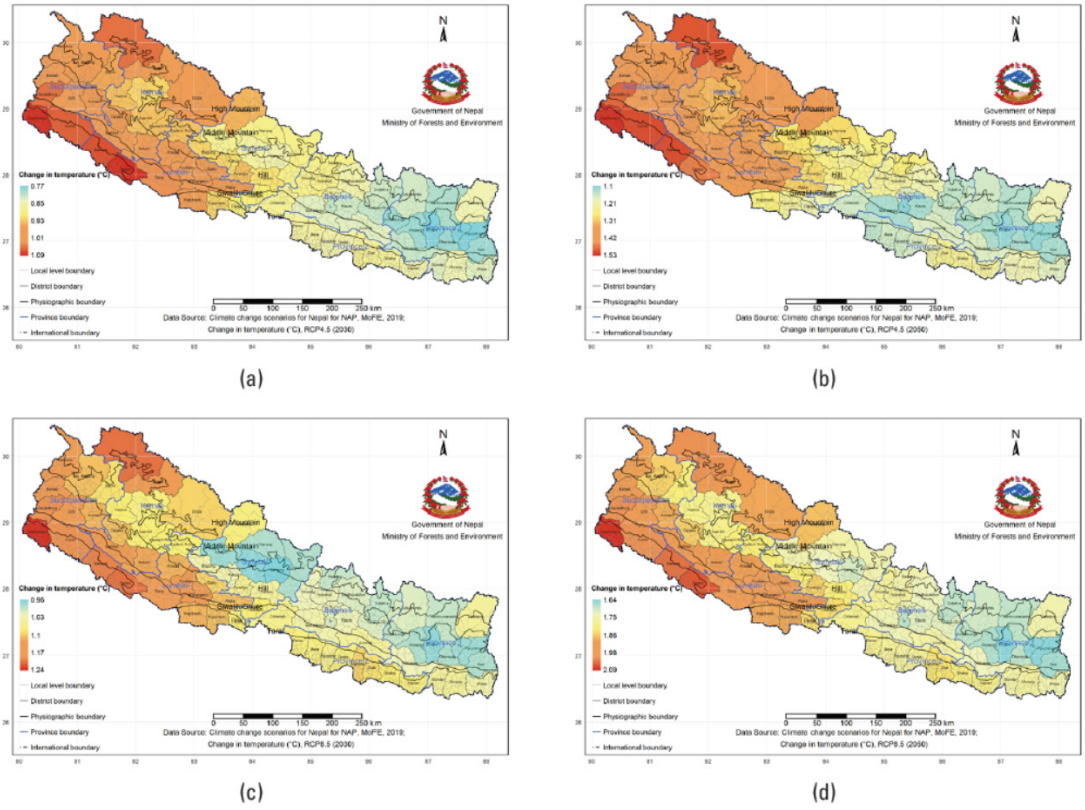

Figure 2-3: Mid-term and long temperatures rises under RCP4.5 (a and b) and RCP 8.5 (c and d) scenarios

Source: MoFE (2021)

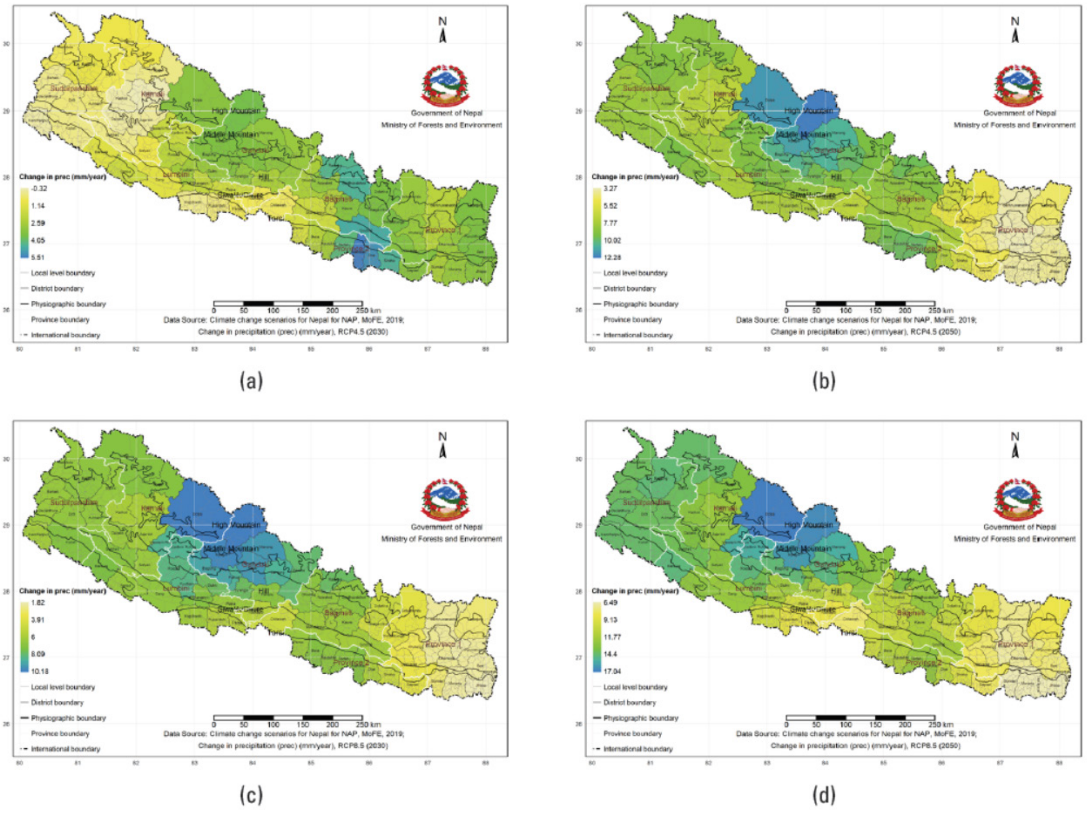

Figure 2-3: Mid-term and long-term precipitation changes under RCP4.5 (a and b) and RCP8.5 (c and d) scenarios.

Source: MoFE (2021)

The study's findings suggest that, in general, the future climate will be warmer and wetter by mid-century compared to the reference period of 1981 – 2010. This trend is consistent with broader global climate projections that predict higher temperatures and altered precipitation patterns due to increased GHG concentrations.

3.9.2 STEP 2: Application of the VRA

A vulnerability and risk assessment (VRA) provides a systematic and methodological approach for identifying priority vulnerabilities, which in turn informs the development of targeted adaptation interventions. (See section 3.3.2.) Such assessments are critical for establishing a climate rationale and supporting broader project proposals. By demonstrating the causal linkage between climate change impacts, observed and projected vulnerabilities, and targeted adaptation strategies, project proponents can effectively address the specific needs of vulnerable groups, sectors, and geographic areas. *See section 3.3.2 for a detailed description of how to conduct a VRA.*

Objectives of the VRA

The primary objectives of a vulnerability and risk assessment include:

- **Identification of key vulnerabilities:** Determining the most critical vulnerabilities in a given context, whether they are social, economic, or environmental.
- **Prioritization of adaptation needs:** Assessing which vulnerabilities require immediate attention and which can be addressed over a longer time frame.
- **Integration into policy and planning:** Ensuring that the findings of the assessment are incorporated into relevant policies, development plans, and adaptation strategies.

Activities and guiding questions

The UNFCCC (n.d.) outlines key activities and guiding questions for conducting a comprehensive vulnerability and risk assessment, as detailed in Section 3 of the UNFCCC's Adaptation Policy Framework Series. Key activities include:

Scoping and designing the assessment

- **Guiding questions:** What are the objectives of the assessment? What are the boundaries and scope of the assessment?
- **Activities:** Define the goals, scope, and framework for the assessment; identify stakeholders and involve them in the process.

Assessing current vulnerabilities

- **Guiding questions:** What are the current vulnerabilities to climate change? Who is affected and why?
- **Activities:** Conduct field surveys, interviews, and review existing data to assess current vulnerabilities.

Projecting future vulnerabilities

- **Guiding questions:** How might vulnerabilities change in the future under different climate scenarios?
- **Activities:** Use climate models and socio-economic projections to predict future vulnerabilities.

Identifying adaptation options

- **Guiding questions:** What adaptation measures can address identified vulnerabilities?
- **Activities:** Evaluate potential adaptation strategies and prioritize them based on feasibility, effectiveness, and cost.

Integrating Findings into policy and practice

- **Guiding Questions:** How can the results of the assessment inform policy and planning?
- **Activities:** Develop recommendations for integrating assessment findings into local, regional, and national policies and plans.

Demonstrating causal linkages

A critical aspect of these assessments is establishing causal linkages between climate change impacts, vulnerabilities, and adaptation strategies. This involves:

- **Using climate models:** To project potential changes in climate variables such as temperature, precipitation, and sea-level rise (IPCC, 2021).
- **Socio-economic analysis:** To understand how these changes will affect different groups, sectors, and regions (Adger et al., 2005).
- **Impact assessments:** To quantify the potential impacts on ecosystems, infrastructure, health, and economies (Hinkel, 2011).

Tools and resources

Climate vulnerability and risk assessment delves into the potential tools and resources available for these assessments. Some of the commonly used tools include:

- **Geographic information systems (GIS):** For spatial analysis of vulnerabilities and impacts.
- **Climate risk assessment frameworks:** Such as the Climate Vulnerability and Capacity Analysis (CVCA) framework (CARE, 2009).
- **Participatory methods:** Engaging local communities in identifying and prioritizing vulnerabilities and adaptation options.

STEP 3: Prioritization of adaptation actions

The process of selecting and prioritizing different climate actions involves considering several factors. These can include cost-effectiveness, potential environmental and social implications, project scope and impact, and other relevant criteria. The aim is to explore and experiment with different approaches to analyse available options and compare them based on your respective needs, contexts, and priorities. The following tools are commonly used in this process.

- Cost – Benefit Analysis (CBA) – This tool helps in evaluating the overall benefits and costs of an action, providing a clear picture of its net value.
- Cost Effectiveness Analysis (CEA) - This method focuses on the costs related to achieving a specific outcome, making it useful for comparing different actions that achieve similar goals.

- Multi-Criteria Analysis (MCA) - MCA allows for the evaluation of actions based on multiple criteria, providing a more comprehensive assessment.

3.10 Constraints and challenges associated with a climate rationale for adaptation

3.10.1 Data availability and quality

Limited Data: In many regions, especially in developing countries, there is a lack of reliable climatic and socio-economic data.
Data Quality: Even where data exists, it may be outdated, inconsistent, or lack the granularity needed for effective analysis.

3.10.2 Uncertainty in climate projections

Model Variability: Different climate models can produce varying projections, leading to uncertainty in future climate scenarios.
Long-Term Predictions: Predicting climate impacts over long time horizons is inherently uncertain, complicating planning and decision-making.

3.10.3 Integration of multidisciplinary data

Complexity: Combining climatic data with socio-economic, environmental, and technological factors can be complex and challenging.
Interdisciplinary Collaboration: Effective integration requires collaboration across various disciplines, which can be difficult to coordinate.

3.10.4 Financial constraints

Funding Limitations: Securing adequate funding for adaptation projects is often challenging, particularly for large-scale or long-term initiatives.
Cost Analysis: Accurately assessing the costs and benefits of adaptation actions requires robust financial analysis, which may not always be feasible.

3.10.5 Institutional and governance barriers

Policy gaps: Lack of supportive policies and frameworks can hinder the implementation of adaptation measures.
Coordination issues: Poor coordination among different levels of government and between governmental and non-governmental organizations can lead to inefficiencies and conflicts.

3.10.6 Stakeholder engagement

Participation challenges: Engaging a diverse range of stakeholders, including vulnerable communities, in the decision-making process can be difficult.
Conflicting interests: Different stakeholders may have conflicting interests and priorities, complicating consensus-building.

3.10.7 Technological limitations

Access to technology: In some regions, there is limited access to the technology required for effective adaptation.
Capacity building: Ensuring that local communities and stakeholders have the necessary skills and knowledge to use adaptation technologies effectively is essential but challenging.

3.10.8 Socio-economic factors

Vulnerability and inequality: Socio-economic inequalities can exacerbate vulnerability to climate impacts, making it harder to implement equitable adaptation strategies.
Behavioural change: Encouraging behavioural change among communities and stakeholders to adopt adaptation measures can be difficult.

3.10.9 Environmental considerations

Ecosystem impacts: Adaptation actions can have unintended consequences on local ecosystems, requiring careful consideration and mitigation.
Sustainability: Ensuring that adaptation measures are sustainable in the long term is crucial but often challenging.

3.10.10 Monitoring and evaluation

Performance metrics: Developing appropriate metrics and indicators to monitor and evaluate the effectiveness of adaptation actions can be complex.
Feedback mechanisms: Establishing robust feedback mechanisms to learn from past experiences and adjust strategies accordingly is essential but often overlooked.

Chapter 4

Developing a Climate Rationale in the Context of Mitigation

4.1 Introduction

This chapter outlines the strategy for strengthening the climate rationale to improve the quality of climate mitigation projects and programmes. It emphasizes the importance of using robust data and projections that support the urgency of mitigation efforts. The climate rationale for such actions must clearly demonstrate the interconnections between climate, climate impacts, mitigation actions and societal benefits, all grounded in the best available climate data and science.

The chapter covers key elements and guiding questions for developing a strong climate rationale for mitigating projects. It also outlines the steps involved in this process, ensuring the rationale is comprehensive and aligned with scientific and policy frameworks.

Furthermore, the chapter also explores relevant project activities within the current policy framework, offering both global and Nepal-specific examples of how climate rationale has been integrated into mitigation projects. It aims to demystify the complexities behind climate mitigation, providing an overview of Nepal's GHG inventory and addressing the challenges encountered in developing a climate rationale for mitigation efforts.

4.2 Climate mitigation

Climate change mitigation involves actions aimed at reducing or preventing the emissions of GHG that drive human-induced climate change. Mitigation can be achieved through various strategies, including the adoption of new technologies, the promotion of renewable energy sources, the enhancement of energy efficiency in existing systems, and changes in management practices or consumer behaviour. According to IPCC (Stocker et al., 2014; Edenhofer et at., 2015), mitigation refers to efforts to control human activities that contribute to climate change, particularly through the reduction of GHGs and other pollutants, such as black carbon, which affect the planet's energy balance.

Mitigation also includes efforts to enhance the processes that remove GHGs from the atmosphere, known as carbon sinks. Defined by IPCC, mitigation is "a human intervention to reduce the sources or enhance the sinks of GHGs." This intervention is crucial for reducing the substances that directly or indirectly contribute to climate change. For instance, it includes reducing particulate matter (PM) emissions that can directly alter the Earth's radiation balance, such as black carbon, or controlling emissions of carbon monoxide, nitrogen oxides (NO_x), volatile organic compounds (VOCs), and other pollutants that impact the concentration of tropospheric ozone (O_3) which indirectly affects the climate (Stocker et al., 2014).

Given its potential to lower the projected impacts of climate change and reduce the risks of extreme weather events, mitigation constitutes a part of a policy strategy. This strategy should be informed by a climate rationale, integrating various approaches to effectively address climate change.

Climate change mitigation focuses on reducing GHG emissions and their concentrations in the atmosphere through a variety of strategies. Examples of these strategies include:

- Upgrading current commercial and multifamily buildings to improve energy efficiency and reduce dependence on fossil fuels for heating and cooling.
- Implementing net-zero energy building codes for new developments to ensure sustainable energy use from the outset.
- Enhancing energy efficiency across various sectors to lower overall consumption.
- Boosting electricity production while optimizing the energy distribution network for greater efficiency.
- Expanding the share of renewable energy within the energy mix.
- Establishing renewable portfolio standards to progressively raise the share of renewable energy used.
- Reducing reliance on private cars by promoting the use of public transportation.
- Encouraging active transportation options such as biking and walking.
- Introducing and promoting the adoption of zero-emission electric vehicles.

4.3 Elements for and benefits of climate mitigation

The climate rationale for mitigation efforts encompasses several key elements that highlight the urgency and importance of reducing GHG emissions to limit global warming. These elements collectively highlight the critical need for proactive measures to build a sustainable and resilient future for both current and future generations. By prioritising mitigation, countries can mitigate climate risks, protect natural resources, and foster equitable and inclusive development.

4.3.1 Mitigating climate change impacts

Climate mitigation aims to reduce the severity and impact of climate change on ecosystems, economies, and human societies. By lowering GHG emissions, particularly carbon dioxide (CO_2) from burning fossil fuels, mitigation efforts help curb global temperature rise and associated risks such as extreme weather events, sea-level rise, and biodiversity loss.

4.3.2 Protecting vulnerable populations

Vulnerable communities, especially those in low-lying coastal areas, arid regions, and small island states, are disproportionately affected by climate change. Mitigation measures are vital in protecting these populations by reducing their exposure to climate-related risks and enhancing their resilience to climate impacts.

4.3.3 Preserving ecosystems and biodiversity

Climate change threatens ecosystems and biodiversity through habitat loss, altered migration patterns, and increased extinction risks. Mitigation efforts help preserve these valuable natural resources by minimizing habitat destruction and maintaining ecological balance.

Aligning with Sustainable Development Goals (SDGs)

Climate mitigation is closely aligned with the SDGs, particularly Goal 13 (Climate Action), which calls for urgent action to combat climate change and its impacts. Mitigation also contributes to achieving other SDGs such as poverty reduction (Goal 1), clean energy access (Goal 7), and sustainable cities and communities (Goal 11).

Health benefits

Mitigating climate change can lead to significant health co-benefits by reducing air pollution, which is linked to respiratory and cardiovascular diseases. Transitioning to cleaner energy sources and promoting sustainable transportation can improve air quality and public health outcomes.

Economic opportunities

Investing in clean energy technologies, energy efficiency measures, and sustainable practices can stimulate economic growth, create new jobs, and enhance energy security. Mitigation measures also help reduce the economic costs associated with climate change impacts, such as damage to infrastructure and disruptions to agriculture and tourism sectors.

Global responsibility

Climate change is a global challenge that requires collective action from all countries to achieve meaningful reductions in GHG emissions. Mitigation efforts demonstrate international cooperation and commitment to addressing the root causes of climate change and achieving global climate goals, such as those outlined in the Paris Agreement.

Long-term sustainability

Mitigation measures promote long-term sustainability by encouraging the adoption of renewable energy sources, promoting energy efficiency, and integrating climate considerations into development planning. These actions help build resilient communities and reduce reliance on fossil fuels, which are finite and contribute to environmental degradation (Figure 4.1).

The elements of climate rationale for mitigation focus on addressing the root causes of climate change by reducing greenhouse gas emissions and enhancing carbon sinks (Box 4.1). These elements help create a robust framework for mitigating climate change by providing a clear, evidence-based rationale for the proposed actions.

Box 4.1 Elements of climate rationale for mitigation

Forming scientific basis for climate rationale
Emission trajectories for mitigation projects
Pathways to shift the emission trajectories for mitigation projects
Assessment of mitigation options based on priorities

4.3.4 Forming the scientific basis for a climate rationale

The climate science basis involves using scientific evidence to justify and support decisions or actions aimed at addressing climate change mitigation. Ensuring that climate rationale are grounded in robust evidence allows them to align with our understanding of the climate system and the impact of human activities. This scientific foundation is crucial for making informed, effective decisions in the fight against climate change.

4.3.5 Emission trajectory for the relevant sectors and potential pathways to shift projected emission trajectory

An emission trajectory represents the projected path of GHG emissions over time for a specific country or sector. It includes assessing current emissions, making future projections, and setting targets and goals. By tracking these trajectories, sectors can monitor progress towards meeting emission reduction targets or identify potential pathways to alter projected emissions. For mitigation projects, incorporating data on emissions trajectories and historical trends strengthens the climate rationale, ensuring that actions are both targeted and justified. It is important to include a clear description of the methodologies used for data collection, detailing which target areas or populations are impacted by or will benefit from the proposed interventions. This organized information is important for justifying the need for mitigation projects and programs.

4.3.6 Prioritizing mitigation interventions for addressing barriers

Addressing barriers to climate action often requires a strategic approach based on a MCA of available options. MCA involves systematically evaluating various strategies to overcome specific obstacles. This process involves identifying barriers, establishing criteria to evaluate potential interventions, developing potential interventions for each barrier, prioritizing these interventions, and finally, developing a detailed action plan for implementing the top strategies. This structured approach ensures that interventions are not only effective but also strategically targeted to address the most significant challenges.

4.3.7 Integration of policy and decision making

For climate actions to be effective, they must be integrated into wider policy and decision-making frameworks. This integration ensures that the climate initiatives align with existing plans and strategies, complement other policies, and leverage opportunities for collaborations. By embedding climate actions within wider policy contexts, it becomes possible to achieve more cohesive and coordinated efforts in addressing climate change, maximizing the impact of mitigation measures.

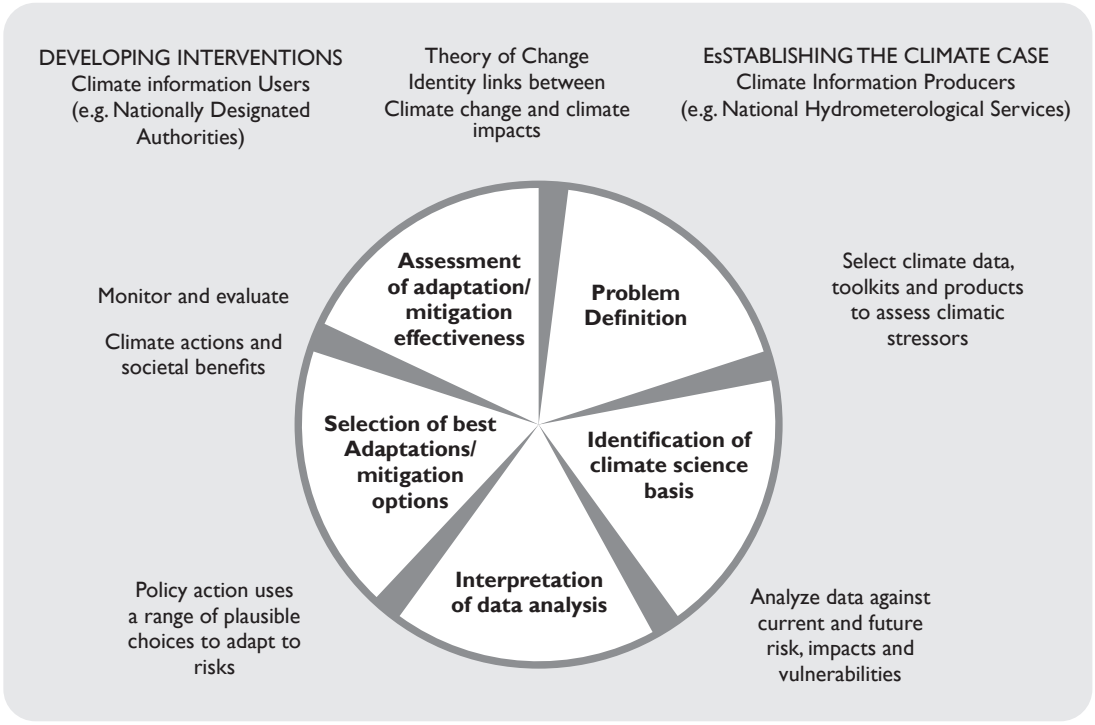

Figure 4.1: Main steps for designing climate rationale project and programmes

Source: WMO (2024)

4.4 Guiding questions for building climate rationale - mitigation

Developing a climate rationale for mitigation in Nepal involves addressing the unique challenges and opportunities that arise from its specific environmental, socio-economic, and developmental contexts. By addressing these guiding questions, Nepal can formulate context-specific mitigation strategies that not only reduce GHG emissions but also promote sustainable development, enhance resilience, and safeguard the well-being of its people.

Collaboration among stakeholders, leveraging international support, and prioritizing inclusivity are essential to achieving transformative climate action that benefits all segments of Nepali society. The following key guiding questions are essential for developing effective climate mitigation strategies relevant to Nepal's context are discussed herewith.

4.4.1 What are the current and projected climate change impacts in Nepal?

Nepal, nestled in the Himalaya, is facing a range of pronounced impacts from climate change, ranging from glacial retreat, altered precipitation patterns, and an increased frequency of extreme weather events. Understanding these impacts is fundamental for effectively prioritizing mitigation efforts.

Firstly, what are the current and projected climate change impacts in Nepal? The Himalayan region is particularly vulnerable to climate change due to its sensitivity to temperature changes and the rapid melting of glaciers. This phenomenon not only affects the availability of freshwater resources but also increases the risks of glacial lake outburst floods (GLOFs) and has downstream impacts on agriculture and hydropower generation.

Furthermore, how do these impacts vary across different regions and sectors? Nepal's geographical diversity, from the low-lying Terai plains to the high-altitude mountain regions, leads to varied climate vulnerabilities. For instance, the Terai is susceptible to floods, exacerbated by intensified monsoon rains, while mountain communities face risks associated with landslides and reduced water availability. Understanding these regional and sectoral variations is key to developing targeted and effective mitigation strategies.

4.4.2 What are the socio-economic implications of climate change in Nepal?

Climate change in Nepal is closely intertwined with its socio-economic development goals, presenting challenges that must be addressed through mitigation strategies. It is important to ask *what are the economic costs of climate change impacts on Nepal's key sectors?* Agriculture, which employs a significant portion of the population, is especially vulnerable to shifting precipitation patterns and the spread of pests and diseases. Declines in agricultural productivity not only threaten food security but also impact livelihoods and rural economies.

Moreover, *how does climate change exacerbate existing social and economic inequalities?* Vulnerable populations, including women, indigenous communities, and the economically disadvantaged, often disproportionately suffer the effects of climate impacts. To effectively enhance resilience and reduce poverty, mitigation strategies must ensure inclusivity and equitable distribution of benefits across all segments of society.

4.4.3 What are the opportunities for sustainable development through mitigation in Nepal?

Mitigation efforts in Nepal also present opportunities for advancing sustainable development, particularly through the promotion of renewable energy and improved resource management. For instance, *what are the opportunities for promoting renewable energy sources such as hydropower and solar energy?* Nepal has large potential for hydropower generation, given its numerous rivers and steep terrain. Expanding renewable energy infrastructure not only reduces reliance on fossil fuels but also strengthens energy security and fosters economic growth.

Additionally, *how can energy efficiency and sustainable transportation contribute to mitigation efforts?* Improving energy efficiency in industries and households reduces carbon emissions and lowers energy costs while promoting sustainable practices. Similarly, investing in public transportation and promoting non-motorized transport options can reduce urban emissions and improve air quality.

4.4.4 How can climate mitigation in Nepal enhance public health and promote social equity?

Climate mitigation in Nepal must prioritize health co-benefits and address social equity considerations to ensure equitable and sustainable development. *What are the health impacts of climate change in Nepal, and how can mitigation actions improve public health outcomes?* Air pollution from fossil fuel combustion is a significant contributor to respiratory and cardiovascular diseases, especially in urban areas. By transitioning to cleaner energy sources and reducing pollution, mitigation efforts can greatly enhance public health and well-being.

Furthermore, *how can mitigation policies and initiatives promote social equity?* The gender-specific impacts of climate change, such as differential access to resources and decision-making opportunities, must be addressed. Integrating gender-responsive approaches ensures that women - who often play critical roles in agriculture and natural resource management - benefit equitably from mitigation actions, thereby promoting societal equity.

4.4.5 How does Nepal Align its climate action with international commitments, and what are the benefits of international cooperation?

Nepal is committed to global climate agreements, such as the Paris Agreement, and has opportunities to support international cooperation for effective mitigation. By aligning its climate actions with global climate goals, Nepal can access international climate finance, benefit from technology transfer, and receive capacity-building support. Collaboration with international partners not only enhances Nepal's resilience to climate impacts but also facilitates the sharing of best practices in mitigation and adaptation, contributing to more effective and sustainable climate action.

4.4.6 What are the synergies between mitigation and adaptation strategies in building resilience in Nepal?

Mitigation strategies in Nepal should incorporate resilience-building measures to enhance adaptive capacity and reduce vulnerability to climate risks. Ecosystem-based approaches, such as forest conservation and watershed management, provide dual benefits by sequestering carbon and enhancing biodiversity and ecosystem services. These approaches also strengthen community resilience to climate impacts by protecting natural resources and promoting sustainable land use practices, creating a holistic strategy that addresses both mitigation and adaptation needs.

4.4.7 What are the barriers and challenges hindering effective climate mitigation in Nepal, and how can they be overcome?

Identifying and addressing institutional, financial, and technical barriers is crucial for implementing successful mitigation strategies. Strengthening policy frameworks, enhancing institutional capacity, and mobilizing adequate financial resources are essential steps to overcoming these challenges. These actions are key to accelerating Nepal's transition to a low-carbon, climate-resilient future.

4.5 Steps to design climate rationale for mitigation projects

Designing a climate rationale for mitigation projects involves several key steps to ensure effectiveness, relevance to local contexts, and alignment with broader climate goals (Figure 4.2).

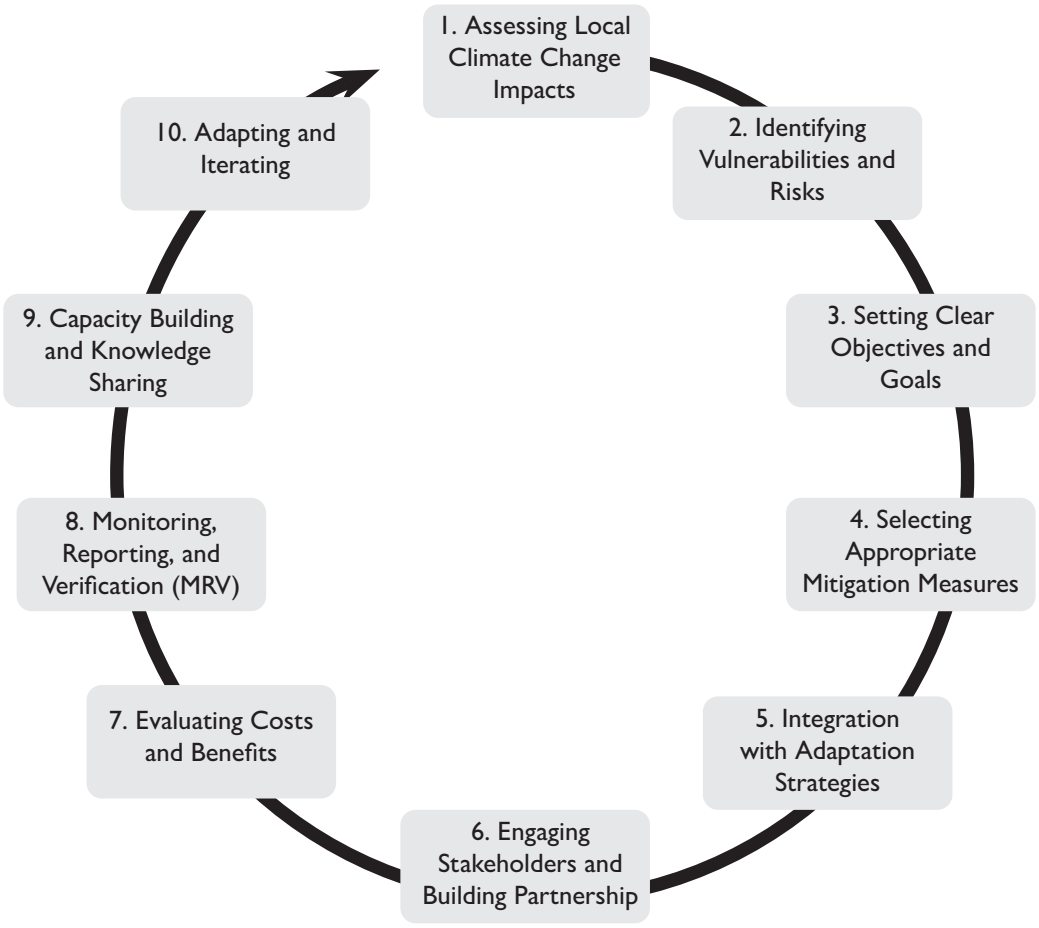

Figure 4.2: Steps to design climate rationale for mitigation projects

Source: GCF (2018)

4.5.1 Assessing local climate change impacts

This step involves a comprehensive analysis of how climate change is affecting or is projected to affect the local area. It includes studying changes in temperature patterns, precipitation levels, extreme weather events, and other relevant climate indicators. This assessment should be based on the latest scientific data and climate models, and should consider both current and future scenarios.

4.5.2 Identifying vulnerabilities and risks

Once the local climate impacts are understood, the next step is to identify which sectors, populations, or systems are most vulnerable to these impacts. This involves assessing the exposure, sensitivity, and adaptive capacity of different elements within the project area. Risks

should be prioritized based on their likelihood and potential impact.

4.5.3 Setting clear objectives and goals

Based on the identified impacts, vulnerabilities, and risks, clear and measurable objectives should be established for the mitigation project. These objectives should align with national and international climate targets and should specify the expected outcomes in terms of emissions reduction or other relevant metrics.

4.5.4 Selecting appropriate mitigation measures

This step involves choosing the most effective and feasible mitigation strategies for the specific context. These could include renewable energy implementation, energy efficiency improvements, sustainable transportation solutions, or nature-based solutions. The selection should be based on their potential impact, cost-effectiveness, and alignment with local needs and capacities.

4.5.5 Integration with adaptation strategies

While the focus is on mitigation, it's crucial to consider how these measures can be integrated with adaptation strategies. This ensures a holistic approach to climate action and can lead to co-benefits. For example, urban greening projects can both sequester carbon and reduce urban heat island effects.

4.5.6 Engaging stakeholders and building partnerships

Successful mitigation projects require the involvement and support of various stakeholders. This step involves identifying key stakeholders, including local communities, government agencies, private sector entities, and civil society organizations. It's important to engage them throughout the project design and implementation process, fostering partnerships and ensuring local ownership.

4.5.7 Evaluating costs and benefits

A thorough cost-benefit analysis should be conducted to assess the economic viability of the project. This should include both direct costs and benefits, as well as indirect ones such as improved air quality or health outcomes. The analysis should also consider the cost of inaction and potential future savings from early mitigation efforts.

4.5.8 Monitoring, reporting and verification (MRV)

Developing a robust MRV system is crucial for tracking the project's progress and impacts. This involves setting up systems to regularly collect and analyze data on emissions reductions and other relevant indicators. The MRV system should be transparent and align with international standards to ensure credibility and facilitate reporting to funding bodies or national inventories.

4.5.9 Capacity building and knowledge sharing

This step focuses on enhancing the skills and knowledge of local stakeholders to effectively implement and maintain the mitigation measures. It can involve training programs, workshops, and the development of educational materials. Knowledge sharing platforms should also be established to disseminate best practices and lessons learned.

4.5.10 Adapting and iterating

Climate mitigation is an ongoing process, and projects need to be flexible to adapt to changing circumstances or new information. This final step involves regularly reviewing the project's performance, incorporating feedback, and making necessary adjustments. It ensures that the project remains effective and relevant over time.

4.6 Principles of climate rationale development for GCF mitigation projects

The GCF is a financial mechanism under the UNFCCC and the Paris Agreement, aimed at supporting developing countries in their efforts to combat climate change. The GCF provides funding for projects that reduce GHG emissions and enhance climate resilience. To ensure the effectiveness and alignment of these projects, the GCF has established principles for climate rationale in mitigation projects.

4.6.1 Demonstration of GHG emissions reductions

Proposals must show that the projected GHG emissions reductions or removals will occur. These reductions should not happen without the GCF-funded activity.

4.6.2 Alignment with host country priorities

Activities must align with the host country's priorities, including its NDC or other national climate strategies. Ensures integration of country ownership and targets areas of highest impact and need.

4.6.3 Methodological approach for quantification and monitoring

A methodological approach for quantifying and monitoring mitigation results must be selected and implemented. Encourages the use of established methodologies like the Clean Development Mechanism and joint implementation under the Kyoto Protocol.

4.6.4 Relevance of methodology to specific activities

Proposals should use the most relevant methodology for the specific activities proposed. Steps include determining project impact boundaries, defining the baseline, and showing additionality (i.e., GHG reductions would not occur without GCF).

4.6.5 Consistency with national GHG reporting

Quantification of mitigation impact should use consistent assumptions (e.g., emission factors) as those in national GHG reporting. Ensures accurate quantification of support provided to countries in meeting their NDCs.

4.6.6 Establishment of measurement, reporting, and verification (MRV) system

Proposals should describe the establishment of a MRV system for GHG emission reductions and removals. Facilitates assessment of whether the funded activity generated the projected mitigation results. Includes all indicators, equations, input values, and assumptions used for quantification. Provides projections of annual emission reductions or removals during the project's lifetime.

4.7 Methodologies for emission trajectories for mitigation projects and pathways to shift emissions

The IPCC Guidelines for National Greenhouse Gas Inventories provide a comprehensive framework for countries to estimate and report their GHG emissions and removals. These guidelines, initially established in 2006 and refined in 2019, offer standardized methodologies to ensure consistency, transparency, and accuracy in national GHG inventories (IPCC 2019). They cover various sectors, including energy, industrial processes, agriculture, land use, and waste, and emphasize the importance of quality assurance and control, uncertainty management, and time series consistency (IPCC 2019). This standardized approach helps countries meet their reporting obligations under international agreements like the Paris Agreement, facilitating global efforts to track and reduce GHG emissions (IPCC 2022b).

The Working Group III report of the IPCC on Mitigation of Climate Change is a critical component of the IPCC's Sixth Assessment Report. Published in 2022, it provides an updated global assessment of progress in climate change mitigation, examining the sources of global emissions and evaluating the effectiveness of mitigation efforts[4]. The report highlights the importance of immediate and sustained action across all sectors to limit global warming to 1.5°C above pre-industrial levels. It also explores various mitigation pathways, technological innovations, and policy measures necessary to achieve long-term climate goals. By offering a

4 2019 Refinement to the 2006 IPCC Guidelines for National Greenhouse Gas .... https://www.ipcc.ch/report/2019-refinement-to-the-2006-ipcc-guidelines-for-national-greenhouse-gas-inventories/.

detailed analysis of current trends and future scenarios, the report serves as a vital resource for policymakers, researchers, and stakeholders committed to combating climate change.

Some Key Approaches for Emission Trajectories are presented in Box 4.2.

Box 4.2 Some Key Approaches for Emission Trajectories

1. **Baseline and credit methodology (BCM)**
   - **Definition**: Establish a baseline emission level against which emission reductions can be measured.
   - **Application**: Commonly used in carbon offset projects where reductions generate credits that can be sold or traded.
   - **Steps**: Define the baseline emissions, implement emission reduction activities, monitor and verify reductions, and issue credits.
2. **Sectoral approach**
   - **Definition**: Focus on specific sectors (e.g., energy, transportation, agriculture) to identify key sources of emissions.
   - **Application**: Develop tailored strategies and technologies to reduce emissions within each sector.
   - **Steps**: Conduct sectoral assessments, set sector-specific emission reduction targets, implement sector-specific policies and technologies.
3. **Technology roadmaps**
   - **Definition**: Long-term plans that outline the development and deployment of key technologies needed to achieve emission reduction goals.
   - **Application**: Guide investments and policies towards low-emission technologies and infrastructure.
   - **Steps**: Identify technology options, assess feasibility and scalability, set milestones for deployment, and integrate into broader policy frameworks.
4. **Integrated assessment models (IAMs)**
   - **Definition**: Quantitative models that integrate economic, technological, and environmental data to simulate the impact of different emission reduction pathways.
   - **Application**: Inform policy decisions by evaluating trade-offs and synergies between emission reduction strategies.
   - **Steps**: Develop scenarios based on different policy and technology assumptions, model emission trajectories, assess costs and benefits, and optimize pathways.
5. **Lifecycle assessment (LCA)**
   - **Definition**: Evaluate emissions and environmental impacts across the entire lifecycle of products, processes, or services.
   - **Application**: Identify emission hotspots and opportunities for reductions throughout the lifecycle.
   - **Steps**: Define system boundaries, collect data on emissions and resource use, assess impacts, identify improvement opportunities, and optimize processes.
6. **Policy and regulatory frameworks**
   - **Definition**: Establish legal and regulatory frameworks to incentivize emission reductions and enforce compliance.
   - **Application**: Provide a structured approach to setting emission targets, allocating responsibilities, and monitoring progress.
   - **Steps**: Develop emission reduction targets and timelines, implement policies (e.g., carbon pricing, regulations, subsidies), and enforce compliance through monitoring and reporting.
7. **Stakeholder engagement and partnerships**
   - **Definition**: Involve stakeholders (e.g., businesses, communities, NGOs) in the design and implementation of emission reduction strategies.
   - **Application**: Foster collaboration, share knowledge and resources, and build consensus on mitigation efforts.
   - **Steps**: Identify stakeholders, establish partnerships, engage in dialogue, and co-develop strategies to shift emissions.

4.7.1 Emission calculation for Nepal

Nepal, despite its relatively small carbon footprint on a global scale (0.06%) is considered one of the highly vulnerable countries to climate change (MoFE, 2021). Nepal's gross domestic product (GDP) is highly dependent on climate-sensitive sectors, such as agriculture, water, energy, and tourism. Nepal's GHG inventory encompasses all four sectors of the economy: IPPU, AFOLU, and Waste. The total net GHG emissions of 28,166.06 Gg CO_2-eq was estimated for Nepal in the base year 2011. This grades a significant increase from the emissions (13,447 Gg CO_2-eq) of the base year 2000/01 (MoFE, 2021). Nepal prepared its national GHG inventory in 1997 (base year 1990/91; DHM 1997), 2004 (base year 1994/95; MOPE 2004), 2014 (base year 2000/01; MoPE, 2014), and 2021 (base year 2010/11; Mo FE, 2021).

The rigor of any emission inventory relies on the quality of its activity data, the emission factors and inventory methodologies used. Emission factors (EFs) are coefficients that relate the amount of GHG emissions to a specific activity or process. EFs from various agricultural activities are important for developing in National GHG Inventory as a part of reporting under the UNFCCC and the Paris Agreement. As these activities have a significant share in Nepal's GHG emission, nationally developed EFs reduce the uncertainty in GHG reporting and support in national mitigation policies. Nepal has previously computed its GHG inventory using default EFs from IPCC EF database (Table 10) based on the 2006 IPCC guidelines for NGI (Tier I method). It is assumed that the Tier I method has comparatively more uncertainty (~30%) in estimation of the emission compared to higher Tier methods (Tier 2 or 3) which rely on country-specific data. So, it is a wise idea to assess the status of the EFs and prepare the country-specific EFs for the activities that have significant share in the GHG emission.

A few studies have reported country-specific EFs of GHGs emissions in some sub-sectors of Nepal. In 2015, Nepal Ambient Monitoring and Source Testing Experiment (NAMaSTE) was conducted to fill in the information gap in the field of air pollution. One of the objectives of NAMaSTE was to develop emissions factors and detail emission profiles to support emission inventories in South Asia. The experiment was conducted around the Kathmandu valley and Indo-Gangetic plain of Southern Nepal. The EFs of CO_2, CO, CH_4, non-methane hydrocarbons and some oxygenated hydrocarbons were measured from the trace gases in the experiment. The sources of combustion ranged from solid fuels burning in various stoves, brick kilns, generators, motorcycles, agricultural residue burning, open burning of municipal wastes (Stockwell *et al.,* 2016). In Nepal, the country-specific EFs for livestock emissions was developed using the IPCC Tier 2 methodology, and the spatiotemporal variation of CH_4 fluxes was studied for Nepal Himalaya by Thakuri et al. (2020) and Nepal et al. (2023). Thakuri et al. (2020) estimated the enteric methane (CH_4) EF for different age groups of the local cattle breeds (LCB) and improved cattle breeds (ICB), while Nepal et al. (2023) showed that total CH_4 flux from enteric and manure management emissions of the domestic water buffalo in Nepal. Recently, a study is ongoing on the emission factor development for the other categories of livestock.

The National Forest Reference Level of Nepal (2000-2010) has estimated country-specific EF for deforestation and forest degradation (MoFSC, 2017). Further, the emission factor has been studied for diesel irrigation pumps (Adhikari et al., 2019) and diesel vehicles (Das et al., 2022). In summary, the country-specific EFs of Nepal, so far, are available on wood use in cooking stove, biogas lamp, wood burning, garbage burning, 2-wheelers, diesel irrigation pumps, cattle enteric fermentation, and forest degradation/conversion.

4.7.2 Emission trajectory and projection for Nepal

In the context of Nepal, emission projections and assessments are crucial for understanding the country's current and future carbon footprint, identifying key sources of emissions, and developing effective mitigation strategies. These projections and assessments play a critical role in guiding climate policy, setting priorities for mitigation and adaptation, and enhancing resilience to climate change impacts. Continued efforts in data collection, capacity building, and policy implementation are essential for achieving Nepal's climate goals and sustainable development objectives.

Projections show that implementation of Nepal's current policies would keep its emissions aligned to a 1.5 compatible range. Nepal's emissions (excl. land use) have increased by 81% between 1990 and 2017 to 42 $MtCO_2$ e. When considered by category, the biggest increase by far is in the agriculture and energy sectors. The AFOLU sector contributes more than 80% of the total GHG emissions in Nepal followed by the energy, transport, waste and industrial processes sectors. Nepal's 2020 sectoral NDC targets have been conservatively estimated to reduce emissions by 1.9-5.6 $MtCO_2e/yr$ leading to emissions of 69-76 $MtCO_2e/yr$ by 2030 (excl. land use). The largest driver of overall GHG emissions are CO_2 emissions from fuel combustion. In Nepal, energy-related CO_2 emissions from the transport sector are the largest contributor at 50%, followed by the industrial and building sectors with 27% and 15% respectively.

The AR6 report presents updated emission projections under various socioeconomic and policy scenarios known as Shared Socioeconomic Pathways (SSPs) (IPCC, 2021a). These scenarios examine potential future developments in population dynamics, economic growth, technological advancements, and climate policies. The projections offer insights into possible greenhouse gas emission trajectories and their implications for future climate change.

The report emphasizes the urgency of achieving deep, rapid, and sustained reductions in greenhouse gas emissions to limit global warming to 1.5°C above pre-industrial levels, in line with the Paris Agreement (IPCC, 2021a). It explores different emissions trajectories and their consequences for climate impacts, adaptation needs, and mitigation co-benefits. Meeting the 1.5°C target requires transformative changes across various economic sectors, including energy, transportation, industry, and land use.

To achieve this goal, the implementation of a diverse portfolio of mitigation measures is essential. This includes adopting renewable energy sources, enhancing energy efficiency, developing carbon capture and storage technologies, and utilizing nature-based solutions.

4.8 Nepal's pledged emission reductions and enabling environment

Nepal envisions achieving socio-economic prosperity by building a climate-resilient society. To support this vision, the country has established a comprehensive policy and institutional framework designed to guide its climate actions. In alignment with Article 4, paragraph 19 of the Paris Agreement, Nepal is developing a long-term strategy aimed at achieving low GHG emissions by 2021, with an ambitious goal of reaching net-zero emissions by 2050.

In its Second NDCs, Nepal has made several key commitments to drive this transition (Table 1). These commitments reflect the country's dedication to reducing emissions while fostering sustainable development.

Table 4.1: Sectoral emission reduction targets (GoN, 2020)

Sector	Pledges as committed targets
Energy	• Increase the share of renewable energy, particularly hydropower and solar energy, to reduce dependency on fossil fuels. **Energy Generation:** By 2030, expand clean energy generation from approximately 1,400 MW to 15,000 MW, of which 5-10 % will be generated from mini and micro-hydro power, solar, wind and bio-energy. Of this, 5,000 MW is an unconditional target. The remainder is dependent upon the provision of funding by the international community. • By 2030, ensure 15% of the total energy demand is supplied from clean energy sources. **Transport**: Sales of electric vehicles (e-vehicles) in 2025 will be 25% of all private passenger vehicles sales, including two-wheelers and 20% of all four-wheeler public passenger vehicle sales (this public passenger target does not take into account electric-rickshaws and electric-tempos) in 2025 By 2030, increase sales of e-vehicles to cover 90% of all private passenger vehicle sales, including two-wheelers and 60% of all four-wheeler public passenger vehicle sales (the public passenger target does not take into account electric-rickshaws and electric-tempos). By 2030, develop 200 km of the electric rail network to support public commuting and mass transportation of goods. **Residential cooking and biogas:** • By 2030, ensure 25% of households use electric stoves as their primary mode of cooking. • By 2025, install 500,000 improved cookstoves, specifically in rural areas. • By 2025, install an additional 200,000 household biogas plants and 500 large scale biogas plants (institutional/industrial/municipal/community).
Transport	• Promote electric vehicles (EVs) to account for 20% of all passenger vehicle sales by 2025 and 90% by 2030.

AFOLU	- Enhance climate-resilient agricultural practices to reduce emissions and increase productivity. By 2030, maintain 45% of the total area of the country under forest cover (including other wooded land limited to less than 4%). By 2030, manage 50% of *Tarai* and Inner *Tarai* forests and 25% of middle hills and mountain forests sustainably, including through the use of funding from REDD+ initiatives.
Waste	By 2025, 380 million litres/day of wastewater will be treated before being discharged, and 60,000 cubic meters/year of faecal sludge will be managed. These two activities will reduce around 258 Gg CO2 eq. compared to business-as-usual scenario.

Nepal, though a low emitter of GHGs on a global scale, has taken significant steps to address climate change. As a signatory to the Paris Agreement, Nepal has committed to ambitious targets for reducing emissions and implementing policies that support sustainable development. Nepal's commitment to addressing climate change is evident in its focus on key areas such as renewable energy, sustainable transportation, forest conservation, and climate-smart agriculture. By prioritizing these sectors, Nepal aims to achieve substantial reductions in GHG emissions. Despite its limited contribution to global emissions, the country is dedicated to playing a proactive role in global climate efforts.

4.8.1 Relevant policies for achieving the mitigation targets

Nepal has made several policy provisions for implementing the pledged targets (Table 2). The effective implementation of policies will be essential for Nepal to meet its climate goals. This will require strong international cooperation, access to climate finance, and active community involvement. Through these efforts, Nepal not only seeks to mitigate its environmental impact but also to enhance its resilience to the effects of climate change, ensuring a sustainable future for its people.

Table 4.2: Associated policies that support Nepal's emission reduction pledges.

Sector	Policies
Energy Sector	Hydropower Development Policy: Focus on the development of large-scale and small-scale hydropower projects to harness Nepal's significant hydropower potential.
	Renewable Energy Subsidy Policy: Provide subsidies and incentives for the adoption of solar, wind, and biogas technologies, particularly in rural areas.
Transport Sector	National Transport Policy: Promote the use of electric and hybrid vehicles through subsidies, tax exemptions, and infrastructure development for charging stations. Mass Transit Development: Invest in the expansion of public transportation systems to reduce reliance on private vehicles.
Forest and Land Use Policies	Community Forestry Program: Engage local communities in the management and conservation of forests, which has been effective in increasing forest cover and biodiversity.
	REDD+ Strategy: Implement the REDD+ strategy to enhance carbon sequestration and support sustainable forest management.
Agricultural Policies	Climate-Smart Agriculture: Promote practices such as crop diversification, improved irrigation, and the use of resilient crop varieties to adapt to climate change and reduce emissions.
	Agricultural Extension Services: Strengthen extension services to disseminate knowledge and technologies to farmers for sustainable agricultural practices.
Disaster Risk Reduction Policies	National Disaster Risk Reduction Policy: Develop and implement measures to enhance resilience to climate-induced disasters, including early warning systems, resilient infrastructure, and community-based disaster risk management.

4.8.2 Implementation strategies

Nepal has developed a range of policies and strategies with the aim to support sustainable development while reducing the country's carbon footprint and enhancing resilience to climate impacts. An overview of the key climate mitigation-related policies, plans, and strategies of Nepal are presented in Box 4.3. These policies and strategies reflect Nepal's commitment to addressing climate change through a combination of mitigation measures.

Box 4.3. Climate mitigation-related policies, strategies, and plans

- National Climate Change Policy 2019 (2076)

https://climate.mohp.gov.np/downloads/National_Climate_Change_Policy_2076.pdf

- Second Nationally Determined Contributions (NDCs) 2020

https://climate.mohp.gov.np/attachments/article/167/Second%20Nationally%20Determined%20Contribution%20(NDC)%20-%202020.pdf

- Five-Year Plan for Nepal (The Fifteenth Plan)

https://www.npc.gov.np/images/category/15th_plan_English_Version.pdf

- Nepal's Long-term Strategy for Net-zero Emissions 2021

https://unfccc.int/sites/default/files/resource/NepalLTLEDS.pdf

- The Environment Protection Act 2019 (2076)

https://lawcommission.gov.np/en/wp-content/uploads/2021/03/The-Environment-Protection-Act-2019-2076.pdf

- Environment Protection Regulations 2019 (2077)

https://fwmrc.gov.np/environment-protection-regulations-2077/

When designing emission trajectories for mitigation projects and pathways to shift emissions, several methodologies and frameworks can be employed (Table 4.3). These methodologies can be tailored and combined to suit the specific context, goals, and challenges of each emission reduction project or pathway. Effective implementation often requires a mix of technical expertise, stakeholder engagement, and supportive policy frameworks. This integrated approach ensures that the strategies are both practical and impactful, enabling successful reductions in GHG emissions.

Table 4.3: Medium for achieving the mitigation targets

International Cooperation and Climate Finance	• Access international climate finance through mechanisms like the Green Climate Fund (GCF) and the Global Environment Facility (GEF) to support climate action projects. • Engage in regional cooperation with neighboring countries for knowledge sharing and joint initiatives on climate mitigation and adaptation.

Capacity Building and Technology Transfer	• Strengthen institutional capacities through training and education programs to implement and monitor climate policies effectively. • Facilitate technology transfer from developed countries to accelerate the adoption of clean and efficient technologies.
Public-Private Partnerships (PPPs)	• Encourage PPPs to mobilize investment in renewable energy projects, sustainable transportation, and infrastructure development. • Engage the private sector in developing innovative solutions and financing mechanisms for climate mitigation efforts.
Community Involvement and Awareness	• Promote community-based programs that involve local populations in conservation and sustainable development initiatives. • Increase public awareness about the impacts of climate change and the importance of mitigation and adaptation measures through education and outreach programs.

4.9 Constraints and challenges associated with developing a climate rationale for mitigation

Mitigation of climate change faces several constraints and challenges, arising from socio-economic, political, and environmental factors. Key constraints associated with the rationale for climate mitigation efforts include:

4.9.1 Economic costs and trade-offs

- *Investment Requirements:* Implementing mitigation measures often requires significant upfront investments in renewable energy, energy efficiency technologies, and sustainable practices.
- *Economic Impacts*: Transitioning away from carbon-intensive industries or practices can have short-term economic impacts on sectors reliant on fossil fuels, potentially leading to job losses or economic dislocation.
- *Equity Concerns:* There are concerns about the distribution of costs and benefits of mitigation efforts, especially for vulnerable and low-income communities who may bear disproportionate costs.
- *Technology Readiness:* Some clean technologies, such as carbon capture and storage (CCS), may still be in early stages of development or deployment, limiting their immediate scalability and effectiveness.
- *Infrastructure Requirements:* Building necessary infrastructure for renewable energy generation, electric vehicle charging networks, and energy-efficient buildings requires time, resources, and coordinated planning.

4.9.2 Policy and regulatory issues

- *Political Will:* Mitigation efforts require consistent political will and commitment over the long term, which can be influenced by changing political landscapes and competing policy priorities.
- *Regulatory Frameworks:* Developing and implementing effective regulations, standards, and incentives that support emission reductions while balancing economic growth and development goals is challenging.
- *International Cooperation:* Aligning national policies with international agreements like the Paris Agreement requires coordination among diverse stakeholders with varying interests and priorities.

4.9.3 Behavioral and societal factors

- *Behavioral Change:* Achieving significant emissions reductions often requires changes in consumer behavior, such as adopting energy-efficient practices or choosing sustainable products, which can be difficult to achieve at scale.
- *Awareness and Education:* Enhancing public awareness and understanding of climate change impacts and the benefits of mitigation measures is essential but requires ongoing efforts and resources.

4.9.4 Scientific and data limitations

- *Data Availability*: Limited availability and quality of data on emissions, particularly in developing countries, can hinder accurate baseline assessments and monitoring of progress.
- *Scientific Uncertainty:* Uncertainty in climate science projections and the effectiveness of mitigation measures can complicate decision-making and planning for long-term investments.

4.9.5 Adaptation and mitigation trade-offs

- **Prioritization**: Balancing resources between mitigation (reducing emissions) and adaptation (building resilience to climate impacts) efforts poses challenges, especially in vulnerable regions where immediate adaptation needs are critical. Addressing these constraints requires a different approach that integrates policy, technology innovation, financial mechanisms, and international cooperation. Overcoming these challenges is essential for effective climate mitigation action and achieving sustainable development goals globally.

Chapter

5 Guidance for Project Development

5.1 Introduction

This chapter provides detailed guidance on developing a climate rationale for project proposals, integrating essential elements to ensure strong, compelling submissions. The emphasis is on aligning project outcomes with national and international targets and commitments, delivering measurable results within financial and operational constraints, and effectively managing resources and risks, and includes:

- A well-developed climate rationale must clearly demonstrate how the project contributes to broader national and international commitments. Moreover, the project should also illustrate tangible environmental and social benefits to justify investment.
- While achieving deliverables is crucial, the challenge lies in ensuring that these outputs lead to meaningful long-term impacts, especially in the context of climate adaptation and mitigation. Many projects struggle to bridge the gap between meeting immediate targets and contributing to sustainable outcomes.
- Timelines are essential for progress tracking, yet project developers often face the difficulty of maintaining flexibility in the face of unforeseen delays, especially in regions with unpredictable environmental or socio-political conditions. The ability to adapt timelines without compromising the overall goals is key.
- Financial constraints can limit innovation and the scope of interventions, making it essential to balance cost efficiency with impactful outcomes. A critical challenge lies in securing adequate funding while ensuring transparency and accountability in resource allocation.
- Resource optimization is important, yet often involves multiple stakeholders, including governments, communities, and private actors. Conflicting interests can lead to inefficiencies, requiring strong coordination and stakeholder management to ensure resources are used effectively.
- Ensuring that the project fits into the organization's existing operations can streamline implementation. However, the broader challenge is to ensure that climate projects do not merely add to the organization's workload but catalyze systematic change within its operational framework.

- While managing risks is vital, traditional risk framework may fall short in addressing the complex, multi-dimensional risks posed by climate change, which require dynamic and forward-looking mitigation strategies that incorporate both environmental and socio-economic factors.
- Climate projects often directly affect local communities. It is not enough to engage stakeholders superficially; meaningful and participatory consultation processes must be integrated throughout the project life cycle to ensure that affected groups have a voice in decision-making.

This chapter further explores the landscape of climate financing, focusing on the GCF and GEF – the two primary mechanisms established under the Kyoto Protocol and Paris Agreement. While these institutions provide crucial funding, accessing these resources often proves complex, requiring not only a solid climate rationale but also a deep understanding of the specific requirements and priorities of each fund. The Special Climate Change Fund (SCCF) and Least Developed Countries Fund (LDCF), both managed by GEF, offer targeted support, but navigating these funds can be difficult, particularly for countries with limited institutional capacity.

The Adaptation Fund, established under the Kyoto Protocol, also provides valuable resources but faces limitations in scale compared to the GCF. While these funds aim to support climate resilience, the processes involved in securing funding can be bureaucratic and slow.

While this chapter offers comprehensive guidance on project development and financing, it also highlights the inherent complexities in designing climate projects that are both effective and fundable. Successful proposals must strike a balance between technical rigors. Stakeholder engagement, and strategic alignment with the priorities of international funding institutions.

5.2 Key Consideration for developing a strong GCF project proposal

Developing a robust project proposal for GCF requires a comprehensive and strategic approach, one that carefully aligns climate action with broader social, environmental, and economic objectives. A strong proposal should not only address climate adaptation or mitigation, but also demonstrate co-benefits such as enhanced livelihoods, improved ecosystem health, or reduced inequalities. Below are critical insights into the essential requirements for drafting a successful GCF project proposal.

5.2.1 Building a robust evidence base

To secure funding, such as from GCF, a project must present a well-documented and compelling evidence base. A strong evidence base demonstrates the urgency of the climate challenge and the effectiveness of the proposed interventions, providing critical justification for financial support. Key considerations during proposal development include the following aspects, which help ensure that the project is scientifically, socially, and financially sound.

Climate trends and project response

A core element of the proposal is showcasing the scientific evidence that underpins the need for the project. This should include detailed analyses of climate trends such as temperature rise, rainfall variability, and increasing occurrences of droughts or water shortages. The project must explain how it responds to these specific climate impacts in the target area.

Proposals that provide superficial or anecdotal evidence may lack the scientific rigor required for approval. It is essential to cite credible data sources, climate models, and projections that clearly illustrate the expected trends and how the project will mitigate or adapt to these impacts.

Vulnerability assessment

The proposal should include a thorough assessment of the existing vulnerabilities to climate change in the region where the project will be implemented. This involves identifying particularly vulnerable populations, ecosystems, or sectors and explaining how the project will enhance their resilience.

Proposals often fail to clearly link vulnerability assessments with project interventions. To strengthen the rationale, the proposal should draw direct connections between identified vulnerabilities and the actions the project will take to address them, such as building infrastructure, restoring ecosystems, or developing early warning systems.

Historical climate impacts

The proposal should provide evidence of how historical climate events have impacted the region, such as extreme weather events, floods, or prolonged droughts. This helps contextualize the need of the project and reinforces the urgency of intervention.

Including historical data can help project proponent demonstrate patterns of climate impacts that may be exacerbated in the future. Proposals that fail to integrate this context risk being seen as reactive rather than proactive in addressing climate challenges.

Emission reduction methodologies

For mitigation projects, it is essential to include sound methodologies for calculating emissions reductions. This might involve specifying the baseline emissions trajectory and explaining how the project will reduce emissions through specific interventions, such as transitioning to renewable energy or improving energy efficiency.

Proposal lacking credible or detailed methodologies for emission calculations may be dismissed as speculative. Including internationally recognized standards and methodologies, such as those from IPCC, will strengthen the credibility of the proposal.

5.2.2 Alignment with GCF strategic impact areas

The next step is identifying which of the 8 strategic impact areas defined by the GCF the project falls under (see figure 5.1). These areas are designed to focus GCF's resources on high-impact, transformative sectors. The impact areas include energy generation and access, transport, buildings, industries, ecosystems, agriculture, and more.

Proponents often struggle with categorization, attempting to fit their project into multiple areas, which can weaken the clarity and focus of the proposal. It is important to select the most relevant impact area(s) and develop a compelling case for how the project will drive change within that sector.

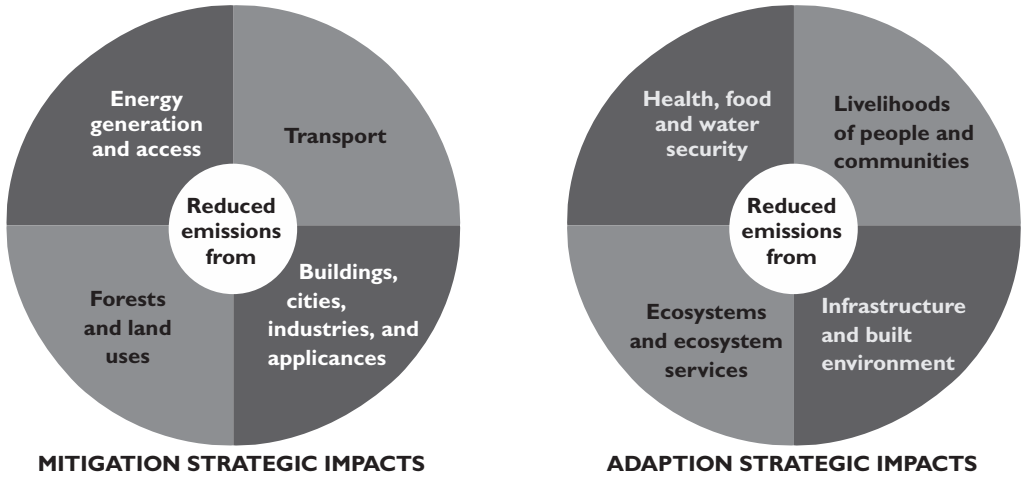

Figure 5.1: Strategic impact areas of the GCF

Source: GCF, www.greenclimatefund.com, (2018)

5.2.3 Co-benefits and sustainable development

A critical component of any GCF proposal is articulating the co-benefits that accompany climate action, such as improved biodiversity, poverty reduction, and gender equality. These co-benefits often align with the SDGs and are important in showcasing the project's holistic impact.

Projects that only focus on climate outcomes, without demonstrating wider social and environmental benefits, are less competitive. A winning proposal should interweave SDGs into its core narrative, emphasizing how the project will contribute to long-term sustainable development.

5.2.4 Risk management and sustainability

A solid proposal must also include a well-developed risk management strategy. This means not only identifying potential risks, such as political instability or environmental degradation, but also outlining robust mitigation measures. Additionally, the project should have a clear plan for financial and operational sustainability beyond the GCF funding period.

Risk management sections often overlook the complexity of climate risks, especially long-term uncertainties associated with climate change. Proposals should incorporate adaptive management strategies that allow for flexibility and resilience in response to evolving risks.

5.2.5 Financial and operational efficiency

The financial structure of the proposal should be both realistic and aligned with the GCF's co-financing requirements. This includes demonstrating how funds will be used efficiently, ensuring value for money, and highlighting any leveraged financing from other sources.

Projects frequently underestimate operational costs or fail to secure co-financing commitments, which can jeopardize long-term viability. Successful proposals provide transparent financial plans with a clear justification for each cost item and its relevance to achieving project objectives.

5.2.6 Monitoring and evaluation

A strong monitoring and evaluation (M&E) framework is essential for tracking the progress of project implementation and ensuring accountability. The proposal should include *key performance indicators* (KPIs) that are directly linked to the desired outcomes and impact areas.

M&E frameworks are often treated as an afterthought, leading to vague or impractical indicators. A successful proposal defines precise, measurable, and actionable KPIs that align with both GCF standards and the project's specific goals.

Therefore, development of a GCF project proposal requires a deep understanding of the fund's strategic priorities, as well as a coherent approach to achieving tangible climate impacts.

5.2.7 Gender equality and social inclusion

Projects funded by the GCF must demonstrate how they address gender equality and social inclusion. This includes providing evidence on how women and marginalized groups will benefit from the project and how their specific vulnerabilities will be considered in project design.

Many proposals treat gender, equity, and inclusiveness as an afterthought, leading to weak justifications. To succeed, the proposals should integrate gender equity and social inclusion considerations throughout the project lifecycle, from design to implementation, backed by data on how these groups are disproportionately affected by climate change.

5.2.8 Quantified project benefits and co-benefits

Quantifying the expected outcomes of the project is crucial for demonstrating its impact. This can include the number of beneficiaries, emissions reductions in tonnes of CO_2 equivalent, or the expected co-benefits, such as job creation, improved health, or health ecosystem services.

Proposals that are vague or general about the expected impacts risk being overshadowed by more detailed submissions. Including quantifiable data not only provides a clearer picture or the project's value but also shows that the project has been well thought out in terms of deliverables.

5.2.9 Environmental and social standards (ESS)

The proposal must include an impact assessment to ensure compliance with the GCF's Environmental and Social Standards (ESS). This assessment should detail any potential environmental or social risks and outline mitigation measures.

Projects that do not adequately assess risks or propose weak mitigation measures may fail to meet GCF standards. A robust assessment that addresses both immediate and long-term environmental and social impacts will demonstrate a responsible and sustainable approach to project implementation.

5.2.10 Financial sustainability

A sound financial plan is essential for ensuring that the project remains viable after GCF funding ends. The proposal should demonstrate how the project will achieve financial sustainability, including any potential for co-financing or leveraging additional funding sources.

Financial sustainability is often a weak point in proposals, particularly proposals show how the project can generate revenue, attract future investments, or continue operations through other financial mechanisms, ensuring long-term benefits.

5.2.11 Consistency with national priorities and existing policy frameworks

A key element in developing a successful GCF project proposal is ensuring consistency with national priorities and policy frameworks. The proposed interventions must align with the country's NDCs, Long-Term Strategies (LTS), National Adaptation Plans (NAPs), and NAPAs. These frameworks represent the county's climate change goals and commitments under the Paris Agreement and other international accords.

To further strengthen the proposal, project proponents should explicitly demonstrate how the intervention supports the country's broader climate strategies and targets. This alignment not only shows that the project is part of the national climate agenda but also illustrates its capacity to deliver co-benefits across various sectors. These co-benefits can include economic growth, job creation, improvements in public health, and positive environmental outcomes.

A common shortfall in many proposals is the lack of clear connection to national priorities. This weakens the proposal's relevance and undermines its potential for impactful, sustainable outcomes. Proposals that reflect national climate synergies, as well as socio-economic and environmental synergies, gain credibility with both local stakeholders and international funders like the GCF.

5.2.12 Stakeholder engagement

Stakeholder engagement is a crucial component of a successful GCF project proposal. A good project actively involves stakeholders at all stages, from project ideation to implementation and monitoring. This multi-stakeholder approach ensures that the project is inclusive, participatory, and reflective of the needs and priorities of those affected by and involved in the project.

Key considerations for stakeholder engagement:

- Stakeholders, particularly from local communities, civil society, private sector, government agencies, and vulnerable groups, should be engaged early in the project's lifecycle. This helps shape project design by incorporating their insights, ensuring that the interventions are both relevant and culturally sensitive.

- An on-going consultative process that provides regular updates on the project's progress, while offering opportunities for stakeholder feedback, strengthens the project's responsiveness to changing conditions and stakeholder needs.

- Civil society organizations (CSOs) can play a pivotal role in monitoring and evaluating project outcomes. Their involvement enhances transparency, accountability, and ensures that the project remains aligned with its goals.

- Establishing formal mechanisms such as advisory committees or stakeholder platforms can provide a structured way for different groups to participate in decision-making, voice concerns, and contribute to solutions.

Proposal that actively engage stakeholders throughout the project cycle tend to receive stronger support from both local communities and funders. They also mitigate the risk of opposition, delays, or conflict, especially in contexts where climate-related projects could impact vulnerable populations.

Engaging stakeholders in the M&E phase might be equally important, as it allows for real time feedback on project performance and promotes a shared sense of ownership. By integrating diverse perspectives into the M&E process, the project gains credibility, improving its ability to meet both local and global climate goals.

Moreover, clear documentation of the engagement process, including how concerns are addressed, demonstrates the project's commitment to inclusivity, transparency, and accountability, further increasing the proposal's chances of approval by the GCF.

5.3 Process of developing GCF proposal

The GCF requires the National Designated Authority (NDA) to oversee the submission procedures for funding proposals at the national level. The NDA is responsible for ensuring that proposals adhere to GCF investment requirements, ensuring they align with the country's national strategies and climate priorities. Additionally, the NDA facilitates the coordination between the Accredited Entities (AEs) and GCF standards.

A GCF funding proposal follows a 6-step process for approval and implementation:

- ***Stage 1 – 3 (National level)***: At the national level, the project concept is developed, and the NDA and AEs ensure it aligns with national and GCF priorities. Engagement with stakeholders, including civil society and vulnerable groups, is crucial during these stages.
- ***Stage 4 (GCF secretariat review)***: After submission, the GCF Secretariat reviews the proposal for completeness and consistency with GCF investment framework and strategic priorities.
- ***Stage 5 (Technical evaluation by ITAP)***: The Independent Technical Advisory Panel (ITAP) conducts a technical evaluation, assessing the proposal's feasibility, risks, and potential climate impacts.
- ***Stage 6 (board decision)***: The final decision is made by the GCF Board based on the ITAP's review and the proposal's alignment with the GCF investment framework.

AEs are encouraged to submit proposals that align with GCF's strategic priorities and investment framework. While there are no country-specific allocations of resources, the GCF ensures geographical balance in funding disbursement, particularly in addressing the needs of developing countries and vulnerable populations.

5.3.1 Key Steps for GCF project concept preparation

In Nepal, the process of developing a GCF project proposal must be done in close coordination with the NDA (Ministry of Finance) and adhere to the GCF Results Management Framework (RMF). Below is a checklist to guide the preparation of the GCF project concept: see figure 5.2

- ***Assembling a team of experts***: Bringing together relevant practitioners and experts to ensure a well-rounded project concept.

- ***Engage with the NDA***: Seek approval from the Ministry of Finance – NDA, early in the process and communicate the intention of developing a GCF project concept.
- ***Identify and AE***: Work closely with an AE to increase the likelihood of the project concept advancing to a full proposal.
- ***Check the funds calendar***: Monitor submission deadlines that coincide with GCF board meetings.
- ***Review GCF templates and guidance***: Familiarize yourself with GCF concept note template and related guidance documents to ensure alignment with their requirements.
- ***Study past proposals***: Review previous successful proposals submitted to the GCF to understand expectations and best practices.
- ***Collect baseline data***: Gather and review baseline climate data, vulnerabilities, and potential impacts.
- ***Stakeholder consultation***: Involve relevant stakeholders, including vulnerable communities, government officials, and sector experts, to ensure the project is inclusive and responsive to local needs.
- ***Draft the project concept***: Use clear, concise language and supporting documentation (e.g., maps, financial models, environmental and social impact assessments) to communicate the project effectively.

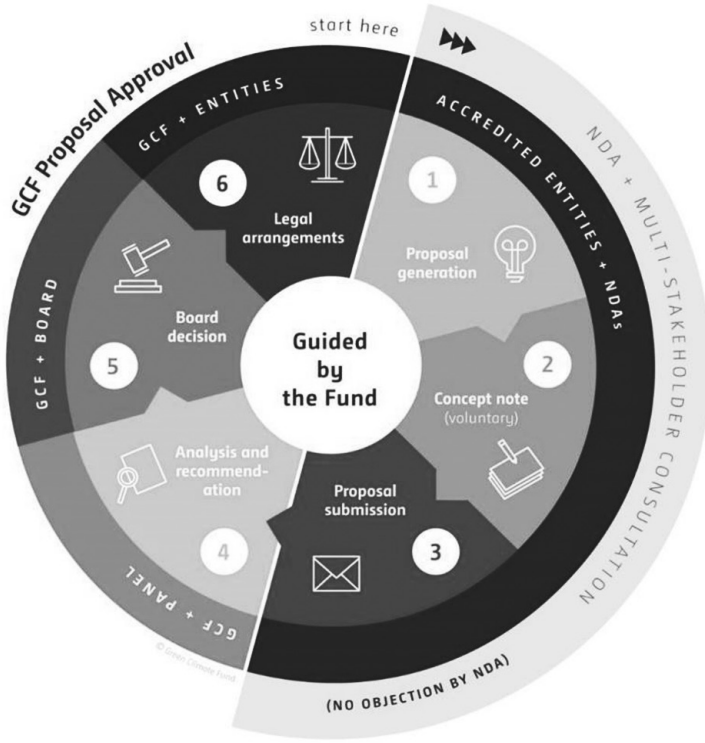

Figure 5.2: The GCF proposal development and approval process

Source: https://climatestrategies.org/capitalise-leverage-and-diversify-africas-gcf-portfolio-and-opportunities-for-engagement/

The successful proposals usually have the following characteristics:

(a) Country-specific relevance: Successful proposals often excel by closely aligning with national climate policies, such as NDCs, NAPs, and other relevant frameworks.

(b) Engagement with NDA and accredited entities: Early and continuous coordination with the NDA and an Accredited Entity is essential for ensuring that the proposal adheres to both national priorities and GCF investment standards.

(c) Comprehensive data and evidence: Proposals should include robust scientific evidence, such as climate trends, vulnerabilities, and mitigation/adaptation strategies, to build a strong case for funding.

5.3.2 Steps to enhance the climate rationale of GCF-supported projects

Securing funding from the GCF requires a proposal that not only aligns with the fund's strategic priorities but also presents a compelling climate rationale. This concept refers to clearly demonstrating how a project directly addresses the drivers and impacts of climate change, ensuring it contributes to the GCF's mandate of fostering climate resilience and lowering GHG emissions. Climate rationale is a critical component that justifies the use of GCF resources, linking scientific evidence with specific climate vulnerabilities, risks, and projected impacts.

Below are the critical steps to enhance the climate rationale of GCF-supported projects:

- Baseline Climate Assessment
- Clear Linkage Between Climate Impacts and Project Interventions
- Integration of Adaptation and Mitigation Benefits
- Alignment with National and International Climate Policies
- Use of Climate Science and Evidence-Based Decision-Making
- Robust Monitoring and Evaluation Framework
- Stakeholder Engagement and Inclusive Planning
- Leveraging Co-financing and Private Sector Involvement
- Justifying Transformational Change

5.3.3 Mitigation

The following broad guidelines, aligned with recognized protocols and industry best practices for estimating emission reductions in the climate finance sector, should be considered when evaluating the impact potential of a mitigation financing proposal (Green Climate Fund 2022).

- **Alignment with host country priorities**: Proposals must demonstrate that activities align with the host country's priorities, including long-term climate strategies aimed at maintaining the global average temperature to well below 2°C. This alignment ensures the integration of country ownership into the proposal and targets areas with the highest potential impact and need within the country.

- **Methodological approach for quantification**: A clear methodological framework for quantifying the mitigation results and monitoring them must be selected and implemented.

- **Relevance of methodologies**: The proposal should utilize methodologies that are specifically relevant to the proposed activities.

- **Consistency with national GHG reporting**: The quantification of mitigation impacts should employ consistent assumptions (e.g., emission factors) that align with national GHG reporting. This consistency facilitates accurate assessment of the support provided to countries in fulfilling their NDCs in accordance with the Paris Agreement.

- **Measurement, reporting, and verification (MRV) system**: Proposals should outline the establishment of a robust MRV system for tracking GHG emissions reductions and removals, ensuring alignment with existing national MRV systems.

5.3.4 Adaptation

Establishing the impact potential of an adaptation funding proposal is guided by four overarching principles:

- **Identification**: Adaptation proposals must clearly demonstrate how the proposed activity addresses existing or anticipated climate change risks or impacts, along with a rationale for its effectiveness as a response.
- **Response**: Proposals should articulate how the activity will reduce the exposure and vulnerability of people, systems, or ecosystems, thereby mitigating the risks or impacts associated with climate change.
- **Alignment**: Proposals must confirm that the proposed activity is consistent with the host country's national plans and climate strategies, ensuring coherence and integration within broader climate adaptation efforts.
- **Monitoring and Evaluation**: Proposals should provide a comprehensive description of the monitoring and evaluation system that will be implemented to assess the outcomes of adaptation activities and quantify the number of beneficiaries affected by these interventions.

5.3.5 Building climate rationale for - selected themes (water sanitation, climate-induced disaster, sustainable transport, health etc)

Climate rationale is a critical framework for assessing the impacts, risks, and vulnerabilities associated with climate change. It provides a scientific foundation for evidence-based climate decision-making, ensuring that the connections between climate impacts, climate actions, and societal benefits are firmly rooted in the best available climate data and scientific research (Gallo 2018). Key institutions such as the IPCC and various climate finance organizations, including the GCF and the GEF, utilize this rationale, which generally comprises three main phases (Green Climate Fund 2018):

- **Establishing credible Climate science and evidence**: This phase involves conducting a robust assessment of exposure, impacts, vulnerabilities, and disaster risks in the context of adaptation. It also includes accurately determining greenhouse gas emission trajectories, which are essential for understanding future climate scenarios.

- **Development of optimal interventions**: This step focuses on formulating a comprehensive set of interventions designed to address the underlying climate risks effectively. The aim is to maximize sustainable development benefits, ensuring that the proposed measures are not only effective in mitigating climate impacts but also contribute positively to social and economic development.

- **Integrating interventions into policy and decision-making**: The final phase emphasizes the need to incorporate these interventions into broader national and international policy frameworks. This integration is crucial for fostering long-term low-emission, climate-resilient development and for meeting commitments under the UNFCCC and other global agendas. By embedding climate rationale into policy processes, stakeholders can ensure that climate actions are aligned with broader development goals and are sustainable over the long term.

Table 5.1: Climate rationale for prospective proposals, under various themes.

Selected themes	Elements that enhance climate rationale
Water, Sanitation, Hygiene and Health care waste management	Climate impacts to be addressed, including vulnerabilities and risks of the climate impacts to children and women Emission trajectories for mitigation actions Assessment of adaptation options based on priorities and How the proposed intervention fits into broader domestic and international policies and decision-making processes
Climate-Induced Disaster	Develop capacities for national policy development and implementation that promote coherence and synergy between climate change adaptation. Build a coherent risk governance system that takes an all-hazards approach Develop financing strategies for climate and disaster risk-informed investment Coordinate data collection, assessment, implementation, monitoring and evaluation
Sustainable Transport	Using more energy-efficient vehicles Improving urban and interurban planning Investing in infrastructure to achieve sustainability in transportation Catalyzing climate innovation

Forest and Land Use	Protecting natural forests and landscapes Restoring degraded forests and other landscape Sustainable management of productive forest landscapes
Ecosystem and Ecosystem Services	Supporting transformational planning and programming Catalyzing climate innovation in policy, institutions, business, technology and finance Mobilizing finance at scale by de-risking investments and strengthening domestic financial systems and institutions Expanding and replicating knowledge by sharing lessons, traditional knowledge, scientific advances and standards about ecosystem services and their climate benefits

5.3.6 GEF Project Cycle

The Global Environment Facility (GEF) provides new and additional grants and concessional funding to achieve global environmental objectives (GEF, 2010). Its focus areas include biodiversity, climate change, international waters, land degradation, persistent organic pollutants, and ozone layer depletion. The GEF project cycle consists of two main steps (see figure 5.3):

- **Project identification stage (PIF Approval)**: The primary goal of this stage is to ensure that the proposed project concept aligns with the objectives of the Least Developed Country Fund (LDCF) and qualifies for funding. Once the Project Identification Form (PIF) is approved, funds are reserved for that specific project, contingent upon the submission of a fully developed proposal to the GEF Secretariat. Although there is no minimum preparation time, a maximum of 22 months is allowed for project development. After PIF approval, the project becomes eligible for an optional Project Preparation Grant (PPG) to support the preparation of the full proposal.

- **Detailed project description stage (CEO Endorsement)**: This stage involves two key steps: In the first step, the technical rationale of the project is elaborated, ensuring that the proposed activities are scientifically sound and effective in achieving the desired environmental outcomes. In the second step, the proposal must demonstrate that all aspects of project implementation have been thoroughly established, confirming that the project is ready to proceed.

- **Implementation and reporting**: The recipient country is responsible for executing the project and ensuring adherence to the objectives and timelines outlined in the proposal. A GEF Secretariat project manager monitors project implementation progress and ensures that progress reports are submitted by the recipient country as scheduled.

- **Disbursement**: Once the grant agreement is signed and counter-signed, the recipient prepares a withdrawal application, attaching the necessary supporting documentation. This application is sent to the GEF Secretariat for review and processing. The recipient is responsible for accounting for all funds disbursed and must refund any unutilized amounts to the bank.

- **Auditing and financial reporting**: The GEF project manager reviews all submitted financial and progress reports to ensure that project implementation and reporting are on track. If any discrepancies are detected during the review, the project manager must alert GEF management.

- **Project closing**: At the conclusion of the project, the recipient country submits the final outputs to the GEF Secretariat and posts them on the convention website, ensuring transparency and accessibility of project results.

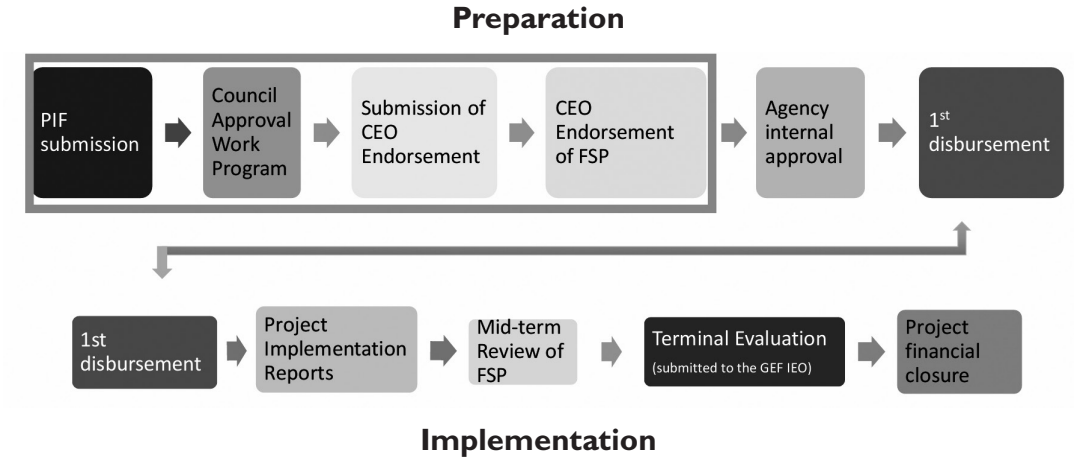

Figure 5.3: Processing steps within the recipient country and the GEF secretariat for the proposed GEF national portfolio formulation.

Source : https://www.thegef.org/sites/default/files/events/How%20to%20prepare%20a%20project_GEF%20Intro%20Seminar%202021_0.pdf

5.4 Steps for proposal development for the adaptation fund

The project cycle of the Adaptation Fund begins with the submission of a proposal by the National Implementation Entity (NIE) designated by the relevant parties (see figure 5.4). This proposal must be endorsed by the designated authority and is subsequently subject to initial screening, project/programme review, and approval.

- ***Review and approval of concrete adaptation projects and programmes***: Proposals can undergo either a one-step or two-step approval process. In the one-step approval process, proponents submit a fully developed project or programme document. In contrast, the two-step process involves an initial submission of a brief project or programme concept, followed by the submission of a comprehensive project document.

- ***Review and approval of project/programme formulation grants***: NIE project or programme proponents can request a Project/Programme Formulation Grant (PFG) alongside the project or programme concept using the PFG form approved by the Board. The Secretariat reviews the request and forwards it to the Project and Programme Review Committee (PPRC) for a final recommendation to the Board. A PFG can only be awarded when a project or programme concept is presented and endorsed.

- ***Transfer of funds***: The Trustee transfers funds based on written instructions from the Board, signed by the Chair or another Board Member designated by the Chair, and subsequently reports to the Board on the fund transfers.

- ***Monitoring, evaluation, and review***: The Board holds strategic oversight responsibility for projects and programmes funded by the Adaptation Fund, guided by its overarching strategic results framework. The Ethics and Finance Committee (EFC), with support from the Secretariat, monitors the Fund's project portfolio, while the PPRC addresses issues identified during the implementation of individual projects and programmes.

- ***Procurement***: Procurement activities carried out by implementing entities or their affiliated organizations must adhere to internationally accepted procurement principles, good procurement practices, and the applicable procurement regulations of the respective Party.

- ***Project/Programme suspensions and cancellations***: At any point during the project or programme cycle, the EFC may recommend to the Board the suspension or cancellation of a project or programme. This can occur at the EFC's discretion or in response to findings from independent evaluations or investigations.

- ***Review of operational policies and guidelines***: The Board is responsible for continually reviewing these operational policies and guidelines and will amend them as necessary to ensure they remain effective and relevant.

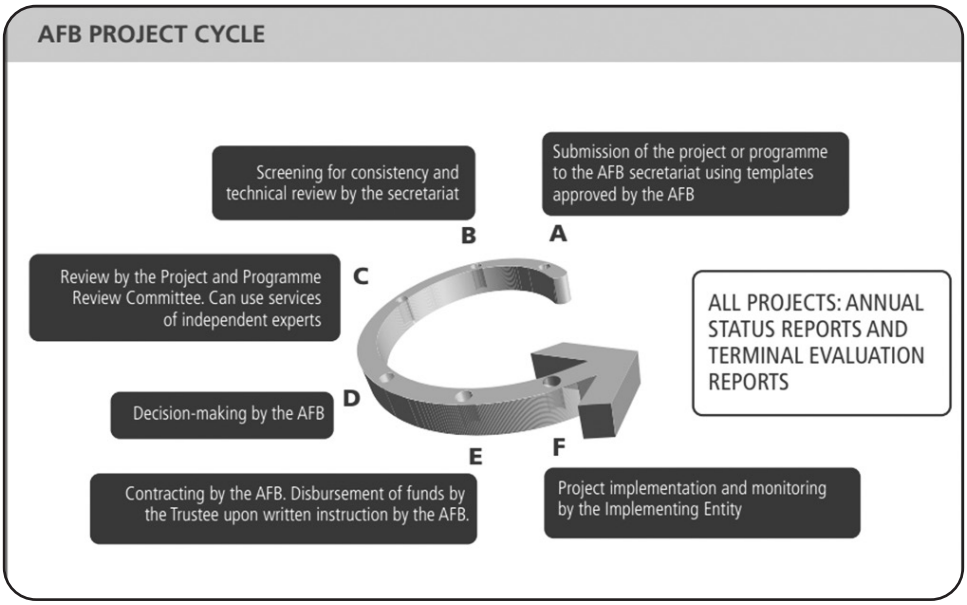

Figure 5.4: Timelines of the review process for the Adaptation Fund

Source: Farayi Madziwa (2019)

A comprehansive climate change project proposal is grounded in well-defined objectives, a strong scientific foundation, comprehensive stakeholder engagement, and detailed implementation plans. This chapter serves as a guide for project proponents in Nepal seeking funding from the GCF and GEF.

To enhance the climate rationale for projects supported by these funds, proponents should focus on several key elements:

- **Utilization of climate data**: Proposals should leverage the best available climate data to assess vulnerabilities and inform decision-making processes. This ensures that projects are grounded in evidence and can effectively address climate risks.
- **Alignment with national commitments**: It is essential to align project activities with national climate commitments and strategies, such as NDCs. This alignment fosters country ownership and increases the likelihood of successful implementation.
- **Demonstration of measurable impacts**: Proposals must articulate how the project will achieve measurable climate impacts, such as greenhouse gas reductions or enhanced resilience. Clear metrics for success should be established to facilitate monitoring and evaluation.

- **Quantification of benefits**: A thorough assessment of the economic, social, and environmental benefits associated with the project is crucial. This quantification should illustrate how the project contributes to both climate goals and broader sustainable development objectives.

- **Community engagement**: Engaging local communities throughout the project lifecycle is vital. Their insights and experiences can help tailor interventions to address specific local needs, ensuring that projects are socially equitable and culturally appropriate.

- **Incorporation of co-benefits**: Projects should aim to deliver co-benefits that extend beyond climate objectives, such as improving health outcomes, enhancing food security, or promoting sustainable livelihoods. Highlighting these co-benefits can strengthen the case for funding.

- **Leveraging existing initiatives**: Building on existing programs and initiatives can enhance project effectiveness and sustainability. Identifying synergies with other efforts in areas such as water and sanitation, climate-induced disasters, sustainable transport, and health can lead to more integrated and impactful solutions.

By adhering to these principles and addressing specific themes through tailored strategies, project proponents can effectively tackle climate challenges and contribute to sustainable development. This approach not only enhances the climate rationale but also increases the potential for securing funding from GCF and GEF, ultimately leading to more resilient communities and ecosystems.

Chapter 6

Use Cases of Climate Rationale- Examples from Climate Change Projects in Nepal

Case Study 1: Improving climate resilience of vulnerable communities and ecosystems in the gandaki river basin, nepal

This project aimed to address climate vulnerability through an ecosystem-centred and community-based strategy with a primary focus on building the resilience of both local ecosystems and communities. By integrating sustainable natural resource management practices, ecosystem restoration, and conservation efforts, the initiative seeks to improve the capacity of the environment to withstand climate stresses. It also aimed to promote active community in climate governance, empowering local stakeholders to take ownership of climate adaptation strategies.

Key elements of the project include enhancing adaptive capacities of marginalized and vulnerable groups, fostering collaboration between communities and government agencies, and ensuring that climate adaptation efforts are sustainable and inclusive. The initiative is expected to provide long-term benefits by safeguarding biodiversity, protecting vital ecosystems, and improving the livelihoods of communities that depend on natural resources in the Gandaki River Basin.

Climate rationale of the project

Nepal's Gandaki River Basin (GRB) is facing significant and rapidly intensifying impacts from climate change. Projections indicate that average temperature in the basin are expected to rise dramatically by the 2060s (1.3 - 3.8°C) and continue increasing by the 2090s (1.8 - 5.8°C). Alongside this warming trend, there is an anticipated surge in the occurrence of hot nights—up 77% by the 2060s and a staggering 93% by the 2090s. These rising temperatures are coupled with changing precipitation patterns, signalling profound implications for the region's ecosystems and livelihoods.

Monsoon precipitation is projected to intensify significantly, with a 2% increase by 2030, a 20% rise by 2060, and a substantial 45% escalation by 2090. This increase in monsoon rains will be marked by more extreme wet days (a projected rise of 21-34%), and while overall annual

precipitation might see only a slight increase, this shift will contribute to the saturation of soils, heightening the risk of flash floods, landslides, and soil erosion. On the other hand, drier periods are also expected to worsen, with an increase in consecutive dry days, particularly in the hills and Siwalik regions. Under the moderate emissions scenario (RCP4.5), monsoon rainfall between 2036 and 2065 could increase by 9.4%, while under a high emissions scenario (RCP 8.5), the rise could reach 13.6%.

The impacts of these changes are alarming as the heightened risks of extreme events includes winter droughts, flash floods, and landslides. The increased monsoon rainfall will not only cause soil saturation but also escalate the frequency of floods and landslides, severely affecting both natural and ecosystems and human settlements. Given that subsistence agriculture is the primary livelihood for many communities, the vulnerability of these population is further exacerbated by climate induced disruption in crop yield, soil fertility, and water availability.

The climate rationale highlights the critical risks posed to agricultural activities, which form the backbone of the local economy in the Gandaki River Basin. With agriculture serving as a key economic sector, projected climate impacts threaten food security, income stability, and overall resilience. The rationale also includes detailed assessments that disaggregate the projected impacts by subregion and ethnic groups within the basin, offering a nuanced understanding of how different communities will experience climate vulnerabilities.

To address these threats, the project's adaptation strategy is well-founded, targeting the most vulnerable areas and groups. The adaptation measures are validated through the comprehensive climate rationale, which draws on multiple data sources, including stakeholder consultations, to pinpoint priority actions. The project's proposed interventions align with broader national and international climate policies, including Nepal's NDCs, NAPs, and other sector-specific strategies, ensuring that the project is integrated into both domestic and global climate governance frameworks.

By tackling climate risks to agriculture, water resources, and ecosystems, this project underscores the urgency of enhancing resilience for vulnerable communities in the Gandaki River Basin and fits within Nepal's long-term climate adaptation goals.

Methods of formulating the project action

The project had prioritized tasks using VRA to focus on the most critical areas and activities, which consisted of:

- Identification of the high-risk GLOF lakes and flood-prone area through spatial analysis and community consultations.
- Assessment of the community vulnerability using exposure, sensitivity, and adaptive capacity indicators.
- Prioritizing of project activities considering cost-effectiveness, community needs, and scalability potential.

Constraints and challenges in developing the climate rationale

- Lack of high-resolution climate data and accurate predictions for Nepal, making it difficult to quantify future climate risks and vulnerabilities. Therefore, the project had to rely on broader regional studies and national NAPA findings to develop the project's climate rationale.
- Need for coordination with multiple government agencies and development partners to ensure integration with existing programs. Alignment with national policies and plans was critical but time-consuming.

Recommendations for strengthening the climate rationale

To strengthen the climate rationale, future initiatives might invest in strengthening local and regional climate monitoring and modelling capacities, resulting in more detailed data and projections.

- Conduct in-depth vulnerability assessments that use both quantitative and qualitative methodologies to better understand community-level climate threats and adaptation needs.
- Establish stronger connections between project activities and national/subnational climate change adaptation and catastrophe risk reduction policies from the start.
- Improve coordination structures among government agencies, development partners, and communities to support integrated, multi-stakeholder approaches to climate change adaptation.

Case Study 2: Community based flood and glacial lake outburst risk reduction project

This project was funded by UNDP and GEF and implemented by DHM, Ministry of Science, Technology and Education (MOSTE). The primary objective was to reduce human and material losses from GLOF events in Solukhumbu and catastrophic flooding in the Terai and Churia regions.

Climate rationale of the project

For this project, the study team conducted an in-depth literature review that analysed over 30 years of temperature and precipitation data, providing a solid scientific foundation for assessing climate trends. This review, combined with climate modelling for flood prediction, enabled the project to identify emerging flood risks, particularly those posed by GLOFs. The climate modelling used scientific techniques to forecast potential flood events, contributing to the design of effective risk reduction interventions.

A well-equipped, inter-sectoral team was formed to ensure a comprehensive approach. The study focused on GLOFs, and relevant data sets – such as precipitation, temperature, and glacial lake dynamics – were collected to inform flood predictions. Both qualitative and quantitative analyses were employed to evaluate the data, leading to the adoption of GLOF risk reduction interventions.

Methods of formulating the project action

- Vulnerability and Risk Assessment: The project identified vulnerable areas, communities, and infrastructure at risk from GLOFs.
- Indicator Selection and Definition: Key indicators such as glacial lake behavior, flood susceptibility, and community exposure were likely used to gauge risk levels.
- Prioritization Methods: Prioritization based on the severity of risk, population density, and vulnerability of infrastructure, ensuring that high-risk areas received immediate attention.

This integrated approach strengthened the project's climate rationale and also ensured that targeted interventions are grounded in both scientific analysis and community-level needs.

This project satisfied the criteria outlined in UNFCCC decision 7/CP.7, guidance of COP 9 and project was prioritized by Nepal's NAPA.

Constraint and challenges in developing the climate rationale

The climate rationale for the project was primarily based on secondary literature, which, while informative, may not provide sufficient depth for accurately linking GLOF events, flooding, and broader climate science. One key limitation was the lack of high-resolution, localized climate data. The project had relied on broad regional trends, which may not had captured the nuanced, site-specific dynamics of GLOF risks or flooding patterns in Nepal.

Furthermore, the scientific connection between GLOFs, flood risks, and climate change might require more direct, empirical evidence. GLOFs are often triggered by glacial melting due to rising temperatures, but establishing a clear, data-driven relationship between local glacial behaviour, temperature increases, and subsequent flood events require more precise monitoring and modelling. The absence of continuous, high-resolution datasets on glacial lake dynamics, temperature fluctuations, and precipitation patterns weakens the causal link-needed to forecast flood risks reliably under changing climatic conditions.

To strengthen this foundation, future research must invest in localized, long-term monitoring of glaciers, glacial lakes, and hydrological systems. Developing region-specific models that integrate local climate data with flood risk prediction can create a more robust scientific base. Without this empirical evidence and advanced modelling, the climate rationale remains broad and less grounded in specific, actionable data necessary for precise GLOF and flood risk interventions.

Recommendations for strengthening the climate rationale

Possible recommendation to strengthen climate rationale would be rather than relying on literature to have created a detailed sophisticated model for the linkage of glaciers, GLOF, flooding, and temperature rise.

Case Study 3: Increasing community resilience through enhancement of equitable access to green agriculture

The specific objective of the project is to ensure food security and reduce poverty for climate vulnerable households and communities by improving resilience of agricultural production through stimulating investments in solar energy based improved modern irrigation practices, as well as the mitigation of greenhouse gases. It aims to initiate a sustainable market transformation to renewable energy-based irrigation for agriculture by injecting sizable investments in renewable energy-based irrigation and showcasing business models using GCF funds in combination with government funds and private sector investments.

Climate rationale of the project

The project addresses the growing vulnerabilities of rural communities to climate change, including erratic rainfall, prolonged droughts, floods, and rising temperatures, which threaten food security and livelihoods. By promoting **green agriculture**, it introduces climate-resilient practices such as drought-tolerant crops, agroforestry, and water-efficient technologies. These practices not only enhance adaptive capacity but also reduce greenhouse gas emissions through sustainable land management and organic farming. The project prioritizes **equitable access** to resources, empowering marginalized groups like women and smallholder farmers to adopt climate-smart agriculture. Aligned with national and global climate goals, it aims to build long-term resilience and sustainable livelihoods for vulnerable communities.

Methods of formulating the project action

- **Climate-smart agriculture (CSA):** The project employs Climate-Smart Agriculture methods to enhance agricultural productivity sustainably. By promoting practices such as crop diversification, conservation agriculture, and the use of climate-resilient crop varieties, the initiative aims to improve resilience against climate change while minimizing greenhouse gas emissions.

- **Adaptive capacity and resilience:** To help communities endure and recover from climate-induced shocks, such as extreme weather events, the project focuses on enhancing adaptive capacity. This involves educating farmers about techniques that can withstand climatic variability and improving access to resources that support adaptive practices.

- **Sustainable practices and biodiversity:** The project aims to increase biodiversity by utilizing native and climate-resilient crops that are better suited to the local climate and more resistant to pests and diseases. This approach not only fosters ecological balance but also enhances food security within the community.

- **Community involvement and knowledge sharing:** By integrating traditional knowledge and involving local communities in agricultural practices, the project ensures that the solutions are culturally appropriate and widely accepted. Knowledge-sharing among community members enables the adoption of effective practices and fosters a sense of collective resilience.

Constraint and Challenges in developing the climate rationale

While the project has presented several promising strategies aimed at mitigating climate change impacts, it exhibited some notable inadequacies in its foundational approach:

- **Limited empirical evidence**: The rationale relies on established concepts such as Climate Smart Agriculture (CSA) and community engagement without providing sufficient empirical evidence to support their effectiveness in the specific context to support their effectiveness in the specific context of the targeted communities. While CSA is a recognized framework, the project would benefit from presenting data or case studies demonstrating its successful implementation in similar environments, especially in relation to climate resilience.

- **Simplification of adaptive capacity**: Enhancing adaptive capacity is a complex process that often requires more than education and resource access. The rationale has simplified this concept. It should consider socio-economic factors, existing community vulnerabilities, and power dynamics that influence adaptive capacity. A deeper analysis of these variables is essential for understanding how climate shocks affect different segments of the community, particularly marginalized groups.

- **Enhanced focus on climate change projections:** The rationale requires more adequate

- **Insufficient focus on climate change projections:** The rationale does not adequately address future climate scenarios or projections specific to the project area. While promoting climate-resilient crops and sustainable practices is important, it is crucial to understand the specific climatic challenges communities are likely to face in the coming years. Integrating localized climate projections could enhance the rationale's relevance and urgency.

- **Neglecting systemic barriers:** While the emphasis on community involvement and knowledge sharing is commendable, the rationale fails to address systemic barriers that may hinder the adoption of proposed agricultural practices. Factors such as market access, policy support, and infrastructure limitations play a critical role in the successful implementation of sustainable agricultural practices. Acknowledging these barriers would provide a more comprehensive understanding of the challenges communities face.

- **Lack of monitoring and evaluation framework:** The rationale does not outline a clear monitoring and evaluation framework to assess the effectiveness of the proposed interventions. Without defined metrics for success and a systematic approach to evaluate outcomes, it becomes difficult to ascertain whether the project is meeting its objectives or to adapt strategies as needed.

- **Potential overreliance on traditional knowledge:** While integrating traditional knowledge is valuable, an overreliance on it without incorporating scientific evidence and innovative practices may limit the project's effectiveness. A balanced approach that respects local practices while also introducing modern agricultural techniques can lead to more sustainable outcomes.

Common challenges across the project implementation

- The implementation of climate-smart agricultural techniques is greatly hampered by resource restrictions, including restricted access to financial resources, technical skills, and agricultural inputs. Extreme weather events including storms, floods, and droughts combined with climate unpredictability pose a serious danger to agricultural output.

- Infrastructure deficiencies, including inadequate irrigation systems, transportation networks, and storage facilities, limit the ability of farmers to adopt and benefit from climate-smart agricultural practices.

- Socio-economic challenges, such as high levels of poverty and economic insecurity among smallholder farmers, make it difficult for them to invest in and adopt new agricultural practices.

- Environmental degradation, such as soil erosion, deforestation, and loss of biodiversity, exacerbates the vulnerability of agricultural systems to climate change.

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