

PROJECT DEVELOPMENT

Guidance Note
on Climate Change
Due Diligence For
Project Development



**Ministry of Planning
Development & Special Initiatives**
Government of Pakistan

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List of Abbreviations

CARA	Climate Adaptation and Resilience Assessment
ccGAP	Pakistan's Climate Change Gender Action Plan
CDWP	Central Development Working Party
CHIRA	Climate and Hazard Initial Risk Assessment
CIME	Climate Indicators for Monitoring and Evaluation
CMA	Climate Mitigation Assessment
C-PIMA	Climate Public Investment Management Assessment
GCISC	Global Change Impact Studies Centre
GHG	Greenhouse Gas
GoP	Government of Pakistan
IMF	International Monetary Fund
iPAS	Intelligent Project Automation System (of MoPDSI)
NC	National Communication
NDC	Nationally Determined Contribution
MOPDSI	Ministry of Planning, Development & Special Initiatives
MDP	Manual for Development Projects
NAP	National Adaptation Plan
NDRMF	National Disaster Risk Management Fund
NDMA	National Disaster Management Authority
PCN	Project Concept Note
PC-X	Planning Commission (PC) Forms – followed by number relevant to stage
PIPP	Public Investment Procedures and Parameters
PSDP	Public Sector Development Programme
RSF	Resilience and Sustainability Facility
tCO ₂ e	Tonnes of Carbon Dioxide equivalent
TFS	Technical Feasibility Study

Section 1: Introduction

1.1 Overview

1. **This Guidance Note is designed to assist project proponents in the Government of Pakistan to systematically integrate gender-responsive climate change considerations into the early stages of project development.** It serves as a practical supplement to the *2024 Manual for Development Projects (MDP)* and its annexed *Handbook on Climate Risk Screening for Policy Planning* (“the Handbook”). The Handbook’s key terms are adopted in this Guidance Note, including mitigation, adaptation, resilience and co-benefits.
2. This Guidance Note provides three core functions:
 - i. **Definition of the climate due diligence process:** outlines a clear, step-by-step process for assessing climate risks and opportunities during project formulation, including gender-related climate risks. This guidance goes beyond the issues covered in the MDP and Handbook to provide a holistic and comprehensive approach to managing climate-related risks and identifying climate-related opportunities.
 - ii. **Improvement in consistency and clarity in project submissions:** provides standardised approaches to help proponents respond effectively to climate-related questions in PCN, TFS and PC-I templates.
 - iii. **Alignment of projects with national climate policy frameworks:** directs project proponents to identify and apply relevant actions from Pakistan’s national climate change policies to provide structured linkages to these policy instruments and ensure that proposed investments contribute meaningfully to national goals on climate resilience and low-emission development, including gender-sensitive climate action.

1.2 Rationale for Enhanced Climate Due Diligence

3. Pakistan is highly susceptible to climate and disaster risks, experiencing a range of natural hazards that have significantly impacted the nation. In recent years, the country has faced devastating floods, severe heatwaves, droughts, and landslides causing enormous loss of life and excessive damages and economic losses. The country’s vulnerability to climate change is projected to intensify, including increased variability of monsoons, accelerated recession of Himalayan glaciers, and heightened risks of extreme events such as floods, droughts, and cyclones. It is vital that new infrastructure, projects, and policies are designed to withstand/alleviate these conditions to the extent possible and to mitigate against poor investment decisions and stranded assets.
4. At the same time, minimising GHG emissions to reduce the exacerbation of climate change is also vital. While Pakistan’s GHG emissions are minimal globally, reducing them strengthens Pakistan’s moral and diplomatic position in international climate negotiations and supports global efforts to limit warming. This in turn enhances access to international climate finance, improves energy security/affordability, provides health benefits (e.g., from reduced air pollution), and offers other economic opportunities associated with the low-carbon transition.
5. In addition, climate change affects men and women differently. For instance, women and children are 14 times more likely than men to die during a disaster¹, and women and girls face additional obstacles in accessing healthcare, relief supplies, food distribution points, economic resources, and markets post-disaster. To address climate challenges, the full, equal, and meaningful participation of women is needed. By embedding gender-responsive climate change due diligence into early-stage project development, this guidance helps ensure that proposals are both policy-

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https://www.unisdr.org/files/48152_disasterandgenderstatistics.pdf;
<https://www.tandfonline.com/doi/full/10.1111/j.1467-8306.2007.00563.x>

aligned and finance-ready, fulfilling national and international expectations for climate-responsive public investment.

- The rationale for enhanced climate change due diligence in project development has also been reinforced by the International Monetary Fund's (IMF) assessments and recommendations on public investment.

The IMF 'Climate Public Investment Management Assessment' (C-PIMA) highlighted the Government of Pakistan's need to "Develop specific technical guidance on key issues such as how to conduct various forms of climate, economic, financial, technical analysis including on discount rates, social pricing and quantification of climate costs, systematically incorporating climate risks." This guidance note addresses this requirement by providing the relevant guidance both at the overarching level and by sector.

This alignment is also essential for meeting the requirements of the IMF 'Resilience and Sustainability Facility' (RSF), which supports Pakistan's efforts to build resilience to natural disasters and climate risks through more climate-responsive planning and investment processes. Specifically, under the RSF:

- By August 2026, the Public Sector Development Programme (PSDP) selection process will be updated so that **climate change carries a weighting of at least 30% in project appraisal criteria**; and
- By August 2027, **all new infrastructure projects must include assessments of climate vulnerability, adaptation, and mitigation** as part of standard due diligence

1.3 Appraisal of Project Climate Change Credentials

- A project's climate change-related credentials will contribute 30% of the overall appraisal score of a given project, with the remaining 70% accounted for by the 'Public Investment Procedures and Parameters' (PIPP) as depicted in Figure 1 below. By following this guidance, project teams can interpret how best to maximise climate-related appraisal scores towards the 30% project appraisal weighting applied to climate change through a combination of gender sensitive climate change due diligence and related project outcomes.

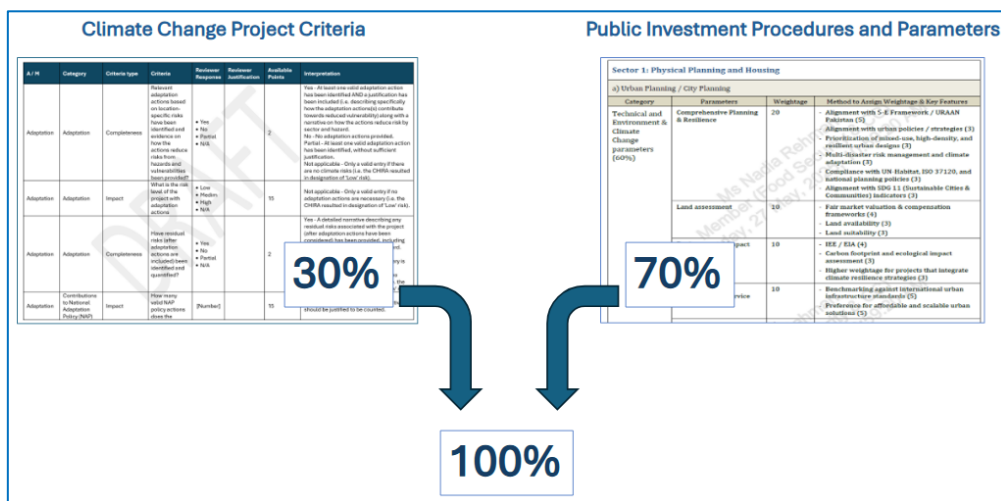


Figure 1. Contributions to overall project appraisal scores

1.4 Who Should Use This Guidance

8. This document is intended for use by both federal and provincial **project development teams, technical consultants, and planning officers** involved in the preparation of public investment projects. It assumes familiarity with the MDP and PCN/TFS/PC-II/PC-I templates but does not necessarily require prior climate expertise. It is particularly relevant for sectors where climate change presents significant risks or where mitigation opportunities exist.

1.5 How to Use This Document²

9. Read **Section 2** ('Application of this Guidance Note') for scope and application and to understand the policy context and existing frameworks.
10. Follow the **step-by-step instructions in Section 4** ('Sector-specific Considerations') to complete climate-related components of the PCN, TFS, PC-II and PC-I.
11. Consult the **annexed references** to identify relevant policy actions, approaches for economic analysis and sector-specific adaptation or mitigation considerations and measures as well as how to populate the project templates.

Section 2: Application of this Guidance Note

2.1 Purpose

12. The Guidance Note provides a structured, **step-by-step approach to help project proponents integrate climate change and gender considerations into the early phases of project development**. It is intended for professionals who are technically proficient in their respective sectors but may have limited expertise in climate risk assessment or climate policy alignment.
13. The guidance focuses on the early stages of **project identification, definition, and development**, specifically the **Project Concept Note (PCN)** and the **Technical Feasibility Study (TFS)**. These are the key entry points in the project cycle where climate relevance, risk exposure, and alignment with national climate policies must be established. Key gender gaps and issues are also identified during these early, critical phases.
14. Although this guidance focuses on early-stage inputs, the outputs of this process will contribute to the robustness and credibility of later project stages (PC-I through PC-V), strengthening the overall climate rationale and readiness for financing.

2.2 Existing Framework and Process

15. In June 2024, the Government of Pakistan notified that the updated Manual for Development Projects (MDP) would serve as the central framework for preparing, appraising, and approving publicly funded projects. The MDP now explicitly incorporates climate change as a core consideration in public investment planning and mandates climate-related due diligence from the earliest stages of project development.
16. An important component of the MDP is the annexed 'Handbook on Climate Risk Screening for Policy Planning' ("the Handbook"), which outlines procedures for assessing climate risks and identifying potential adaptation and mitigation responses across different project types. The Handbook details the following assessments:
 - The **Climate and Hazard Initial Risk Assessment (CHIRA)**, used to screen projects for exposure to climate hazards and to determine the level of risk.

² This is a living document and may be updated as policy frameworks, assessment tools, and implementation experience evolve.

- The **Climate Adaptation and Resilience Assessment (CARA)**, required for projects identified as having medium or high risk, to assess how to manage risk through adaptation measures.
 - The **Climate Mitigation Assessment (CMA)**, which determines project-related GHG emissions and assesses potential mitigation measures.
17. While the Handbook establishes a robust technical foundation, it does not provide a step-by-step instructional guide tailored to the practical needs of project proponents. This Guidance Note fills that gap **by translating the core processes and expectations into an operational format aligned with the actual workflows of project development teams.**
18. Specifically, this Guidance Note:
- Clarifies when and how to apply the CHIRA, CARA, and CMA.
 - Provides structured templates and examples for responding to climate-related questions in the PCN and TFS stages.
 - Provides guidance on conducting economic analyses of climate adaptation and mitigation measures and determining feasibility and cost-benefit.
 - Links project-level assessments to the National Adaptation Plan (NAP), Nationally Determined Contribution (NDC), and other policy frameworks to ensure policy coherence.
 - Outlines key steps to mainstream gender into projects and references priority actions from Pakistan’s Climate Change Gender Action Plan (ccGAP) to support gender integration in climate action.
19. This note is therefore not a replacement for the Handbook, but a companion resource that operationalises its content—helping government staff understand **what to do, when to do it, and how to do it** within the broader MDP framework.

Section 3: Step-by-step Overview of Climate Change Related Inputs

3.1 Project Due Diligence Pathways

20. The level of due diligence required to assess a project effectively against the relevant climate change criteria depends on several factors, including the project type (infrastructure, services, research and development, etc.), scale, location, and cost. To simplify this from the project proponent’s perspective, various ‘pathways’ have been developed to outline the necessary steps. Figure 2 provides a summary of these pathways during the PCN and TFS phases of project development. Note that all projects should follow both mitigation and adaptation pathways to ensure compliance.
21. This guidance note focuses on the process, due diligence and inputs for the PCN, TFS and PC-I templates. It is at these early design stages when the climate change assessments and gender analysis should be undertaken. This information should subsequently be reported in the PC-I templates at which point the climate change related (and other criteria) will be assessed.

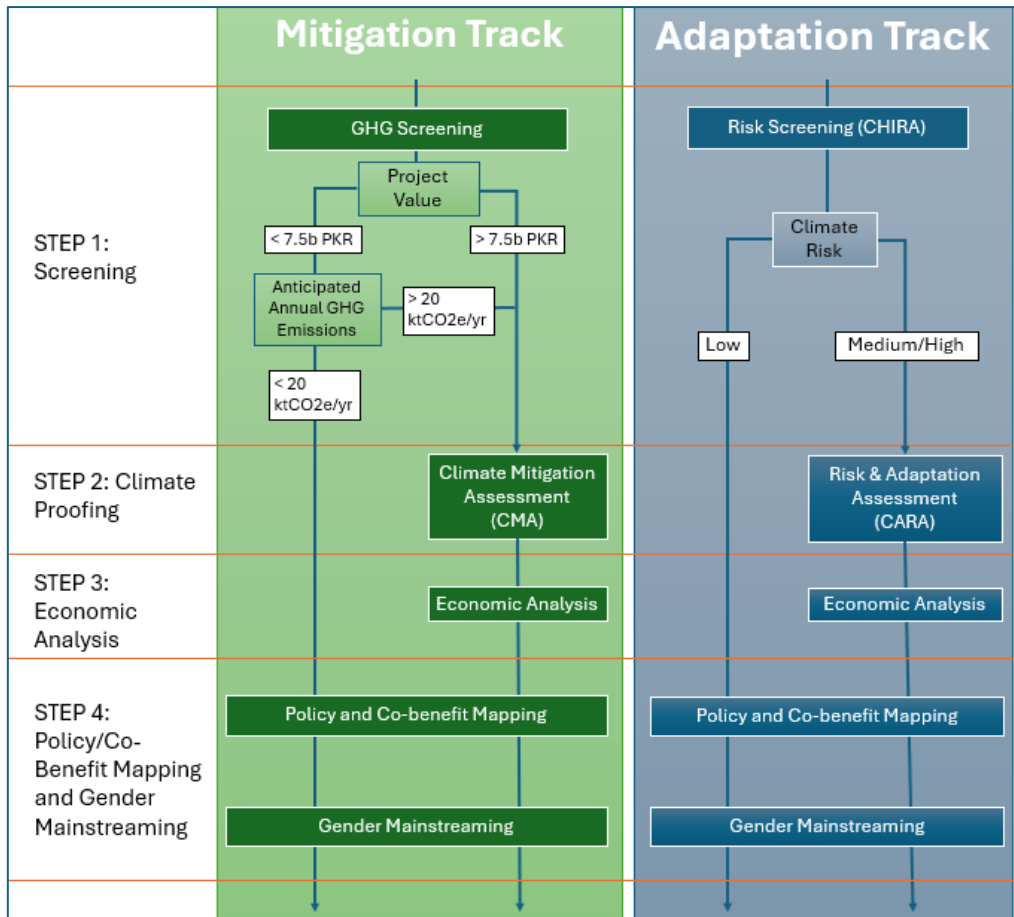


Figure 2. Decision tree of the pathways to assess a project against climate change criteria

22. For **adaptation**, the threshold for more detailed due diligence is when the project is deemed medium or high risk based on CHIRA outputs; in that case, a CARA is required.
23. For **mitigation**, the thresholds for the more detailed CMA are: if the project value exceeds 7.5 billion PKRs³, or if the project is anticipated to generate more than 20,000 tCO₂e⁴ in GHG emissions per year.
24. The following Sections provide more detail regarding the various steps for adaptation and mitigation.

3.2 Quick Reference Checklist

25. The following checklist outlines the steps and actions for project developers to complete the climate due diligence for a project. These should be undertaken sequentially to ensure the relevant information and data are available to support subsequent analysis.
26. The relevant next steps and reporting references for each checklist item are provided in the checklist's 'Output' column. These outputs are mostly intended to be reported in the CHIRA/CARA/CMA documents; the PCN; the TFS; and/or in the PC-I template. The [➡] icon refers to external templates/iPAS where the information should be reported.

³ This is the threshold for ECNEC approval which requires higher scrutiny (such as the CMA) and political oversight of large-value investment projects.

⁴ The 20,000 tCO₂e/year threshold is used by the Asian Development Bank (ADB). Other MDBs use similar thresholds to define whether GHG emissions are 'significant'.

3.2.1 STEP 1: Climate Screening

27. The first step is to determine the extent to which the project could impact or be impacted by climate change. This relates to the potential for significant risk to the project from climate hazards (identified by the CHIRA assessment) and/or the potential for significant GHG emissions arising because of the project (the thresholds described above). **The relevant guidance for this step is contained within the Handbook on Climate Risk Screening for Policy Planning.**

#	Action	Output
ADAPTATION		
A.1.1	Undertake CHIRA assessment using the NatCat model to identify risks and exposures.	➡ Automatically created CHIRA Tables and Graphics
A.1.2	Assign overall risk level for project	<ul style="list-style-type: none"> – If risk is defined as ‘low’, proceed to Step 4 (Steps 2 and 3 not required) – If risk is defined as ‘medium’ or ‘high’, proceed through Steps 2, 3 and 4
MITIGATION		
M.1.1	Is the project value > 7.5 billion PKR?	<ul style="list-style-type: none"> – If no to both, proceed to Step 4 (Steps 2 and 3 not required) – If yes to either, proceed through Steps 2, 3 and 4
M.1.2	Are annual GHG emissions for the project anticipated to exceed 20,000 tCO ₂ e/year?	

3.2.2 STEP 2: Climate Proofing

28. If significant climate risks exist and/or there is potential for significant GHG emissions, a ‘climate proofing’ exercise should be undertaken to mitigate risks to the extent feasible (CARA assessment) and to reduce GHG emissions from the project (CMA assessment).

29. **The relevant guidance for this step is contained within the Handbook on Climate Risk Screening for Policy Planning.**

#	Action	Output
ADAPTATION		
A.2.1	Determine environmental, economic, physical and social vulnerabilities for the project	➡ CARA Tables 5.1, 5.3 and 5.4
A.2.2	Identify and chose adaptation measures	➡ CARA Tables 5.6, 5.7 and 5.8
A.2.3	Develop adaptation action plan	➡ CARA Table 5.10
MITIGATION		
M.2.1	Develop annualised GHG emissions estimate for ‘Business-as-Usual’ scenario	➡ CMA Table 6.1
M.2.2	Develop annualised GHG emissions estimate for ‘Baseline Project’ Scenario	➡ CMA Table 6.2
M.2.3	Calculate annualised net change in emissions	➡ CMA Table 6.3
M.2.4	Consider potential mitigation options	➡ CMA Table 6.5
M.2.5	Estimate annualised GHG emission reductions from selection of mitigation options	➡ CMA Table 6.5

3.2.3 STEP 3: Economic Analysis

30. Once climate mitigation and adaptation measures have been identified and qualitatively screened through the CMA and CARA processes, they should be assessed for economic viability.

31. **The relevant guidance for this step is contained within Annexes VIII and IX.**

#	Action	Output
ADAPTATION		

A.3.1	Economic analysis and selection of climate adaptation measures (identified in CARA)	➡ TFS Table 2
A.3.2	Integrate full climate-adjusted CAPEX, OPEX and avoided losses into overall economic analysis for project	➡ PC-I: 'Financial/Economic Analysis (with assumptions)'
A.3.3	Clearly show relevant adaptation benefits/co-benefits in economic tables	➡ PC-I: 'Climate related share of project investment'
A.3.4	Use climate finance tagging as per MOCC&EC climate finance dashboard requirements	➡ PCN: 'Project cost' ➡ PC-I: 'Climate related share of project investment'
MITIGATION		
M.3.1	Economic analysis and selection of climate mitigation measures identified in CMA (including social cost of carbon analysis).	➡ TFS Table 2
M.3.2	Integrate full climate-adjusted CAPEX, OPEX and social cost of carbon into overall economic analysis for project	➡ PC-I: 'Financial/Economic Analysis (with assumptions)'
M.3.3	Clearly show relevant mitigation benefits/co-benefits in economic tables	➡ PC-I: 'Climate related share of project investment'
M.3.4	Use climate finance tagging as per MOCC&EC climate finance dashboard requirements	➡ PCN: 'Project cost' ➡ PC-I: 'Climate related share of project investment'

3.2.4 STEP 4: Policy/Co-Benefit Mapping and Gender Mainstreaming

32. All projects should consider alignment with national and regional climate change policy and potential co-benefits of climate measures (where relevant). This can help significantly strengthen project proposals by demonstrating alignment with national/regional priorities.
33. All projects should also support gender integration by taking the actions described below during project design, development, and implementation.
34. **The relevant guidance for this step is contained within Annexes II, III and IV.**

#	Action	Output
ADAPTATION		
A.4.1	Provide a narrative describing how the project reduces climate risk exposure and describe the overall adaptation objective for the project.	➡ PCN: 'Project Objective'
A.4.2	Identify and justify any of Pakistan's NAP Policy Actions which the project contributes towards.	➡ PCN: 'Project Objective'
A.4.3	Identify and justify any other local/regional/national level or sector-specific climate policy objectives which the project contributes towards.	➡ PCN: 'Project Objective'
A.4.4	Identify and justify any innovative climate adaptation solutions/technologies included in the project which are pioneering in the Pakistan context.	➡ TFS Table 2
A.4.5	Identify and justify any climate-related co-benefits / SDGs which the project contributes towards which are tangibly/quantifiably impactful on a social, economic or environmental basis.	➡ PCN: 'Project Objective'
A.4.6	Identify and list SMART climate related indicators and describe the plan for data collection, reporting, and capacity building for the monitoring and evaluation system.	➡ PCN: 'Description of Activities, Outputs and Outcome'
MITIGATION		
M 4.1	Provide a narrative describing how the project minimises GHG emissions and describe the overall mitigation objective for the project.	➡ PCN: 'Project Objective'

#	Action	Output
M.4.2	Identify and justify any of Pakistan's NDC policy objectives which the project contributes towards.	➡ PCN: 'Project Objective'
M.4.3	Identify and justify any other local/regional/national level or sector-specific climate policy actions which the project contributes towards.	➡ PCN: 'Project Objective'
M.4.4	Identify and justify any innovative climate mitigation solutions/technologies included in the project which are pioneering in the Pakistan context.	➡ TFS Table 2
M.4.5	Identify and justify any climate-related co-benefits / SDGs which the project contributes towards which are tangibly/quantifiably impactful on a social, economic or environmental basis.	➡ PCN: 'Project Objective'
M.4.6	Identify and list SMART climate related indicators and describe the plan for data collection, reporting, and capacity building for the monitoring and evaluation system.	➡ PCN: 'Description of Activities, Outputs and Outcome'
GENDER		
G.4.1	Conduct a project-specific gender analysis to identify gender gaps and structural issues that may impede gender-responsive climate action. (See Annex X for examples of gender analysis guidance) Consult Pakistan's Climate Change Gender Action Plan (ccGAP) to identify relevant sector-specific gender issues, indicators, and policy objectives that the project directly addresses. Gender data available on the National Gender Data Portal (https://ngdp-ncsw.org.pk/)	➡ TFS Table 2
G.4.2	Describe how climate investments reduce gender inequalities, address identified gender gaps and mitigate risks to gender inequality and gender-based violence in climate action. Show how the project promotes gender equality; social, economic, environment and climate rights; and the participation of minorities/ underprivileged.	➡ PCN: 'Project Objective' ➡ TFS Table 2
G.4.3	Respond to the gender mainstreaming questions in the Planning Commission Gender Unit's <i>Gender, Climate and Children's Rights and Inclusion-Centered Programming Checklist</i> (See Annex X for link to checklist) and rank the gender mainstreaming risk level based on checklist.	➡ PCN: 'Is there any component for Gender Equality and Mainstreaming?'
G.4.4	Reflect gender-specific climate outputs, outcomes, impact, and indicators in the project's logical framework, and monitoring and evaluation framework. There should be at least one gender-specific climate indicator. Gender-disaggregated data should be collected for all people indicators. Indicate the estimated budget allocation for supporting gender-responsive climate action. Gender data available on the National Gender Data Portal (https://ngdp-ncsw.org.pk/)	➡ PCN: 'Description of Activities, Outputs and Outcome' ➡ PCN: Annex 2 Table 1
G.4.5	Describe how women, men, gender-diverse and local project stakeholders with subject matter expertise are meaningfully engaged in developing climate mitigation and adaptation measures and issues related to resilience.	➡ TFS: Table 2

Section 4: Sector-Specific Considerations

35. Project proponents are encouraged to consider all climate adaptation and mitigation options relevant to the sectors and sub-sectors included in the project. Projects with comprehensive climate change due diligence and/or strong climate benefits will have a higher likelihood of funding

or financing, given the Government of Pakistan’s commitment to assessing projects on climate credentials, with a minimum 30% weighting. Considering sector-specific climate factors will strengthen the submission.

36. Resources are provided in the annexes to support project teams in considering sector-specific issues:

i. Annex I contains checklists of technical and economic issues, tailored to specific sectors.

Purpose: The checklists provide a quick-reference guide to help users ensure their climate-related due diligence (a review process to identify climate risks and impacts) is thorough and addresses all unique issues relevant to the specific industry or sub-sector.

Action: The issues identified in the checklists should be reported in the appropriate Tables within the PCN and the TFS templates as (see Annexes VII and VIII).

ii. Annex X provides a compilation of useful tools and resources covering adaptation, mitigation, and gender mainstreaming.

Purpose: The tools and resources offer practical guidance, data sources, analytical frameworks, and sector-specific methodologies to support users in assessing climate risks, estimating greenhouse gas impacts, designing adaptation and mitigation measures, and integrating gender considerations into project planning and implementation.

Action: Users should apply the relevant tools and resources, as appropriate, to inform climate risk assessments, mitigation analyses, and gender analyses, and reflect the findings in the corresponding Tables within the PCN and the TFS templates (see Annexes VII and VIII).

Section 5: Key Resources

37. Project proponents can make use of existing resources to ease the burden of undertaking their climate change due diligence and to ensure that the related information submitted will be comprehensive and high quality, thus improving the appraisal outcome of the project.

5.1 Intelligent Project Administration System (iPAS)

38. iPAS is a web-based tool that automates the Public Sector Development Programme (PSDP), mandated to track both the financial and physical progress of projects, automate fund releases, and facilitate online submission of all templates and proformas (PC-I to PC-V). The system is purpose-built to streamline the development portfolio, ensure efficient collaboration among all stakeholders, improve financial efficiency, automate manual processes, and minimise information gaps throughout the entire project lifecycle.

5.2 Natural Catastrophe (NatCat) Model

39. The NDRMF has launched Pakistan’s first national-level Natural Catastrophe (NatCat) Model. This resource aims to assess the risks posed by natural hazards—including hydro-meteorological events (such as floods, droughts, and tropical cyclones) and geophysical hazards (like earthquakes). The model evaluates the exposure and vulnerability of elements at risk and

estimates the potential financial impacts down to the Tehsil (sub-district) level. Designed as a probabilistic risk assessment and loss estimation tool, it aspired to enable decision-makers to make informed choices about disaster risk reduction, climate adaptation investments, and disaster risk financing.

- Project teams can use the NatCat system via the iPAS platform to compile a CHIRA assessment for their respective project. The system uses location-specific hazards, categorised exposures (i.e. asset types), vulnerabilities (i.e. to what degree the hazard may impact the exposure) and risk/loss estimations to generate the risk profile and define the project as 'Low', 'Medium' or 'High' risk (see example output in Figure 3, below) as defined/categorised under the CHIRA process.

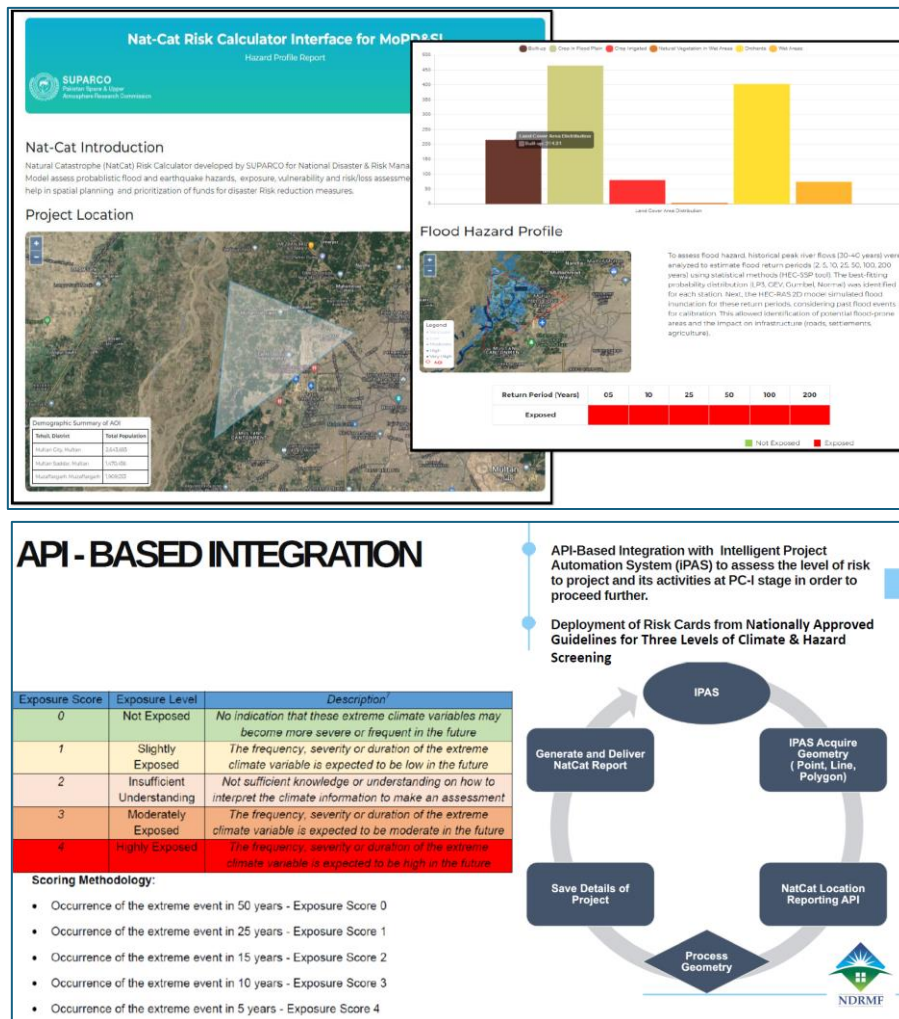


Figure 3: Outputs from the iPAS – Nat Cat module, which automates the CHIRA process for project teams

Section 6: Summary of Annexes

- The annexes included in this Guidance Note provide a range of referenceable resources designed to support project teams in identifying, analysing, and reporting climate change-related due diligence. The table below summarises the annexes and their use and timing.

#	Title	Use
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I	Sector-specific guidance checklists	Project teams should reference the relevant checklist(s) to determine if they have considered all relevant climate change considerations for the sector/sub-sector.
II	Pakistan National Adaptation Plan (NAP) Policy Actions	Project teams should identify any NAP policy actions their project addresses and reference/justify accordingly.
III	Pakistan Nationally Determined Contribution (NDC) Policy Actions	Project teams should identify any NDC policy actions their project addresses and reference/justify accordingly.
IV	Climate Change Gender Action Plan (ccGAP) Policy Actions	Project teams should identify any ccGAP policy actions their project addresses and reference/justify accordingly.
V	Climate Change Related Inputs for Logical Frameworks	Example climate-specific activities, outputs, outcomes, impacts etc. for project teams are provided.
VI	How to Populate the PCN Template	Project teams should use this resource when completing the PCN to determine how best to respond to climate and gender related criteria.
VII	How to Populate Technical Feasibility Study (TFS) Template	Project teams should use this resource when completing the TFS to determine how best to respond to climate and gender related criteria.
VIII	Economic Analysis of Climate Change Adaptation Measures	Provides guidance on how to undertake detailed economic analysis of climate adaptation measures, avoided costs, etc. and integrate the outputs into the overall economic analysis for the project.
IX	Economic Analysis of Climate Change Mitigation Measures and Social Cost of Carbon	Provides guidance on how to undertake detailed economic analysis of climate mitigation measures and the social cost of carbon and integrate the outputs into the overall economic analysis for the project.
X	Useful Tools and Resources	Links to useful tools and resources for climate adaptation, climate mitigation and gender mainstreaming.

Section 7: Conclusion

42. Achieving Pakistan's development goals hinges on developing climate-resilient, low-carbon projects. This imperative is reflected in the 30% weighting for climate change during project appraisal. Project teams that conduct detailed climate due diligence and maximise the resilience and mitigation aspects of their proposals will significantly improve their chances of securing funding. Following the outlined steps ensures comprehensive, well-structured documentation that effectively communicates the project's climate benefits, thereby raising appraisal scores and the overall quality of project submissions.

Annex I – Sector-Specific Guidance Checklists

Water Sector

The checklist below is a non-exhaustive list of technical, economic, financial, and social considerations associated with climate change. These checklists are quick-reference guides to help users ensure their climate-related due diligence is thorough and covers all the unique issues relevant to the Transport Sector. The topics identified in the checklists relevant to the project should be reported in the appropriate Tables of the PCN and the TFS templates (see Annexes VII and VIII).

Please consult the Water and Sanitation chapter of the ccGAP (Part II, Chapter 5) to identify relevant gender-responsive climate action and sample gender indicators in this sector.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
Large Dams ³	Adaptation	<ul style="list-style-type: none"> ✓ Design spillways and dam safety systems to account for changed flood frequency and intensity. ✓ Incorporate sedimentation management strategies (sluicing, dredging, upstream soil conservation) to address changed erosion from climate variability. ✓ Use real-time hydrological monitoring and early warning systems for extreme events and monitor long-term trends. ✓ Ensure structural resilience to glacial lake outburst floods (GLOFs). ✓ Establish drought contingency operation rules (e.g., flexible 	<ul style="list-style-type: none"> ✓ Costly emergency repairs after overtopping or dam safety failures during floods. ✓ Increased sedimentation reducing storage capacity (loss of asset value). 	<ul style="list-style-type: none"> ✓ Reduced repair/rehabilitation costs by designing for extreme flood scenarios. ✓ Prolonged dam life by incorporating sediment management.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		water allocation, priority to critical uses), ensuring that both men and women are trained.		
	Mitigation	<ul style="list-style-type: none"> ✓ Address watershed management including afforestation and reducing deforestation and forest degradation ✓ Use locally sourced/manufactured materials ✓ Use low carbon materials ✓ Minimise earth works ✓ Procure energy efficient pumps ✓ Use renewable energy (e.g. solar PV) to supply pumps etc. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments. ✓ Reduced energy costs from efficient water delivery.
	Gender	<ul style="list-style-type: none"> ✓ Engage women and underserved groups in local communities in planning and implementation, particularly securing women's and marginalized voices and representation in community water level use and management bodies. ✓ Ensure that women and girls have easy access to clean water and sanitation services to support safe, close, and easy access to water collection, toilet use and menstrual hygiene management (including within schools). ✓ Ensure early warning systems reach both women and men as well as all vulnerable groups, 	<ul style="list-style-type: none"> ✓ Increased gender disparity and social exclusion due to the lack of measures to address how gender roles and contextual inequalities impede effective climate action and gender equality. ✓ Risk of loss of life and injury without effective early warning communication systems that reach the entire population, especially the most marginalised. ✓ Exclusion of women in climate training risks underutilising the operational capacity and knowledge of the entire community. 	<ul style="list-style-type: none"> ✓ Increased gender equality and social inclusion due to the inclusion of gender analysis and measures to address gendered impacts of climate action. ✓ Women and girls will have equitable access to water and sanitation services. ✓ Human toll from dam breaches can be reduced with effective inclusive early warning systems. ✓ More effective community climate action and project implementation when both women and underserved groups are trained.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>and that all have the means to evacuate safely.</p> <ul style="list-style-type: none"> ✓ Ensure both women and underserved groups receive training in climate related capacity building activities, including climate adaptation tools and are trained on the water and techniques for improved water management. 		
Medium/small dams ¹	Adaptation	<ul style="list-style-type: none"> ✓ Strengthen embankments and spillways for changed flood peaks. ✓ Promote modular/intake design to adjust for variable water inflows. ✓ Install multi-purpose storage features (recharge, flood buffering). ✓ Use climate-smart reservoir operation rules. ✓ Evaluate integration of groundwater recharge systems. 	<ul style="list-style-type: none"> ✓ Higher O&M costs due to frequent damage from flash floods. ✓ Crop losses in irrigated areas if small dams fail during drought or flood. 	<ul style="list-style-type: none"> ✓ Lower crop insurance claims through stable irrigation supply. ✓ Reduced expenditure on drought relief due to reliable water storage
	Mitigation	<ul style="list-style-type: none"> ✓ Address watershed management including afforestation and reducing deforestation and forest degradation. ✓ Use locally sourced manufactured materials. ✓ Use low carbon materials. ✓ Minimise earth works. ✓ Procure energy efficient pumps. ✓ Use renewable energy (e.g. solar PV) to supply pumps etc. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments. ✓ Reduced energy costs from efficient water delivery.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
	Gender	<ul style="list-style-type: none"> ✓ Engage women and underserved groups in local communities in planning and implementation, particularly securing women's and marginalized voices and representation in community water level use and management bodies. ✓ Ensure that women and girls have easy access to clean water and sanitation services to support safe, close, and easy access to water collection, toilet use and menstrual hygiene management (including within schools) ✓ Ensure early warning systems reach both women and men as well as all vulnerable groups, and that all have the means to evacuate safely. ✓ Ensure both women and underserved groups receive training in climate related capacity building activities, including climate adaptation tools and are trained on the water and techniques for improved water management. ✓ Provide training and raise awareness on the sanitation needs of women, and linkages between gender, water and sanitation, and climate challenges. 	<ul style="list-style-type: none"> ✓ Increased gender disparity and social exclusion due to the lack of measures to address how gender roles and contextual inequalities impede effective climate action and gender equality. ✓ Risk of loss of life and injury without effective early warning communication systems that reach the entire population, especially the most marginalised. ✓ Exclusion of women in climate training risks underutilising the operational capacity and knowledge of the entire community. 	<ul style="list-style-type: none"> ✓ Increased gender equality and social inclusion due to the inclusion of gender analysis and measures to address gendered impacts of climate action. ✓ Women and girls will have equitable access to water and sanitation services. ✓ Human toll from dam breaches can be reduced with effective inclusive early warning systems. ✓ More effective community climate action and project implementation when both women and underserved groups are trained.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
Canals	Adaptation	<ul style="list-style-type: none"> ✓ Introduce canal automation for real-time flow regulation during floods/droughts. ✓ Use canal linings or coverings to minimize evaporation under higher temperatures. ✓ Reinforce vulnerable canal segments against overtopping during extreme precipitation. ✓ Install smart monitoring (sensors, drones, satellite imagery) to identify breaches or leakage early. ✓ Promote conjunctive use (surface + groundwater) to maintain reliability. 	<ul style="list-style-type: none"> ✓ Reduced expenditure on drought relief due to reliable water storage. ✓ High maintenance costs from bank erosion, siltation, and flooding. ✓ Loss of water from seepage/evaporation exacerbated by rising temperatures. ✓ Revenue losses due to unreliable delivery for agriculture. 	<ul style="list-style-type: none"> ✓ Reduced O&M costs by preventing canal breaches with higher embankments. ✓ Avoided emergency response costs through early-warning-enabled automation. ✓ Increased agricultural productivity through drought-resilient water delivery.
	Mitigation	<ul style="list-style-type: none"> ✓ Does the project contribute towards developing and promoting inland waterways transportation (National Climate Change Plan objective)? ✓ Address watershed management including afforestation and reducing deforestation and forest degradation. ✓ Use locally sourced manufactured materials. ✓ Use low carbon materials. ✓ Minimise earth works. ✓ Procure energy efficient pumps. ✓ Use renewable energy (e.g. solar PV) to supply pumps etc. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments. ✓ Reduced energy costs from efficient water delivery.
	Gender	<ul style="list-style-type: none"> ✓ Engage women and underserved groups in local 	<ul style="list-style-type: none"> ✓ Increased gender disparity and social exclusion due to the lack of measures to 	<ul style="list-style-type: none"> ✓ Increased gender equality and social inclusion due to the inclusion of gender

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>communities in planning and implementation, particularly securing women's and marginalized voices and representation in community water level use and management bodies.</p> <ul style="list-style-type: none"> ✓ Ensure that women and girls have easy access to clean water and sanitation services to support safe, close, and easy access to water collection, toilet use and menstrual hygiene management (including within schools). ✓ Ensure early warning systems reach both women and men as well as all vulnerable groups, and that all have the means to evacuate safely. ✓ Ensure both women and underserved groups receive training in climate related capacity building activities, including climate adaptation tools and are trained on the water and techniques for improved water management. ✓ Provide training and raise awareness on the sanitation needs of women, and linkages between gender, water and sanitation, and climate challenges. 	<p>address how gender roles and contextual inequalities impede effective climate action and gender equality.</p> <ul style="list-style-type: none"> ✓ Risk of loss of life and injury without effective early warning communication systems that reach the entire population, especially the most marginalised. ✓ Exclusion of women and marginalized groups in climate training risks underutilising the operational capacity and knowledge of the entire community. 	<p>analysis and measures to address gendered impacts of climate action.</p> <ul style="list-style-type: none"> ✓ Women and girls will have equitable access to water and sanitation services. ✓ Human toll from dam breaches can be reduced with effective inclusive early warning systems. ✓ More effective community climate action and project implementation when both women and men underserved groups are trained.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
Barrages	Adaptation	<ul style="list-style-type: none"> ✓ Watershed management including afforestation and reducing deforestation and forest degradation. ✓ Retrofit barrages to handle larger flood discharges. ✓ Upgrade gates and hoisting mechanisms for rapid response during peak flows. ✓ Add sediment flushing mechanisms to sustain storage and capacity. ✓ Develop integrated operation protocols between barrages and upstream dams to manage floods and droughts. ✓ Implement redundancy in control systems (backup power, remote automation). 	<ul style="list-style-type: none"> ✓ Structural failure leading to catastrophic downstream damage. ✓ Higher costs of dredging and sediment management. ✓ Loss of navigation/irrigation services during high flood stress. 	<ul style="list-style-type: none"> ✓ Avoided disaster response and reconstruction costs by strengthening barrages. ✓ Reduced dredging costs through improved sediment flushing. ✓ Maintained agricultural yields and economic stability downstream.
	Mitigation	<ul style="list-style-type: none"> ✓ Address watershed management including afforestation and reducing deforestation and forest degradation ✓ Use locally sourced/ manufactured materials. ✓ Use low carbon materials. ✓ Minimise earth works. ✓ Procure energy efficient pumps ✓ Use renewable energy (e.g. solar PV) to supply pumps etc. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments. ✓ Reduced energy costs from efficient water delivery.
	Gender	<ul style="list-style-type: none"> ✓ Engage women and underserved groups in local communities in planning and implementation, particularly 	<ul style="list-style-type: none"> ✓ Increased gender disparity and social exclusion due to the lack of measures to address how gender roles and contextual inequalities 	<ul style="list-style-type: none"> ✓ Increased gender equality and social inclusion due to the inclusion of gender analysis and measures to

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>securing women's and marginalized voices and representation in community water level use and management bodies.</p> <ul style="list-style-type: none"> ✓ Ensure that women and girls have easy access to clean water and sanitation services to support safe, close, and easy access to water collection, toilet use and menstrual hygiene management (including within schools). ✓ Ensure early warning systems reach both women and men as well as all vulnerable groups, and that all have the means to evacuate safely. ✓ Ensure both women and underserved groups receive training in climate related capacity building activities, including climate adaptation tools and are trained on the water and techniques for improved water management. ✓ Provide training and raise awareness on the sanitation needs of women, and linkages between gender, water and sanitation, and climate challenges. 	<p>impede effective climate action and gender equality.</p> <ul style="list-style-type: none"> ✓ Risk of loss of life and injury without effective early warning communication systems that reach the entire population, especially the most marginalised. ✓ Exclusion of women and marginalized groups in climate training risks underutilising the operational capacity and knowledge of the entire community. 	<p>address gendered impacts of climate action.</p> <ul style="list-style-type: none"> ✓ Women and girls will have equitable access to water and sanitation services. ✓ Human toll from dam breaches can be reduced with effective inclusive early warning systems. ✓ More effective community climate action and project implementation when both women and men underserved groups are trained.
Rehabilitation/ Lining of Main Canals/ B.	Adaptation	<ul style="list-style-type: none"> ✓ Use climate-resilient lining materials (resistant to cracking under heat stress). 	<ul style="list-style-type: none"> ✓ Rising costs from water losses in hotter, drier conditions. 	<ul style="list-style-type: none"> ✓ Avoided losses in agricultural productivity from water shortages.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
Canals/ Distributaries and Watercourses		<ul style="list-style-type: none"> ✓ Raise canal banks in areas prone to overtopping due to changes in extreme rainfall. ✓ Combine with on-farm water storage (ponds, tanks) to buffer variable supplies. ✓ Link rehabilitation with efficiency measures (drip/sprinkler irrigation). 	<ul style="list-style-type: none"> ✓ Increased vulnerability to canal breaches during extreme floods. 	<ul style="list-style-type: none"> ✓ Lower emergency maintenance and rehabilitation expenses.
	Mitigation	<ul style="list-style-type: none"> ✓ Watershed management including afforestation and reducing deforestation and forest degradation ✓ Locally sourced/manufactured materials. ✓ Use of low carbon materials. ✓ Minimising earth work. ✓ Energy efficient pumps. ✓ Renewable energy (e.g. solar PV) to supply pumps etc. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO2e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations. ✓ Reduced energy costs from efficient water delivery.
	Gender	<ul style="list-style-type: none"> ✓ Engage women and underserved groups in local communities in planning and implementation, particularly securing women's and marginalized voices and representation in community water level use and management bodies. ✓ Ensure that women and girls have easy access to clean water and sanitation services to support safe, close, and easy access to water collection, toilet use and menstrual hygiene 	<ul style="list-style-type: none"> ✓ Increased gender disparity and social exclusion due to the lack of measures to address how gender roles and contextual inequalities impede effective climate action and gender equality. ✓ Risk of loss of life and injury without effective early warning communication systems that reach the entire population, especially the most marginalised. ✓ Exclusion of women and marginalized groups in climate training risks 	<ul style="list-style-type: none"> ✓ Increased gender equality and social inclusion due to the inclusion of gender analysis and measures to address gendered impacts of climate action. ✓ Women and girls will have equitable access to water and sanitation services. ✓ Human toll from dam breaches can be reduced with effective inclusive early warning systems. ✓ More effective community climate action and project implementation when both

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>management (including within schools).</p> <ul style="list-style-type: none"> ✓ Ensure early warning systems reach both women and men as well as all vulnerable groups, and that all have the means to evacuate safely. ✓ Ensure both women and underserved groups receive training in climate related capacity building activities, including climate adaptation tools and are trained on the water and techniques for improved water management. ✓ Provide training and raise awareness on the sanitation needs of women, and linkages between gender, water and sanitation, and climate challenges. 	<p>underutilising the operational capacity and knowledge of the entire community.</p>	<p>women and underserved groups are trained.</p>
High Efficiency Irrigation System (HIES)	[Irrigation is covered under the Agriculture Sector – please refer to Agriculture Checklist]			
Flood Management	Adaptation	<ul style="list-style-type: none"> ✓ Integrate hybrid approaches (structural + nature-based): levees, diversion channels, floodplain zoning. ✓ Enhance forecasting and early warning capacity linked to community response. ✓ Upgrade drainage systems in urban/peri-urban flood hotspots. ✓ Create emergency storage reservoirs or retention basins. 	<ul style="list-style-type: none"> ✓ Escalating infrastructure damage costs due to more intense floods. ✓ Higher disaster relief and recovery expenditure by government. ✓ Disruption of economic activity (transport, markets, livelihoods). 	<ul style="list-style-type: none"> ✓ Reduced infrastructure repair costs through hybrid flood control. ✓ Avoided loss of agricultural production by protecting floodplains. ✓ Lower emergency response and health costs by reducing exposure to floods.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> ✓ Strengthen community-based flood preparedness and evacuation systems. ✓ Integrate flood retention systems with urban parks and recreational centers for multiple benefits. 		
	Mitigation	<ul style="list-style-type: none"> ✓ Use of nature-based solutions for flood control (e.g. wetland restoration, floodplain restoration, retention ponds etc.) 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO2e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations. ✓ Avoided infrastructure costs and potential reduction in O&M costs from nature-based solutions
	Gender	<ul style="list-style-type: none"> ✓ Engage women and underserved groups in local communities in planning and implementation, particularly securing women's and marginalized voices and representation in community water level use and management bodies. ✓ Ensure that women and girls have easy access to clean water and sanitation services to support safe, close, and easy access to water collection, toilet use and menstrual hygiene management (including within schools). 	<ul style="list-style-type: none"> ✓ Increased gender disparity and social exclusion due to the lack of measures to address how gender roles and contextual inequalities impede effective climate action and gender equality. ✓ Risk of loss of life and injury without effective early warning communication systems that reach the entire population, especially the most marginalised. ✓ Exclusion of women and marginalized groups in climate training risks underutilising the operational capacity and knowledge of the entire community. 	<ul style="list-style-type: none"> ✓ Increased gender equality and social inclusion due to the inclusion of gender analysis and measures to address gendered impacts of climate action. ✓ Women and girls will have equitable access to water and sanitation services. ✓ Human toll from dam breaches can be reduced with effective inclusive early warning systems. ✓ More effective community climate action and project implementation when both women and underserved groups are trained.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> ✓ Ensure early warning systems reach both women and men as well as all vulnerable groups, and that all have the means to evacuate safely. ✓ Ensure both women and underserved groups receive training in climate related capacity building activities, including climate adaptation tools and are trained on the water and techniques for improved water management. ✓ Provide training and raise awareness on the sanitation needs of women, and linkages between gender, water and sanitation, and climate challenges. 		
Master Planning, Policies, Regulatory Frameworks, Feasibilities and Research studies ⁴	Adaptation	<ul style="list-style-type: none"> ✓ Incorporate climate projections into all planning baselines and feasibility analyses. ✓ Establish adaptive water allocation rules across competing sectors (agriculture, energy, domestic). ✓ Support groundwater governance reforms (permits, monitoring, recharge schemes). ✓ Encourage cross-sectoral coordination (agriculture, energy, disaster management). ✓ Build institutional capacity for climate-informed decision-making. 	<ul style="list-style-type: none"> ✓ Unplanned investment decisions leading to stranded or maladapted assets. ✓ Increased fiscal burden from ad-hoc, unplanned adaptation/relief measures. 	<ul style="list-style-type: none"> ✓ Reduced risk of maladaptation by integrating climate projections in planning. ✓ Avoided capital losses through climate-proofed infrastructure investments. ✓ Improved efficiency of public expenditure via coordinated water allocation policies. ✓ Reduced O&M costs through climate resilient infrastructure design.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> ✓ Avoiding development in flood-prone areas. 		
	Mitigation	<ul style="list-style-type: none"> ✓ Develop integrated water resource management planning ✓ Develop policy actions, programs, or technical assistance for establishing fiscal incentives for natural resource management with the objective of reducing GHG emissions / creating carbon sinks. ✓ Develop policies and/or institutional development to support energy efficiency improvements for water supply activities and phasing out non-revenue water (NRW). ✓ Implement digitization of water management and supply systems for reduced water consumption. 	<ul style="list-style-type: none"> ✓ Insufficient planning or policy development can lead to unintended GHG emissions, lock-in of those emission sources long-term and missed opportunities for emission reductions and resource conservation. 	<ul style="list-style-type: none"> ✓ Improved efficiency of public expenditure via coordinated water allocation policies. ✓ Reduced O&M costs through climate resilient infrastructure design, technologies and planning. ✓ Reduced water scarcity and interruption of supply. ✓ Reduced energy costs. ✓ Potential for enhanced ecosystem services.
	Gender	<ul style="list-style-type: none"> ✓ Address structural issues related to women's needs (e.g., the lack of toilets in offices, factories, places of work and public buildings) ✓ Engage women and underserved groups in local communities in planning and implementation, particularly securing women's and marginalized voices and representation in community water level use and management bodies. 	<ul style="list-style-type: none"> ✓ Increased gender disparity and social exclusion due to the lack of measures to address how gender roles and contextual inequalities impede effective climate action and gender equality. ✓ Risk of loss of life and injury without effective early warning communication systems that reach the entire population, especially the most marginalised. ✓ Exclusion of women and marginalized groups in 	<ul style="list-style-type: none"> ✓ Increased gender equality and social inclusion due to the inclusion of gender analysis and measures to address gendered impacts of climate action. ✓ Women and girls will have equitable access to water and sanitation services. ✓ Human toll from dam breaches can be reduced with effective inclusive early warning systems. ✓ More effective community climate action and project

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> ✓ Ensure that women and girls have easy access to clean water and sanitation services to support safe, close, and easy access to water collection, toilet use and menstrual hygiene management (including within schools). ✓ Ensure early warning systems reach both women and men as well as all vulnerable groups, and that all have the means to evacuate safely. ✓ Ensure both women and underserved groups receive training in climate related capacity building activities, including climate adaptation tools and are trained on the water and techniques for improved water management. ✓ Provide training and raise awareness on the sanitation needs of women, and linkages between gender, water and sanitation, and climate challenges Participation of both women and men in local communities in research, planning and implementation. 	<p>climate training risks underutilising the operational capacity and knowledge of the entire community.</p>	<p>implementation when both women and underserved groups are trained.</p>

Transport & Communications Sector

The checklist below is a non-exhaustive list of technical, economic, financial and social considerations associated with climate change. These checklists are quick-reference guides to help users ensure their climate-related due diligence is thorough and addresses the unique issues relevant to the Transport Sector. The topics identified in the checklists which are relevant to the project should be reported in the appropriate Tables within PCN and the TFS templates (see Annexes VII and VIII).

Please consult the Energy and Transportation chapter of the ccGAP (Part II, Chapter 6) to identify relevant gender-responsive climate action and sample gender indicators in this sector.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
Railways	Adaptation	<ul style="list-style-type: none"> ✓ Design rail infrastructure to withstand increased flooding from extreme precipitation events. ✓ Elevate critical rail segments in flood-prone areas. ✓ Use heat-resistant materials for tracks to prevent buckling under extreme temperatures. ✓ Ensure adequate ventilation and cooling systems in rail tunnels and stations. ✓ Strengthen infrastructure against increased wind loads from intensified storms. ✓ Assess vulnerability to landslides in mountainous terrain and implement slope stabilization measures. ✓ Ensure rail operations can continue during heat waves and other extreme weather events. ✓ Install climate monitoring and early warning systems for extreme weather events (floods, heat waves, landslides). 	<ul style="list-style-type: none"> ✓ Costly emergency repairs after track buckling during heat waves. ✓ Service disruptions and revenue losses from flooding and extreme weather events. ✓ Increased maintenance costs from accelerated infrastructure degradation. ✓ Safety risks to passengers and workers during extreme weather events. ✓ Loss of freight transport reliability affecting supply chains. ✓ Reduced operational efficiency during extreme temperature events. 	<ul style="list-style-type: none"> ✓ Reduced repair and rehabilitation costs through climate-resilient design. ✓ Maintained service reliability and revenue generation during extreme weather. ✓ Lower emergency response and disaster recovery expenditures. ✓ Avoided economic losses from transport disruptions. ✓ Enhanced passenger safety and comfort during climate extremes. ✓ Prolonged infrastructure lifespan through adaptation measures.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
	Mitigation	<ul style="list-style-type: none"> ✓ Fleet and/or infrastructure for rail transit used for public transport. ✓ Projects investing in fleet and/or infrastructure for rail transit used for freight. ✓ Fleets and infrastructure for passenger/freight transport, electric, hydrogen, hybrid, and plug-in hybrid vehicles and associated infrastructure. ✓ Rail fleets and infrastructure for transport utilising synthetic fuels that use low-carbon feedstocks of hydrogen and CO₂. ✓ Policy or systems leading to reduction in use of personal or freight transportation and shifting from private car use to mass transit. ✓ Research on or development of low-carbon technologies, or other technologies instrumental to achieving full decarbonisation of the rail sector. ✓ Activities aimed at reducing resource or energy use from rail infrastructure/operations (e.g., energy efficient propulsion). ✓ Digitization of rail systems resulting in improved efficiency/reduced energy/resource use. ✓ Activities supporting closure of rail systems serving fossil fuel plants. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments. ✓ Improved public transport leads to improved mobility, improved air quality and lower energy consumption.
	Gender	<ul style="list-style-type: none"> ✓ Design railways based on the needs and priorities of end users, 	<ul style="list-style-type: none"> ✓ Railways will not be used efficiently or effectively or may not be easily 	<ul style="list-style-type: none"> ✓ Most women and girls depend on public transportation to earn

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>giving special consideration to vulnerable populations, including women and girls, the urban and rural poor, children and youth, elderly people, and people with disabilities.</p> <ul style="list-style-type: none"> ✓ To prevent harassment and promote safety for women and girls, design railways to include adequate lighting at women's toilets, stops and in waiting areas, and designate women-only spaces on railway cars. ✓ Increase accountability and improve grievance/reporting mechanisms and enforcement within the railways system (including CCTV and hotlines) to prevent gender-based violence and harassment. ✓ Employ more women as conductors, station staff, security or engineers given low staffing of women in the railway system. ✓ Design travel services that meet the needs of women (e.g., offering multi-stop railway rides for family visits and caregiving trips). 	<p>accessed by different marginalised population subgroups if the needs of various users are not taken into account during the design process. Women in particular underutilise public transportation due to fears of harassment and personal safety.</p> <ul style="list-style-type: none"> ✓ Women regularly face harassment and risks to personal safety and gender-based violence (GBV) on public transportation in Pakistan. 	<p>livelihoods, study, access critical services (e.g., healthcare) and visit family. Putting in place measures and protections to meet differentiated needs of various disadvantaged groups, will support greater mobility for all people, and facilitate income generation, access to education and health services, and participation in social and political activities.</p> <ul style="list-style-type: none"> ✓ Special measures to: prevent women's harassment and GBV; increase GBV accountability and reporting mechanisms; design travel services catering to women; and increase the employment of women in the railways system, will decrease the incidence of GBV, create a safer, more welcoming environment for women and girl travelers, and increase the use of railways spur the economy.
Roads	Adaptation	<ul style="list-style-type: none"> ✓ Design road drainage systems to accommodate increased rainfall 	<ul style="list-style-type: none"> ✓ High costs of emergency repairs from flood damage, landslides, and pavement failure. 	<ul style="list-style-type: none"> ✓ Lower emergency maintenance and rehabilitation costs through climate-resilient design.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>intensity and extreme precipitation events.</p> <ul style="list-style-type: none"> ✓ Use heat-resistant pavement materials to prevent rutting, cracking, and deformation under high temperatures. ✓ Elevate roadbeds in flood-prone areas to maintain accessibility during floods. ✓ Strengthen road embankments and slopes against increased erosion from extreme rainfall. ✓ Install enhanced drainage capacity (culverts, channels, pipes) sized for future climate projections. ✓ Use climate-resilient materials for road surfaces that accommodate greater moisture content and temperature extremes. ✓ Implement slope stabilization and erosion control measures in vulnerable areas. ✓ Incorporate permeable surfaces and bioretention systems where appropriate. ✓ Design bridges with adequate clearance for projected flood levels and scour protection. ✓ Establish real-time monitoring systems for road conditions during extreme weather. ✓ Develop contingency routes and emergency access plans for climate-related disruptions. 	<ul style="list-style-type: none"> ✓ Frequent road closures disrupting economic activity and access to services. ✓ Increased maintenance costs from accelerated deterioration due to temperature extremes and flooding. ✓ Loss of rural connectivity during monsoon season affecting livelihoods and market access. ✓ Safety risks from deteriorating road conditions during extreme weather. ✓ Revenue losses from transport disruptions. ✓ Reduced agricultural productivity due to inability to transport goods. 	<ul style="list-style-type: none"> ✓ Maintained rural connectivity and market access during extreme weather. ✓ Reduced economic losses from road closures and transport disruptions. ✓ Enhanced road safety under changing climate conditions. ✓ Prolonged road lifespan and reduced lifecycle costs. ✓ Avoided disaster recovery expenditures. ✓ Sustained supply chain reliability and food security.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> ✓ Use flexible pavement designs that can accommodate subsurface moisture changes. ✓ Ensure adequate road maintenance budgets for climate-related repairs. 		
	Mitigation	<ul style="list-style-type: none"> ✓ Infrastructure for non-motorised transport (i.e. walking, cycling). ✓ Projects investing in fleet and/or infrastructure for buses/coaches used for public transport. ✓ Fleets and infrastructure for passenger/freight transport utilising electric, hydrogen, hybrid, and plug-in hybrid vehicles and associated infrastructure. ✓ Fleets and infrastructure for transport utilising synthetic fuels that use low-carbon feedstocks of hydrogen and CO₂. ✓ Policy or systems leading to reduction in use of personal or freight transportation and shifting from private car use to mass transit, non-motorised transport (NMT), e.g., transit-oriented development (TOD), mobile sharing application providing access to alternative modes such as bicycles and scooters, and investments in ICT to increase traffic operational efficiency or enable shared mobility. ✓ Use of waste gas as fuel. ✓ Research on or development of low-carbon technologies, or other technologies instrumental to 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments. ✓ Reduced congestion or including public transport infrastructure can lead to improved mobility (and productivity), improved air quality and lower energy consumption.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> achieving full decarbonisation of the transport sector. ✓ Digitization of road systems resulting in improved efficiency/reduced energy/resource use. ✓ Use of low carbon materials. ✓ Minimising earth work. 		
	Gender	<ul style="list-style-type: none"> ✓ Design roads based on the needs and priorities of end users, giving special consideration to vulnerable populations, including women and girls, the urban and rural poor, children and youth, elderly people, and people with disabilities. ✓ To prevent harassment and promote safety for women and girls, design roads to include sufficient lighting, especially where women pedestrians may need to stop and wait (e.g., toilets, rest stops, water collection areas). ✓ Increase accountability and improve grievance/reporting mechanisms and enforcement (including CCTV and hotlines) to prevent gender-based violence and harassment on all forms of transportation, including on public buses, mini-buses, and rickshaws. 	<ul style="list-style-type: none"> ✓ Roads will not be used efficiently or effectively or may not be easily accessed by different marginalised population subgroups if the needs of various users are not taken into account during the design process. Women in particular underutilise public roads due to fears of harassment and safety. ✓ Women regularly face harassment and risks to personal safety and gender-based violence (GBV) on public roads in Pakistan. 	<ul style="list-style-type: none"> ✓ Most women and girls depend on public transportation to earn livelihoods, study, access critical services (e.g., healthcare) and visit family. Putting in place measures and protections to meet differentiated needs of various disadvantaged groups, will support greater mobility for all people, and facilitate income generation, access to education and health services, and participation in social and political activities. ✓ Special measures to: prevent women's harassment and GBV; increase GBV accountability and reporting mechanisms; design travel services catering to women; and increase the employment of women in road infrastructure development, will decrease the incidence of GBV, create a safer, more welcoming environment for women and girl travelers, and increase the use of roads to spur the economy.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
Airports (Aviation)	Adaptation	<ul style="list-style-type: none"> ✓ Design runway surfaces to withstand extreme heat without deformation or reduced load-bearing capacity. ✓ Enhance drainage systems for airport infrastructure to handle intense rainfall events. ✓ Enhance coastal engineering structures for airports coastal areas to sea level rise, storm surges and changes in wave climate. ✓ Ensure adequate cooling and ventilation systems in terminals and operational facilities. ✓ Strengthen infrastructure against increased wind loads from intensified storms. ✓ Elevate critical infrastructure in low-lying areas vulnerable to flooding. ✓ Install monitoring systems for extreme weather conditions affecting flight operations. ✓ Design for increased water management during extreme precipitation. ✓ Assess impacts of changing wind patterns on runway operations and aircraft safety. ✓ Ensure backup power systems can operate during extreme weather events. ✓ Protect fuel storage and other critical facilities from flooding and storm surge. 	<ul style="list-style-type: none"> ✓ Flight cancellations and disruptions from extreme weather events causing revenue losses. ✓ Costly repairs to runways damaged by extreme heat or flooding. ✓ Increased operational costs from cooling requirements during heat waves. ✓ Safety risks to aircraft operations from extreme weather conditions. ✓ Reduced airport capacity during extreme weather events. ✓ Damage to critical infrastructure from coastal flooding and storm surges. 	<ul style="list-style-type: none"> ✓ Maintained airport operations and revenue during extreme weather. ✓ Reduced infrastructure repair costs through climate-resilient design. ✓ Enhanced aviation safety under changing climate conditions. ✓ Avoided economic losses from flight disruptions. ✓ Prolonged infrastructure lifespan. ✓ Lower emergency response costs during extreme weather events.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
	Mitigation	<ul style="list-style-type: none"> ✓ Renewable energy installations in airports (e.g., solar farm in airfield). ✓ Airport vehicle fleets and infrastructure utilising electric, hydrogen, hybrid, and plug-in hybrid vehicles and associated infrastructure. ✓ Airport fleets and infrastructure utilising synthetic fuels that use low-carbon feedstocks of hydrogen and CO₂. ✓ Use of waste gas as fuel. ✓ Projects of policies enhancing efficiency of air traffic management ✓ Higher operational efficiency of aircraft movements in the airfield and in the landing and take-off cycle. ✓ Energy efficiency improvements for airport equipment. ✓ Research on or development of low-carbon technologies, or other technologies instrumental to achieving full decarbonisation of the aviation sector (i.e. alternative fuels, energy efficiency, etc.). ✓ Activities aimed at reducing demand for aviation (e.g. awareness raising campaigns, alternative transportation etc.). ✓ Digitization of aviation systems resulting in improved efficiency/reduced energy/resource use. ✓ Use of low carbon materials. ✓ Minimising earth work. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
	Gender	<ul style="list-style-type: none"> ✓ Design airports and air transportation systems based on the needs and priorities of end users, giving special consideration to vulnerable populations, including women and girls, the urban and rural poor, children and youth, elderly people, and people with disabilities. ✓ To prevent harassment and promote safety and privacy for women and girls, design airport facilities to ensure adequate lighting in all areas (including in screening, waiting and transfer areas, toilets), establish nursing rooms, and designate women-only spaces in waiting areas. ✓ Increase accountability and improve grievance/reporting mechanisms and enforcement within airports (including CCTV) to prevent harassment and gender-based violence. ✓ Employ more women in aviation operations, air traffic, ground handling, technical and leadership roles. 	<ul style="list-style-type: none"> ✓ Airports will not be used efficiently or effectively or may not be easily accessed by different marginalised population subgroups if the needs of different users are not taken into account during the design process. Women in particular underutilise public transportation due to fears of harassment and safety. ✓ Women regularly face harassment and risks to personal safety and gender-based violence (GBV) on public transportation in Pakistan. 	<ul style="list-style-type: none"> ✓ Air transportation enables people to earn livelihoods, study, participate in social activities. Putting in place measures and protections to meet differentiated needs of various disadvantaged groups, will support greater mobility for all people, and facilitate income generation, and participation in social activities. ✓ Special measures to: prevent women's harassment and GBV; increase accountability and GBV reporting mechanisms; design travel services catering to women; and increase the employment of women in the air transportation system, will decrease the incidence of GBV, create a safer, more welcoming environment for women and girl travelers, and increase the use of air transport systems to spur the economy.
Ports	Adaptation	<ul style="list-style-type: none"> ✓ Assess vulnerability to sea level rise and design port infrastructure 	<ul style="list-style-type: none"> ✓ Significant damage to port infrastructure from sea level rise and storm surges. 	<ul style="list-style-type: none"> ✓ Reduced infrastructure damage costs through climate-resilient design and sea level rise adaptation.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>with adequate elevation and freeboard.</p> <ul style="list-style-type: none"> ✓ Strengthen coastal protection structures (breakwaters, seawalls) to withstand increased wave heights and storm surges. ✓ Design berthing facilities and quay walls to accommodate projected sea level rise over infrastructure lifespan. ✓ Enhance drainage systems to manage increased coastal flooding and extreme precipitation. ✓ Use corrosion-resistant materials to withstand increased salinity and saltwater exposure. ✓ Install real-time monitoring systems for sea level, wave height, and storm surge. ✓ Implement nature-based solutions (mangrove restoration, artificial reefs) to buffer storm impacts. ✓ Design critical infrastructure (warehouses, container yards) above projected flood levels. ✓ Ensure port operations can continue during extreme weather events with backup systems. ✓ Assess subsidence risks from groundwater salinization and 	<ul style="list-style-type: none"> ✓ Disruptions to shipping and supply chains from port closures during extreme weather. ✓ Costly repairs and reconstruction after coastal flooding events. ✓ Loss of port operational capacity from inundation of low-lying areas. ✓ Increased maintenance costs from saltwater corrosion and coastal erosion. ✓ Economic losses from disrupted trade and commerce. ✓ Safety risks to port workers and vessels during extreme weather. 	<ul style="list-style-type: none"> ✓ Maintained port operations and trade during extreme weather events. ✓ Avoided disaster recovery and reconstruction expenditures. ✓ Enhanced supply chain resilience and economic stability. ✓ Lower maintenance costs through use of corrosion-resistant materials. ✓ Prolonged infrastructure lifespan despite sea level rise. ✓ Protected coastal communities through nature-based solutions. ✓ Sustained employment and livelihoods dependent on port operations.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> erosion and implement ground stabilization measures where needed. ✓ Plan for flexible infrastructure that can be adapted as sea levels rise. ✓ Strengthen connections between port and inland transport networks against flooding. ✓ Develop emergency response plans for storm surge and flooding events. 		
	Mitigation	<ul style="list-style-type: none"> ✓ Shore power connections. ✓ Fleet and/or infrastructure for ferries used for public transport. ✓ Fleet and/or infrastructure for inland waterway, short-sea-and deep-sea shipping infrastructure and fleets including improvements in design, propulsion, machinery and operation, route optimisation services, ship-to-ship route exchanges, enhanced monitoring systems, introduction of digitisation and port-call synchronisation. ✓ Fleets and infrastructure for passenger/freight transport utilising electric, hydrogen and hybrid vessels and associated infrastructure. ✓ Fleets and infrastructure for transport utilising synthetic fuels that use low-carbon feedstocks of hydrogen and CO₂. 	<ul style="list-style-type: none"> ✓ Calculate the social cost of carbon based on estimated GHG emissions/savings (compared to business-as-usual) from the project (including Scope 3 emissions) and the cost per tonne of CO₂e (refer to Gov't of Pakistan policy for current carbon price). 	<ul style="list-style-type: none"> ✓ Include social cost of carbon in IRR calculations to demonstrate cost-benefit of climate mitigation investments.

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<ul style="list-style-type: none"> ✓ Policy or systems leading to reduction in use of personal or freight transportation and shifting from private car use to mass transit (i.e. ferries.) ✓ Use of waste gas as fuel. ✓ Research on or development of low-carbon technologies, or other technologies instrumental to achieving full decarbonisation of water transport. ✓ Activities aimed at reducing resource or energy use from ferry infrastructure/operations (e.g., energy efficient propulsion.) ✓ Use of low carbon materials. ✓ Minimising earth work. 		
	Gender	<ul style="list-style-type: none"> ✓ Design ports based on the needs and priorities of end users, giving special consideration to vulnerable populations, including women and girls, the urban and rural poor, children and youth, elderly people, and people with disabilities. ✓ To prevent harassment and promote safety and privacy for women and girls, design port facilities to ensure adequate lighting in all passenger areas (including in terminals, waiting and rest areas, toilets), establish nursing rooms, and designate women-only spaces in waiting and transfer areas. ✓ Increase accountability and improve grievance/reporting 	<ul style="list-style-type: none"> ✓ Ports will not be used efficiently or effectively or may not be easily accessed by different, marginalised population subgroups if the needs of various users are not taken into account during the design process. Women, in particular, underutilise public transportation due to fears of harassment and safety. ✓ Women regularly face harassment and risks to personal safety and gender-based violence (GBV) on public transportation in Pakistan. 	<ul style="list-style-type: none"> ✓ Transportation through ports enables people to earn livelihoods, study, and participate in social activities. Putting in place measures and protections to meet differentiated needs of various disadvantaged groups, will support greater mobility for all people, and facilitate income generation, and participation in social activities. ✓ Special measures to: prevent women's harassment and GBV; increase accountability and GBV reporting mechanisms; design travel services catering to women; and increase the employment of women in the port transportation system, will decrease the incidence of GBV, create a safer, more welcoming environment for women and girl

Sub-sector	Aspect	Technical Due Diligence Checklist	Economic / Financial / Social Risks Associated with CC	Avoided Costs & Impacts Associated with CC
		<p>mechanisms and enforcement within terminals (including CCTV) to prevent gender-based violence and harassment.</p> <p>✓ Employ more women in ports and shipping-related jobs, and technical and leadership roles.</p>		<p>travelers, and increase the use of port systems to spur the economy.</p>

Annex II – Pakistan National Adaptation Plan⁵ (NAP) Policy Actions

The following tables are taken directly from the National Adaptation Plan Pakistan 2023. The tables only include the objectives and initiatives organised by sector and retain original numbering.

Agriculture–Water Nexus

Table 4.1.1: Key Objectives and Initiatives for the Agriculture–Water Nexus

No.	Objective & Initiative
Objective 1: Incentivizing farmers to transition to climate smart water and land management practices	
1.1	<p>Improve agricultural research and extension services. This will include:</p> <ul style="list-style-type: none"> • Focusing on climate resilient crop varieties, regenerative agriculture practices for land preparation, sowing, and harvesting, efficient and sustainable fertilizer application, improved on-farm water management (OFWM), inter-cropping and crop diversification • Tailoring extension services to agro-ecological zones, fostering inclusivity in the development process, and learning from past successful pilots (e.g., expansion of olive cultivation) and accomplishments at scale (e.g., steady increase in maize production) • Ensuring extension services related to irrigation application are informed by groundwater assessments and best estimates of projected changes in rainfall timing • Research and extension priorities specific to livestock in strengthening disease control, breeding of more productive and disease-resistant animals and increasing access to nutrition and feed to increase productivity and reduce enteric emissions
1.2	Support creation of forums, such as producer groups, that facilitate collaboration between small farmers and other actors in crop-specific value chains, including private sector that can help farmers access national and international markets
1.3	Increase access to credit for on-farm technology adoption and purchase of inputs that support CSA, which includes establishing institutions that provide information to the farmers regarding finances available for technologies, equipment, and climate resilient crops.
1.4	Restructure existing financial tools to target smallholder farmers and repurpose them as instruments to incentivize crop diversification, improved water productivity, and improved land management.
1.5	Identify and develop a risk management system including crop insurance.
Objective 2: Modernizing surface and groundwater irrigation services to support the transition to CSA	
2.1	<p>Upgrade IBIS rehabilitation programs to modernize surface water distribution systems. Key modernization steps will include:</p> <ul style="list-style-type: none"> • Increasing hydraulic control in the secondary distribution system to ensure sufficient delivery to water courses under different low regimes • Improving real-time groundwater monitoring in canal command areas to facilitate conjunctive management of ground and surface water • Developing integrated hydro-agro informatics systems to make irrigation supply responsive to crop water requirements <p>Develop flexible and participatory institutional arrangements and regulations to maximize equity and reliability in the operations of modernized infrastructure.</p>

⁵ National Adaptation Plan Pakistan:
https://unfccc.int/sites/default/files/resource/National_Adaptation_Plan_Pakistan.pdf

2.1	Develop a long-term plan for asset management, and operations and maintenance with a focus on: <ul style="list-style-type: none"> • Maintaining conveyance efficiency • Reducing non-beneficial losses, especially leakages in saline groundwater zones and waterlogged areas • Ensuring access for tail-end users • Ensuring all measurement systems are regularly calibrated
2.3	Develop regulatory frameworks to manage groundwater use in agriculture and a program for managed aquifer recharge.
2.4	Modernize the abiana framework by digitizing the abiana assessment and collection system and creating a financial diversification program for irrigation departments to increase revenue.
Objective 3: Developing long-term agriculture growth strategy with a focus on productivity improvement, climate resilience, and physical expansion	
3.1	Establish a coordination mechanism to reduce overlap and maximize synergies between various public sector and private institutions working on CSA.
3.2	Develop a dynamic dashboard for monitoring crop water requirements using a combination of remote sensing and periodic ground-truthing, linking to the action above on developing hydro-agro informatics systems.
3.3	Develop an environmental management plan for agriculture which focuses on conservation of soil and water quality.
3.4	Assess culturable wastelands of Pakistan and develop a long-term investment program to identify feasible interventions that can bring land into environmentally sustainable productive use.
3.5	Reduce post-harvest losses by investing in agricultural storage, transport, and investments in physical and communication infrastructure that integrate farmers with value-chains.
Objective 4: Objective 4: Developing a plan for managing projected river flow and rainfall variability under different climate scenarios	
4.1	Develop plans for managing drought-flood cycles in areas where both hazards affect agricultural communities. Key actions in the development and implementation of these plans will include: <ul style="list-style-type: none"> • The most feasible and locally appropriate infrastructure options from the above list • Institutional and community-based measures for rationalizing water use during periods of drought Improving risk monitoring and early warning systems
4.2	Develop a plan for strategic water storages across the country that minimize environmental and social harms and decentralize and devolve management of stored water. Priority will be given to: <ul style="list-style-type: none"> • Small rainfall and runoff capture dams for groundwater recharge or direct use • Dispersion structures with downstream storages for productive use of hill torrents • Small storages within the canal distribution system to regulate irrigation supply • Watershed restoration work that increases infiltration of rainfall and runoff into groundwater

Natural Capital (Land, Water, and Air)

Table 4.2.1: Key Objectives and Initiatives for Natural Capital

No.	Objective & Initiative
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Objective 1: Mainstreaming sustainable land management into ecosystem services	
1.1	Prepare and implement a landscape restoration program across Pakistan, including innovative financing approaches and mainstreaming into provincial programs.
1.3	Support a transition to regenerative agriculture for the reduction of agro-chemical usage, which plays a crucial role in curbing water body pollution.
1.4	Expand agro-forestry into smallholder farming and rangelands management across Pakistan.
1.5	Introduce a system to reduce and replace pesticide and chemical fertilizer use to minimum needs.
1.6	Introduce schemes to reduce agricultural burning of crop residues and to improve soil fertility.
1.7	Increase investment in the restoration of ecosystem services and income-generating infrastructure in priority-protected areas.
1.8	Introduce right pricing of user charges and fees for natural resources (water, fisheries, timber) and the polluter pays principle.
Objective 2: Promoting integrated watershed management	
2.2	Restore top 20 percent of heavily degraded upper watersheds through re-seeding, forest planting, land reclamation structures, and livestock management and productivity improvements
2.3	Introduce ecosystem service payments to communities for providing clean, sediment-free water downstream and for watershed maintenance
2.4	Operationalize the Living Indus Initiative: <ul style="list-style-type: none"> • Establish the Indus Protection Act and associated trust fund • Prepare study and implement scheme to return e-lows to the Indus • Promote coordination and knowledge exchange
Objective 3: Improving water quality through better wastewater management	
3.1	Install wastewater treatment plants in all urban sewerage systems; and develop a financing model to maintain the existing combined eluent treatment plants to keep them functional and operational at their full capacity.
3.2	Replicate existing best practices in anaerobic digestion technology for recycling and waste-to-energy use
Objective 4: Investing in coastal and marine resources protection	
4.1	Design and implement coastal management and resilience plans to restore mangroves, coastal barriers and coastal aquifer recharge.
4.2	Implement plans to reduce coastal plastic, solid and liquid pollution.
4.3	Develop the potential of the “Blue Economy,” including the health of marine and coastal ecosystems.
Objective 5: Investing in air pollution-climate change nexus	
5.1	Prepare and implement clean-air investment plans for priority sectors to achieve Pakistani air-quality standards (domestic cooking, transport, industries, agriculture, municipal solid waste burning).
5.2	Prepare air governance assessments and implement strengthening plans.
5.3	Establish and enforce air quality standards in priority sectors.
5.4	Implement the identified programs; and periodically review and update the investment plans based on new data and changing circumstances.

Urban Resilience

Table 4.3.1: Key Objectives and Initiatives for Urban Resilience

No.	Objective & Initiative
Objective 1: Mainstream climate adaptation in urban planning across federal, provincial, and local governments	
1.1	Generate granular, precise, and reliable data on climate risks, infrastructure, and poverty to improve the targeting of adaptation measures.
1.3	Incorporate climate vulnerability and risk considerations into the city's master plan and other urban development policies.
Objective 2: Improving land regulation and land-use planning to bolster resilient service provision	
2.1	Introduce better land use planning and control measures to ensure that settlements do not occur in flood, landslide, and liquefaction-prone areas
2.2	Apply land use planning and tools such as site and service instruments to enable more efficient urban anatomies
2.3	Register peri-urban properties to make them part of the formal land management system, with land conversion controls, zoning and building codes to increase resilience in the face of disasters
2.4	Ensure that land records and maps are unified, accurate, and digitized as the basis for improved land allocation, risk-informed spatial planning, and asset management strategies to support resilience
2.5	Develop and adopt national and subnational urban resilience strategy and action plans.
2.6	Upgrade informal settlements based on the action plan adopted in the national urban resilience strategy and subnational adaptation plans.
2.7	Address poorly functioning land markets and onerous land use regulations to limit current low-density growth patterns.
Objective 3: Bolstering climate-smart municipal services	
3.1	Mobilize local authorities and community volunteers to proactively remove debris and garbage from drainage systems to reduce flooding
3.2	Enhance drainage networks and promote sustainable urban drainage solutions.
3.3	Strengthen regulations and institutions that regulate, manage, and enforce the provision of infrastructure and services.
3.4	Upgrade infrastructure and systems to provide adequate and equitable municipal services.
Objective 4: Leveraging NBSs to manage climate risks	
4.1	Identify and introduce NBS initiatives to enable adaptation and to tackle urban heat, urban water scarcity, and flood risks
4.2	Identify opportunities to scale up urban forest projects.
4.3	Construct open spaces and wetlands to help control stormwater by capturing runoff.
4.4	Construct green roofs and permeable pavements to promote rainfall infiltration
Objective 5: Developing financing instruments to ensure sustainable revenue streams for green and resilient urbanization	
5.1	Carry out concentrated policy action to facilitate PPPs, including addressing gaps at the framework level and in existing standardized contracts to address climate change issues.
5.2	Introduce intergovernmental fiscal transfers focused on a multi-sectoral investment menu which targets adaptation interventions
5.3	Improve cost recovery for urban services through the adjustment of user-charges to free up financing for green public investments and address relevant policy actions

Human Capital

Table 4.4.1: Key Objectives and Initiatives for Human Capital

No.	Objective & Initiative
Objective 1: Mainstream climate adaptation in urban planning across federal, provincial, and local governments	
Health	
1.1	Conduct assessment to strengthen the understanding of climate change impact on public health, and formulate a roadmap to address such challenges.
1.2	Improve data collection, reporting, analysis, and record keeping of climate-sensitive diseases.
1.3	Upgrade and extend disease outbreak monitoring and forecasting to counteract possible climate change health impacts, and support planning for effective interventions
1.4	Integrate climate change adaptation measures into the national and subnational policies in health sector
Education	
1.5	Conduct assessment to strengthen the understanding of climate change impact on education, and formulate a roadmap to address such challenges.
1.6	Improve data collection, reporting, analysis, and record keeping of loss to education-days, student-absenteeism
1.7	Mainstream climate change adaptation into the roadmap for skills development in Pakistan.
1.8	Integrate climate change adaptation measures into the national and subnational policies in education sector.
Objective 2: Enhance Climate Resilience through Disaster Emergency Preparedness and Response	
Health	
2.1	Develop a communication and dissemination strategy for climate-health nexus and implement associated the awareness and prevention campaigns
2.2	Issue timely alerts and advisories on climate and disaster information to health personnel and communities.
2.3	Strengthen the capacity of federal, provincial, and district level healthcare bodies to prepare for and respond to health risks during climate-exacerbated disasters.
2.4	Ensure family planning services are available at all levels.
2.5	Expand climate-resilient WASH facilities to unserved and underserved areas and populations.
Education	
2.6	Develop emergency and evacuation Standard of Procedures for educational institutions and associated facilities.
2.7	Provide trainings and simulations (or drills) for teachers, students, workers, and other education personnel on emergency response and evacuation procedures.
2.8	Construct educational facilities that could serve as multi-purpose shelters in the event of weather or climate disasters, especially in most vulnerable areas
Objective 3: Enhance Climate Resilience through Disaster Emergency Preparedness and Response	
1.1	Include climate change in the curricula of all secondary schools and offer specialized courses in colleges and universities.

1.2	Develop and implement occupational and vocational training programs to a wide range of occupational fields, production, services, and livelihoods that are directly or indirectly linked with climate change.
1.3	Provide enabling environment for entrepreneurs and small businesses to develop environmentally friendly products and services

Cross-Cutting Areas

Table 4.5.1: Key Objectives and Initiatives for DRM

No.	Objective & Initiative
Objective 1: Understanding climate and disaster risk by investing in state-of-the-art hydromet, climate and early-warning systems	
1.1	Establish an open-access, credible, national climate data and information database for sharing climate-related data and information to stakeholders across various sectors.
1.2	Develop a nationwide and district-level <i>Multi-Hazard Vulnerability and Risk Assessment</i> in a spatial-temporal format, including detailed and location-specific assessments.
1.3	Undertake GIS mapping of all existing irrigation infrastructure, especially flood embankments, for effective flood monitoring and management.
1.4	Undertake hydrological modeling and flood-plain mapping and zoning of the Indus River system using climate change scenarios to estimate various projected flood levels.
1.5	Strengthen hydro-meteorological monitoring, forecasting, and early-warning systems
1.6	Develop capacity based on Remote Sensing and GIS techniques for monitoring temporal changes in glaciers and snow cover, and in land cover in different agro-ecological zones.
1.8	Strengthen GCISC's capacity to enhance knowledge management on climate change adaptation, fostering interdisciplinary research, innovation, and capacity building within the country.
Objective 2: Strengthening disaster risk governance	
2.1	Prepare and upgrade National Disaster Management Plan II (NDMP) and National Flood Protection Plan IV (NFPP-IV).
2.2	Formulate and approve provincial-level disaster management and climate change legislation, policies, plans and strategies.
2.3	Put systemic functions in place to ensure that policy and regulatory frameworks are implemented and enforced.
2.4	Enhance coordination and cooperation among entities responsible for climate change and development to identify means for risk-informed development.
Objective 3: Investing in disaster risk reduction to bolster the resilience of communities and critical infrastructure	
3.1	Develop robust disaster and climate risk-screening tools to be integrated into the public financial management processes at both the federal and provincial levels.
3.2	Mainstream disaster and climate risk screening into public investment appraisals, planning, implementation, and monitoring at both the federal and provincial levels.
3.3	Implement cost-effective, innovative, and agile DRM solutions to reduce the loss of life, infrastructure, and livelihoods at all scales.
3.4	Establish Climate and DRM Funds at the subnational or provincial levels.

3.5	Develop and implement climate and disaster risk finance and insurance products, with a focus on the most vulnerable and marginalized communities.
3.6	Building on existing programs, establish a climate and disaster shock-responsive social protection system, with a focus on the most vulnerable and marginalized communities.
3.7	Ensure that infrastructure, including telecommunication, power, utilities, and transport, are resilient in the face of climate change impacts, particularly extreme weather events.
Objective 4: Enhancing disaster preparedness for effective response and to “Build Back Better” by incorporating risk-informed approaches into recovery and reconstruction efforts	
4.1	Develop a Disaster Recovery Framework (DRF) to institutionalize recovery, enabling the development of strategies, guidelines, capacities, and institutions for proactive recovery management.
4.2	Develop a last-mile, early-warning dissemination system for natural disasters using innovation and technology (for example, radio and SMS messaging).
4.3	Ensure community participation in early-warning dissemination and disaster risk reduction activities, particularly in developing evacuation plans.
4.4	Develop standard operating procedures (SOPs) that clearly define the roles and responsibilities of each relevant department during natural disasters.
4.5	Strengthen the capacities of the DRM agencies and the district-level actors to address multiple hazards and to raise the resilience, efficiency, and effectiveness of the whole DRM system.
4.6	Scale up community-based disaster risk management (CBDRM) to strengthen the adaptive capacity of communities through local-level organizations.
4.7	Upgrade public evacuation shelters and provide comprehensive awareness training to ensure their effective use.

Gender, Youth, and Social Inclusion

Table 4.6.1: Key Objectives and Initiatives for Gender, Youth, and Social Inclusion

No.	Objective & Initiative
Objective 1: Support Vulnerable Groups in Strengthening Their Capacity for DRM	
1.1	Map key stakeholders and identify their capacity needs for gender and socially inclusive DRM; conduct training and capacity development corresponding to their needs.
1.2	Set quotas for the inclusion of women in all district and municipal DRM authorities.
1.3	Set up a helpline for reporting gender-based violence (GBV) and child marriage to protect women and girls during and post disasters.
1.4	Develop learning materials to integrate gender and social inclusion, and how they link with climate change and disasters, into school, college, and university curricula.
1.5	Develop community disaster management systems linked to existing community service delivery platforms, strengthening early-warning systems.
Objective 2: Empower Vulnerable Groups through Fostering Climate-Resilient Livelihoods	
2.1	Introduce energy-efficient, low-cost cooking technologies tailored to women's needs to promote sustainable cooking practices.
2.2	Provide comprehensive training programs on climate smart agriculture practices and regenerative agriculture.

2.3	Foster entrepreneurship in agriculture and food production by removing bottlenecks and providing financial and other incentives, such as business incubation and mentoring programs.
2.4	Increase the representation of female extension officers and invest in safer transport to reach female farmers, particularly in rural areas.
2.5	Identify, document, and scale up indigenous water management technologies to promote sustainable water resource use.
2.6	Provide comprehensive training programs focusing on water, sanitation, and health issues at the local level.
2.7	Provide comprehensive training programs focusing on sustainable land and watershed management, and biodiversity conservation at the local level.
2.8	Provide comprehensive training programs focusing on fisheries and coastal management at local level.
2.10	Promote entrepreneurship in forestry and non-timber forest products by removing bottlenecks and providing financial and other incentives, such as business incubation and mentoring programs.
Objective 3: Promote Inclusive Participation of Vulnerable Groups in Climate-Related Policy and Development Planning	
3.1	Conduct research and data collection to better understand the specific impacts of climate change on vulnerable groups.
3.2	Launch awareness campaigns and outreach programs to raise awareness about the importance of including vulnerable groups in climate change decision-making.
3.3	Encourage the representation of vulnerable groups in key decision-making bodies related to climate change, such as climate councils, environmental agencies, and advisory committees.
3.4	Integrate gender and social inclusion considerations in all climate-related policies and programs to ensure that they are inclusive and responsive to the needs of diverse vulnerable groups.

Annex III – Pakistan 3rd Nationally Determined Contribution⁶ (NDC) Policy Actions

High Priority Actions

1. **Renewable, Hydro, and Clean Energy Share:** By 2035, renewable energy (including hydropower) and clean energy are expected to reach about 38,472 MW and 43,202 MW, representing around 62% and 69% of the planned capacity mix under IGCEP 2025-2035. This transition will make renewables and clean energy technologies as the dominant sources of new electricity generation.
2. **Fuel Mix Transition in Power Generation:** Natural gas and furnace oil are set to decline, with net reductions of 2,147 MW and 430 MW respectively, as per IGCEP 2025-2035, signaling a gradual phase down of fossil fuels in Pakistan's capacity mix.
3. **Transport:** The transition to cleaner transport is targeted through 30% of new vehicle sales and adding 3,000 charging stations by 2030.
4. **Energy Efficiency:** Pakistan Energy Efficiency and Conservation Policy targets an emission reduction of 35 MtCO₂e by 2030 through upgraded industrial processes, adoption of efficient appliances, and enhanced demand side management.
5. **Grid Flexibility through BESS:** Deployment of battery energy storage systems (BESS) is planned to enhance grid flexibility, stabilize renewable variability, and support reliable large-scale integration, requiring an estimated USD 1 billion investment.
6. **Transmission:** Massive investments will be required to upgrade the transmission network by 2040. This will escalate in a case with large share of variable power from solar and wind.
7. **Agriculture:** Prioritized as the key sector for adaptation, given its high vulnerability to climate change and critical linkages to national food security. The sector also offers mitigation co-benefit through targeted interventions, including adoption of Alternate Wetting and Drying (AWD) in rice cultivation, application of slow-release fertilizers, enhanced manure management via composting and bio-digesters, and discouraging crop residue burning.
8. **Forestry:** Through the Upscale Green Pakistan Programme (UGPP), which focuses on large-scale afforestation and ecosystem restoration, the forestry sector is expected to play a major role in enhancing carbon sinks and contribute significantly to Pakistan's mitigation efforts by 2035.
9. **Waste Sector:** Achieve a 17% emission reduction from the waste sector through integrated solid waste, composting of organic waste, semi-aerobic land filling and wastewater management solutions, including segregation, recycling, composting, landfill gas capture, upgraded treatment facilities, and deployment of advanced methane capture and utilization systems, contributing to global methane reduction efforts.

Additional Measures

10. **Cooking & Heating (Clean Cooking Transition):** Reduce reliance on fuelwood by scaling up clean cooking solutions, including electric stoves, improved cook-stoves, biogas systems, and sustainable options such as briquetting and agricultural residue utilization to protect forests, safeguard public health, and accelerate the transition to sustainable energy.
11. **Transport (Vehicles & Mobility):** Expand mass transit in major cities, modernize railways to increase the freight share from road to rail, and encourage R&D in green hydrogen.
12. **Buildings (Residential & Commercial):** Efforts will focus on expanding access to clean cooking fuels and technologies with the aim of phasing out traditional biomass use. Promotion of energy efficient buildings with solar rooftops, passive cooling, and efficient air conditioners will be undertaken. Appliance efficiency standards will be strengthened, alongside the encouragement of a full shift to LED lighting and wider adoption of efficient cooling systems.

⁶ Pakistan's Third Nationally Determined Contribution ([Pakistan_NDC3.0_24_Sep.pdf](#))

Pakistan has also ratified the Kigali Amendment to the Montreal Protocol, which guides actions to reduce direct and indirect emissions from the Refrigeration and Air Conditioning sector through energy-efficient and environment-friendly cooling technologies.

13. **Industry (Energy Use & Manufacturing):** Green transformation by improving industrial and energy efficiency, wastewater treatment, waste-heat recovery, and the overall modernization of industrial boilers.
14. **Aviation:** Efforts on deployment of sustainable aviation fuels. Domestic aviation emissions will align with ICAO global mitigation pathways.
15. **Maritime:** Ports and shipping will adopt low-carbon fuels and electrified port operations.

Annex IV – ccGAP Priority Actions and Key Activities for Gender Inclusiveness

Priority Actions for Gender Inclusiveness⁷

During ccGAP workshops and consultative sessions, certain themes emerged across sectors. These themes represent priority actions relevant to gender-responsive climate action in all sectors. The ccGAP uses these themes as a framework for building its recommendations. The priority actions required to operationalize these principles are similar and equally important. While lead actors across sectors may differ, the focus and purpose of their actions remain the same. These measures are essential for the effective implementation of the ccGAP.

Priority Cross Cutting Actions	
Priority Action	Key Activities
Ensure the participation and representation of women at all levels of climate policy, planning and decision making across sectors.	<ul style="list-style-type: none"> Establish quotas to ensure the representation of women in key decision-making spaces. Consult with stakeholders when designing policies and programmes, including to raise awareness and socialise this ccGAP. Develop a roster of key stakeholders and experts to consult during design and implementation.
Strengthen coordination and promote institutionalisation to address gender issues and support gender mainstreaming.	<ul style="list-style-type: none"> Formalise a Gender Committee with representatives from ministries, women's groups and other stakeholders. Identify ministries required to consult the Gender Committee when formulating new policies and programmes. Coordination with the National Commission on the Status of Women (NCSW) to set up thematic working groups to support the work of the Gender Committee.
Develop gender responsive climate actions through national and provincial policies and programmes.	<ul style="list-style-type: none"> Review existing policies and programmes and revise or update if necessary to ensure gender responsiveness. Designate gender focal points in all relevant ministries and departments to coordinate gender responsive implementation.
Collect gender disaggregated data to fill information gaps.	<ul style="list-style-type: none"> Design and implement processes to capture gender disaggregated data in all relevant sectors. Make this data widely available and ensure its use in the development of new policies and programmes.
Invest in context specific research to inform policy making and programming.	<ul style="list-style-type: none"> Conduct sector specific gender analyses to inform policy making and programming. Ensure research findings are made available to policymakers and practitioners.
Develop a framework to monitor progress on ccGAP implementation.	<ul style="list-style-type: none"> Develop a ccGAP monitoring and evaluation framework in consultation with the Gender Committee, NCSW and other stakeholders and experts. Communicate results from monitoring to inform policy and programming, and to course correct if necessary.

Key Principles for Gender Inclusiveness

⁷ [Climate Change Gender Action Plan of the Government and People of Pakistan \(2022\)](https://drive.google.com/file/d/1rP2JtOoWet2dkZiC2iUJa8PZNvdQEXYd/view?edoph=true)
(<https://drive.google.com/file/d/1rP2JtOoWet2dkZiC2iUJa8PZNvdQEXYd/view?edoph=true>)

Participation and representation: Elevate the voices of women, and promote their representation, participation and leadership at all levels of climate policy, planning and decision-making.

Coordination and institutionalisation: Identify opportunities to strengthen coordination and institutionalise measures for gender mainstreaming.

Policy and programmes: Develop or update policies and programmes to address and include the needs of women and girls.

Gender disaggregated data: Collect gender disaggregated data, make it widely available, and use it to inform policy and programme decisions.

Context specific research: Invest in context specific research to inform policy making and programming.

Monitoring and evaluation: Develop frameworks to monitor progress on implementation of this ccGAP, to inform new programmes and policies, and to course correct where necessary.

Note on Terminology

The IUCN Gender Equality and Women's Empowerment Policy (2018) defines gender responsiveness in the following terms: "To identify and understand gender gaps and biases, and then act on them, developing and implementing actions to overcome challenges and barriers, thereby improving gender equality. Gender responsive has come to mean more than 'doing no harm'; it means "to do better" (IUCN 2018a).⁸

Several other key terms and phrases used throughout the ccGAP require elaboration. For clarity and to avoid repetition, those terms are explained here as follows:

- **Agricultural activities:** Includes farming, livestock, forestry, fisheries.
- **Decision-making:** Refers to all levels, from government ministries and departments at the federal and provincial levels to community level decision making bodies, as relevant; includes decision on policy, planning, and implementation.
- **Institutionalisation:** Process to introduce or consolidate behaviors and practices within institutions; includes reform initiatives, rulemaking, developing or introducing best practices, capacity development and training.
- **Vulnerable communities:** Vulnerability related to gender, age, disability, ethnicity, religion, poverty; also referred to as marginalised or disenfranchised groups.

⁸ IUCN Gender Equality and Women's Empowerment Policy (October 2018), (<https://iucn.org/sites/default/files/2022-05/iucn-policy-on-gender-equity-and-equality-october-2018-english-only.pdf>)

Annex V – Climate Change Related Inputs for Logical Frameworks

Below are some examples of logframe work inputs, based on the ‘Indicative Logical Framework’ template included in Annex X of the Project Concept Note (PCN) template.

Adaptation

Project Objectives	Activities/ Actions	Output	Output Indicator	Timeline	Desired Outcomes	Outcome Indicator	Timeline	Impacts	Impact Indicator	Timeline
Climate Objective										
Transport Sector										
Develop climate-resilient transport systems										
Implementation of heat-resistant road materials		1,000 km of heat-resistant road surfaces	Km of upgraded road infrastructure	2027	Reduced transport disruptions during extreme weather	Days of transport disruption annually	2028	Sustained economic activity	Economic activity during extreme weather	2029
Installation of climate-controlled bus stations		100 climate-controlled bus stations	Number of climate-controlled bus stations	2026	Improved passenger comfort during heatwaves	Passenger satisfaction scores	2027	Improved public health outcomes	Heat-related health incidents at transport hubs	2028
Development of flood-resistant transport infrastructure		50 flood-resistant bridges and overpasses	Number of flood-resistant structures	2028	Enhanced transport accessibility during floods	Transport accessibility index	2029	Enhanced regional connectivity	Regional transport connectivity metrics	2030
Develop climate-resilient rural road networks										
Upgrading rural roads with improved drainage		2,000 km of rural roads upgraded	[province] km of upgraded/ elevated/ permeable roads	2026	Improved rural connectivity during monsoon	Number of days roads are passable	2027	Reduced economic losses	Value of goods transported during monsoon	2028
Elevating roadbeds in flood-prone districts		100 km of elevated road segments	As above	2027	Reduced road washouts	Market access metrics	2028	Improved food supply chain resilience Enhanced rural livelihoods	Food price stability	2029
Use of permeable surfaces		300 km permeable pavement	As above	2028	Enhanced access to markets	Road maintenance cost reduction	2029	Lower disaster recovery costs	Rural income levels Disaster recovery costs	2030 2032
Agriculture Sector										
Promote climate-smart agriculture and resilient cropping										
Introduction of drought/heat/saline-tolerant crop varieties		100,000 ha under climate-smart crops	Hectares under new varieties	2026	Increased resilience to climate shocks	Crop loss statistics	2027	More stable rural incomes	Farmer income trends	2028
Integrated pest management (IPM)		5,000 farmers trained in IPM	Number trained	2027	Reduced crop losses	Adoption rates	2028	Reduced food insecurity	Food security indicators	2029

Project Objectives	Activities/ Actions	Output	Output Indicator	Timeline	Desired Outcomes	Outcome Indicator	Timeline	Impacts	Impact Indicator	Timeline
Farmer field schools for climate-smart practices		200 field schools established	Number of field schools	2028	Improved farmer knowledge	Knowledge assessment scores	2029	Lower input costs	Input cost reduction	2030
Water & Irrigation Sector										
Enhance agricultural resilience through water-efficient irrigation systems										
Installation of drip/sprinkler irrigation		500,000 ha with efficient irrigation	Hectares equipped	2029	Water use reduced by 30%	Water use pre/post project	2027	Enhanced food security	Food production metrics	2028
Farmer training		10,000 farmers trained	Number trained	2028	Crop yields up 25%	Crop productivity baseline vs 2028	2027	Improved livelihoods	Farmer income	2028
Rainwater harvesting structures		1,000 rainwater systems	Number of systems	2030	Improved groundwater recharge	Groundwater depth	2028	Reduced water stress	Water stress index	2029
Energy Sector										
Strengthen energy grid resilience to climate impacts										
Modernization of power distribution infrastructure		4 DISCOs upgraded	Number of upgraded DISCOs	2028	Transmission losses reduced to 15%;	Transmission loss percentage	2029	Improved energy access	Population with reliable electricity	2029
Deployment of smart grid technologies		500 smart grid systems	Number of smart grid systems	2029	Grid reliability improved by 40%	Grid reliability index	2030	Enhanced productivity	Industrial productivity	2030
Climate-proofing of transmission lines		10,000 km of climate-resistant transmission lines	Km of climate-resistant lines	2032	Enhanced power supply during extreme weather	Power supply continuity	2033	Reduced energy poverty	Energy poverty reduction	2033
Decentralise energy production for resilience										
Installation of solar mini-grids in off-grid areas		500 mini-grids	Number of mini-grids	2026	Reduced blackout frequency	Blackout days/year	2027	Improved health and education outcomes	School and clinic operational days	2028
Promotion of rooftop solar for public buildings (e.g. schools, municipal buildings)		2,000 public buildings with rooftop solar	Number of rooftop solar installations	2027	Increased energy access	Public buildings served	2028	Enhanced economic activity	Local business hours	2029
Community-based wind microgrids in coastal areas		50 wind microgrids	Number of wind microgrids	2028	Enhanced local control over energy	Community satisfaction surveys	2029	Lower GHG emissions	GHG emissions reduction	2030
Health Sector										
Climate-proof hospitals and community health centers										
Climate-resilient hospitals		100 hospitals upgraded	Number of upgraded facilities per year	2026 -	Reduced disruption of essential health services	Days of service interruption	2027	Protected vulnerable populations	Mortality rates	2028
Climate-resilient community health centers in high-risk districts		500 health centers upgraded	As above		Improved safety during disasters Faster recovery	Recovery time		Reduced disaster-related mortality Improved community resilience	Community recovery index	2029 2030

Project Objectives	Activities/ Actions	Output	Output Indicator	Timeline	Desired Outcomes	Outcome Indicator	Timeline	Impacts	Impact Indicator	Timeline
Water supply & Sewerage										
Improve climate resilience of water supply and sewerage services										
Climate-proof design and upgrading of water treatment plants, pumping stations, distribution networks, and sewerage systems to address flood and drought risks	1,000 km and of climate-resilient water and sewerage pipelines and 100 pumping and treatment plants constructed or retrofitted	Number of upgraded facilities Distance of linear infrastructure climate proofed	2026 2027 2028	Improved reliability and continuity of water and sanitation services	Reduction in service disruptions during flood and drought events (%)	2027 2028 2029	Protected vulnerable populations Reduced disaster-related mortality Reduced climate-related damages and public health risks	Mortality rates Avoided damage costs; reduction in water contamination incidents	2028 2029 2030	
Natural Capital & Ecosystems										
Restore natural ecosystems for climate adaptation										
Reforestation in [province]	50,000 ha forest restored 200 community conservation groups supported	Hectares forest Number groups	2027 2026	Enhanced ecosystem services Improved biodiversity Increased carbon sequestration	Ecosystem valuation Biodiversity indices Carbon sequestration (tCO2/yr)	2028 2027 2028	Improved biodiversity regulation Sustainable livelihoods Enhanced resilience	Biodiversity Livelihood income Ecosystem resilience	2029 2029 2030	
Conserve and restore mangrove ecosystems										
Large-scale mangrove plantation	20,000 ha mangroves planted	Hectares planted	2026	Reduced coastal erosion	Coastal erosion rates	2027	Enhanced coastal resilience; Improved biodiversity; Sustainable livelihoods	Coastal resilience index;	2028	
Community-based mangrove protection	50 community protection groups	Number of groups supported	2027	Improved fishery productivity	Fish catch data	2028		Biodiversity monitoring;	2029	
Eco-tourism initiatives	10 eco-tourism sites	Number of sites	2028	Increased community income	Community income statistics	2029		Livelihood diversification	2030	
Disaster Risk Management										
Strengthen disaster resilience through early warning systems										
Climate monitoring stations	200 monitoring stations;	Number of stations;	2026	Disaster response time cut by 50%;	Response time pre/post 2025	2026	Reduced disaster losses	Economic loss (PKR bn);	2027	
Mobile early warning apps	App with 1M users	App users	2025	Improved preparedness	Preparedness scores	2027;	Lives/property saved	Disaster mortality	2027	
Community preparedness training	50,000 trained	Number trained	2025	Enhanced warning coverage	Population coverage	2026	Enhanced resilience	Resilience index	2028	

Mitigation

Project Objectives	Activities / Actions	Outputs	Output Indicator	Timeline	Desired Outcomes	Outcome Indicator	Timeline	Impacts	Impact Indicator	Timeline
Climate Objective										
Energy Sector										
Reduce the carbon intensity of electricity production (Hydropower station)										
Construction of new hydropower station	Low carbon electricity generated	GWh/year of energy generated	2028	[province] electricity emission factor reduced by X%	Comparison of energy sources 2028 vs 2029 (MWh)	2029	GHG emissions reduced	kTCO2e/year 2028		
Construction of energy efficient transmission lines from A to B	Reduction in energy losses from current transmission lines	MWh/year energy saved (compared to BAU)	2028	Coal fired power station decommissioned	Cessation of coal fired generation	2030	Air pollution reduced	PM2.5 levels		2028
Installation of energy storage system	Supply side management	80% of peak load generated by hydro	2029				Improved energy security	Reduced coal imports (PKR/yr)		2028
Transport Sector										
Reduced congestion, GHG emissions and air pollution (New road bypass)										
Construction of new highway to bypass [city]	50km new highway	Kms of highway constructed	2029	Traffic count reduced	Traffic counts pre and post 2026	2027	GHG emissions reduced	kTCO2e/year		2027
Construction of park and ride system	500 space car park, bus shelters, electric buses	Infrastructure constructed	2029	Travel time reduced	Average travel time from A to B		Air pollution reduced	PM2.5 levels		2027
Agriculture / Water Sector										
Reduced energy and water consumption (Irrigation system replacement)										
Install demand driven irrigation system	New system with moisture sensors, variable speed drives	Infrastructure constructed	2026	Energy consumption reduced by X%	Energy consumption pre and post 2026	2027	GHG emissions reduced	kTCO2e/year		2028
				Water consumption reduced by X%	Water consumption pre and post 2026	2027	Groundwater recharged	Water table depth		2028
Health Sector										
Reduced energy consumption and GHG emissions (Hospital replacement)										
Installation of photovoltaics (500kW)	System installed to stated capacity	Installed capacity (kW)	2027	Renewable energy generated on site	450 MWh of electricity generated annually	2028	GHG emissions reduced	kTCO2e/year		2028
Installation of solar water heaters (400kW)	System installed to stated capacity	Installed capacity (kW)	2027	Renewable energy generated onsite	5ML of hot water produced annually	2028	Energy costs reduced	%		2028
Best practice energy performance	Energy consuming equipment installed	Log of installed components	2027	Best practice energy efficiency	50kWh/m ² /year	2028				

Project Objectives	Activities / Actions	Outputs	Output Indicator	Timeline	Desired Outcomes	Outcome Indicator	Timeline	Impacts	Impact Indicator	Timeline
		according to benchmarks								
Water supply & Sewerage										
Reduce greenhouse gas emissions from water supply and sewerage operations										
Installation of energy-efficient pumps, variable-speed drives, renewable energy (e.g. solar PV) at treatment facilities, and methane capture from wastewater treatment	Energy-efficient variable speed pumps installed	# of variable speed pumps installed	2026; 2027; 2028	Reduced energy consumption	Energy consumption reduced (%)	2027; 2028; 2029	Reduction in GHG emissions	Cumulative GHG emissions avoided (tCO ₂ e)		2028; 2029; 2030
	PV panels installed	KW of PV installed		Renewable energy generated	Renewable energy generated (MWh/yr)		Reduction in energy costs	Operating cost savings (PKRs)		

Annex VI – How to Populate Project Concept Note Template

Adaptation / Resilience

The PCN template refers to a series of adaptation related questions/criteria for project proponents to respond to. The following excerpts are taken from the template and include guidance on how users should respond to each.

Table VII-1 Criteria from the PCN template with suggested responses for climate adaptation/resilience

PCN Template Criterion	PCN Template Description	Suggested Response
PCN Template Row 3: 'Project Objective' / 'IV: Climate & Environmental Importance' / ii	<i>"How it will help reduce climate damages (such floods, heatwaves, droughts, floods, landslides, tropical storms, etc.) and losses (ecosystem depletion, water availability air quality etc.) or slow the degradation of ecosystems/slow onset of climate change?"</i>	<ul style="list-style-type: none"> ✓ Provide a narrative describing how the project reduces climate risk exposure (e.g., through infrastructure hardening, ecosystem restoration, or resilient service delivery). ✓ Review the relevant sectoral checklist (see Annex I) and provide sector or sub-sector specific due diligence undertaken. ✓ Reference relevant actions from the National Adaptation Plan (NAP) (Annex II), including sectoral priorities. Justify how project activities reduce specific risks identified in the CHIRA screening. ✓ Include co-benefits such as biodiversity gains or public health improvements, where relevant. ✓ Reference ccGAP priority actions for gender inclusiveness which have been included in project preparation and justify how these actions have been integrated into project design (see Annex IV).
PCN Template Row 3: 'Project Objective' / 'IV: Climate & Environmental Importance' / iii	<i>"How will it help with adaptation, mitigation and co-benefits?"</i>	<ul style="list-style-type: none"> ✓ Explain how the project contributes to adaptation mitigation goals (e.g., nature-based solutions that sequester carbon while managing floods, or solar-powered water pumps that reduce emissions and improve drought resilience). ✓ Reference specific NAP actions the project contributes toward (Annex II). ✓ Highlight how integrated design enhances project sustainability and financing prospects. ✓ Consider co-benefits related to adaptation measures (for example in coastal flood risk reduction project restoring and planting mangroves reduces coastal flooding risks). ✓ Review ccGAP priority actions for gender inclusiveness (see Annex IV) and outline how integrating gender responsive climate action improves mitigation and adaptation outcomes or leads to other co-benefits, including gender equality outcomes.
PCN Template Row 4: "Description of Activities, Outputs and Outcome" / 2	<i>"Depending on the nature of the project, if the objective is linked to climate change</i>	<ul style="list-style-type: none"> ✓ If the project is directly related to adaptation, provide a clear indicator (e.g., "# of hectares protected by flood barriers"; "# of people with access to climate-resilient infrastructure").

PCN Template Criterion	PCN Template Description	Suggested Response
	<i>mitigation or adaptation then provide at least one indicator and highlight it. However, if the project is not directly linked to climate change try to develop casual links to climate mitigation or adaptation indicators, based on initial screening exercise given in CHIRA.”</i>	<ul style="list-style-type: none"> ✓ If indirect, use CHIRA results to establish a causal link of the resilience benefits of a project (e.g., a basic service upgrade in a flood-prone area could enhance resilience). ✓ Include sex-disaggregated data for all people-level indicators (e.g., # of women and men in key decision making climate policy and planning positions, or % of women and men who report receiving early warning messages in time to evacuate safely before a flood event), and add gender-specific indicators that track identified local gender disparities (e.g., # of reports of harassment/ violence against women and girls while traveling to or from evacuation shelters). ✓ Indicators should be SMART – that is, Specific, Measurable, Achievable, Relevant, and Time-bound – and can be drawn from sector logframe examples in Annex IV.
PCN Template Row 7: ‘Are there any Environmental, Social or Climate risks involved?’	“Are there any Environmental, Social or Climate risks involved?”	<ul style="list-style-type: none"> ✓ Refer to the CHIRA output to classify climate risk level (automated via iPAS). ✓ Provide a brief narrative explaining the risk classification and its relevance to the project (e.g., location in a drought- or flood-prone district). ✓ Mention any plans for CARA, if required due to CHIRA results, and early-stage measures considered to manage risks. ✓ Assess if the project may pose risks to women, people with disabilities, and other disadvantaged population sub-groups, including the risk of increased gender-based violence should household power shift.
PCN Template Row 9: ‘The Climate and Hazard Initial Risk Assessment (CHIRA) indicate the project to be undertaken’	“The Climate and Hazard Initial Risk Assessment (CHIRA) indicate the project to be undertaken”	<ul style="list-style-type: none"> ✓ State the CHIRA risk rating output as generated via iPAS and include reference to the key hazards identified (e.g., riverine flooding, extreme heat, landslides). ✓ If “Medium” or “High” risk, note that a CARA will be required and that project design should reflect initial adaptation concepts in anticipation of further detailed vulnerability assessment.

In addition to the criteria listed above, Annex II of the PCN template includes a template for an Indicative Logical Framework, including table rows on climate change (see Figure VII-1, below). In the context of adaptation, this should be populated considering circumstances specific to the project’s sector. Examples of how the Logical Framework is applied by sector are shown in Annex V of this guidance note.

Figure VII-1 Climate change table rows from the ‘Indicative Logical Framework’ from PCN template

Project Objectives	Activities / Actions	Outputs	Output Indicator	Timeline	Desired Outcomes	Outcome Indicator	Timeline	Impacts	Impact Indicator	Timeline
Climate Objective										
Sub-objective 1										
Sub-objective 1										

Mitigation

The PCN template also refers to a series of mitigation related questions/criteria for project proponents to respond to. The following excerpts are taken from the template and include guidance on how users should respond to each.

Table VII-2 Criteria from the PCN template with suggested responses for climate mitigation

PCN Template Criterion	PCN Template Description	Suggested Response
PCN Template Row 3: 'Project Objective' / 'IV: Climate & Environmental Importance' / iii	<i>"How will it help with adaptation, mitigation and co-benefits?"</i>	<ul style="list-style-type: none"> ✓ Provide a narrative regarding how the project minimises GHG emissions to the extent possible. ✓ Reference any of the NDC Policy Actions (listed in Annex III) which the project addresses and provide the associated justification. ✓ Review the relevant sectoral checklist (see Annex I) and provide sector or sub-sector specific due diligence undertaken. ✓ Identify how the project contributes to co-benefits related to gender equality through gender analysis (e.g., improving mitigation and gender equality outcomes by ensuring women's equal participation and decision making in the planning and implementation of mitigation projects).
PCN Template Row 4: "Description of Activities, Outputs and Outcome" / 2	<i>"Depending on the nature of the project, if the objective is linked to climate change mitigation or adaptation then provide at least one indicator and highlight it. However, if the project is not directly linked to climate change try to develop casual links to climate mitigation or adaptation indicators, based on initial screening exercise given in CHIRA."</i>	<ul style="list-style-type: none"> ✓ If the objective is linked to climate change mitigation, provide an indicator related to GHG emissions. For example, a new hydropower dam will generate Y MWh/year of clean electricity and reduce emissions by X tCO₂e/year. ✓ If the objective is not linked to climate change, consider how it may impact GHG emissions (e.g., a new highway bypass to ease urban traffic congestion may reduce GHGs compared with the business-as-usual scenario). ✓ Indicators should be SMART – that is, Specific, Measurable, Achievable, Relevant, and Time-bound (examples of SMART indicators are provided in the log frame examples in Annex IV). ✓ Include sex-disaggregated data for all people level indicators and add gender specific indicators that track identified gender disparities.

In addition to the criteria listed above, Annex II of the PCN template includes a template for an Indicative Logical Framework, including table rows on climate change (see Figure 2, below). In the context of mitigation, this should be populated with any GHG emission reduction objectives and the associated outputs and outcomes. For example, a project objective may be to reduce GHG emissions from transport in a city as part of a public works and services project upgrading roads. Activities such as installing EV charging stations and public/active transport infrastructure could be included, with outputs related to infrastructure installed and outcomes related to EV vehicles in the city and public/active transport activity. Some worked examples of climate change related log frameworks are provided in Annex IV of this guidance note.

Figure VII-2 Climate change table rows from the 'Indicative Logical Framework' from PCN template

Project Objectives	Activities / Actions	Outputs	Output Indicator	Timeline	Desired Outcomes	Outcome Indicator	Timeline	Impacts	Impact Indicator	Timeline
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<i>Climate Objective</i>										
Sub-objective 1										
Sub-objective 1										

Annex VII – How to Populate Technical Feasibility Study

Adaptation / Resilience

The TFS template sets out a survey/feasibility study framework to be developed by the project team to communicate the initial due diligence and ‘fact-finding’ which has been carried out to justify investment in the project. Depending on the outcome of the CHIRA assessment carried out during PCN development, if the project is determined to be medium or high risk, a ‘Climate Adaptation and Resilience Assessment’ (CARA) will need to be carried out to demonstrate how the climate hazards and vulnerabilities will be managed⁹. In addition, a series of qualitative questions are set out in the instructions for the ‘Technical Feasibility Study’ which should be used by the project team to describe and emphasise the adaptation-related aspects included in the project. Providing a detailed description and a strong rationale for these aspects will strengthen the case for project financing during appraisal. Table 3 below provides an overview of the relevant criteria and suggested responses for each.

Table VIII-1 Criteria from the TFS template with suggested responses for climate adaptation/resilience

TFS Template Criterion	TFS Template Description	Suggested Response
TFS Template Table 2: Row 1	<i>“The material, equipment and resources are climate resilient with longer lifespans?”</i>	<ul style="list-style-type: none"> ✓ Provide a narrative on how materials and equipment specified enhance climate resilience and have extended lifespans under changing climate conditions (e.g., heat-resistant road surfaces, flood-resistant construction materials, drought-tolerant crop varieties, climate-proofed transmission lines). Describe how these materials reduce vulnerability to climate hazards and maintain functionality during extreme weather events. ✓ Review the relevant sectoral checklist (see Annex I) and provide sector or sub-sector specific considerations for climate resilience and extended lifespans.
TFS Template Table 2: Row 3	<i>“Project size makes it vulnerable to social, economic or climate risks?”</i>	<ul style="list-style-type: none"> ✓ Assess how project scale affects exposure to climate risks. Large-scale projects may have greater exposure to climate hazards but also greater potential for adaptation co-benefits. ✓ Describe risk mitigation measures proportionate to project size, including early warning systems, diversified implementation approaches, and phased implementation to allow for adaptive management. ✓ Reference relevant examples from Pakistan’s adaptation priorities.

⁹ Guidance on how to complete the CARA is provided in the ‘Handbook on Climate Risk Screening for Policy Planning’.

TFS Template Criterion	TFS Template Description	Suggested Response
		<ul style="list-style-type: none"> ✓ Ensure that scaling does not reduce analysis and attention to addressing local contextual gender roles and inequalities in climate action.
TFS Template Table 2: Row 4	<i>“Are there any social, economic or climate risks to the project based on its location?”</i>	<ul style="list-style-type: none"> ✓ Conduct location-specific climate risk assessment identifying hazards relevant to the project area (e.g., flooding, heat waves, glacial melting, cyclones in coastal areas). ✓ Describe how these risks could affect project implementation and operation. ✓ Detail specific adaptation measures to address location-based risks, such as flood-resilient designs for flood-prone areas or heat-resistant materials for heatwave-prone regions. ✓ Outline key gender analysis findings and risks to increased gender inequality in the local context and identify ways to address these inequalities.
TFS Template Table 2: Row 5	<i>“Does the project duration pose any social, economic or climate risks?”</i>	<ul style="list-style-type: none"> ✓ Assess how climate change projections over the project lifetime may affect project outcomes. Longer-duration projects face greater climate uncertainty and changing risk profiles. ✓ Describe adaptive management approaches, including monitoring systems, flexible design elements, and planned adaptation upgrades. ✓ Reference climate projections and ensure design standards account for projected climate change changes as appropriate for project type and location (e.g. temperature, glacial flooding, precipitation, extreme weather frequency, sea-level rise) ✓ Ensure the continued meaningful, equal participation of women in climate-related consultation and decision making over the duration of the project.
TFS Template Table 2: Row 6	<i>“Project is resilient to changing climate conditions?”</i>	<ul style="list-style-type: none"> ✓ Demonstrate how project design incorporates climate resilience features aligned with Pakistan’s adaptation priorities. Examples include: water-efficient irrigation systems, flood-resistant transport infrastructure, heat-resistant urban design, climate-proofed energy systems, ecosystem-based adaptation measures. ✓ Describe performance under projected climate scenarios and adaptive capacity to respond to changing conditions.
TFS Template Table 2: Row 9	<i>“Are there design and technological alternatives available?”</i>	<ul style="list-style-type: none"> ✓ Demonstrate how project design incorporates climate resilience features aligned with Pakistan’s adaptation priorities. Examples include: water-efficient irrigation systems, flood-resistant transport infrastructure, heat-resistant urban design, climate-proofed energy systems, ecosystem-based adaptation measures. ✓ Describe performance under projected climate scenarios and adaptive capacity to respond to changing conditions. ✓ Describe any community-based design and technological alternatives with proven effectiveness, including those led by women.

TFS Template Criterion	TFS Template Description	Suggested Response
TFS Template Table 2: Row 10	<i>“The technology used is novel?”</i>	<ul style="list-style-type: none"> ✓ Describe any innovative or emerging adaptation technologies used in the Pakistani context (e.g. climate monitoring systems, mobile-based early warning apps, smart irrigation technologies, heat-resistant materials, flood-resistant construction techniques). ✓ Highlight how these technologies enhance adaptive capacity and represent advancement in Pakistan’s climate resilience capabilities.
TFS Template Table 2: Row 11	<i>“Is there capacity to adopt climate mitigation and/or adaptation measures or pollution control technology?”</i>	<ul style="list-style-type: none"> ✓ Describe how the climate adaptation components of a project will be implemented and managed. ✓ Demonstrate institutional capacity, technical competency, and community engagement mechanisms to deliver adaptation outcomes. ✓ Reference whole-of-society approaches involving government, civil society, private sector, and local communities. ✓ Describe how gender and social inclusion in adaptation capacity building will be achieved, with particular attention to strengthening capacities of vulnerable and marginalised groups, including women.

Mitigation

As with adaptation, the TFS template includes criteria related to climate mitigation. Depending on the overall value of the project (i.e. if > 7.5 billion PKR) or the anticipated annual GHG emissions (i.e. if > 20,000 tCO₂e), a ‘Climate Mitigation Assessment’ (CMA) may need to be carried out to estimate anticipated GHG emissions and demonstrate how emissions have been minimised¹⁰. In addition, a series of qualitative questions is set out in the instructions for the ‘Technical Feasibility Study’, which should be used by the project team to describe and emphasise the mitigation-related aspects included in the project. Providing a detailed description and strong rationale for these aspects will improve the argument for financing the project during appraisal. Table 5 below provides an overview of the relevant criteria and suggested responses for each.

The Handbook requires that *“Climate change mitigation assessment is necessary for projects likely to contribute to greenhouse gas emission,”* which, as discussed above, is considered relevant if the anticipated GHG emissions exceed 20,000 tCO₂e/year. The assessment to determine if a project’s emissions will exceed this threshold should be based on high-level assumptions and the nature of the project. In the case where

¹⁰ Guidance on how to complete the CMA is provided in the ‘Handbook on Climate Risk Screening for Policy Planning’. It is recommended that this be carried out by climate mitigation experts/consultants with experience in GHG emission computation.

there is any uncertainty about whether GHG emissions will exceed the threshold, a conservative approach should be adopted and the CMA undertaken.

Table VIII-2 Criteria from the TFS template with suggested responses for climate mitigation

TFS Template Criterion	TFS Template Description	Suggested Response
TFS Template Table 2: Row 1	<i>“The material, equipment and resources are climate friendly with longer lifespans?”</i>	<ul style="list-style-type: none"> ✓ Provide a narrative on how materials and equipment specified are sustainable and minimise impact to the extent possible (e.g., low carbon/recycled materials, low emission equipment etc.). Describe how these materials reduce GHG emissions.
TFS Template Table 2: Row 7	<i>“Project has ability to cause pollution and emissions?”</i>	<ul style="list-style-type: none"> ✓ sources of emissions from the CMA. ✓ If the CMA is not required, describe minor sources of GHG emissions either emitted directly from project activity (e.g., fossil fuel combustion from equipment/vehicles) or embodied carbon in materials used (e.g., GHG emissions generated from the construction of a road).
TFS Template Table 2: Row 9	<i>“Are there design and technological alternatives available?”</i>	<ul style="list-style-type: none"> ✓ Describe the low carbon technologies/materials included in the project. ✓ If low carbon technologies/materials were considered but not included, describe the issues leading to their exclusion. ✓ Describe any community-based design and technological alternatives with proven effectiveness, including those led by women.
TFS Template Table 2: Row 10	<i>“The technology used is novel?”</i>	<ul style="list-style-type: none"> ✓ Describe any innovative or emerging solutions/technologies used in the Pakistani context (e.g., renewable energy or energy efficient technology, low carbon materials).
TFS Template Table 2: Row 11	<i>“Is there capacity to adopt climate mitigation and/or adaptation measures or pollution control technology?”</i>	<ul style="list-style-type: none"> ✓ Describe how the climate mitigation components of a project will be implemented and managed. ✓ Demonstrate how the solutions are sustainable and that the relevant technical competency will exist to deliver the climate mitigation outcomes defined. ✓ Describe how gender and social inclusion in adaptation capacity building will be achieved, with particular attention to strengthening capacities of vulnerable and marginalised groups, including women.

Annex VIII – Economic Analysis of Climate Change Adaptation Measures

Rationale

Why integrate climate change adaptation measures and associated economic analysis into project development?

Pakistan's infrastructure faces escalating exposure to climate hazards, including floods, droughts, heatwaves, and glacial lake outburst floods (GLOFs). Conventional cost–benefit analysis based on historical climate underestimates future asset losses and service disruptions. Against this backdrop, including evidence both within Pakistan and around the world on rising climate-related losses, integrating adaptation measures into project design delivers multiple strategic, economic, and social benefits, including:

1. **Resilient and future-proofed:** Including adaptation measures strengthens project resilience by lowering potential asset losses and reducing service disruption, delivering sustained economic benefit across multiple climate scenarios.
2. **Access to climate finance:** Where well-justified, integrating adaptation measures helps unlock concessional funding and international support from sources such as the Green Climate Fund (GCF) and development partners.
3. **Strategically aligned:** Supports national adaptation objectives under Pakistan's National Adaptation Plan (NAP) and Nationally Determined Contribution (NDC).
4. **Risk reduction:** Resilience-building project investments that include adaptation measures help develop a more resilient economy to the shocks and stresses from the impacts of a changing climate.
5. **Efficient and equitable:** Protects public investments, supports vulnerable groups, and reduces gender inequities by improving climate-resilient service delivery.
6. **Enhanced leadership and investment attractiveness:** Demonstrating commitment to adaptation measures reinforces national leadership on building climate resilience and can attract green and foreign investment.

Conducting an economic analysis of climate change adaptation measures enables decision-makers to assess these costs and benefits in a transparent, comparable manner, integrating them into the overall project economic assessment. This ensures a comprehensive understanding of both the financial and developmental value of climate-responsive investments, strengthening the case for climate-resilient investment.

Context

The 'Manual for Development Projects' and annexed 'Handbook on Climate Risk Screening for Policy Planning' establish the overall process for project due diligence on climate change. Project information developed through this process is reported through the TFS and PC-I templates to the Ministry of Planning, Development and Special Initiatives (MOPDSI).

Two core assessment tools – the **Climate and Hazard Initial Risk Assessment (CHIRA)** and the **Climate Adaptation and Resilience Assessment (CARA)** – underpin this climate-responsive planning framework. Economic assessments of climate-resilient projects must be based on the outputs of these tools to ensure that adaptation investment decisions are evidence-based, developed consistently, and optimised to meet national and international standards.

CHIRA (Climate and Hazard Initial Risk Assessment)

CHIRA is the initial screening tool that determines a project's exposure to climate hazards and categorises risk level (low, medium, or high). Using the National Catastrophe (NatCat) climate risk model – managed by the National Disaster Risk Management Fund (NDMRF) and now automatically linked to project appraisal through the Planning Commission's iPAS interface – CHIRA provides a rapid, standardised assessment of climate vulnerability across multiple hazards, including riverine flooding, flash flooding, droughts, extreme heat, landslides, glacial lake outburst floods, and others. NatCat employs downscaled climate projections, historical hazard data, and site-specific exposure analyses to screen projects systematically. CHIRA outputs identify which projects warrant deeper analysis. Specifically, projects rated as **medium or high risk** trigger the requirement for a full Climate Adaptation and Resilience Assessment (CARA).

CARA (Climate Adaptation and Resilience Assessment)

For projects identified as medium- or high-risk by CHIRA, a detailed CARA must be conducted during the Technical Feasibility Study phase. The CARA's level of detail is tailored to the project's characteristics, scale, and geographic context, ensuring that the assessment is proportionate to the size and complexity of the project. CARAs may be carried out with support from a qualified expert and can span from a targeted desktop review to a more advanced, multi-hazard climate analysis that includes:

- Detailed climate hazard modelling using climate projections from Pakistan's NatCat model, CLIMADA, or site-specific climate data.
- Comprehensive vulnerability and asset exposure analysis under future climate conditions.
- Identification and appraisal of adaptation measures tailored to specific hazards and asset vulnerabilities.

- Quantification of climate-related risks and benefits of alternative adaptation measures.
- Development of two climate impact scenarios reflecting a range of possible future emissions and climate system responses, based on two IPCC emission scenarios used in the NatCat outputs used in the CHIRA assessment, namely the intermediate pathways (SSP2-4.5) and higher-emission scenarios (SSP5-8.5). These scenarios acknowledge uncertainty in future global emissions trajectories and in how the climate, land, ocean, and cryospheric (ice) systems respond to cumulative greenhouse gases already in the atmosphere and those emitted in the coming decades.

This guidance supplements the CHIRA/CARA exercise by enabling more detailed economic analysis of adaptation measures identified through the CARA exercise, including their associated benefits.

This supplementary guidance is intended for use to assess the climate change related economic cost-benefit of projects overall and/or the specific adaptation measures identified for potential inclusion in a project.

‘With’ and ‘Without’ Analysis: Foundation for Economic Assessment

The economic assessment framework presented in this Annex builds upon CARA findings by conducting **‘with’ and ‘without’ analysis**. This approach compares two scenarios:

- **‘Without’ (Baseline/Business-as-Usual Scenario, S0):** The project is designed and constructed to future projections of climate change – as per the CHIRA/CARA assessments – but without explicit adaptation measures. This scenario quantifies baseline exposure to future climate hazards, including Expected Annual Losses (EAL), asset damage costs, service disruption losses, and maintenance cost escalation.
- **‘With’ (Integrated Adaptation Scenario, S1):** The project incorporates a single, comprehensive, integrated design package of adaptation measures calibrated to SSP2-4.5 (intermediate emissions scenario).

The **economic benefit of adaptation** is calculated as the difference between these two scenarios, with avoided losses attributed to individual adaptation measures to support transparent cost-effectiveness analysis.

By calculating avoided losses for each adaptation measure independently – and assessing the additional CAPEX and OPEX required to implement them – project proponents can optimise investment choices against the benefits accrued. This enables them to:

- Prioritise investments based on the cost-benefit performance of individual measures.
- Adjust the adaptation package if project budgets or financing constraints evolve.
- Support transparent reporting under NAP, NDC, and IMF RSF commitments.

This structure ensures that economic metrics – Net Present Value (NPV), Economic Internal Rate of Return (EIRR), and Benefit–Cost Ratio (BCR) – transparently reflect how adaptation measures create value by avoiding losses, sustaining asset utility, and improving economic returns under the projected climate pathway.

Figure 1 illustrates how the findings of climate risk and adaptation assessments from CARA inform a structured economic appraisal of adaptation measures. It shows the stepwise progression from establishing a “without-adaptation” baseline, through the assessment of individual adaptation measures, to the preparation of an integrated adaptation package that can be compared transparently against the baseline. The final outputs provide a consistent, evidence-based input into the overall project economic analysis, ensuring that adaptation investments are justified, prioritised, and aligned with broader planning and financing requirements.

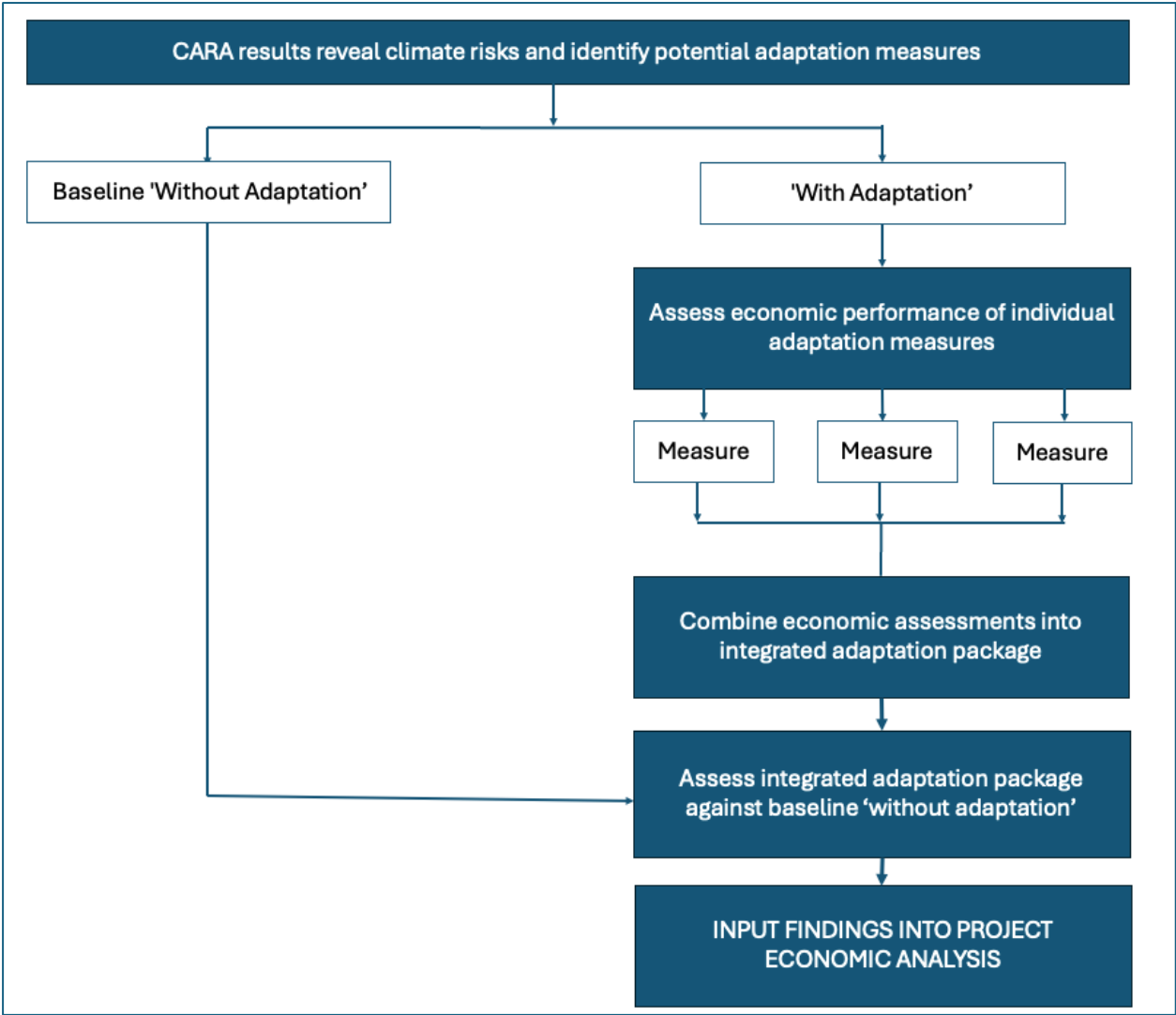


Figure 1: Flowchart for Economic Analysis for Adaptation Measures

Steps in the Economic Assessment of Adaptation Measures

Figure 2 shows the steps to that build the causal pathway from climate hazards through vulnerability and exposure to estimated economic losses, enabling transparent and evidence-based selection of adaptation measures. Each step supports the systematic evaluation of economically justified adaptation measures.

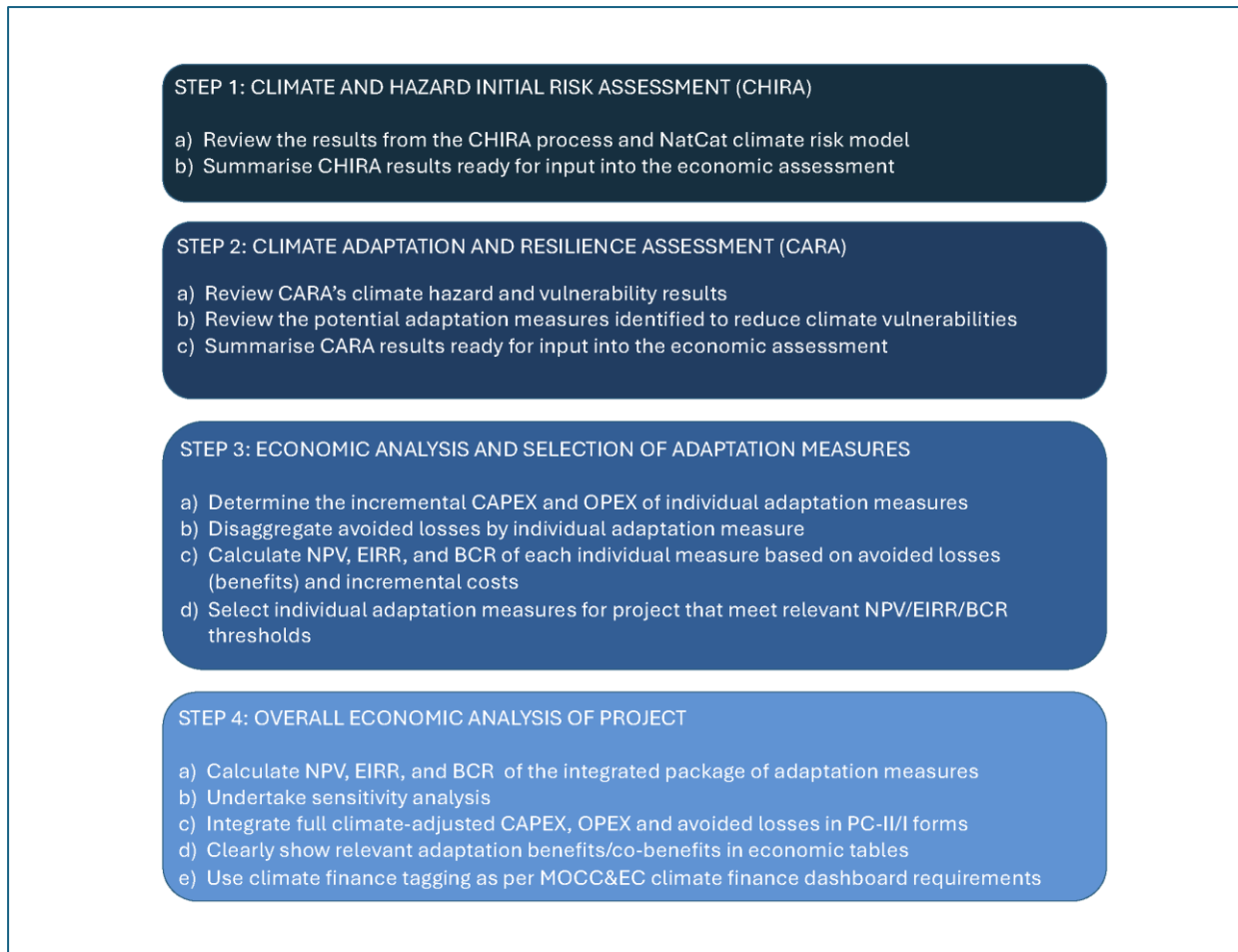


Figure 2: Stepwise Workflow for Climate Change Adaptation Economic Assessment

Step 1: Climate and Hazard Initial Risk Assessment (CHIRA)

STEP 1: CLIMATE AND HAZARD INITIAL RISK ASSESSMENT (CHIRA)

- a) Review the results from the CHIRA process and NatCat climate risk model
- b) Summarise CHIRA results ready for input into the economic assessment

Figure 3: Climate and Hazard Initial Risk Assessment (CHIRA)

Review the results from CHIRA, powered by the NatCat climate risk model, which was used to screen all projects for climate hazard exposure, vulnerability, and climate risk. Projects flagged as medium/high risk must proceed to CARA and subsequent economic assessment. Summarise the CHIRA results, including the CHIRA rating, identified key hazards, and geographic/sectoral context.

Step 2: Climate Adaptation and Resilience Assessment (CARA)

STEP 2: CLIMATE ADAPTATION AND RESILIENCE ASSESSMENT (CARA)

- a) Review CARA's climate hazard and vulnerability results
- b) Review the potential adaptation measures identified to reduce climate vulnerabilities
- c) Summarise CARA results ready for input into the economic assessment

Figure 4: Climate Adaptation and Resilience Assessment (CARA)

Summarise the CARA findings that are relevant for the economic assessment, noting that the scope and depth of the CARA will have been tailored to the project's scale, complexity, and climate vulnerability.

Carefully review the full set of adaptation measures identified through the CARA. Each measure should be considered as a discrete, stand-alone option so it can be taken forward into the economic analysis (Step 3). This ensures that decision-makers can compare options transparently and select the adaptation measures that are economically justified and aligned with project objectives.

Step 3: Economic Analysis and Selection of Climate Adaptation Measures

STEP 3: ECONOMIC ANALYSIS AND SELECTION OF ADAPTATION MEASURES

- a) Determine the incremental CAPEX and OPEX of individual adaptation measures
- b) Disaggregate avoided losses by individual adaptation measure
- c) Calculate NPV, EIRR, and BCR of each individual measure based on avoided losses (benefits) and incremental costs
- d) Select individual adaptation measures for project that meet relevant NPV/EIRR/BCR thresholds

Figure 5: Economic Analysis and Selection of Climate Adaptation Measures

Determine the incremental CAPEX and OPEX costs of each adaptation measure. This involves isolating the additional investment needed beyond the project's baseline design and identifying any ongoing operational or maintenance requirements introduced by the adaptation intervention. These adaptation measures may include structural measures, such as increasing the height of flood embankments, or non-structural measures, such as early warning systems or nature-based solutions. Clearly documenting these incremental costs is essential for the cost-benefit analysis in the next step and supports transparent justification of proposed adaptation measures.

Estimate Expected Annual Losses (EAL) under the 'without adaptation' scenario and the avoided losses achieved 'with adaptation' for each individual adaptation measure. This requires analysing how climate hazards assessed in CARA translate into physical damage, service disruption, and long-term performance impacts on assets and systems. Assessments should capture not only asset-level effects but also system-wide impacts, ensuring that the broader societal and economic benefits of the adaptation measure are reflected. For each adaptation measure, assess:

- **A lifecycle cost baseline** for the 'without adaptation' scenario that reflects the full project lifetime, allowing comparison with the improved performance and reduced losses achieved under the adapted scenario.
 - **Direct asset damage**, including repair and replacement costs from hazards events (e.g., flood inundation or heat-related pavement degradation).
 - **Indirect losses** relevant to the project, such as service downtime, productivity loss, and foregone revenue for users and operators.
 - **Maintenance cost escalation** driven by increased climate stress, such as more frequent regrading of roads or accelerated wear of drainage infrastructure.

Developing these EAL and avoided-loss estimates provides the core evidence for comparing the economic performance of the adaptation options in the subsequent step.

Calculate relevant economic metrics for the project, including NPV, EIRR and BCR for each adaptation measure. These metrics should be based on the comparison of

the avoided losses (benefits) and incremental CAPEX and OPEX of each adaptation measure. Applying these metrics to each measure individually helps establish a consistent, transparent basis for comparing adaptation alternatives and identifying the most efficient allocation of resources for maximum benefit

Engage with the project team the adaptation measures for the project with respect to relevant NPV/EIRR/BCR thresholds used by the Planning Commission and development partners. Some individual adaptation measures may be economically justified on a stand-alone basis – showing a positive NPV, acceptable EIRR, or BCR >1 – while others may perform more poorly. This analysis enables the project team to:

- Identify which measures deliver the strongest economic case for inclusion.
- Combine measures into an optimised package where the overall benefits to the project exceed the costs, even if some individual interventions perform less strongly.
- Exclude or redesign measures that consistently underperform relative to economic thresholds.
- Provide transparent, evidence-based justification for adaptation investments during PC-I review and financing discussions, both within the Government and with development partners.

By using these economic metrics systematically, teams can build a robust, defensible rationale for integrating climate adaptation measures into the final project design and financing strategy, through to the final step of the assessment.

Step 4: Overall Economic Analysis of Project

STEP 4: OVERALL ECONOMIC ANALYSIS OF PROJECT

- a) Calculate NPV, EIRR, and BCR of the integrated package of adaptation measures
- b) Undertake sensitivity analysis
- c) Integrate full climate-adjusted CAPEX, OPEX and avoided losses in PC-II/I forms
- d) Clearly show relevant adaptation benefits/co-benefits in economic tables
- e) Use climate finance tagging as per MOCC&EC climate finance dashboard requirements

Figure 6: Overall Economic Analysis of Project

The final step of the analysis is to integrate the climate-adjusted analysis into the project's overall economic evaluation. This requires combining the full set of adaptation-related incremental CAPEX and OPEX as well as the avoided losses generated by the selected measures with the baseline ('without adaptation') economic assessment of the project.

The resulting analysis is the 'integrated adaptation scenario' which reflects the combined package of individual adaptation measures selected in Step 3. This scenario is used to:

- Calculate NPV, EIRR, and BCR for the full adapted project by incorporating avoided losses and incremental CAPEX/OPEX baseline economic model. This demonstrates how the adaptation package influences overall project viability and helps confirm compliance with relevant Government and development partner thresholds.
- Apply sensitivity analysis to test the robustness of results under key uncertainties – such as across CHIRA/CARA climate-scenarios, changes in discount rate, assumptions about asset lifespan and degradation, and different damage costs or service disruption. Sensitivity testing ensures that the integrated adaptation scenario remains economically defensible under a range of plausible future conditions and strengthens the credibility of the final economic justification.

The economic appraisal summary for inclusion in the TFS/PC-I and/or climate finance proposal should:

- Present both baseline ‘without adaptation’ and integrated ‘with adaptation’ scenarios under SSP2-4.5, clearly showing how climate risks influence project performance and how the adaptation package improves asset resilience, service continuity, and long-term economic returns.
- Highlight the incremental adaptation CAPEX, OPEX, and avoided losses associated with the integrated project design. This should include a short narrative explaining how adaptation influences lifecycle costs, asset durability, system-wide performance, and co-benefits.
- Present the net economic gain – NPV, EIRR, and BCR – for the adapted project. noting whether the full project meets Government economic viability thresholds and development-partner requirements. Where useful, include a side-by-side comparison of metrics for ‘with adaptation’ and ‘without adaptation’.
- Acknowledge that actual climate impacts may differ from SSP2-4.5 projections based on future emissions trajectories and climate system responses. Sensitivity analysis should be summarised to demonstrate the robustness of economic performance across a range of plausible futures.
- Tag adaptation-related costs for potential climate finance mobilization, specifying which measures qualify under different climate Measure Examples available from multi-lateral and bi-lateral development partners. This helps strengthen the case for concessional financing and aligns with Pakistan’s climate-finance mobilisation strategy.
- Use climate finance tagging as per the MOCC&EC climate finance dashboard, ensuring consistency with Pakistan’s reporting framework while keeping the core investment decision anchored in integrated economic metrics (NPV/EIRR/BCR). Climate-finance tagging should be used to support financing discussions, not as the primary determinant of adaptation measure selection.

Templates & Checklists

These templates are provided to help summarise the adaptation analysis in a clear and standardised format, enabling integration into the project’s overall economic assessment. Their use is at the discretion of the project proposer. However, project teams may find them valuable when preparing the TFS, particularly for presenting avoided-loss estimates, incremental adaptation costs, and the supporting rationale in a manner consistent with the CARA/CMA framework. The templates also strengthen the clarity and auditability of adaptation logic, which is increasingly important for securing climate finance from development partners and international funds.

Template 1: CARA Economic Appraisal Summary

Item	Details
Project Name & Location	[]
Sector	[]
Project Lifespan (Years)	[XX]
CHIRA Risk Rating (NatCat Assessment)	[Medium/High] - based on exposure, hazard severity, and vulnerability profile
Key Climate Hazards	[Riverine flood, flash flood, drought, extreme heat, GLOFs etc.]
Baseline EAL (Without Adaptation) – SSP2-4.5	[PKR XX] including direct, indirect, maintenance-related, and system-level losses
CARA Summary	[Concise narrative of key vulnerabilities, exposure hotspots, and potential adaptation measures]
Integrated Adaptation Package	[Narrative describing the combined set of adaptation measures chosen in Step 3; structural, non-structural, NbS etc., justification for inclusion]
Incremental Adaptation CAPEX	[PKR XX] - additional capital required beyond baseline design
Incremental Adaptation OPEX	[PKR XX/year] - additional operational and maintenance requirements
Annual Avoided Losses (by measure) – SSP2-4.5	
Adaptation Measure 1:	[PKR/Year XX]
Adaptation Measure 2:	[PKR/Year XX]
Adaptation Measure 3:	[PKR/Year XX]
Adaptation Measure X:	[PKR/Year XX]
Total Avoided Loss – SSP2-4.5	[PKR/Year XX]
NPV (Integrated Adaptation Scenario SSP2-4.5)	[PKR XX]
EIRR (Integrated Project)	[% ,]
BCR	Ratio
Sensitivity Analysis Summary	[Discount rate range, damage cost multipliers, hazard intensity shifts, asset lifespan variations; results remain within acceptable thresholds]
Climate Uncertainty Note	Actual impacts may be more, or less, severe depending on future emissions and climate system responses; design incorporates resilience margins.
NAP/NDC Alignment	[Brief summary of alignment with national adaptation priorities; incorporation of climate-resilient design standards; support for national reporting]
Climate Finance Potential	[Summary of adaptation measures eligible for multi-lateral and bi-lateral financing windows]
Climate Finance Tagging (MOCC&EC Framework)	[Adaptation expenditures tagged in line with the Pakistan Climate Finance Dashboard; tagging supports finance

Item	Details
	mobilisation but economic decision is based on integrated NPV/EIRR/BCR.]

Template 2: Example Sector-Specific Table

Sector	Hazard	Vulnerabilities Addressed	Adaptation Design Measure	Baseline Loss (Without Adaptation)	Incremental Adaptation CAPEX	Avoided Loss/ year	Incremental Adaptation OPEX/year	BCR	Rationale
Transport	Flood	Low-lying road segments frequently inundated during monsoon season. Undersized or blocked culverts causing localised washouts. Weak embankment materials and insufficient slope protection. Lack of flood early warning communication for maintenance crews.	Raised embankment. Redesign drainage culverts. Early warning systems.	PKR XXX	PKR XXX	PKR XXX	PKR XXX/yr	Ratio	Fewer closures/repairs.
Water	Drought	High seepage losses from unlined canals. Reduced irrigation water availability during dry spells. Decline in crop yields due to unreliable irrigation.	Canal lining.		PKR XXX	PKR XXX			Preserves yields.

Notes:

- **Baseline Loss (Without):** Estimated annual loss for the specific asset or system in the 'without adaptation' scenario, under SSP2-4.5. This includes direct asset damage, indirect losses from service downtime, increased maintenance needs due to climatic stress, and system-wide socio-economic impacts identified through CHIRA/CARA.
- **Avoided Loss (With Adaptation):** Difference between baseline losses and residual losses after applying adaptation measures. For an integrated adaptation package, the total avoided losses should capture synergistic system-wide benefits.
- **Incremental CAPEX/OPEX:** Additional capital and operational costs required to implement each adaptation measure beyond the baseline design.
- **BCR Calculation:** $[\text{Avoided Loss (NPV)} / \text{Incremental CAPEX} + \text{OPEX (NPV)}]$. $\text{BCR} \geq 1.0$ indicates cost-effectiveness. Where measures fall below this threshold individually, they may still contribute value as part of an optimised multi-measure package.

Template 3: Economic Appraisal Summary – Integrated Adaptation Package

Metric	Without Adaptation (Baseline, S0) – SSP2-4.5	With Integrated Adaptation (S1) – SSP2- 4.5
Expected Annual Loss (EAL)	XXX PKR/year	XXX PKR/year
Total Lifecycle Loss (NPV, 25 yr @ 9% DR)	PKR XXX	PKR XXX
Annual Avoided Loss	-	PKR XXX/year
Total Avoided Loss (NPV)	-	PKR XXX
Incremental Adaptation CAPEX	-	PKR XXX
Incremental Adaptation OPEX (NPV)	-	PKR XXX
Total Incremental Adaptation Cost (NPV)	-	PKR XXX
Net Adaptation Benefit (NPV)	-	PKR XXX
NPV (Project with Adaptation)	-	PKR XXX
Overall Project NPV	PKR XXX (may fall below threshold due to unmitigated climate risk)	PKR XXX (climate-adjusted, incorporating avoided losses and incremental costs)
EIRR	N/A (climate impacts undermine viability)	XX %
BCR	—	Ratio (≥1.0 indicates cost-effectiveness)
Recommendation	Not viable under SSP2-4.5 climate; project fails due to escalating climate risks that significantly reduce service life, increase lifecycle costs, and lower economic returns.	Summary of how adaptation package is economically justified; integrated measures reduce losses, enhance service reliability, and restore project viability under SSP2-4.5.

Metric	Without Adaptation (Baseline, S0) – SSP2-4.5	With Integrated Adaptation (S1) – SSP2-4.5
Climate Uncertainty Caveat	Actual climate impacts may be more or less severe than SSP2-4.5 projections depending on future global emissions trajectories and responses of the climate, land, ocean, and ice systems.	Actual avoided losses may differ; accordingly, design incorporates resilience margins and sensitivity analysis informed by CHIRA/CARA multi-scenario exploration (incl. SSP2-4.5 and SSP5-8.5).

Figure 7 below shows the relevant excerpt regarding the information that needs to be included in the analysis. A summary of this economic analysis of climate adaptation aspects should be provided in the 'Technical Feasibility Study' and PC-I templates to demonstrate the due diligence undertaken and methodology used.

<p>Financial/Economic Analysis (with assumptions)</p> <p><u>Financial analysis</u></p> <ol style="list-style-type: none"> Quantifiable output of the project Profit and loss account and cash flow statement Net present value (NPV) and benefit cost ratio (BCR) Internal financial rate of return (IFRR) Unit cost analysis Break even Point (BEP) Payback period Return on equity (ROE) <p><u>Economic & Social benefit analysis</u></p> <ol style="list-style-type: none"> Provide taxes & duties separately in the capital and operating cost Net present value (NPV) and benefit cost ratio (BCR) Internal economic rate of return (IERR) Foreign exchange rate of the project (Bruno's Ratio) for import substitute and export-oriented projects Unit cost analysis Break-even Point (BEP) Poverty alleviation

Figure 7: Excerpt from PC-I Template Heading 11: Benefits of the project and analysis

Costs associated with climate adaptation measures of the project should also be reported as climate finance in the relevant part of the PC-I Template, see Figure 8, below.

<p>iv. Climate related share of project investment</p> <p>Indicate amount allocated for:</p> <table border="1"> <thead> <tr> <th>Adaptation</th> <th>Mitigation</th> <th>Co-benefits</th> <th>Total</th> </tr> </thead> <tbody> <tr> <td> </td> <td> </td> <td> </td> <td> </td> </tr> </tbody> </table>	Adaptation	Mitigation	Co-benefits	Total				
Adaptation	Mitigation	Co-benefits	Total					

Figure 8: Excerpt from PC-I Template Heading 10: Financial Plan (subheading iv)

Worked Example

A new road is proposed as a city bypass to alleviate urban traffic and congestion. The road will be 25 kilometres long and developed on a greenfield site. Traffic modelling indicates that travel time will be substantially reduced for both journeys within the city and for vehicles transiting through. The project is anticipated to have a lifespan of 25 years.

The Project Cost estimate is **PKR 8.85 billion with an annual OPEX of PKR 15 million**. The economics of the project are being assessed using a 9% discount rate.¹¹

The proposed bypass includes a new river crossing and segments along low-lying floodplains that have frequently flooded in the past. With climate change, the new road will face heightened flood risk and potential riverbank erosion. The CHIRA screening using the NatCat climate risk model classified the project as medium-to-high risk due to multiple hazards, triggering a detailed CARA and a rigorous economic assessment.

By 2050, climate projections from the NatCat model indicate that rainfall intensity and variability are expected to increase significantly, especially during the monsoon season. The models suggest that:

Rainfall and Flood Projections

- Extreme precipitation events are expected to rise by **10–20%** by mid-century.
- Monsoon rainfall intensity and variability are increasing significantly.
- Flood return periods are reducing from historical **5–7 years** to projected **3–4 years**.
- Projected inundation depths are increasing by **0.3–0.7 m** above historical levels.
- More frequent flash flooding and drainage system overload expected.

Riverbank Erosion

- Riverbank erosion rates projected to increase by **50–75%**.
- Lateral migration is accelerating at the bridge crossing site.
- Threatens bridge piers and approach embankments.

Temperature and Heat Stress

¹¹ Note that 9% is used for the purposes of this example. For government-funded projects, the discount rate is fixed by the Budget Wing of the Finance Division for the development loans and changes each year. Check with the Budget Wing for the current discount rate to apply to your project.

- Mean annual temperature expected to rise by **1.5–2.5°C**.
- Number of days exceeding 40°C projected to **double** (from ~30–40 days/year to 60–80 days/year by 2050).
- Accelerated pavement deterioration and substantially increased maintenance demands.

Without adaptation, the project will likely become severely economically compromised, with substantial recurring climate-related losses rendering it non-viable under projected future climate conditions.

The project team and their consultants are tasked with assessing the economics of individual adaptation measures and developing an optimised, integrated adaptation package.

In addition to risks along the river corridor, the project area lies within the downstream drainage catchment of a rapidly urbanising district that experiences recurrent surface flooding during monsoon events. Existing drainage infrastructure is undersized. Flooding in adjoining residential and commercial zones has caused repeated economic disruption—damaging roads, inundating properties, and blocking access routes to markets and public facilities. Historical records and municipal loss assessments indicate that average annual damages in the surrounding urban area are approximately **PKR 90 million per year**, a figure expected to rise as stormwater runoff intensifies with land-cover change and climate variability.

Adaptation Design Package

A single integrated adaptation design package was developed, but each measure within it was also assessed individually by the project team to evaluate its economic performance on its own merits. The package comprises three complementary measures, each sized and costed against SSP2-4.5 performance targets.

Measure 1: Reinforced Flood Protection Works

This measure consolidates elevated embankments, reinforced slope protection, and silt management into a single engineering-based intervention package. The combined measure directly addresses the dominant hazard pathway identified through the CHIRA/CARA process: increased flood frequency and severity leading to embankment overtopping, slope failure, and sedimentation in downstream channels.

The measure reduces both direct damages (embankment erosion, culvert blockages, slope instability) and indirect losses (road closure, traffic diversion, emergency repair mobilisation). Embankment elevation enhances the road's capacity to withstand higher projected water levels, while slope protection stabilises vulnerable cut/fill segments. Silt management—through debris traps, sediment basins, and channel maintenance—reduces the sediment load that contributes to downstream bottlenecks and drainage failure.

- **Design specification:** Embankments raised to withstand mid-century (2050) SSP2-4.5 flood projections. The elevation design also provides additional flood protection for a neighboring urban residential area that has experienced chronic flooding. Vegetated slope reinforcement and geotextile lining at river crossing; silt trap/pond to manage erosion and channel migration.
- **Incremental CAPEX:** PKR 600 million (additional fill, geotechnical reinforcement, construction management).
- **Incremental OPEX:** PKR 1.5 million/year (structural maintenance, silt clearance).
- **Rationale:** Protects road assets and minimises service closures under projected mid-century floods; provides a co-benefit of extra levels of flood protection for the neighboring urban population. Reduces asset loss from accelerated riverbank erosion; co-benefit of riparian ecosystem restoration and aquifer connectivity.

Measure 2: Blue-Green & Heat-Resilient Infrastructure System

This measure integrates blue-green infrastructure with heat-resilient pavement designs and shade-tree planting to respond to multiple climate stressors—stormwater surges, intensifying heat, drought, and urban heat island effects.

Blue-green elements such as rain gardens, bioswales, infiltration trenches, and multi-use vegetated buffers increase stormwater retention capacity and reduce surface flooding. These elements complement the hydrological objectives of Measure 1 by slowing runoff, decreasing sediment mobilisation, and providing additional storage during extreme rainfall events.

Heat-resilient pavements and roadside tree corridors mitigate asphalt deformation, reduce heat-induced maintenance cycles, and improve user comfort and safety. As a combined system, the measure provides ecological co-benefits – improved biodiversity, groundwater recharge, and air quality – while also enhancing social resilience. These features are also provide environmental, social, and gender co-benefits.

- **Design specification:** Vegetated swales and bioretention ponds along right-of-way; permeable pavement in select non-critical segments; enhanced culvert sizing for mid-century runoff peaks (SSP2-4.5). Light-colored, permeable asphalt and concrete in select areas; shade tree planting (native species) along carriageway and medians; lifecycle maintenance protocol accounting for projected heat stress changes.
- **Incremental CAPEX:** PKR 200 million (includes tree establishment, irrigation, and initial care).

- **Incremental OPEX:** PKR 3.0 million/year (Bioswales and recreational areas designed for managing runoff require maintenance to ensure public safety. Roadside vegetation needs active maintenance to prevent risks to traffic from falling trees or shedding limbs).
- **Rationale:** Reduces surface runoff volume and peak flow, lowering flood pressure on primary drainage; enhances aquifer recharge; reduces urban heat island; provides green space co-benefit, particularly beneficial for vulnerable populations and gender equity. Slows pavement deterioration under increased heat stress; reduces surface temperature; lowers lifecycle maintenance costs substantially; public health and gender co-benefits (improved safety, reduced heat morbidity, improved public access).

Measure 3: Real-Time Monitoring, Early Warning & Adaptive O&M System

This measure consolidates digital monitoring technologies, automated early warning, and adaptive operation and maintenance (O&M) protocols. It supplements structural and nature-based measures by improving preparedness, response time, and operational efficiency.

Real-time monitoring systems include sensors for rainfall, water level, slope movement, and pavement temperature. These feed a digital dashboard that allows project operators to anticipate failures, issue automated alerts, and mobilise maintenance teams before damage escalates.

Early warning systems also support downstream communities and road users by providing timely hazard alerts, reducing exposure during extreme events and limiting secondary economic losses associated with road closures and mobility disruption.

This measure is viewed by the project team as low-regret options that enhance system-wide resilience.

- **Design specification:** Embedded water-level sensors for flood detection; temperature and humidity sensors for heat-sensitive pavement performance; structural health monitoring to detect embankment settlement, erosion and early slope instability; telemetry units for live data transfer; and integrated emergency alert protocols linked to district administration, traffic police, and maintenance units. This configuration allows near-continuous situational awareness and supports proactive maintenance scheduling.
- **Incremental CAPEX:** PKR 100 million (sensors, data infrastructure, alert system, staff training).
- **Incremental OPEX:** PKR 0.5 million/year (data management, telecommunications, alert dissemination, system maintenance).
- **Rationale:** Provides continuous intelligence on flood, heat, and geotechnical conditions; allows rapid mobilisation of field teams before failures propagate;

significantly reduces emergency response time and unplanned service downtime; supports evidence-based scheduling of O&M; and generates long-term climate and hydrological datasets that strengthen adaptive management and inform future design upgrades. It also enhances public safety through reliable, real-time alerts to communities and road users.

Total Integrated Package:

- **Total Incremental CAPEX:** PKR 900 million (~10% above baseline design cost).
- **Total Incremental OPEX:** PKR 5.0 million/year.

Economic Appraisal Process

1. Baseline ‘Without Adaptation’ Scenario (S0)

The road is designed to without explicit adaptation measures. Under the projected SSP2-4.5 future climate, the CARA found that the asset faces escalating climate hazards:

Flood Damages (Direct and Indirect):

- Embankments and culverts designed for historic flood levels are insufficient for projected mid-century floods.
- Expected inundation depth during monsoon events is projected to increase, causing embankment erosion, culvert overtopping, and pavement saturation.

Service Downtime and Indirect Losses:

- Flooding causes multiple partial road closures per year until floodwaters recede, and damage assessment/repairs are completed.
- Diverted traffic burden on secondary routes; delayed goods transport; emergency/health service delays; tourism disruption.

Maintenance Cost Escalation (Heat Stress)

- Pavement deterioration accelerates due to projected changes in heat stress and thermal cycling (wet season followed by intense heat).

Riverbank Erosion and Structural Instability (Not Quantified Separately; Included in Direct Damage Above):

- Accelerated lateral bank migration threatens bridge piers and approach embankments.
- Residual loss captured in direct damage estimates (emergency stabilisation, repairs).

2. Integrated Adaptation Scenario – SSP2-4.5

The integrated adaptation package (all five measures) is implemented as specified above, with each measure designed to SSP2-4.5 performance targets. Economic benefit is calculated by disaggregating avoided losses by individual measure, accounting for inter-measure synergies.

Measure 1: Reinforced Flood Protection Works (with extra urban food damage reduction) – Avoided Loss (SSP2-4.5)

- Design specification: Embankments raised to match projected mid-century inundation depths. Elevation design provides extra protection to neighboring urban flood-prone areas.
- With elevated embankments, inundation is prevented except during the rarest extreme events.
- Vegetated slope reinforcement and geotextile lining; silt management.
- **Extra urban flood protection**
 - There is considerable urban damage reduction due to higher embankment elevation: (a significant portion of urban flooding is prevented by embankment elevation).
- **Total Avoided Loss (Measure 1): PKR 75 M/year** (35M road + 40M extra urban protection).
- Incremental CAPEX: PKR 600 M.
- Incremental OPEX: PKR 1.5 million/year (structural maintenance, silt clearance).

Measure 2: Blue-Green & Heat-Resilient Infrastructure System – Avoided Loss (SSP2-4.5)

- Design specification: Vegetated swales, rain gardens, permeable pavements, enhanced culverts.
- Cool/permeable pavements, shade tree planting. Under projected heat stress changes (increased heat stress days), pavement deterioration is accelerated. Cool/permeable pavements will show slower deterioration under heat stress; tree shade provides additional cooling (and mitigation co-benefits).
- Baseline runoff and drainage issues (without adaptation measures): Traditional drainage systems designed based on historical rainfall patterns. Under SSP2-4.5, increased rainfall causes culverts to become undersized; surface runoff overwhelms local drainage, leading to localised urban flooding in low-lying areas.

- Residual drainage loss (with blue-green infrastructure): Runoff volume is reduced through infiltration and retention; peak flow is attenuated; culvert capacity is improved.
- **Avoided Drainage and Runoff Loss: PKR 25 M/year.**
- Incremental CAPEX: PKR 200 M.
- Incremental OPEX: PKR 3.0 M/year (swale/garden vegetation maintenance, sediment removal, infiltration system inspection).
- **Benefit–Cost Ratio: 1.1 (cost-effective).**

Measure 3: Monitoring & Early Warning – Avoided Loss (SSP2-4.5)

- Design specification: Real-time water level, temperature, structural sensors; alert protocols.
- Real-time alerts enable rapid emergency response and reduced service downtime.
- **Avoided Service Downtime Loss: PKR 7 M/year.**
- Incremental CAPEX: PKR 100 M.
- Incremental OPEX: PKR 0.5 M/year (monitoring operations).
- **Benefit–Cost Ratio: ~0.66 (not cost-effective).**

Assessment of Individual Measure Performance

The project team’s stand-alone economic appraisal of each adaptation measure determined their ‘stand alone’ viability, independent of the integrated package. Measures 1 and 2 demonstrate strong cost-effectiveness under SSP2-4.5 conditions, with avoided losses that clearly justify their incremental investment costs. In contrast, Measure 3 does not achieve a positive benefit–cost ratio when assessed individually, reflecting the relatively modest scale of avoided service-downtime losses compared with its capital and operational requirements.

This creates a decision point for the project team. One option is to exclude Measure 3 on efficiency grounds. Alternatively, the team may choose to retain it within the integrated adaptation package if its inclusion can be justified based on synergistic system-wide benefits – particularly its contribution to operational reliability, faster recovery during extreme events, and improved performance of the structural and nature-based measures. If these cross-measure interactions materially enhance the resilience dividend of the overall package, retaining Measure 3 may be defensible despite its stand-alone economic performance.

3. Aggregated Avoided Loss – Integrated Package

Summing individual measure avoided losses:

- Measure 1 (Reinforced Flood Protection Works ~35 M/Yr for road and ~40 M/Yr for flood loss reduction for neighboring urban area): PKR 75 M/year
- Measure 2 (Blue-Green & Heat-Resilient Infrastructure System): PKR 25 M/year
- Measure 5 (Real-Time Monitoring, Early Warning & Adaptive O&M System): PKR 7 M/year
- **Sum:** PKR 107 M/year

4. Economic Metrics – Integrated Adaptation, SSP2-4.5, 9% Discount Rate

Incremental Adaptation Costs:

- Total Incremental CAPEX: PKR 900 M.
- Total Incremental OPEX: PKR 5 M/year, or **PKR 48.8 M (NPV over 25 years at 9% discount rate)**.
- **Total Incremental Cost (NPV): PKR 900 M + PKR 48.8 M = PKR 948.76 M.**

Net Adaptation Benefit (SSP2-4.5, 9% DR):

Avoided Loss (NPV) – Incremental Cost (NPV) = PKR 1051 M – PKR 754 M = 297M (cost-effective).

The integrated package achieves **BCR = 1.39**, indicating **cost-effectiveness at 9% discount rate**. The project is justified for the following reasons:

1. **Service Sustainability:** Without adaptation, the baseline scenario results in projected lifecycle climate-related losses of approximately PKR 1,660 million (NPV at a 9% discount rate), leaving both the road corridor and adjacent urban areas economically and functionally vulnerable. With the integrated adaptation measures in place, residual losses decline sharply to around PKR 609 million (NPV) - an improvement in project viability of roughly PKR 1,051 million relative to the unadapted baseline. This demonstrates that the adaptation investment not only preserves asset functionality but also enhances the long-term service sustainability and resilience of the transport system.
2. **Strategic Alignment & Policy Commitment:** The project is consistent with Pakistan's National Adaptation Plan (NAP) and Nationally Determined Contribution (NDC) commitments to develop climate-resilient infrastructure. It also supports the objectives of the IMF Resilience and Sustainability Facility (RSF) by incorporating climate-adjusted appraisal and investment planning within the project design framework.
3. **Co-Benefits & Social Value:** The adaptation package generates multiple co-benefits, including enhanced ecosystem services (aquifer recharge and riparian restoration), public health gains (reduced heat-related morbidity and improved

mobility), urban flood protection spillovers, and equity improvements through safer, greener public spaces. These benefits extend the project’s social and environmental value well beyond the scope of the direct economic analysis.

4. **Climate Finance Eligibility:** The incremental adaptation CAPEX (PKR 900 M) is eligible for concessional climate finance from international climate finance institutions. Securing the costs of adaptation investments through concessional financing will substantially improve the project's financial viability and net benefits.
5. **Urban Resilience Benefits:** The integrated suite of adaptation measures—including elevated embankments, improved drainage, blue–green infrastructure, and slope protection—provides an estimated PKR 40 million per year in avoided flood damage to adjacent urban areas. This system-wide benefit underscores how the combined design elements deliver co-benefits beyond direct road protection, reinforcing the overall economic justification for the investment.

Economic Metrics:

Metric	Value	Interpretation
Avoided Loss (NPV, 9% DR)	PKR 1,051M	Lifecycle damage reduction achieved by adaptation measures (SSP2-4.5 scenario)
Incremental Cost (NPV, 9% DR)	PKR 754 M	Total additional CAPEX and OPEX for adaptation
Net Adaptation Benefit (Direct)	PKR 297 M (positive)	Net benefit of adaptation; project remains economically viable with avoided losses exceeding incremental costs.
EIRR (Adaptation Value)	~ 10.4%	Internal rate of return on incremental adaptation investment exceeds 9% threshold
BCR (Avoided Loss / Incremental Cost)	1.39	Cost-effective @ 9% discount rate; benefits exceed costs
Project Viability Improvement (vs. without)	PKR 1,051 M	Improvement in lifecycle viability: baseline NPV of losses = 1,660 M; with adaptation = 609 M.
Urban Spillover Benefit (PKR 40M/year)	~ PKR 340 M (NPV)	Additional benefit to neighboring urban area from enhanced flood protection.

Reporting & Climate Finance Tagging

PC-I Summary (Government Planning):

The project's adaptation component demonstrates clear eligibility for international climate finance, combining economic viability with measurable resilience outcomes. The integrated package yields a lifecycle avoided loss of PKR ~1.1 billion (NPV) against an incremental cost of PKR ~0.9 billion, producing a BCR of 1.39 at a 9 % discount rate. These results confirm that the adaptation investments deliver tangible risk-reduction benefits and align with the Adaptation Fund, Green Climate Fund (GCF), and IMF Resilience and Sustainability Facility (RSF) criteria for climate-aligned infrastructure financing.

Component	Value	Climate Finance Potential
Total Project Cost (with adaptation)	PKR 9.75 billion	—
Baseline Design Cost (without adaptation)	PKR 8.85 billion	—
Incremental Adaptation CAPEX	PKR 0.9 billion	Adaptation Fund, GCF, IMF RSF, ADB Concessional
Adaptation as % of Baseline Project Cost	10.2%	—
Baseline EAL (SSP2-4.5)	PKR 169 M/year	Averted by integrated adaptation package (road + urban flooding)
Avoided Loss (Lifecycle, SSP2-4.5, 9% DR)	PKR 1,051 M	Justification for adaptation investment
Residual EAL (with adaptation)	PKR 47 M/year	Remaining climate risk after measures – including regional urban flood risk
EIRR (Adaptation Component)	~10.4%	Meets strategic threshold
BCR (Adaptation Component)	1.39	Cost-effective at 9% discount rate; positive net benefit.

Climate Finance Proposal Framing:

The project provides strong economic and strategic justification for scaling climate-resilient infrastructure in Pakistan. By investing in an integrated suite of adaptation measures—costing PKR 0.9 billion in incremental CAPEX (approximately 10.2 % of total project cost)—the project achieves cost-effectiveness with a BCR of 1.39 at a 9 % discount rate, while avoiding approximately PKR ~1.1 billion in lifecycle climate-

related losses under the SSP2-4.5 scenario. The combined interventions—including elevated embankments, improved drainage, slope protection, and blue–green infrastructure—also provide co-benefits to adjacent urban areas, yielding an estimated PKR 40 million per year in additional avoided flood damages.

Key opportunities for climate finance:

- Cost-effective at a 9 % discount rate (BCR = 1.39), confirming the economic viability of the adaptation investment.
- Enhances project viability by approximately PKR 1.1 billion (NPV) compared with the unadapted baseline.
- Delivers significant system-wide benefits, including avoided urban flood damages of about PKR 40 million per year.
- Fully aligned with international climate finance criteria, supporting eligibility under the Adaptation Fund, GCF, and IMF RSF.
- Strengthens multi-hazard resilience, addressing flood, erosion, heat, and service-continuity risks in an integrated manner.
- Generates broad co-benefits, such as enhanced ecosystem services, improved public health, gender and social equity outcomes, and stronger regional connectivity.

The project is recommended for approval.

Frequently Asked Questions (FAQs): Economic Assessment of Adaptation Projects

The following FAQs address common questions that arise when conducting economic assessments of adaptation measures during project preparation for approval. They clarify methodological steps, support consistent application of the Annex, and help project teams translate CHIRA and CARA results into robust economic appraisals.

For further guidance or case-specific technical advice, project teams should consult experts within MoPDSI and the Planning Commission, including those responsible for economic appraisal standards and climate-related assessments, as well as any formally notified support mechanisms.

A. Purpose and Scope

How does this Annex relate to the Manual and CHIRA/CARA?

It operationalises risk information generated through CHIRA and CARA, ensuring alignment with PC-II and PC-I processes.

Who is expected to use this Annex?

Those preparing project proposals, including line ministries, Planning Commission reviewers, consultants, and development partners.

When is economic analysis of adaptation required?

For all projects flagged by CHIRA as medium- or high-risk and therefore requiring a CARA.

B. Economic Metrics and Methodology

What is Expected Annual Loss (EAL)?

A monetised estimate of average annual climate-related damages and disruptions.

How do NPV, EIRR and BCR apply?

They summarise projected avoided losses relative to incremental CAPEX and OPEX from adaptation investments.

What discount rate should be used?

For government-funded projects, the discount rate is fixed by the Budget Wing of the Finance Division for the development loans and changes each year. Check with the Budget Wing for the current discount rate to apply.

How should measures with $BCR < 1$ be treated?

They may still be included when essential for integrity, safety, system resilience, or where significant qualitative co-benefits exist.

How can double-counting be avoided?

Use clear S0 baselines, incremental estimation, and transparent documentation of interactions among measures.

C. With- and Without-Adaptation Scenarios

What is the 'without adaptation' scenario (S0)?

A projection of future climate losses if only traditional design standards are applied.

What is the 'with adaptation' scenario (S1)?

The integrated adaptation package designed to meet climate resilience objectives.

Why one integrated package?

It reflects real project design optimisation rather than producing multiple full variants.

D. Climate Scenarios and Uncertainty

What are CHIRA and CARA, and why are both needed?

CHIRA screens climate risk; CARA provides detailed assessment. The Annex translates both into economic metrics.

Why use SSP2-4.5 and SSP5-8.5?

They align with CHIRA/CARA and provide an intermediate and high-emissions basis for economic appraisal.

How does the Annex treat climate uncertainty?

By using multiple scenarios, sensitivity testing, and explicit uncertainty caveats.

E. Data, Capacity and Sector Application

What if data are limited?

Teams may rely on NatCat outputs or other credible sources, CHIRA/CARA results, sector norms, conservative assumptions, and sensitivity tests.

Is the Annex only for transport?

No. Although the example is a road bypass, the Annex applies across all sectors.

What technical capacity is needed?

Economic appraisal skills, climate risk interpretation, and expert judgement relevant to the project.

How should non-market and distributional benefits be handled?

Monetise where feasible and complement with qualitative descriptions such as public health, gender and equity, safety, and ecosystem services.

F. Templates and Reporting

How should templates be used?

Templates 1–3 create a consistent audit trail from risk screening to economic justification.

How should results be reported in PC-I?

Show S0 and S1 economics, incremental costs, avoided losses, and uncertainty analysis.

How does climate finance tagging relate?

Tagging tracks expenditure, but economic metrics determine the justification for adaptation investments.

G. International Alignment and Climate Finance

How does this support IMF RSF and international commitments?

It strengthens climate-informed public investment and supports Pakistan's alignment with IMF RSF reform commitments and access to climate finance.

H. Additional Literature and Research Resources

Where can project teams find additional technical literature and guidance?

Teams seeking deeper technical grounding should consult three categories of resources:

1. Government-issued guidance:

- The Manual for Development Projects and the Climate Risk Screening Handbook.
- Any future CHIRA and CARA methodological notes and updates from MoPDSI.
- Relevant notifications, circulars, and technical advisories from the Planning Commission.

2. International best-practice literature:

- Asian Development Bank's (ADB) guidance on adaptation and resilience project preparation.

- World Bank guidance, including Climate and Disaster Risk Screening Tools, CHIRA/CARA analogues, and sector adaptation economics.
- IPCC AR6 Working Group II (Impacts, Adaptation and Vulnerability).
- OECD analyses on adaptation economics and cost–benefit approaches.

3. National support structures:

Because literature alone cannot fully resolve case-specific questions, project teams should also consult the Planning Commission’s economic appraisal experts and any formally notified technical facilities that support ministries and executing agencies. These experts provide authoritative interpretation, ensure alignment with national procedures, and help strengthen the credibility of project submissions.

Annex IX – Economic Analysis of Climate Change Mitigation Measures and Social Cost of Carbon

Rationale

Why integrate climate change mitigation measures and associated economic analysis into project development?

The development of projects aimed at reducing greenhouse gas (GHG) emissions, together with the integration of climate change mitigation measures into national and provincial initiatives, is essential to ensure that public investments foster long-term, resilient, and sustainable growth. Such an approach safeguards against the entrenchment of outdated, high-emission technologies that may expose the country to significant transition risks in the future. Benefits include:

1. **Resilient and future-proof growth:** Mitigation measures promote resource efficiency, energy savings, and inclusive growth, helping to secure sustainable economic development.
2. **Access to climate finance:** When well-justified, integrating mitigation measures can help unlock concessional funding and international support from sources such as the GCF and development partners.
3. **Improved project viability:** Low-carbon design and efficient technologies help reduce operating costs and enhance overall economic performance.
4. **Alignment with national policy goals:** Climate-smart projects that include mitigation measures directly support national objectives such as Pakistan's Nationally Determined Contribution (NDC), thereby strengthening the project's strategic and policy justification.
5. **Reduced transition and investment risk:** Investments including mitigation measures help avoid potential stranded assets and enhance investor confidence in a low-carbon transition.
6. **Social and environmental co-benefits:** Many mitigation measures deliver additional local benefits, including cleaner air, improved health outcomes, and job creation.
7. **Enhanced leadership and investment attractiveness:** Demonstrating commitment to emission reduction reinforces national leadership on climate action and can attract green and foreign investment.

Conducting an economic analysis of the 'social cost of carbon' and other climate mitigation measures enables decision-makers to identify, quantify, and integrate the net costs and benefits of such actions into the overall project economic assessment. This approach ensures a comprehensive evaluation of both the financial and

developmental value of climate-responsive investments, thereby strengthening the basis for informed and sustainable policy and investment decisions.

This supplementary guidance supports project developers in assessing the economic impacts of project-related greenhouse gas (GHG) emissions and in evaluating the cost–benefit of climate change mitigation measures aimed at enhancing the overall economic viability and sustainability of projects

Context

The ‘Manual for Development Projects’ and annexed ‘Handbook on Climate Risk Screening for Policy Planning’ establish the overall process for project due diligence on climate change. Project information developed through this process is reported to the Ministry of Planning, Development, and Special Initiatives (MOPDSI) through the PC-II and PC-I templates. From a climate mitigation perspective, the ‘Climate Mitigation Assessment’ (CMA) is the primary process to determine a project’s GHG emissions¹² compared to a baseline scenario¹³. Through this process, climate mitigation options are also developed (where relevant) to determine how project emissions can be minimised. Finally, the costs and co-benefits of mitigation measures are assessed (6.4: Identifying Mitigation Options) to justify their inclusion (or exclusion).

Projects undergoing the CMA may require two types of economic assessment:

1. **Analysis of cost/benefit of climate mitigation measure(s) which could be included in the project.** This includes identifying relevant measures (as part of the CMA), determining incremental CAPEX, OPEX and the economic benefits associated with each measure (including the social cost of carbon), and developing economic indicators for each measure.
2. **Analysis of the social cost of carbon for the entire project, to be included in the overall economic evaluation.** Estimating the annualised social cost of carbon for the entire project, including any identified mitigation measures, for inclusion in the overall economic analysis within the PC-II/PC-I processes.

This guidance complements the CMA by facilitating a detailed economic analysis of climate change mitigation measures, including their associated benefits and the project’s overall social cost of carbon. Figure 1 below outlines the steps and analytical flows, which are explained in the following Section. It is important to note that projects that do not consider including climate mitigation measures (i.e. Step 2) in a project (where potentially relevant) risk achieving reduced scores during project appraisal, and thus may be at a comparative disadvantage for funding.

¹² *Handbook on Climate Risk Screening for Policy Planning, Climate Mitigation Assessment, Section 6.2*

¹³ *Handbook on Climate Risk Screening for Policy Planning, Climate Mitigation Assessment, Section 6.1*

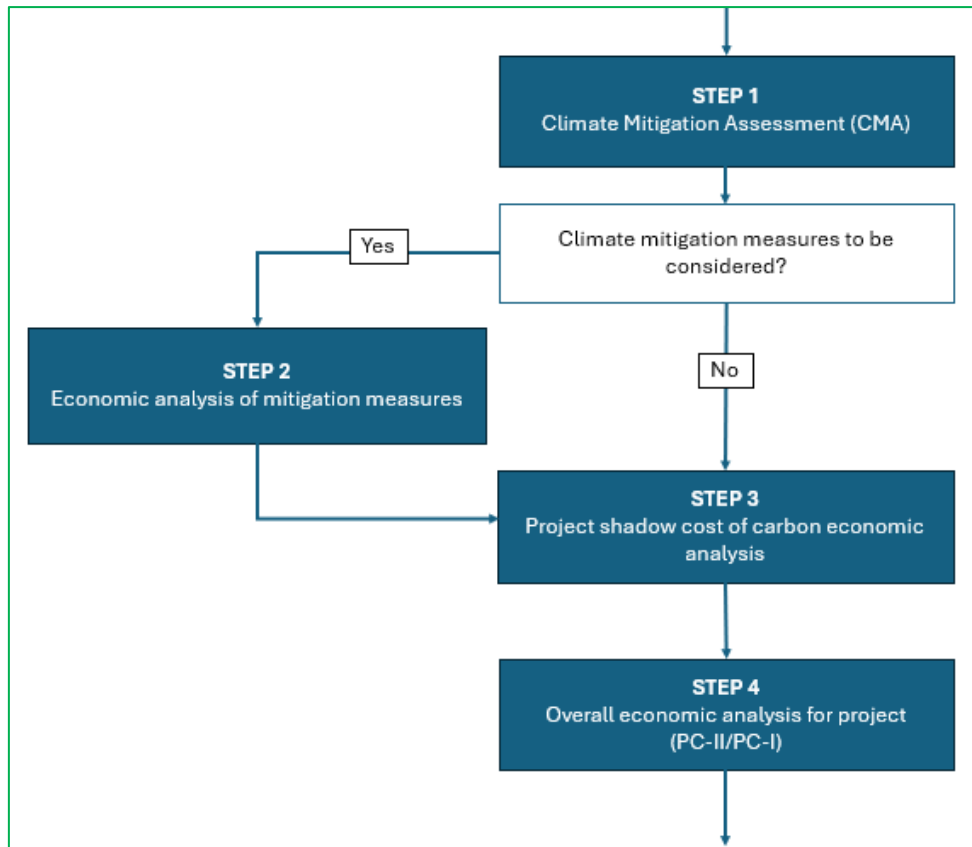


Figure 1: Decision tree for economic analysis of climate change mitigation for projects.

Stepwise Workflow for Economic Assessment

The step-by-step approach for undertaking the economic analysis of climate change mitigation options and the social cost of carbon is summarised in Figure 2, below.

For the purposes of this analysis there are 3 scenarios we need to consider:

Scenario Name	Description
Baseline	The 'without project' scenario
Project	The 'with project, without mitigation measures' scenario
Optimised project	The 'with project, with mitigation measures' scenario

GHG emission projections for each of these options need to be undertaken to complete the comparative analysis, as described in the following Sections.

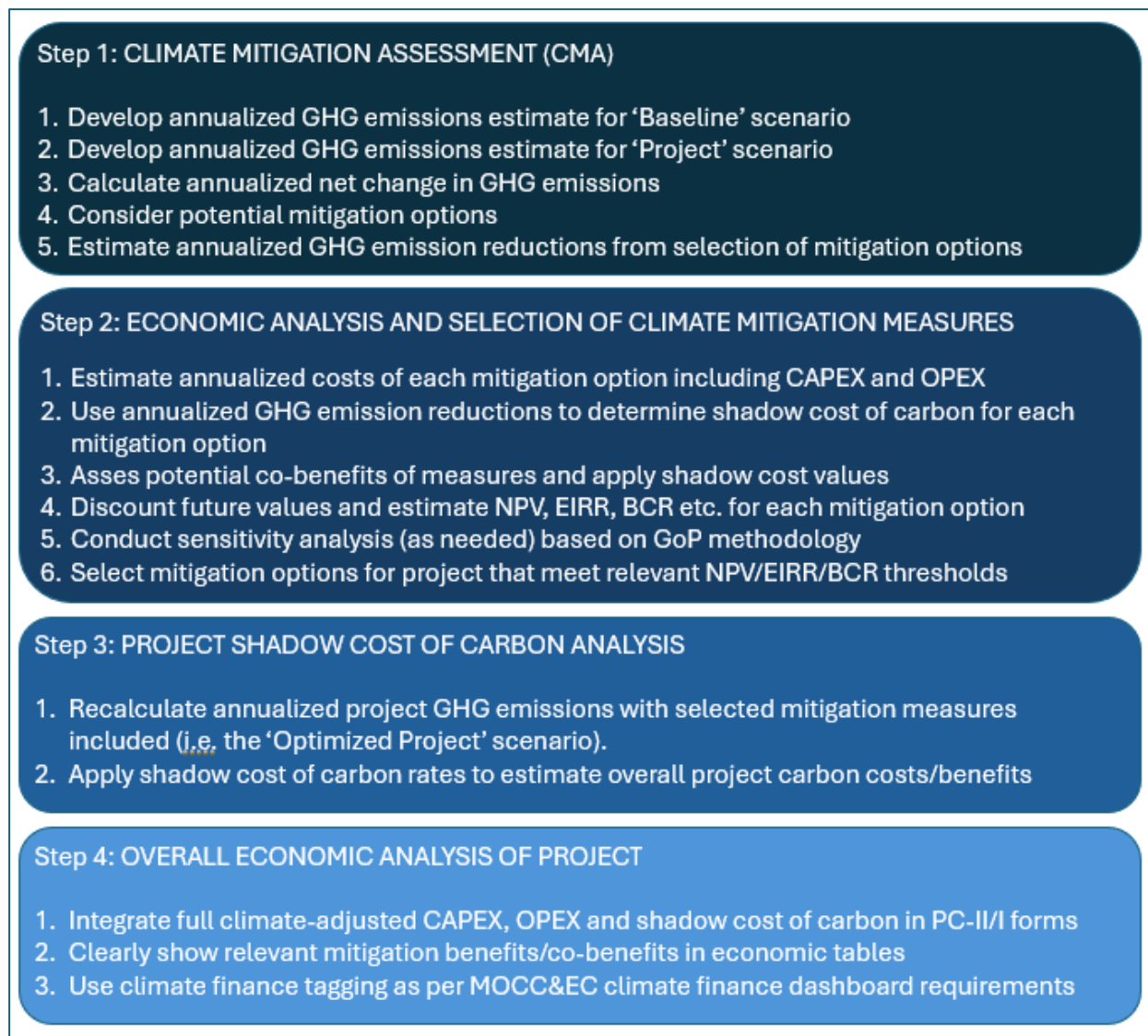
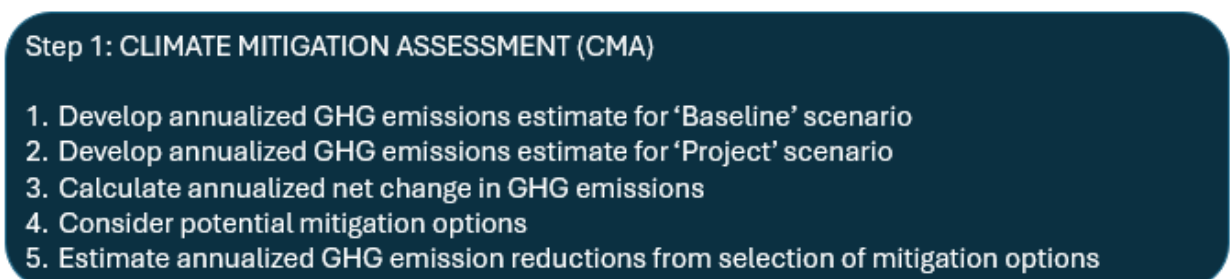


Figure 2: Stepwise Workflow for Climate Change Mitigation Economic Assessment

Stepwise Workflow for Economic Assessment

Step 1: Climate Mitigation Assessment (CMA)



Use the CMA (outlined in the 'Handbook on Climate Risk Screening for Policy Planning') process to establish GHG emissions in the 'Baseline' and 'Project'

scenarios and identify relevant climate mitigation measures for inclusion in the project¹⁴.

Step 2: Economic Analysis and Selection of Climate Mitigation Measures

Step 2: ECONOMIC ANALYSIS AND SELECTION OF CLIMATE MITIGATION MEASURES

1. Estimate annualized costs of each mitigation option including CAPEX and OPEX
2. Use annualized GHG emission reductions to determine shadow cost of carbon for each mitigation option
3. Assess potential co-benefits of measures and apply shadow cost values
4. Discount future values and estimate NPV, EIRR, BCR etc. for each mitigation option
5. Conduct sensitivity analysis (as needed) based on GoP methodology
6. Select mitigation options for project that meet relevant NPV/EIRR/BCR thresholds

Based on the climate mitigation measures identified in the CMA, carry out a detailed economic assessment of each option to demonstrate the cost/benefit of their potential inclusion in the project. This will build upon the outputs in Table 6.5 of the CMA to incorporate economic indicators. The analysis should include annualised data on the following:

- Capital and operation/maintenance costs/benefits for the equipment/materials/intervention
- GHG emissions compared to the 'Project' scenario
- Social cost of carbon rates

This data can then be input into a cashflow forecast for each mitigation measure, like that shown in Figure 3 below. Using the 'Total net cost including carbon' cashflow, the Net Present Value (NPV), Estimated Internal Rate of Return (EIRR) and Benefit Cost Ratio (BCR) can be estimated.

Once all mitigation measures have been analysed, the results can be summarised and compared to prioritise measures accordingly (see Figure 4, below).

¹⁴ Note, the CMA process should consider the impact of 'induced demand' (i.e. the increase in the use of a good or service that occurs after its supply or capacity is expanded). The CMA's induced demand analysis should be included in the economic assessment.

Year	Total net cost excl. carbon (CAPEX, OPEX and revenue)	Total net change in emissions	Shadow cost of carbon rate	Shadow cost of carbon	Total net cost incl. carbon
	PKRs	tCO ₂ e	PKRs	PKRs	PKRs
1					
2					
3					
4					
5					

Figure 3: Example table for cost/benefit, including the social cost of carbon

Criteria	Mitigation Option 1	Mitigation Option 2	Mitigation Option 3	Mitigation Option 4
Mitigation Potential (tCO ₂ e)				
Incremental cost (CAPEX and OPEX) (PKRs)				
Direct Unit Costs (PKRs/tCO ₂ e)				
NPV (PKRs)				
EIRR				
BCR				

Figure 4: Template to compare economic indicators of climate mitigation measures

Step 3: Project Social Cost of Carbon Analysis

Step 3: PROJECT SHADOW COST OF CARBON ANALYSIS

1. Recalculate annualized project GHG emissions with selected mitigation measures included (i.e. the 'Optimized Project' scenario).
2. Apply shadow cost of carbon rates to estimate overall project carbon costs/benefits

Once additional mitigation measures have been selected, the associated costs and benefits need to be incorporated into the overall project analysis (to create the 'Optimised project' scenario). This involves:

- Applying any additional GHG reductions to Table 6.2 of the CMA to provide updated net GHG emissions compared to the 'Baseline' and 'Project' scenarios.
- Net GHG emissions for the project are then applied to the social cost of carbon rate to determine annualised social cost of carbon for the project.

An example template/table is provided in Figure 5 below. This should be populated with annualised data for:

1. The original estimated emissions for the project (i.e. the 'Project' scenario) (Column A);
2. The net emissions from additional climate mitigation measures to be included in the project (Columns B and C);
3. The net GHG emissions for the project with additional climate mitigation measures (i.e. the 'Optimised project' scenario) (Column D);
4. Net emissions from the 'Baseline' scenario (Column E);
5. Total net change in GHG emissions for the project with additional climate mitigation measures (Column F);
6. The social cost of carbon rates (Column G); and,
7. The resultant social cost of carbon for the project (Column H).

	A	B	C	D	E	F	G	H
Year	Total net emissions in project scenario	Net emissions from Measure 1	Net emissions from Measure 2	Total net emissions in project scenario with additional measures (A-B-C)	Total net emissions in baseline scenario (D)	Total net change in emissions (D-E)	Shadow cost of Carbon rate	Cost of carbon
	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	tCO ₂ e	PKRs	PKRs
1								
2								
3								
4								
5								

Figure 5: Example template to estimate a project's annualised social cost of carbon

Step 4: Overall Economic Analysis of Project

Step 4: OVERALL ECONOMIC ANALYSIS OF PROJECT

1. Integrate full climate-adjusted CAPEX, OPEX and shadow cost of carbon in PC-II/I forms
2. Clearly show relevant mitigation benefits/co-benefits in economic tables
3. Use climate finance tagging as per MOCC&EC climate finance dashboard requirements

The annualised cost of carbon should then be included in the overall economic analysis for the project in the PC-I template, along with any additional CAPEX, OPEX, and/or other revenues associated with any additional climate mitigation measures which have been included. Figure 6 shows the relevant excerpt regarding the information that needs to be included in the analysis. A summary of this economic analysis of climate mitigation aspects should be provided in the 'Technical Feasibility Study' and PC-I templates to demonstrate the due diligence undertaken and methodology used.

Financial/Economic Analysis (with assumptions)

Financial analysis

- a. Quantifiable output of the project
- b. Profit and loss account and cash flow statement
- c. Net present value (NPV) and benefit cost ratio (BCR)
- d. Internal financial rate of return (IFRR)
- e. Unit cost analysis
- f. Break even Point (BEP)
- g. Payback period
- h. Return on equity (ROE)

Economic & Social benefit analysis

- a. Provide taxes & duties separately in the capital and operating cost
- b. Net present value (NPV) and benefit cost ratio (BCR)
- c. Internal economic rate of return (IERR)
- d. Foreign exchange rate of the project (Bruno's Ratio) for import substitute and export-oriented projects
- e. Unit cost analysis
- f. Break-even Point (BEP)
- g. Poverty alleviation

Figure 6: Excerpt from PC-I Template Heading 11: Benefits of the project and analysis

Costs associated with climate mitigation measures of the project should also be reported as climate finance in the relevant part of PC-I templates, see Figure 7, below.

iv. Climate related share of project investment

Indicate amount allocated for:

Adaptation	Mitigation	Co-benefits	Total

Figure 7: Excerpt from the PC-I Template Heading 10: Financial Plan (subheading iv)

Social Cost of Carbon Rates and Discount Rates

Establishing a nationally relevant cost of carbon and related discount rate for economic analysis of mitigation measures is key to capturing the benefits and avoided damages/losses from reductions in GHG emissions.

Social Discount Rate

It is widely accepted practice for governments to **use a different (usually lower) discount rate to value the cost of carbon / climate damages than the rate used for general project appraisal**¹⁵. General project appraisal discount rates (often 5–12% in developing countries) are designed to reflect the opportunity cost of capital, public budget constraints, risk and capital scarcity and short- to medium-term fiscal trade-offs. Conversely, the cost of carbon represents long-lived impacts (centuries) and thus using the same high discount rate for carbon damages would undervalue long-term climate harm. Using a ‘social discount rate’ for economic analysis of the cost of carbon ensures that the climate benefits are more accurately captured.

A **social discount rate of 2%** for valuing long-term climate impacts (including carbon cost) is justified, representing the most appropriate value (based on a survey of expert economists¹⁶).

Social Cost of Carbon Rate

Consistent with IPCC-approved IAMs, the **social cost of carbon is assumed to increase in real terms over time** on the basis that:

- i. Marginal damages rise as atmospheric concentrations increase.
- ii. Economic exposure grows with income and population.
- iii. Climate thresholds and non-linear damages become more likely.

When using a 2% social discount rate, a real escalation of approximately **3% per year** reflects rising marginal climate damages as temperatures, exposure, and vulnerability increase¹⁷.

Based on the 2% social discount rate, the global social cost of carbon was estimated as USD \$185 in 2022¹⁸. Using the 3% escalation rate **a social cost of carbon of ~USD \$200/tCO₂e (circa PKR 56,000) for 2025 is used**. Table 1 below provides the social cost of carbon rates up to 2035, with rates continuing to grow by 3% annually after that period.

¹⁵ OECD *Monetary Carbon Values in Policy Appraisal: An Overview of Current Practice and Key Issues* Smith, S. & Braathen, N.A. (2015). *Monetary Carbon Values in Policy Appraisal: An Overview of Current Practice and Key Issues*. OECD Environment Working Papers, No. 92, OECD Publishing, Paris. <https://doi.org/10.1787/5jrs8st3ngvh-en>

¹⁶ Grantham Research Institute on Climate Change and the Environment. (2018). *What are social discount rates?* London School of Economics and Political Science.

¹⁷ William Nordhaus (2017), Revisiting the Social Cost of Carbon using the ‘Dynamic Integrated model of Climate and the Economy’ (DICE IAM)

¹⁸ Rennert, K., Errickson, F., Prest, B.C. et al. Comprehensive evidence implies a higher social cost of CO₂. *Nature* 610, 687–692 (2022). <https://doi.org/10.1038/s41586-022-05224-9>

Table 1: Social Cost of Carbon values for the period 2025 – 2035 (increasing 3% annually thereafter)

Year	Social Cost of Carbon (PKRs/tCO₂e)	
2025	Rs	56,600
2026	Rs	58,298
2027	Rs	60,047
2028	Rs	61,848
2029	Rs	63,704
2030	Rs	65,615
2031	Rs	67,583
2032	Rs	69,611
2033	Rs	71,699
2034	Rs	73,850
2035	Rs	76,066

Worked Example

A new road is proposed as a city bypass to alleviate urban traffic and congestion. The road will be 25 kilometres long and will be developed on a greenfield site. Traffic modeling indicates that travel time will be significantly reduced for both journeys within the city and for vehicles transiting through, including the impact of induced demand from alleviation of the congestion. The project is anticipated to have a lifespan of 25 years.

In the project scenario, congestion is anticipated to increase by 5% per year over the project's lifespan. Resulting emissions are slightly offset by the anticipated integration of more fuel-efficient and electric vehicles within the fleet over time (a 2% year-on-year improvement).

Consultants were engaged on the project to analyse how resultant GHG and other air pollutants would be affected by the proposed road, resulting in improved travel times and a reduction in inner-city traffic. The 'Baseline' scenario GHG emissions from traffic in the city, excluding projects, are provided in the CMA Table 6.1 below.

Table 1: Example of populated version of CMA Table 6.1, including hypothetical data for the proposed Road Bypass Project

Year	Total net emissions in baseline scenario (E)	Total net removals in baseline scenario (R)	Total net baseline emissions and removals (E-R)
	tCO ₂ e	tCO ₂ e	tCO ₂ e
1	500,000	0	500,000
2	514,500	0	514,500
3	529,421	0	529,421
4	544,774	0	544,774
5	560,572	0	560,572
6	576,829	0	576,829
7	593,557	0	593,557
8	610,770	0	610,770
9	628,482	0	628,482
10	646,708	0	646,708
11	665,463	0	665,463
12	684,761	0	684,761
13	704,619	0	704,619
14	725,053	0	725,053
15	746,080	0	746,080
16	767,716	0	767,716
17	789,980	0	789,980
18	812,889	0	812,889
19	836,463	0	836,463
20	860,720	0	860,720
21	885,681	0	885,681
22	911,366	0	911,366
23	937,796	0	937,796
24	964,992	0	964,992
25	992,977	0	992,977
Totals	17,992,168	-	17,992,168

In the with-project scenario, inner-city congestion and journey times are expected to be reduced by 35% compared to the without-project scenario. This includes a level of ‘induced traffic’ resulting from reduced travel times and additional roadway. The with project GHG emissions for traffic in the city are provided in the CMA Table 6.2 below. The road will take three years to construct, during which a short-term increase in congestion and resulting emissions is anticipated, as well as emissions from materials and construction.

Table 2: Example of populated version of CMA Table 6.2, including hypothetical data for the proposed Road Bypass Project

Year	Total net emissions in project scenario (E)	Total net removals in project scenario (R)	Total net project emissions and removals (E-R)
	tCO₂e	tCO₂e	tCO₂e
1	550,000	0	550,000
2	602,900	0	602,900
3	659,926	0	659,926
4	354,103	0	354,103
5	364,372	0	364,372
6	374,939	0	374,939
7	385,812	0	385,812
8	397,000	0	397,000
9	408,513	0	408,513
10	420,360	0	420,360
11	432,551	0	432,551
12	445,095	0	445,095
13	458,003	0	458,003
14	471,285	0	471,285
15	484,952	0	484,952
16	499,015	0	499,015
17	513,487	0	513,487
18	528,378	0	528,378
19	543,701	0	543,701
20	559,468	0	559,468
21	575,693	0	575,693
22	592,388	0	592,388
23	609,567	0	609,567
24	627,245	0	627,245
25	645,435	0	645,435
Totals	12,504,187	-	12,504,187

Using the outputs of CMA Tables 6.1 and 6.2, the net GHG emissions can be determined.

Table 3: Example of populated version of CMA Table 6.3, including hypothetical data for the proposed Road Bypass Project

Year	Total net emissions and removals in project scenario (A) tCO ₂ e	Total net emissions and removals in baseline scenario (B) tCO ₂ e	Total net change in emissions and removals (A-B) tCO ₂ e
1	550,000	500,000	50,000
2	602,900	514,500	88,400
3	659,926	529,421	130,506
4	354,103	544,774	-190,671
5	364,372	560,572	-196,200
6	374,939	576,829	-201,890
7	385,812	593,557	-207,745
8	397,000	610,770	-213,769
9	408,513	628,482	-219,969
10	420,360	646,708	-226,348
11	432,551	665,463	-232,912
12	445,095	684,761	-239,666
13	458,003	704,619	-246,617
14	471,285	725,053	-253,769
15	484,952	746,080	-261,128
16	499,015	767,716	-268,701
17	513,487	789,980	-276,493
18	528,378	812,889	-284,511
19	543,701	836,463	-292,762
20	559,468	860,720	-301,252
21	575,693	885,681	-309,988
22	592,388	911,366	-318,978
23	609,567	937,796	-328,229
24	627,245	964,992	-337,747
25	645,435	992,977	-347,542
Totals	12,504,187	17,992,168	-5,487,981

Based on this initial assessment, over the course of the project, an anticipated net reduction in GHG emissions of 5,500 ktCO₂e is anticipated.

The project team also wants to evaluate the economic benefits of additional climate mitigation options that could be added to the project to enhance its potential benefits further. Consultants have been engaged to determine the viable options and to assess them accordingly. The relevant options identified were as follows:

1. Park-and-Ride transit system with electric buses serving routes into the city from the new bypass.
2. Low-carbon/reclaimed materials to be used for construction.
3. Electric vehicle charging infrastructure to be included.

4. Nature-based solutions for carbon sequestration, enhancing the resilience of the system and producing social co-benefits.

Table 4: GHG emissions, costs, and social cost of carbon for a hypothetical Park-and-Ride mitigation option to be included as part of the Road Bypass Project

Year	Total net change in emissions	Social cost of carbon rate	Social cost of carbon	Total cost (CAPEX, OPEX and revenue)	Net cost
	tCO ₂ e	Rs '000	Rs '000	Rs '000	Rs '000
1	25,000	57	1,415,000	1,500,000	2,915,000
2	25,000	58	1,457,450	1,500,000	2,957,450
3	25,000	60	1,501,174	1,500,000	3,001,174
4	-20,000	62	-2,164,692	-150,000	-2,314,692
5	-20,400	64	-2,274,226	-150,000	-2,424,226
6	-20,808	66	-2,389,301	-150,000	-2,539,301
7	-21,224	68	-2,510,200	-150,000	-2,660,200
8	-21,649	70	-2,637,216	-150,000	-2,787,216
9	-22,082	72	-2,770,659	-150,000	-2,920,659
10	-22,523	74	-2,910,855	-150,000	-3,060,855
11	-22,974	76	-3,058,144	-150,000	-3,208,144
12	-23,433	78	-3,212,886	-150,000	-3,362,886
13	-23,902	81	-3,375,458	-150,000	-3,525,458
14	-24,380	83	-3,546,256	-150,000	-3,696,256
15	-24,867	86	-3,725,697	-150,000	-3,875,697
16	-25,365	88	-3,914,217	-150,000	-4,064,217
17	-25,872	91	-4,112,276	-150,000	-4,262,276
18	-26,390	94	-4,320,358	-150,000	-4,470,358
19	-26,917	96	-4,538,968	-150,000	-4,688,968
20	-27,456	99	-4,768,640	-150,000	-4,918,640
21	-28,005	102	-5,009,933	-150,000	-5,159,933
22	-28,565	105	-5,263,435	-150,000	-5,413,435
23	-29,136	108	-5,529,765	-150,000	-5,679,765
24	-29,719	112	-5,809,571	-150,000	-5,959,571
25	-30,313	115	-6,103,536	-150,000	-6,253,536
Totals	-880,464		-79,572,665	1,200,000	-78,372,665

The analysis shows that the Park-and-Ride option has an NPV of PKR 72 million, an EIRR of 25% and benefit-cost ratio of 7.6. Similar exercises were carried out by consultants for the other mitigation options listed above (not shown), with the results summarised in the following table.

Table 5: Hypothetical comparison of mitigation options to be included as part of the Road Bypass Project

Criteria	Mitigation Option 1: Park-and-Ride	Mitigation Option 2: Low-carbon Materials	Mitigation Option 3 EV Charging Stations	Mitigation Option 3 Nature-based Solutions
Mitigation Potential (tCO₂e)	880,464	4,000	12,000	1,200
Direct Total Costs (Rs '000)	1,200,000	20,000	280,000	90,000
Direct Unit Costs (Rs/tCO₂e)	1,363	5,000	23,182	74,927
NPV ('000 PKR)	71,995	7,064	-402,541	-444,466
EIRR	25%	124%	-4.2%	-10.3%
BCR	7.60	1.42	0.86	0.72

Based on this assessment, the options for Park-and-Ride and Low-carbon Materials have met the relevant economic thresholds and are to be included in the project. These now need to be bundled into the overall economic assessment as developed in Table 3 above and assessed to demonstrate the combined benefit of the additional measures. These values are summarised in Table 6 below. The 'Cost of carbon' values (in column H) should subsequently be added to the overall economic analysis of the project as a social cost along with any annualised CAPEX/OPEX costs to be incurred as investments in the additional climate mitigation measures (i.e. the costs of Park-and-Ride and Low-carbon Materials).

Table 6: GHG emissions, costs and social cost of carbon for the hypothetical Road Bypass Project, including mitigation measures to be included in the project

Year	A Total net emissions in 'Project scenario' tCO ₂ e	B Net emissions from Measure 1 (Park and Ride) tCO ₂ e	C Net emissions from Measure 2 (Low Carbon Materials) tCO ₂ e	D Total net emissions in 'Optimised project' scenario (i.e. with additional measures (A+B+C)) tCO ₂ e	E Total net emissions in 'Baseline' scenario tCO ₂ e	F Total net change in emissions (D-E) tCO ₂ e	G Social cost of Carbon rate Rs '000	H Cost of carbon Rs '000
1	550,000	25,000	0	575,000	500,000	75,000	57	4,275,000
2	602,900	25,000	-2,000	625,900	514,500	111,400	58	6,461,200
3	659,926	25,000	-2,000	682,926	529,421	153,505	60	9,210,300
4	354,103	-20,000	0	334,103	544,774	-210,671	62	-13,061,602
5	364,372	-20,400	0	343,972	560,572	-216,600	64	-13,862,400
6	374,939	-20,808	0	354,131	576,829	-222,698	66	-14,698,068
7	385,812	-21,224	0	364,588	593,557	-228,969	68	-15,569,892
8	397,000	-21,649	0	375,351	610,770	-235,419	70	-16,479,330
9	408,513	-22,082	0	386,431	628,482	-242,051	72	-17,427,672
10	420,360	-22,523	0	397,837	646,708	-248,871	74	-18,416,454
11	432,551	-22,974	0	409,577	665,463	-255,886	76	-19,447,336
12	445,095	-23,433	0	421,662	684,761	-263,099	78	-20,521,722
13	458,003	-23,902	0	434,101	704,619	-270,518	81	-21,911,958
14	471,285	-24,380	0	446,905	725,053	-278,148	83	-23,086,284
15	484,952	-24,867	0	460,085	746,080	-285,995	86	-24,595,570
16	499,015	-25,365	0	473,650	767,716	-294,066	88	-25,877,808
17	513,487	-25,872	0	487,615	789,980	-302,365	91	-27,515,215
18	528,378	-26,390	0	501,988	812,889	-310,901	94	-29,224,694
19	543,701	-26,917	0	516,784	836,463	-319,679	96	-30,689,184
20	559,468	-27,456	0	532,012	860,720	-328,708	99	-32,542,092
21	575,693	-28,005	0	547,688	885,681	-337,993	102	-34,475,286
22	592,388	-28,565	0	563,823	911,366	-347,543	105	-36,492,015
23	609,567	-29,136	0	580,431	937,796	-357,365	108	-38,595,420
24	627,245	-29,719	0	597,526	964,992	-367,466	112	-41,156,192
25	645,435	-30,313	0	615,122	992,977	-377,855	115	-43,453,325
Totals	12,504,188	-470,980	-4,000	12,029,208	17,992,169	-5,962,961		-539,153,019

Frequently Asked Questions (FAQs): Economic Assessment of Mitigation Projects

The following FAQs address common questions that arise when conducting economic assessments of climate mitigation measures during project preparation for approval. They clarify methodological steps, support consistent application of the Annex, and help project teams translate CMA results into robust economic appraisals.

For further guidance or case-specific technical advice, project teams should consult experts within MoPDSI and the Planning Commission, including those responsible for economic appraisal standards and climate-related assessments, as well as any formally notified support mechanisms.

A. Purpose and Scope

How does this Annex relate to the Manual and CMA?

It uses GHG emission information generated through CMA exercise to determine potential economic cost/benefits and apply a social cost of carbon.

Who is expected to use this Annex?

Those preparing project proposals, including line ministries, Planning Commission reviewers, consultants, and development partners.

When is economic analysis of mitigation required?

For all projects which require a CMA, i.e. those that have a value > 7.5 billion PKR or expected annual GHG emissions > 20 ktCO₂e/year.

B. Definitions and Rationale

What is the social cost of carbon?

The social cost of carbon (also called the social price of carbon) is an implicit price that represents the economic value of reducing one additional tonne of CO₂-equivalent within a model or policy framework (e.g., a Nationally Determined Contribution). It is not an observed market price. Instead, it is the marginal cost required to achieve a given emissions target.

Why is economic analysis important for project development?

Economic analysis informs public investment processes by identifying which mitigation actions deliver the most emissions reductions at the lowest cost. It can also improve the overall cost/benefit of projects and clarify how climate aspects affect jobs, public budgets, industry competitiveness, and vulnerable groups.

What are the economic benefits of climate mitigation?

- Reduced climate hazards (flooding, heatwaves, health impacts).
- Better air quality, leading to fewer deaths and lower healthcare costs.
- Energy savings from more efficient buildings, vehicles, and industry.
- New economic opportunities in clean energy, green manufacturing, and services.
- Improved energy security by reducing fossil fuel dependence.

Will climate mitigation hurt economic growth?

Studies show that well-designed climate projects and policies do not hinder long-term growth. Instead, they can stimulate innovation, create jobs, and avoid extremely costly climate damage in the future. Delayed action increases economic risks and raises future costs.

How do co-benefits shape economic decisions?

Co-benefits can dramatically improve the value of climate action. For example:

- Cleaner air (improved health).
- Better public transport leading to reduced congestion.
- Green spaces leading to improved wellbeing and urban cooling.

Including co-benefits in economic assessments often makes mitigation policies more favourable.

C. Data, Capacity and Sector Application

Is the Annex only for transport?

No. Although the example is a road bypass, the Annex applies across all sectors.

What technical capacity is needed?

Economic appraisal skills, GHG analysis, and expert judgement relevant to the project.

How should non-market and distributional benefits be handled?

Monetise where feasible and complement with qualitative descriptions such as public health, gender and equity, safety, and ecosystem services.

D. Templates and Reporting

How should templates be used?

The example templates can be used to compile project-specific data and included in the PC-II and/or PC-I templates.

How should results be reported in PC-I?

All financial and economic outcomes of this exercise should be included in the overall economic assessment for the project in the PC-I templates. In addition, data and information on climate mitigation measure can be reported with the CMA outputs in the PC-II and/or PC-I.

How does climate finance tagging relate to economic analysis?

Tagging tracks expenditure, but economic metrics determine the justification for mitigation investments.

E. International Alignment and Climate Finance

How does this support IMF RSF and international commitments?

It strengthens climate-informed public investment and supports Pakistan's alignment with IMF RSF reform commitments and access to climate finance.

Annex X – Useful Tools and Resources

All links accessible as of 04-05-2026

Adaptation

Aspect	Link	Source
WeAdapt adaptation knowledge portal	https://weadapt.org/	SEI + Partners –practitioner tools, library of case studies, decision tools, and guidance notes. Strong locally led adaptation, EbA, and participatory approaches
World Bank Climate Change Knowledge Portal	https://climateknowledgeportal.worldbank.org/	World Bank – Country and sector dashboards providing historical climate data, projections, and narrative summaries to support NAPs, NDCs, and investment diagnostics.
OECD Adaptation and Resilience Policy and Finance Resources	https://www.oecd.org/en/topics/climate-adaptation-and-resilience.html	OECD – Analytical frameworks, policy guidance, and case studies on adaptation governance, financing, and private sector engagement.
Guidelines for Climate Proofing Investment in the Transport Sector: Road Infrastructure Projects	https://www.adb.org/documents/guidelines-climate-proofing-investment-transport-sector-road-infrastructure-projects	Step-by-step approach for climate proofing road infrastructure projects across the project cycle (screening, vulnerability assessment, adaptation measures, design responses, and maintenance planning)
Agriculture Adaptation Technology Toolbox	https://ndcpartnership.org/knowledge-portal/climate-toolbox/technologies-climate-change-adaptation-agriculture-sector	GEF / UNEP – Catalogue of 22 adaptation technologies for agriculture.
Infrastructure PPP Climate Toolkits	https://blogs.worldbank.org/en/ppps/introducing-sector-specific-climate-toolkits-infrastructure-ppps	World Bank – Integrating climate risk into PPP structuring for infrastructure.

Mitigation

Aspect	Link	Source
Project Lifecycle GHG Analysis	Project Protocol GHG Protocol	World Resources Institute
GHG Calculation Tools by Sector / Source	Calculation Tools and Guidance GHG Protocol	World Resources Institute
GHG emissions calculator for Transport Sector	MOVES and Mobile Source Emissions Research US EPA	US Environmental Protection Agency
GHG emissions calculator for Water Sector	Climate Toolkits: Water Production and Treatment Public Private Partnership	International Water Association
	Climate Toolkits: Water Production and Treatment Public Private Partnership	World Bank
Embodied GHG emissions for construction materials	EC3 - Building Transparency	Embodied Carbon in Construction Calculator (EC3)
	Embodied Carbon Footprint Database - Circular Ecology	Circular Ecology
Collection of relevant toolkits	Climate Toolbox NDC Partnership	NDC Partnership

Gender Mainstreaming

Aspect	Link	Source
Gender data collection for gender analysis	National Gender Data Portal	National Commission on the Status of Women of Pakistan, UN Women
- Pakistan's policy commitments on gender and climate and priority cross cutting actions for gender inclusiveness; -For gender analysis, identify sector-specific gender issues within climate action	Pakistan's Climate Change Gender Action Plan (2022) Disaster Risk Reduction, Agriculture and Rood Security, Forests and Biodiversity, Integrated Coastal Management, Water and Sanitation, Energy Transport.	Ministry of Climate Change, IUCN
Gender mainstreaming and gender analysis guidance	Handbook on Gender Mainstreaming for Gender Equality Results (2022)	UN Women
Example of guidance notes on how to conduct a gender analysis	Toolkit for Implementing Partners: USAID Gender Analysis and Gender Equality Action Plan	USAID, Banyan Global
Example of key questions for gender analysis with sector-specific resources to inform gender analysis	Gender Analysis Domains and Customized Questions	USAID, Banyan Global