HANDBOOK

on

Climate Risk Screening for Policy Planning

Planning Commission

Islamabad

Overview

This HANDBOOK is prepared to supplement the updated Manual for Development Projects by the Planning Commission and to guide the Principal Accounting Officer (PAO)/ project proponents in preparation of their development projects. The HANDBOOK will be Appendix-D of the Manual for Development Projects. This is aligned with SDG -13 that is “Take urgent action to combat climate change and its impacts” and the climate aspects has also been made part of the processes and procedures given in the manual to imbed the climate change aspect in each development project in the country. This HANDBOOK has been developed to accommodate basic minimum requirements to address climate change challenges so that maximum projects preparing officers can understand and implement it, easily. This will be reviewed periodically and updated gradually in the wake of latest developments and best practices.

This HANDBOOK aims to help PAOs throughout development project lifecycle, starting from preparation of Project Concept Note (PCN) till the project evaluation stage. The purpose is to simplify the process and provide templates for various project stages for ease of proponents and to make sure all relevant information is documented. It consists of templates for PCN and Technical Feasibility Study (TFS) highlighting all the key information that is required to testify the project as viable to be taken up under PSDP. The PCN reviewing officials of Planning Commission can also benefit from this by reviewing the PCN received against this template. The templates, PC-I to PC-V are also revised and cross referenced.

Further, this HANDBOOK is first nationally approved guidelines for three levels of climate change screening, adaptation and mitigation assessments, *Climate and Hazard Initial Assessment (CHIRA), Climate Adaptation and Resilience Assessment (CARA), and Climate Mitigation Assessment (CMA))* to assess project’s vulnerability to climate change impacts and project’s ability to increase vulnerability of surrounding systems due to climate change.

The HANDBOOK has also provided *Climate Indicators for Monitoring and Evaluation (CIME)* guidelines in order to track, monitor and measure the progress of climate adjustments in the project design. These guidelines and methodologies have been prepared and adapted by rigorous review of methodologies by MDB’s and international organizations (references have been cited against each) and adopted after national stakeholder consultations.

HANDBOOK will serve as user guide and, therefore, it has been written in an easy-to-understand language. A list of commonly used and most relevant Glossary for Climate Change (GoCC) terms has been compiled from sources such as National Climate Change Act 2017, United Nations Framework Convention on Climate Change (UNFCCC), and International Panel on Climate Change (IPCC) to help proponent decipher the climate jargon relevant to the project design, development and implementation.

The HANDBOOK is divided into three sections. The Section I entails abbreviations, glossary, and list of reference documents. The Section II includes methodologies while Section III gives guidelines and updated, climate proofed PC proformas which are substituted in the Manual for Development Projects.

I would like to acknowledge the vision of DCPC, guidance & patronage from Secretary and appreciated the efforts of M/o Climate Change, Member, Climate Change, Deputy Chief Climate Change Section, Mr. Ali Touqeer Shiekh, Zeeshan Inam, Assistant chief and Engr. Muhammad Umar, Research Officer for finalizing this document.

Shahid Zia Cheema
Chief (G&E)

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Islamabad, the 5th July, 2024

NOTIFICATION

Subject: **HANDBOOK ON CLIMATE RISK SCREENING FOR POLICY PLANNING**

No. 7(278) G&E/PD & SI/24. In order to access green climate financing and address Pakistan's climate vulnerability, Planning Commission approved a Handbook on Climate Risk Screening for Development Projects in its meeting held on 27th February, 2024. The project proformas have also been climate proofed as PC-1,2024 to PC-V,2024 and updated for integrating climate risk assessment, resilience, adaptation and mitigation into project design and development planning. Soft copy of the same can be accessed at Planning Commission's website (www.pc.gov.pk).

2. The Handbook provides guidance to development practitioners regarding climate risk assessment in project lifecycle, starting from Project Concept Note (PCN) till the project evaluation stage. It aims to assess project's vulnerability to climate change impacts and to decrease the same. The Handbook will be a part of Manual for Development Projects 2021, updated from time to time.

3. The Handbook is notified, in compliance with Chapter-III of Public Finance Management Act 2019 and to Improve Public Investment Management, for strict compliance with immediate effect.

(Shahid Zia Cheema)
Chief (E & R)
Tel: 051-9245075

The Manager,
Pakistan Printing Press,
University Road,
Karachi.

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(Shahid Zia Cheema)
Chief (Employment & Research)
Tel: 051-9245075

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SECTION I

Chapter 1: Abbreviations

ADB – Asian Development Bank

ADP – Annual Development Plan

BAU – Baseline or Business-as-usual

BCR or B/C Ratio – Benefit-Cost Ratio

BEP – Break-even Point

CARA – Climate Adaptation and Resilience Assessment

CBOs – Community-based Organizations

CCS – Carbon dioxide Capture and Storage

CDM – Clean Development Mechanism

CDR – Carbon dioxide Removal

CDWP – Central Development Working Party

CFCs – Chlorofluorocarbons

CH_4 – Methane

CHIRA – Climate and Hazard Initial Risk Assessment

CID – Climatic Impact-Driver

CIME – Climate Indicators for Monitoring and Evaluation

CMA – Climate Mitigation Assessment

CO_2 – Carbon dioxide

COP – Conference of the Parties

DDWP – Departmental Development Working Party

DDWP – Divisional Development Working Party

IT – Information Technology

DFI – Development Finance Institutions

DRM – Disaster Risk Management

DRR – Disaster Risk Reduction

ECNEC – Executive Committee of the National Economic Council

EIA – Environmental Impact Assessment

FEC – Foreign Exchange Component

GCF – Green Climate Fund

GCISC – Global Change Impact Studies Centre

GDP – Gross Domestic Product

GEF – Global Environment Facility

GHGs – Greenhouse Gases

GLOF – Glacial Lake Outburst Flooding

GoCC – Glossary of Climate Change terms

GWP – Global Warming Potential

HFCs – Hydrofluorocarbons

HR – Human Resources

ICF – International Climate Finance

IERR – Internal Economic Rate of Return

IFRR – Internal Financial Rate of Return

IPCC – Intergovernmental Panel on Climate Change

IPPU – Industrial Processes and Product Use

PDs – Project Directors

PP&D – Planning & Development Department

PSDP – Public Sector Development Programme

LAN – Local Area Network

LCA – Lifecycle Assessment

LULUCF – Land use, Land-use Change, and Forestry

MDBs – Multilateral Development Bank

MoCC – Ministry of Climate Change

MoPD&SI – Ministry of Planning Development & Special Initiatives

MRV – Measurable, Reportable and Verifiable

$MTCO_2e$ – Million tons of carbon dioxide equivalent

N_2O – Nitrous Oxide

NDCs – Nationally Determined Contributions

NGO – Non-Governmental Organization

NPV – Net present value

NTCFs – Near-Term Climate Forcers

O_3 – Ozone

O&M – Operations and Maintenance

PAO – Principal Accounting Officer

PC-I – Planning Commission Proforma I

PC-II – Planning Commission Proforma II

PC-III – Planning Commission Proforma III

PC-IV – Planning Commission Proforma IV

PC-V – Planning Commission Proforma V

PCN – Project Concept Note

PDWP – Provincial Development Working Party(ies)

PFCs – Perfluorocarbons

PKR – Pakistani Rupee

PLC – Project Life Cycle

PPP – Public Private Partnership

M&E – Monitoring & Evaluation

RBM – Results Based Monitoring

RBM&E – Result Based Monitoring & Evaluation

RE – Renewable Energy

ROE – Return on Equity

SD – Sustainable Development

SDGs – Sustainable Development Goals

SF_6 – Sulphur Hexafluoride

SLCFs – Short-Lived Climate Forcers

SLCPs – Short-Lived Climate Pollutants

TFS – Technical Feasibility Study

TORs – Terms of Reference

UN – United Nations

UNDP – United Nations Development Program

UNFCCC – UN Framework Convention on Climate Change

WB – World Bank

Chapter 2: Glossary of Climate Change (GoCC) terms

This Chapter is a compilation of various terms frequently used in climate analysis and studies. The purpose is to familiarize the project proponents with scientific terms and ensure consistency in their usage. The definitions have been retrieved from three main reliable sources: 1) Pakistan's Climate Change Act 2017, 2) UNFCCC, and 3) IPCC.

This is an open document; the terms and definitions will be updated with new information coming in. The project proponents should use latest version of the document to avoid any discrepancies.

1	Abatement	Refers to reducing the degree or intensity of greenhouse-gas emissions (UNFCCC).
2	Adaptation	Means adjustment in natural or human systems in response to actual or expected climatic stimuli or their effects which moderates harm or exploits beneficial opportunities (National Climate Change Act, 2017).
3	Adaptive capacity	The ability of systems, institutions, humans and other organisms to adjust to potential damage, to take advantage of opportunities, or to respond to consequences (IPCC, 2014; MA, 2005).
4	Afforestation	Planting of new forests on lands that historically have not contained forests (UNFCCC).
5	Air Pollution	Degradation of air quality with negative effects on human health or the natural or built environments due to the introduction, by natural processes or human activity, into the atmosphere of substances (gases, aerosols) which have a direct (primary pollutants) or indirect (secondary pollutants) harmful effect (IPCC).
6	Anthropogenic greenhouse emissions	Greenhouse-gas emissions resulting from human activities (UNFCCC).
7	Baseline/reference	The baseline (or reference) is the state against which change is measured. The baseline concentration of a trace gas is that measured at a location not influenced by local anthropogenic emissions (IPCC).
8	Baseline/reference Period	A baseline period is the period relative to which anomalies are computed (IPCC).
9	Baseline/reference scenario	A plausible description of how the future may develop based on a coherent and internally consistent set of assumptions about key driving forces (e.g., rate of technological change (TC), prices) and relationships. Note that scenarios are neither predictions nor forecasts, but are used to provide a view of the implications of developments and actions (IPCC).
10	Biodiversity	Biodiversity or biological diversity means the variability among living organisms from all sources including,

		among other things, terrestrial, marine and other aquatic ecosystems, and the ecological complexes of which they are part; this includes diversity within species, between species, and of ecosystems (UN, 1992) (IPCC).
11	Bioenergy	Energy derived from any form of biomass or its metabolic by-products (IPCC).
12	Biofuel	A fuel, generally in liquid form, produced from biomass. Biofuels currently include bioethanol from sugarcane or maize, biodiesel from canola or soybeans, and black liquor from the paper-manufacturing process (IPCC).
13	Biomass	Living or recently dead organic material (IPCC).
14	Black carbon (BC)	A relatively pure form of carbon, also known as soot, arising from the incomplete combustion of fossil fuels, biofuel, and biomass. It only stays in the atmosphere for days or weeks. BC is a climate forcing agent with strong warming effect, both in the atmosphere and when deposited on snow or 13 ice. (IPCC).
15	Blue carbon	Biologically-driven carbon fluxes and storage in marine systems that are amenable to management. Coastal blue carbon focuses on rooted vegetation in the coastal zone, such as tidal marshes, mangroves and seagrasses. These ecosystems have high carbon burial rates on a per unit area basis and accumulate carbon in their soils and sediments. They provide many non-climatic benefits and can contribute to ecosystem-based adaptation. If degraded or lost, coastal blue carbon ecosystems are likely to release most of their carbon back to the atmosphere. There is current debate regarding the application of the blue carbon concept to other coastal and non-coastal processes and ecosystems, including the open ocean (IPCC).
16	Burden sharing (also referred to as Effort sharing)	In the context of mitigation, burden sharing refers to sharing the effort of reducing the sources or enhancing the sinks of greenhouse gases (GHGs) from historical or projected levels, usually allocated by some criteria, as well as sharing the cost burden across countries (IPCC).
17	Business As Usual (BAU)	The term business as usual scenario has been used to describe a scenario that assumes no additional policies beyond those currently in place and that patterns of socio-economic development are consistent with recent trends. The term is now used less frequently than in the past.

		Business as usual projections are based on the assumption that operating practices and policies remain as they are at present (IPCC).
18	Capacity building	In the context of climate change, the process of developing the technical skills and institutional capability in developing countries and economies in transition to enable them to address effectively the causes and results of climate change (UNFCCC).
19	Carbon budget	This term refers to three concepts in the literature: (1) an assessment of carbon cycle sources and sinks on a global level, through the synthesis of evidence for fossil fuel and cement emissions, land-use change emissions, ocean and land CO2 sinks, and the resulting atmospheric CO2 growth rate. This is referred to as the global carbon budget; (2) the estimated cumulative amount of global carbon dioxide emissions that that is estimated to limit global surface temperature to a given level above a reference period, taking into account global surface temperature contributions of other GHGs and climate forcers; (3) the distribution of the carbon budget defined under (2) to the regional, national, or sub-national level based on considerations of equity, costs or efficiency (IPCC).
20	Carbon cycle	The term used to describe the flow of carbon (in various forms, e.g., as carbon dioxide (CO_2), carbon in biomass, and carbon dissolved in the ocean as carbonate and bicarbonate) through the atmosphere, hydrosphere, terrestrial and marine biosphere and lithosphere. In this report, the reference unit for the global carbon cycle is $GtCO_2$ or GtC (Gigatonne of carbon = 1 GtC = 1015 grams of carbon. This corresponds to 3.667 $GtCO_2$) (IPCC).
21	Carbon dioxide (CO_2)	A naturally occurring gas, also a by-product of burning fossil fuels from fossil carbon deposits, such as oil, gas, and coal, of burning biomass, of land use changes, and of industrial processes (e.g., cement production). It is the principal anthropogenic greenhouse gas that affects the Earth's radiative balance. It is the reference gas against which other greenhouse gases (GHGs) are measured and therefore has a Global Warming Potential (GWP) of 1 (IPCC).
22	Carbon dioxide capture and storage (CCS)	A process in which a relatively pure stream of carbon dioxide (CO_2) from industrial and energy-related sources is separated (captured), conditioned, compressed and

		transported to a storage location for long-term isolation from the atmosphere (IPCC).
23	Carbon dioxide capture and utilisation (CCU)	A process in which CO_2 is captured and then used to produce a new product. If the CO_2 is stored in a product for a climate-relevant time horizon, this is referred to as carbon dioxide capture, utilisation and storage (CCUS). Only then, and only combined with CO_2 recently removed from the atmosphere, can CCUS lead to carbon dioxide removal. CCU is sometimes referred to as carbon dioxide capture and use (IPCC).
24	Carbon dioxide removal (CDR)	Anthropogenic activities removing carbon dioxide (CO_2) from the atmosphere and durably storing it in geological, terrestrial, or ocean reservoirs, or in products. It includes existing and potential anthropogenic enhancement of biological or geochemical CO_2 sinks and direct air capture and storage, but excludes natural CO_2 uptake not directly caused by human activities (IPCC).
25	Carbon intensity	The amount of emissions of carbon dioxide (CO_2) released per unit of another variable such as Gross Domestic Product (GDP), output energy use or transport (IPCC).
26	Carbon market	A popular (but misleading) term for a trading system through which countries may buy or sell units of greenhouse-gas emissions in an effort to meet their national limits on emissions, either under the Kyoto Protocol or under other agreements, such as that among member states of the European Union. The term comes from the fact that carbon dioxide is the predominant greenhouse gas, and other gases are measured in units called "carbon-dioxide equivalents" (UNFCCC).
27	Carbon neutrality	Condition in which anthropogenic CO_2 emissions associated with a subject are balanced by anthropogenic CO_2 removals. The subject can be an entity such as a country, an organisation, a district or a commodity, or an activity such as a service and an event. Carbon neutrality is often assessed over the life cycle including indirect (“scope 3”) emissions, but can also be limited to the emissions and removals, over a specified period, for which the subject has direct control, as determined by the relevant scheme. Note: Carbon neutrality and net zero CO_2 emissions are overlapping concepts (IPCC).
28	Carbon pool	The reservoir containing carbon as a principal element in the geochemical cycle (UNFCCC).

29	Carbon price	The price for avoided or released carbon dioxide (CO_2) or CO_2-equivalent emissions. This may refer to the rate of a carbon tax, or the price of emission permits. In many models that are used to assess the economic costs of mitigation, carbon prices are used as a proxy to represent the level of effort in mitigation policies (IPCC).
30	Carbon sequestration	The process of removing carbon from the atmosphere and depositing it in a reservoir (UNFCCC).
31	Carbon tax	A levy on the carbon content of fossil fuels. Because virtually all of the carbon in fossil fuels is ultimately emitted as carbon dioxide (CO_2), a carbon tax is equivalent to an emission tax on CO_2 emissions (IPCC).
32	CDM	Clean Development Mechanism. A mechanism that has been replaced by the Paris Agreement. It was developed under the Kyoto Protocol through which developed countries may finance greenhouse-gas emission reduction or removal projects in developing countries, and receive credits for doing so which they may apply towards meeting mandatory limits on their own emissions (UNFCCC).
33	Chlorofluorocarbons (CFCs)	A chlorofluorocarbon is an organic compound that contains chlorine, carbon, hydrogen, and fluorine and is used for refrigeration, air conditioning, packaging, plastic foam, insulation, solvents, or aerosol propellants. Because they are not destroyed in the lower atmosphere, CFCs drift into the upper atmosphere where, given suitable conditions, they break down ozone (O_3). It is one of the GHGs covered under the 1987 Montreal Protocol as a result of which manufacturing of these gases has been phased out and they are being replaced by other compounds, including hydrofluorocarbons (HFCs) which are GHGs covered under the Kyoto Protocol (IPCC).
34	Climate	Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation, and wind. Climate in a wider sense is the state, including a statistical description, of the climate system (IPCC).

35	Climate Change	Means a change in the climate system which is caused by significant changes in the concentration of greenhouse gases as a direct or indirect consequence of human activities and which is in addition to natural climate change that has been observed during a considerable period (National Climate Change Act, 2017).
36	Climate change Impact assessment	The practice of identifying and evaluating, in monetary and/or nonmonetary terms, the effects of climate change on natural and human systems (IPCC).
	Climate-compatible development (CCD)	A form of development building on climate strategies that embrace development goals and development strategies that integrate climate risk management, adaptation and mitigation. This definition builds from Mitchell and Maxwell (2010) (IPCC).
37	Climatic driver (Climate driver)	A changing aspect of the climate system that influences a component of a human or natural system (IPCC).
38	Climate extreme (Extreme weather or climate event)	The occurrence of a value of a weather or climate variable above (or below) a threshold value near the upper (or lower) ends of the range of observed values of the variable. By definition, the characteristics of what is called extreme weather may vary from place to place in an absolute sense. When a pattern of extreme weather persists for some time, such as a season, it may be classed as an extreme climate event, especially if it yields an average or total that is itself extreme (e.g., drought or heavy rainfall over a season). For simplicity, both extreme weather events and extreme climate events are referred to collectively as 'climate extremes' (IPCC).
39	Climate feedback	An interaction in which a perturbation in one climate quantity causes a change in a second and the change in the second quantity ultimately leads to an additional change in the first. A negative feedback is one in which the initial perturbation is weakened by the changes it causes; a positive feedback is one in which the initial perturbation is enhanced. The initial perturbation can either be externally forced or arise as part of internal variability (IPCC).
40	Climate finance	There is no agreed definition of climate finance. The term climate finance is applied both to the financial resources devoted to addressing climate change globally and to financial flows to developing countries to assist them in addressing climate change. The literature includes

		several concepts in these categories, among which the most commonly used include: **Incremental costs:** The cost of capital of the incremental investment and the change of operating and maintenance costs for a mitigation or adaptation project in comparison to a reference project. It can be calculated as the difference of the net present values of the two projects. **Incremental investment:** The extra capital required for the initial investment for a mitigation or adaptation project in comparison to a reference project. **Total climate finance:** All financial flows whose expected effect is to reduce net GHG emissions and/or to enhance resilience to the impacts of climate variability and the projected climate change. This covers private and public funds, domestic and international flows and expenditures for mitigation and adaptation to present climate variability as well as future climate change. **Total climate finance flowing to developing countries:** The amount of the total climate finance invested in developing countries that comes from developed countries. This covers private and public funds. **Private climate finance flowing to developing countries:** Finance and investment by private actors in/from developed countries for mitigation and adaptation activities in developing countries. **Public climate finance flowing to developing countries:** Finance provided by developed countries' governments and bilateral institutions as well as by multilateral institutions for mitigation and adaptation activities in developing countries. Most of the funds provided are concessional loans and grants (IPCC).
41	Climate governance	Purposeful mechanisms and measures aimed at steering social systems towards preventing, mitigating, or adapting to the risks posed by climate change (IPCC).
42	Climate indicator	Measures of the climate system including large-scale variables and climate proxies. **Key climate indicators**: Key indicators constitute a finite set of distinct variables that may collectively point to important overall changes in the climate system of broad societal relevance across the atmospheric, oceanic, cryospheric and biospheric domains, with land as an implicit cross-cutting theme. Taken together, these

		indicators would be expected to both have changed and continue to change in the future in a coherent and consistent manner. (IPCC).
43	Climate information	Information about the past, current state, or future of the climate system that is relevant for mitigation, adaptation and risk management. It may be tailored or "co-produced" for specific contexts, taking into account users' needs and values (IPCC).
44	Climate model	A numerical representation of the climate system based on the physical, chemical, and biological properties of its components, their interactions, and feedback processes, and accounting for some of its known properties. The climate system can be represented by models of varying complexity; that is, for any one component or combination of components, a spectrum or hierarchy of models can be identified, differing in such aspects as the number of spatial dimensions, the extent to which physical, chemical, or biological processes are explicitly represented, or the level at which empirical parameterizations are involved. There is an evolution towards more complex models with interactive chemistry and biology. Climate models are applied as a research tool to study and simulate the climate, and for operational purposes, including monthly, seasonal, and interannual climate predictions (IPCC).
45	Climate prediction	A climate prediction or climate forecast is the result of an attempt to produce (starting from a particular state of the climate system) an estimate of the actual evolution of the climate in the future, for example, at seasonal, interannual, or decadal time scales. Because the future evolution of the climate system may be highly sensitive to initial conditions, such predictions are usually probabilistic in nature. (IPCC)
46	Climate projection	A climate projection is the simulated response of the climate system to a scenario of future emission or concentration of greenhouse gases and aerosols, generally derived using climate models. Climate projections are distinguished from climate predictions by their dependence on the emission/concentration/radiative-forcing scenario used, which is in turn based on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized (IPCC).

47	Climate-resilient pathways	Iterative processes for managing change within complex systems in order to reduce disruptions and enhance opportunities associated with climate change (IPCC).
48	Climate scenario	A plausible and often simplified representation of the future climate, based on an internally consistent set of climatological relationships that has been constructed for explicit use in investigating the potential consequences of anthropogenic climate change, often serving as input to impact models. Climate projections often serve as the raw material for constructing climate scenarios, but climate scenarios usually require additional information such as the observed current climate (IPCC).
49	Climate services	Climate services involve the provision of climate information in such a way as to assist decision-making. The service includes appropriate engagement from users and providers, is based on scientifically credible information and expertise, has an effective access mechanism, and responds to user needs (Hewitt et al., 2012) (IPCC).
50	Climate-smart agriculture (CSA)	Climate-smart agriculture (CSA) is an approach that helps to guide actions needed to transform and reorient agricultural systems to effectively support development and ensure food security in a changing climate. CSA aims to tackle three main objectives: sustainably increasing agricultural productivity and incomes, adapting and building resilience to climate change, and reducing and/or removing greenhouse gas emissions, where possible (FAO, 2018) (IPCC).
51	Climate system	The climate system is the highly complex system consisting of five major components: the atmosphere, the hydrosphere, the cryosphere, the lithosphere, and the biosphere, and the interactions among them. The climate system evolves in time under the influence of its own internal dynamics and because of external forcings such as volcanic eruptions, solar variations, and anthropogenic forcings such as the changing composition of the atmosphere and land use change (IPCC).
52	Climate threshold	A limit within the climate system (or its forcing) beyond which the behaviour of the system is qualitatively changed (IPCC).
53	Climate variability	Deviations of climate variables from a given mean state (including the occurrence of extremes, etc.) at all spatial and temporal scales beyond that of individual weather

		events. Variability may be intrinsic, due to fluctuations of processes internal to the climate system (internal variability), or extrinsic, due to variations in natural or anthropogenic external forcing (forced variability) (IPCC).
54	Climatic impact-driver (CID)	CIDs are physical climate system conditions (e.g., means, events, extremes) that affect an element of society or ecosystems. Depending on system tolerance, CIDs and their changes can be detrimental, beneficial, neutral, or a mixture of each across interacting system elements and regions (IPCC).
55	CO_2-equivalent (CO_2-eq) emission	The amount of CO_2 emission that would have an equivalent effect on a specified key measure of climate change, over a specified time horizon, as an emitted amount of another GHG or a mixture of other GHGs. For a mix of GHGs it is obtained by summing the CO_2-equivalent emissions of each gas. There are various ways and time horizons to compute such equivalent emissions. CO_2-equivalent emissions are commonly used to compare emissions of different GHGs, but should not be taken to imply that these emissions have an equivalent effect across all key measures of climate change (IPCC).
56	Co-benefits (in climate policy)	policy Co-benefits are the benefits from policy options implemented for various reasons at the same time, acknowledging that most policies resulting in GHG mitigation also have other, often at least equally important, rationales (IPCC).
57	Community-based adaptation	Local, community-driven adaptation. Community-based adaptation focuses attention on empowering and promoting the adaptive capacity of communities. It is an approach that takes context, culture, knowledge, agency, and preferences of communities as strengths (IPCC).
58	Compound weather/climate events	The combination of multiple drivers and/or hazards that contributes to societal and/or environmental risk (IPCC).
59	Cumulative emissions	The total amount of emissions released over a specified period of time (IPCC).
60	Decarbonization	The process by which countries or other entities aim to achieve a low carbon economy, or by which individuals aim to reduce their consumption of carbon (IPCC).
61	Deforestation	Conversion of forest to non-forest (UNFCCC).
62	Disaster	A 'serious disruption of the functioning of a community or a society at any scale due to hazardous events

		interacting with conditions of exposure, vulnerability and capacity, leading to one or more of the following: human, material, economic and environmental losses and impacts' (UNGA, 2016) (IPCC).
63	Disaster management	Social processes for designing, implementing, and evaluating strategies, policies, and measures that promote and improve disaster preparedness, response, and recovery practices at different organizational and societal levels (IPCC).
64	Disaster risk	The likelihood within a specific time period of disaster (IPCC).
65	Disaster Risk Management (DRM)	Processes for designing, implementing, and evaluating strategies, policies, and measures to improve the understanding of disaster risk, foster disaster risk reduction and transfer, and promote continuous improvement in disaster preparedness, response, and recovery practices, with the explicit purpose of increasing human security, well-being, quality of life, and sustainable development (IPCC).
66	Disaster Risk Reduction (DRR)	Denotes both a policy goal or objective, and the strategic and instrumental measures employed for anticipating future disaster risk; reducing existing exposure, hazard, or vulnerability; and improving resilience (IPCC).
67	Ecosystem	A functional unit consisting of living organisms, their nonliving environment, and the interactions within and between them. The components included in a given ecosystem and its spatial boundaries depend on the purpose for which the ecosystem is defined: in some cases they are relatively sharp, while in others they are diffuse. Ecosystem boundaries can change over time. Ecosystems are nested within other ecosystems, and their scale can range from very small to the entire biosphere. In the current era, most ecosystems either contain people as key organisms, or are influenced by the effects of human activities in their environment (IPCC).
68	Ecosystem services	Ecological processes or functions having monetary or non-monetary value to individuals or society at large. These are frequently classified as (1) supporting services such as productivity or biodiversity maintenance, (2) provisioning services such as food, fiber, or fish, (3) regulating services such as climate regulation or carbon sequestration, and (4) cultural services such as tourism or spiritual and aesthetic appreciation (IPCC).

69	Emissions	In relation to a greenhouse gas, means emissions of that gas into the atmosphere caused by human activity (National Climate Change Act, 2017).
70	Emission scenario	A plausible representation of the future development of emissions of substances that are potentially radiatively active (e.g., greenhouse gases, aerosols) based on a coherent and internally consistent set of assumptions about driving forces (such as demographic and socioeconomic development, technological change, energy and land use) and their key relationships. Concentration scenarios, derived from emission scenarios, are used as input to a climate model to compute climate projections (IPCC).
71	Exposure	The presence of people; livelihoods; species or ecosystems; environmental functions, services, and resources; infrastructure; or economic, social, or cultural assets in places and settings that could be adversely affected (IPCC).
72	Externality/external cost/external benefit	Externalities arise from a human activity when agents responsible for the activity do not take full account of the activity's impacts on others' production and consumption possibilities, and no compensation exists for such impacts. When the impacts are negative, they are external costs. When the impacts are positive, they are external benefits (IPCC).
73	Fossil fuels	Carbon-based fuels from fossil hydrocarbon deposits, including coal, oil, and natural gas (IPCC).
74	Fugitive fuel emissions	Greenhouse-gas emissions as by-products or waste or loss in the process of fuel production, storage, or transport, such as methane given off during oil and gas drilling and refining, or leakage of natural gas from pipelines (UNFCCC).
75	Global Environment Facility (GEF)	The GEF is an independent financial organization that provides grants to developing countries for projects that benefit the global environment and promote sustainable livelihoods in local communities. The Parties to the Convention assigned operation of the financial mechanism to the GEF on an on-going basis, subject to review every four years. The financial mechanism is accountable to the COP (UNFCCC).
76	Global warming	Global warming refers to the increase in global surface temperature relative to a baseline reference period, averaging over a period sufficient to remove interannual variations (e.g., 20 or 30 years). A common choice for the

		baseline is 1850-1900 (the earliest period of reliable observations with sufficient geographic coverage), with more modern baselines used depending upon the application (IPCC).
77	Global warming potential (GWP)	An index representing the combined effect of the differing times greenhouse gases remain in the atmosphere and their relative effectiveness in absorbing outgoing infrared radiation (UNFCCC).
78	Green Climate Fund (GCF)	At COP 16 in Cancun in 2010, Governments established a Green Climate Fund as an operating entity of the financial mechanism of the Convention under Article 11. The GCF will support projects, programmes, policies and other activities in developing country Parties. The Fund will be governed by the GCF Board (UNFCCC).
79	Greenhouse effect	The infrared radiative effect of all infrared-absorbing constituents in the atmosphere. GHGs, clouds, and some aerosols absorb terrestrial radiation emitted by the Earth's surface and elsewhere in the atmosphere. These substances emit infrared radiation in all directions, but, everything else being equal, the net amount emitted to space is normally less than would have been emitted in the absence of these absorbers because of the decline of temperature with altitude in the troposphere and the consequent weakening of emission. An increase in the concentration of GHGs increases the magnitude of this effect; the difference is sometimes called the enhanced greenhouse effect. The change in a GHG concentration because of anthropogenic emissions contributes to an instantaneous radiative forcing. Surface temperature and troposphere warm in response to this forcing, gradually restoring the radiative balance at the top of the atmosphere (IPCC).
80	Greenhouse gas	means any gas that contributes to the greenhouse effect by absorbing infrared radiation produced by solar warming of the earth's surface and includes carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), HFCs, perfluorocarbons (PFCs), sulphur hexafluoride (SF_6), nitrogen trifluoride and any other direct or indirect greenhouse gas as recognized by UNFCCC and IPCC from time to time (National Climate Change Act, 2017).
81	Hazard	The potential occurrence of a natural or human-induced physical event or trend or physical impact that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods,

		service provision, ecosystems, and environmental resources. In this report, the term hazard usually refers to climate-related physical events or trends or their physical impacts (IPCC).
82	Impacts (consequences, outcomes)	The consequences of realised risks on natural and human systems, where risks result from the interactions of climate-related hazards (including extreme weather / climate events), exposure, and vulnerability. Impacts generally refer to effects on lives, livelihoods, health and wellbeing, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Impacts may be referred to as consequences or outcomes and can be adverse or beneficial (IPCC).
83	Land use, land-use change, and forestry (LULUCF)	A greenhouse gas inventory sector that covers emissions and removals of greenhouse gases resulting from direct human-induced land use, land-use change and forestry activities (UNFCCC).
84	Lifecycle assessment (LCA)	A widely used technique defined by ISO 14040 as a "compilation and evaluation of the inputs, outputs and the potential environmental impacts of a product system throughout its life cycle". The results of LCA studies are strongly dependent on the system boundaries within which they are conducted. The technique is intended for relative comparison of two similar means to complete a product (IPCC).
85	Likelihood	The chance of a specific outcome occurring, where this might be estimated probabilistically. Likelihood is expressed in this report using a standard terminology (Mastrandrea et al., 2010) (IPCC).
86	Loss and damage	At COP 16 in Cancun in 2010, Governments established a work programme in order to consider approaches to address loss and damage associated with climate change impacts in developing countries that are particularly vulnerable to the adverse effects of climate change as part of the Cancun Adaptation Framework (UNFCCC).
87	Low regrets policy	A policy that would generate net social and/or economic benefits under current climate and a range of future climate change scenarios (IPCC).
88	Maladaptive actions (Maladaptation)	Actions that may lead to increased risk of adverse climate-related outcomes, including via increased GHG emissions, increased vulnerability to climate change, or

		diminished welfare, now or in the future. Maladaptation is usually an unintended consequence (IPCC).
89	Market-based mechanisms, GHG emissions	Regulatory approaches using price mechanisms (e.g., taxes and auctioned emission permits), among other instruments, to reduce the sources or enhance the sinks of GHGs (IPCC).
90	Measures	In climate policy, measures are technologies, processes or practices that contribute to mitigation, for example renewable energy (RE) technologies, waste minimization processes, public transport commuting practices (IPCC).
91	Mitigation (of climate change)	Means efforts that seek to prevent or slow down the increase of atmospheric greenhouse gas concentrations by reducing current or future emissions and enhancing potential sinks or greenhouse gases (National Climate Change Act, 2017).
92	Mitigation (of disaster risk and disaster)	The lessening of the potential adverse impacts of physical hazards (including those that are human-induced) through actions that reduce hazard, exposure, and vulnerability (IPCC).
93	Mitigation capacity	A country's ability to reduce anthropogenic GHG emissions or to enhance natural sinks, where ability refers to skills, competencies, fitness, and proficiencies that a country has attained and depends on technology, institutions, wealth, equity, infrastructure, and information. Mitigative capacity is rooted in a country's sustainable development (SD) path (IPCC).
94	Mitigation potential	The quantity of net greenhouse gas emission reductions that can be achieved by a given mitigation option relative to specified emission baselines (IPCC).
95	Mitigation scenario	A plausible description of the future that describes how the (studied) system responds to the implementation of mitigation policies and measures (IPCC).
96	Models	Structured imitations of a system's attributes and mechanisms to mimic appearance or functioning of systems, for example, the climate, the economy of a country, or a crop. Mathematical models assemble (many) variables and relations (often in a computer code) to simulate system functioning and performance for variations in parameters and inputs (IPCC).
97	Monitoring and evaluation (M&E)	Monitoring and evaluation refers to mechanisms put in place at national to local scales to respectively monitor and evaluate efforts to reduce greenhouse gas emissions and/or adapt to the impacts of climate change

		with the aim of systematically identifying, characterizing and assessing progress over time (IPCC).
98	MRV	Measurable, reportable and verifiable. A process/concept that potentially supports greater transparency in the climate change regime (UNFCCC).
99	NDCs	Nationally determined contributions (NDCs) are at the heart of the Paris Agreement and the achievement of these long-term goals. NDCs embody efforts by each country to reduce national emissions and adapt to the impacts of climate change. The Paris Agreement (Article 4, paragraph 2) requires each Party to prepare, communicate and maintain successive nationally determined contributions (NDCs) that it intends to achieve. Parties shall pursue domestic mitigation measures, with the aim of achieving the objectives of such contributions (UNFCCC).
100	Negative greenhouse gas emissions	Removal of GHGs from the atmosphere by deliberate human activities, i.e., in addition to the removal that would occur via natural carbon cycle or atmospheric chemistry processes (IPCC).
101	"No-regrets options"	Technology for reducing greenhouse-gas emissions whose other benefits (in terms of efficiency or reduced energy costs) are so extensive that the investment is worth it for those reasons alone. For example, combined-cycle gas turbines -- in which the heat from the burning fuel drives steam turbines while the thermal expansion of the exhaust gases drives gas turbines -- may boost the efficiency of electricity generating plants by 70 per cent (UNFCCC).
102	Net zero greenhouse gas emissions	Net zero carbon dioxide (CO_2) emissions are achieved when anthropogenic CO_2 emissions are balanced globally by anthropogenic CO_2 removals over a specified period. Net zero CO_2 emissions are also referred to as carbon neutrality (IPCC).
	Offset (in climate policy)	A unit of CO_2-equivalent emissions that is reduced, avoided, or sequestered to compensate for emissions occurring elsewhere (IPCC).
103	Policies (for mitigation of or adaptation to climate change)	Policies are a course of action taken and/or mandated by a government, e.g., to enhance mitigation and adaptation. Examples of policies aimed at mitigation are support mechanisms for RE supplies, carbon or energy taxes, fuel efficiency standards for automobiles (IPCC).
104	Precautionary principle	A provision under Article 3 of the United Nations Framework Convention on Climate Change (UNFCCC),

		stipulating that the Parties should take precautionary measures to anticipate, prevent, or minimize the causes of climate change and mitigate its adverse effects. Where there are threats of serious or irreversible damage, lack of full scientific certainty should not be used as a reason to postpone such measures, taking into account that policies and measures to deal with climate change should be cost-effective in order to ensure global benefits at the lowest possible cost (IPCC).
105	Projection	A projection is a potential future evolution of a quantity or set of quantities, often computed with the aid of a model. Unlike predictions, projections are conditional on assumptions concerning, for example, future socioeconomic and technological developments that may or may not be realized (IPCC).
106	Reservoirs	A component or components of the climate system where a greenhouse gas or a precursor of a greenhouse gas is stored. Trees are "reservoirs" for carbon dioxide (UNFCCC).
107	Resilience	The capacity of interconnected social, economic and ecological systems to cope with a hazardous event, trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure. Resilience is a positive attribute when it maintains capacity for adaptation, learning and/or transformation (Arctic Council, 2016) (IPCC).
108	Return period	An estimate of the average time interval between occurrences of an event (e.g., flood or extreme rainfall) of (or below/above) a defined size or intensity (IPCC).
109	Risk	The potential for adverse consequences for human or ecological systems, recognizing the diversity of values and objectives associated with such systems. In the context of climate change, risks can arise from potential impacts of climate change as well as human responses to climate change. Relevant adverse consequences include those on lives, livelihoods, health and well-being, economic, social and cultural assets and investments, infrastructure, services (including ecosystem services), ecosystems and species. In the context of climate change impacts, risks result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards. Hazards, exposure and vulnerability may each be subject to uncertainty in

		terms of magnitude and likelihood of occurrence, and each may change over time and space due to socio-economic changes and human decision-making (IPCC).
110	Risk assessment	The qualitative and/or quantitative scientific estimation of risks (IPCC).
111	Risk management	Plans, actions, or policies to reduce the likelihood and/or magnitude of adverse potential consequences, based on assessed or perceived risks. (IPCC).
112	Short-lived climate forcers (SLCFs)	A set of chemically reactive compounds with short (relative to CO_2) atmospheric lifetimes (from hours to decades) but characterized by different physiochemical properties and environmental effects. Their emission or formation has a significant effect on radiative forcing over a period determined by their respective atmospheric lifetimes. Changes in their emissions can also induce long-term climate effects via, in particular, their interactions with some biogeochemical cycles. SLCFs are classified as direct or indirect, with direct SLCFs exerting climate effects through their radiative forcing and indirect SLCFs being the precursors of other direct climate forcers. Direct SLCFs include CH_4, O_3, primary aerosols and some halogenated species. Indirect SLCFs are precursors of O_3 or secondary aerosols. SLCFs can be cooling or warming through interactions with radiation and clouds. They are also referred to as near-term climate forcers (NTCFs). Many SLCFs are also air pollutants. A subset of exclusively warming SLCFs is also referred to as short-lived climate pollutants (SLCPs), including methane, O_3, and black carbon (IPCC).
113	Sink (or Carbon Sink)	Any process, activity or mechanism which removes a greenhouse gas, an aerosol or a precursor of a greenhouse gas from the atmosphere. Forests and other vegetation are considered sinks because they remove carbon dioxide through photosynthesis (UNFCCC).
114	Social cost of carbon (SCC)	The net present value of aggregate climate damages (with overall harmful damages expressed as a number with positive sign) from one more tonne of carbon in the form of carbon dioxide (CO_2), conditional on a global emissions trajectory over time (IPCC).
115	Socioeconomic scenario	A scenario that describes a possible future in terms of population, gross domestic product, and other socioeconomic factors relevant to understanding the implications of climate change (IPCC).

116	Source	Any process, activity or mechanism that releases a GHG, an aerosol or a precursor of a GHG or aerosol into the atmosphere (IPCC).
117	Sustainability	A dynamic process that guarantees the persistence of natural and human systems in an equitable manner (IPCC).
118	Sustainable development	Development that meets the needs of the present without compromising the ability of future generations to meet their own needs (UNFCCC).
119	Sustainable Development Goals (SDGs)	The 17 global goals for development for all countries established by the United Nations through a participatory process and elaborated in the 2030 Agenda for Sustainable Development, including ending poverty and hunger; ensuring health and well-being, education, gender equality, clean water and energy, and decent work; building and ensuring resilient and sustainable infrastructure, cities and consumption; reducing inequalities; protecting land and water ecosystems; promoting peace, justice and partnerships; and taking urgent action on climate change (IPCC).
120	Technology transfer	A broad set of processes covering the flows of know-how, experience and equipment for mitigating and adapting to climate change among different stakeholders (UNFCCC).
121	UNFCCC	The Convention was adopted on 9 May 1992 in New York and signed at the 1992 Earth Summit in Rio de Janeiro by more than 150 countries and the European Community. Its ultimate objective is the 'stabilisation of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system'. It contains commitments for all Parties under the principle of 'common but differentiated responsibilities'. Under the Convention, Parties included in Annex I aimed to return GHG emissions not controlled by the Montreal Protocol to 1990 levels by the year 2000. The convention entered in force in March 1994. In 1997, the UNFCCC adopted the Kyoto Protocol (IPCC).
122	Vulnerability	The degree to which a system is susceptible to, or unable to cope with, adverse effects of climate change, including climate variability and extremes. Vulnerability is a function of the character, magnitude, and rate of climate variation to which a system is exposed, its sensitivity, and its adaptive capacity (UNFCCC).

Chapter 3: Resource Guide

This section includes list of resources to supplement CHIRA, CARA, CMA as well as provide socio-economic, technological, infrastructural and biophysical data sources. This list of reference material is not exhaustive and also does not mean that resources given are best and most current. This list is updated in January each year to include the latest and most relevant information as it becomes available.

Important National Documents on Climate Change

- National Climate Change Policy 2021
- Updated Nationally Determined Contributions 2021
- Nationally Determined Contributions 2016
- National Electric Vehicle Policy 2019
- National Disaster Management Authority Act
-

Climate Resilience and Vulnerability

- GCISC: Future Vulnerability Concerns:
- GCISC: Research areas: 1) Physical Science Basis 2) Impacts, Adaptation & Vulnerability 3) Mitigation & Climate Change Policy
- TBTTP WEB GIS Portal
- National Economic & Environmental Development Study (NEEDS)
- World Resources Institute Climate Analysis Indicators Tool (WRI CAIT)-Pakistan
- National Disaster Management Authority, Website: http://cms.ndma.gov.pk/
- Provincial Disaster Management Authority, Government of Balochistan, Website: https://www.pdma.gob.pk/
- Provincial Disaster Management Authority, Government of KP, Website: https://www.pdma.gov.pk/
- Provincial Disaster Management Authority, Government of Punjab, Website: https://pdma.gop.pk/
- Provincial Disaster Management Authority, Government of Sindh, Website: https://www.pdma.gos.pk/new/
- The Climate Change Knowledge Portal of the World Bank contains global data on historical and future climate vulnerabilities and impacts, including for Pakistan.
    - Climate Projections for temperature and precipitation variables are available. Data is shown as either the projected mean or anomaly (change) and is presented spatially, as a seasonal cycle, time series, or heat plot, which shows seasonal change over long-term time horizons. Provinces can be selected on the given map for provincial projections.
    - The Vulnerability section provides a summary of key natural hazards and their associated socioeconomic impacts. The tool allows for comparisons of natural hazard data with development data.

- The Climate Risk Country Profile summarizes the climate risks faced by Pakistan, primarily meant to inform climate actions by ADB and the World Bank. Key temperature and precipitation trends, projections and impacts are provided.
- ThinkHazard provides a general view of hazards in a given location, that should be considered in project design and implementation to promote disaster and climate resilience. The Pakistan page provides
- PreventionWeb is a global knowledge sharing platform for disaster risk reduction and resilience. Resources for Pakistan are also available, including news updates, documents and publications, and risk profiles.
- Mountain Environment and Natural Resources Information Systems (MENRIS) covers the Himalayan/Hindu Kush region including Bangladesh, Bhutan, the People's Republic of China, Nepal, and Pakistan. It is still in development and aims at bringing together data on meteorological and hydrological parameters, air pollution, ecological and climate change, status and changes in land use and land cover, biodiversity (including threats to biodiversity), floods and other natural hazards, and socioeconomic changes, generated by remote sensing, spatial analysis, and fieldwork.
- Food and Agriculture Organization of the United Nations (FAO) Geonetwork covers base layers (e.g., boundaries, roads, rivers), thematic layers (e.g., protected areas), and backdrop images (e.g., World Forest 2000). Maps can be generated using searchable global and regional functions.

GHG Emissions

- PMD: Estimation of Greenhouse Gas Emissions by Household Energy Consumption: A Case Study of Lahore, Pakistan
- Our World in Data: Pakistan: CO_2 Country Profile
- The World Bank Data: Total greenhouse gas emissions (kt of CO_2 equivalent) - Pakistan
- World Resources Institute Climate Analysis Indicators Tool (WRI CAIT)-Pakistan

Monitoring and Evaluation

- Operational Guidance for Monitoring and Evaluation (M&E) in Climate and Disaster Resilience-Building Operations

Socio-economic, Technological, Infrastructural, Biophysical and Spatial

- World Bank Open Data- Pakistan
- Pakistan Bureau of Statistics
- Pakistan Economic Survey 2021-22
- Population Data: Socioeconomic Data and Applications Center (SEDAC)
- Vegetation Cover: Moderate Resolution Imaging Spectroradiometer, or MODIS, sensor resides aboard the Terra and Aqua platforms, offering a view the Earth's surface every 1-2 days

Disaster Intensity and Frequency Resources

- Disaster Risk Assessment for Project Preparation, A Practical Guide, November 2017

SECTION II

Chapter 4: Climate and Hazard Initial Risk Assessment (CHIRA)

This methodology is based upon Climate Change Screening Tools prepared by the World bank (WB). However, owing to the national circumstances and technical capacity, it has been adapted to include scoring methodology aspired from Asian Development Bank (ADB) Guidelines for climate and disaster risk screening. Throughout the methodology references have been cited. If this methodology is approved, it will lead to an immediate capacity building at senior management level and at all levels of organizational structure, in all national and provincial ministries and departments. This will incentivize early adoption of adaptation and mitigation measures also.

Every project needs to undertake Climate and Hazard Initial Risk Assessment (CHIRA) screening to assess the level of risk to project and its activities at PCN and PC-I stage in order to proceed further. CHIRA can be considered a high-level climate assessment that helps the decision makers explore the viability of the project and also if this project should be proceeded.

In CHIRA, you will define the project location, and then enlist the types of disasters and climate extremes specific to the location to assess hazard exposure. Each identified hazard and extreme will be given an exposure value raging 0 (for no exposure) to 4 (for high exposure) based on both historic and future projections. In the next steps, evaluate the impact on physical and non- physical components of the project as well as how the project's soft components such as policy or plans might together increase or reduce risks from extreme events. Again, values are assigned. The overall climate risk will be evaluated by using information from the previous steps to make an overall risk rating for the project's outcome and service delivery. This is done by adding the exposure and risk values assigned in the previous steps. The resultant value is then compared with the risk scale in order to label the project as High, Moderate or Low risk project.

The result of CHIRA offer opportunities for risk mitigation measures by project planners, these measures include[1]:

Table 4. 1: Some Example of Decisions Against Results of CHIRA

	Result	Decision
1	The project risk is really high, and it is not feasible to pursue it further	Reconsider another project
2	The particular project location is highly vulnerable to climate change	Consider changing project location
3	The project is highly vulnerable to risks currently, but will be feasible in future	Consider delaying the project for more appropriate time
4	The project design and scope will lead to greater climate risks	Consider changing certain design elements or scope of the project to reduce climate impacts

(Note: No section of the methodology should be left blank or incomplete. Make sure the implementing agency does not use NA in every instance)

[1] Adapted from Inter-American Development Bank: Climate Resilient Public Private Partnerships

4.1: Define your Project Location

_____

_____

_____

4.2: Climate Extreme and Hazard Identification

Identify the climate extreme and other hazard events that are relevant to your project location. This will be done by identifying and enlisting all present and potential natural hazards using expert opinion and reviewing other data and information available on climate extreme and hazards.

4.2.1 You are required to choose the extreme events from the list given below:

*(**Note:** If the hazard of concern in not enlisted you can mention it in the list)*

Table 4. 2: List of Extreme Events and Hazards in Pakistan

Climate Extremes and Hazards			
1-Drought	2-Flood	3-Heatwave	4-GLOF
5-Flash Flood	6-Urban Flooding	7-Tropical Storm	8- Wildfire
9-Storm Surge	10-Tsunami	11-Agr. Drought	12-Tropical Cyclone
13-Cloud Outbursts			

Biological Extremes	
1-Epidemic/ Pandemic	2- Locusts[2]

Other Hazards			
1-Climate Migration	2-Air pollution/ Smog	3-Water Scarcity	4-Landslides
5-Earthquake	6-Mudslides	7-Avalanche	
8-Groundwater Pollution and Depletion			

*(**Guidance Note:** Research and review location's historical data on climate extremes and hazards, climate change projections/ scenario and any other relevant scientific data while identifying climate extremes and hazards)*

[2] "Locusts are a collection of certain species of short-horned grasshoppers in the family Acrididae that have a swarming phase. Pakistan has seen sporadic locust attacks in the past too. In the early '60s, the locust attack was so severe that the Plant Protection Department had to hire aircrafts modified to spray insecticides to control the locust attack". (S.M. Hali, 2020, Controlling locust attacks)

4.2.2 Enlist the identified extreme events in the table below:

Table 4. 3: Template to Enlist Extreme Events

	Climate Extreme and Hazard Events
1	
2	
3	

4.3: Assessing Project's Exposure

In this step, the present and future exposure of the identified climate extremes and hazards to project location is assessed[3].

***(Guidance Note:** Rank the identified climate extremes and hazards (highest to lowest) by assigning risk value according to the following criteria:*

1. *How much area they impact i.e. how widespread they are? (Mention Tehsil or District names and Percentage of population it will impact[4])*
2. *Its frequency of occurrence and duration? (Mention how frequently it occurs, what is the return period and how long it persists- days, months, years etc.)*
3. *How severe or intense are they? (Mention the gravity of damage to infrastructure like number of asset / buildings / industry destroyed (partially or completely) or impacted, also mention what is the magnitude?*

For each of the climate extremes and hazards identified, rate the level of exposure according to the given scale to assign the risk value. Add exposure value of 1 for each extreme event (up to a maximum of 4). If extreme events unknown use 2 as an exposure value)

4.3.1 Give brief description of the exposure of the identified climate change extremes and hazards**.**

Table 4. 4: Template for Assessing Project's Present and Future Exposure to Climate Extremes and Hazards

Climate Change Extremes and Hazards 1 (Drought)	
Present Exposure	**Description**
Future Exposure	**Description**
Climate Change Extremes and Hazards 2 (Flood)	
Present Exposure	**Description**
Future Exposure	**Description**

[3] Adapted from World Bank: https://wbclimatescreeningtools.worldbank.org/
[4] ADB: Disaster Risk Assessment for Project Preparation: A Practical Guide

4.3.2 Apply rating to the identified climate change extremes and hazards, for both present and future scenario. Use scoring table under 4.3.3 to assign ratings. The final table would look like this:

Table 4. 5: Final Template with Example for Assessing Project's Present and Future Exposure to Climate Extremes and Hazards

Climate Change Extremes and Hazards			
	Drought	**Flood**	**Heatwave**
Present	4	3	2
Future[5]	4	4	3

Date sources: To fill in the exposure values, use data from Government's annual reports, research articles, donor reports, open-source data and expert opinion.

4.2.3 For scoring the climate extremes and hazards use the table below for guidance:

Table 4. 6: Description of Exposure Scores to be Assigned

Exposure Score	Exposure Level	*Description*[6]
0	Not Exposed	*No indication that these extreme climate variables may become more severe or frequent in the future*
1	Slightly Exposed	*The frequency, severity or duration of the extreme climate variable is expected to be low in the future*
2	Insufficient Understanding	*Not sufficient knowledge or understanding on how to interpret the climate information to make an assessment*
3	Moderately Exposed	*The frequency, severity or duration of the extreme climate variable is expected to be moderate in the future*
4	Highly Exposed	*The frequency, severity or duration of the extreme climate variable is expected to be high in the future*

Scoring Methodology:

- Occurrence of the extreme event in 50 years - Exposure Score 0
- Occurrence of the extreme event in 25 years - Exposure Score 1
- Occurrence of the extreme event in 15 years - Exposure Score 2
- Occurrence of the extreme event in 10 years - Exposure Score 3
- Occurrence of the extreme event in 5 years - Exposure Score 4

[5] Pakistan's National Climate Change Policy 2021 defines future climate change into short, medium- to long- term depending on the nature of the sector. For instance, "*Agriculture in Pakistan is greatly affected by short-term climate variability and could be significantly impacted by long-term climate change*".
[6] World Bank: https://wbclimatescreeningtools.worldbank.org/

4.4: Assessing Impacts to the Project's Physical Components

This step will assess the impacts of the identified climate extremes and hazards on project's physical components (such as external infrastructure and services) for both present and future scenario[7].

(*Guidance note: Consider all the impacts:* ***direct****,* ***indirect****,* ***induced****,* ***transboundary****,* ***long term*** *and* ***cumulative*** *as well as impacts from associated facilities and third parties, when making assessment of the overall impact of the* ***climate extremes and hazards****.)*

Use the following criteria to identify critical components of the project:

1. *Project location*
2. *The intensity, frequency, duration, and magnitude of the impact*
3. *Impact reversibility*
4. *Other sector specific risks*[8]

4.4.1 Give brief description of the identified impacts.

Table 4. 7: Template for Assessing Present and Future Impacts to the Project's Physical Components

Sector/ Component 1 (*Crops)*	
Present Impacts	**Description**
Future Impacts	**Description**
Sector/ Component 2 (*Transport*)	
Present Impacts	**Description**
Future Impacts	**Description**

4.4.2- Apply rating to the identified impacts, for both present and future scenario. Use scoring table under 4.4.3 to assign ratings. The final table would look like this:

Table 4. 8: Final Template with Example for Assessing Present and Future Impacts to the Project's Physical Components

Impact

[7] Adapted from ibid

[8] Adapted from: GCF: Guidelines for the Environmental and Social Screening of Activities Proposed under the Simplified Approvals Process

	Crops	Transport	Storage
Present	4	2	2
Future	4	4	3

Date sources: To fill in the exposure values, use data from Government's annual reports, research articles, donor reports, open-source data and expert opinion.

4.4.3 For each of the component identified, rate the level of impact according to the given scale:

Table 4. 9: Description of Impacts Scores to be Assigned

Impact Value	Impact Level	***Description***[9]
0	No Potential Impacts	*The project is not impacted by potentially damaging climate extremes*
1	Low Potential Impacts	*Non-critical elements of the project maybe impacted by potentially damaging climate extremes*
2	Insufficient Understanding	*Not sufficient knowledge or understanding on how to interpret the climate information to make an assessment*
3	Moderate Potential Impacts	*Critical elements of the project maybe impacted by potentially damaging climate extremes*
4	High Potential Impacts	*Critical elements of the project are likely to be impacted by potentially damaging climate extremes*

Scoring Methodology:

- Elements of the project impacted 0% - Impact Score 0
- Elements of the project impacted 20% - Impact Score 1
- Elements of the project impacted 40% - Impact Score 2
- Elements of the project impacted 60% - Impact Score 3
- Elements of the project impacted 80% - Impact Score 4

Based on your expert opinion, summarize the overall impacts in the box below:

(Guidance note: word limit upto 500 words)

[9] Taken from World Bank: https://wbclimatescreeningtools.worldbank.org/

<Do Not Leave It Blank>

4.5: Assessing Impacts to the Project's Non-Physical Components

This step assesses the influence of various non-physical components relevant to the project. These components for example include readiness of stakeholders, social and political factors etc.[10].

4.5.1 Select soft components relevant to your project and indicate how the selected soft components might together increase or reduce risks from climate extreme and hazard events identified earlier. You may add or omit the parameters according to the project's nature.

Guidance Note: Reduce risk, score = 0, Leave risk unaltered, score = 1, Increase risk, score = 2.

Increases Risk	Unaltered	Reduces Risk
2	1	0

Table 4. 10: Template to Assign Risk Value to Soft Components Relevant to Project

Parameters[11]	Relevant (Yes/ No/ NA)	Risk increases or reduces	Risk value	Description
Policy Development				
Long-term Strategic Planning				
Capacity Building, Training and Outreach				
Emergency Planning				
Maintenance and Operations				
Data Gathering, Monitoring and Information				

[10] Adapted from World Bank: https://wbclimatescreeningtools.worldbank.org/
[11] Parameters taken from World Bank: https://wbclimatescreeningtools.worldbank.org/

Management Systems				

4.5.2 Institutional Capacity & Economic, Social and Political Factors

Guidance Note: Reduce risk, score = 0, Leave risk unaltered, score = 1, Increase risk, score = 2.

Increases Risk	Unaltered	Reduces Risk
2	1	0

Table 4. 11: Template to Assign Risk Value to Institutional Capacity & Economic, Social and Political Factors Relevant to Project

Parameters	Risk increases or reduces	Risk value	Description
Institutional Capacity (*Indicate how the sector of concern in the project region might increase or reduce risks from the climate extreme you have identified such as appropriate relevant policies etc.)*[12]			
Economic, Social and Political Factors *(Indicate how the Economic, Social and Political Factors in the project area might increase or reduce risks from the climate extreme you have identified. The factors may include political stability, population growth, social conflicts, availability of financial resources, and many more.)*[13]			

4.5.3 Stakeholder Engagement and Risk Knowledge

Guidance Note: Answer the following as Yes and No, Yes/No (If No, add 1 risk value). If Unsure, add 1 risk value.

[12] Taken from World Bank: https://wbclimatescreeningtools.worldbank.org/
[13] Ibid

Yes	No	No with high risk	Unsure
0	1	2	1

Table 4. 12: Template to Assign Risk Value to Stakeholder Engagement and Risk Knowledge

Parameters[14]	Yes/ No	Risk value	Description
Do the project proponents have the institutional capacity to successfully incorporate, manage and deliver risk management measures to the project?			
Is it likely that Executing Agency stakeholder(s) has some practical knowledge of risk reduction measures for the project?			
Does the Project require a risk expert to introduce risk reduction measures in project design, implementation, or operations and maintenance?			
Will the project reduce the risk to project beneficiaries?			
Will the project reduce the risk to the localized environment/project dependent ecosystem?			

4.5.4 Inclusion (Gender Mainstreaming/ Youth/ Minorities): Reflect on gender considerations identifying if the project has identified women and youth as particularly vulnerable to climate and disaster risks?

Guidance Note: Answer the following as Yes and No, Yes/No (If No, add 1 risk value). If Unsure, add 1 risk value.

Yes	No	No with high risk	Unsure
0	1	2	1

[14] Parameters taken from ADB: Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security

Table 4. 13: Template to Assign Risk Value to Gender mainstreaming/ Youth/ Minorities Factors Related to Project

Parameters	Yes/ No	Risk value	Description
Does the project include components to help alleviate these risks to women?[15]			
Will potential hazard impacts on minority communities, gender, indigenous peoples, or the social dimensions of risk be considered?[16]			
It increases employment of Labourers?			

4.5.4 Explain your overall analysis in the box below (upto 500 words):

<Do Not Leave It Blank>

4.6: Overall Climate Risk

Use information from the previous steps to make an overall risk rating for the project[17].

4.6.1 *(Guidance: for overall exposure and impacts to project, sum up the risk and exposure values)*

The final table will look like this:

[15] Taken from World Bank: World Bank: https://wbclimatescreeningtools.worldbank.org/
[16] Taken from ADB: Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security
[17] Adapted from World Bank: World Bank: https://wbclimatescreeningtools.worldbank.org/

Table 4. 14: Description of Exposure Scores to be Assigned

Outcome/ Service Delivery					
	Component 1	**Component 2**	**Total Risk Value**	**Risk**	**Risk Category**
Present	*<insert overall exposure and impact rating>*				
Future	*<insert overall exposure and impact rating>*				

4.6.2 Assign risk rating according to the scale given below:

Guidance Note: The following scale gives an indicative value; it may vary according to the nature of the project. Use the scale along with your expert opinion to assign overall risk to the project.

Table 4. 15: Description of Risk Levels Against Scales

Risk	Scale	Description
High Risk	**> 40**	High risk activities have the potential to pose adverse climate extreme and hazard impacts and risks that are irreversible, diverse or unprecedented such as large-scale infrastructure in a critical ecosystem[18]. For high risk projects, it is advised to conduct in-depth analysis and propose risk mitigation and/or adaptation measures[19].
Moderate Risk	**30-40**	Moderate risk activities have the potential to pose limited adverse climate extreme and hazard impacts and risks that are largely reversible, and mostly site-specific.[20] For moderate risk projects, it is advised to build on this screening through additional studies and thorough expert

[18] Adapted from Sustainability guidance note: screening and categorizing GCF-financed activities
[19] See [15]
[20] See [16]

		consultations. It is suggested to further conduct in-depth analysis.[21]
Low/No Risk	**20-30**	Low/ No risk activities have minimal or no adverse climate extreme and hazard impacts and risks for example awareness and outreach, activities within a built-up area etc.[22] For low/ no risk projects, it is advised to continue with the development project if you are confident about the results, however, it is recommended to monitor the climate extreme and hazard risks during the project development and implementation[23].
Insufficient Understanding	**<20**	Gather more information to improve your understanding of climate extremes and hazards and their relationship to your project.

Scoring Methodology:

- **Risk Value 0-5 - Insufficient Understanding**
- **Risk Value 6-10 - Low/No Risk**
- **Risk Value 11-15 - Moderate Risk**
- **Risk Value 16-20 - High Risk**

If the risk is medium or high carry out in-depth Climate Adaptation and Resilience Assessment (CARA): analyze natural hazards, their exposure, and vulnerability and identify appropriate DRM, mitigation adaptation measures and/or co-benefits

[21] See [15]
[22] See [16]
[23] See [15]

Chapter 5: Climate Adaptation and Resilience Assessment (CARA)

The objective of this assessment is to identify, analyze and evaluate climate change impacts on natural and human systems including human well-being and based on the assessment explore appropriate adaptation responses to limit the adverse climatic impacts[24]. The adaptation needs of the project can be viewed from dual lens 1) the risk of climate change on project's objectives (such as reduction in food security), and 2) the ability of project to pose risk by increasing vulnerability of the surrounding area (such has project promoting agriculture production in area that can face severe droughts in future)[25].

This assessment is necessary for projects with medium to high risk as indicated CHIRA, as well as those projects with main aim to build resilience in the community and ecosystem, and is conducted as part of PC-II. This assessment can range from simple desktop analysis to complex climate assessments. However, the depth of assessment will depend on the nature of the project and its location, but following questions can help to make decision:

1. The project is located in an area that has been previously impacted by climate extreme or a natural hazard such as flood-prone area.
2. The project or its components are sensitive to changes in climatic conditions such as excessive glacial melt.
3. The project is of critical importance to the community it serves.
4. The project has national significance, it has ability to provide economic relief and protect lives and livelihoods of its region or province in case of a disaster[26].

If the projects fall in one or more of the following categories, the proponent is required to conduct an in-depth analysis.

Steps involved:

1- Climate Extreme and Hazard Identification and Exposure
2- Vulnerability Assessment
3- Overall Risk
4- Identifying Adaptation Options
5- Lifecycle-based vulnerability assessment (if needed)

5.1: Climate Extreme and Hazard Identification and Exposure

This step will build upon the assessment done during the screening phase, however now the assessment will be in more detail. This will require expanding the data sources, comparing with similar projects, reviewing other feasibility studies for the area or region, consulting stakeholders, on-site inspections apart from desk review and, if required, organizing consultative workshops

[24] IPCC: Technical Guidelines for Assessing Climate Change Impacts and Adaptations
[25] Adapted from Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security Sector
[26] Adapted from Climate Lens - General Guidance: Infrastructure Canada

with subject experts and relevant stakeholders. Hence, the result will be a clearer and detailed picture of the exposure to present and future climate projections giving due importance to project timelines and objectives.

5.2: Vulnerability Assessment

This step involves vulnerability and risk assessment[27] of not only climate extreme and natural hazards, but also slow onset climate events. The impacts are studied on the project as well as the surrounding including people, climate impact chains are constructed to evaluate cumulative impacts for now and in the future. For each event in the present and future scenario, generate a sense of likelihood and consequence of the event. For determining consequences of the event, determine project vulnerability by identifying drivers of vulnerability such as environmental, economic, physical and social conditions of the region, its community and its structures that will be adversely affected by climate change[28]. Describe project vulnerabilities based on severity and frequency of the climate driven event, and if the project has ability to exacerbate the climate risks. Identify the risk stakeholders as well as existing control measure.

The information collected from vulnerability assessment may include impacts on food production impacts to livelihoods due to water availability, and incidence of extreme events. This information will be used to propose and design engineering and non-engineering adaptation solutions[29].

Tabulate your results in the Template given:

Table 5. 1: Template for Exposure to Climate Events and their Likelihood of Occurrence

No.	Climate Extremes and Hazards identified	Description	Likelihood
1			
2			
3			
4			
5			

Use the table below to assign level of likelihood of event to the identified climate extreme and hazards:

Table 5. 2: Estimates of *Likelihood* of Climate Event[30]

Likelihood	Likelihood of Occurrence
Almost certain	Likely to occur once or more annually
Likely	Likely to occur at least once a decade
Possible	Likely to occur once between 10 and 30 years
Unlikely	Likely to occur once between 30 and 50 years
Rare	Not likely to occur in period

[27] Ibid
[28] Adapted from ADB: Disaster Risk Assessment for Project Preparation: A Practical Guide
[29] Adapted from ADB: Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security
[30] Climate Lens - General Guidance: Infrastructure Canada

List down the climate vulnerability indicators relevant in the template given below:

Table 5. 3: Template for Listing Drivers of Vulnerability

Drivers of Vulnerability	Description/ Indicator
Environment	
Economic	
Social	
Physical	

Next step is to categorize the vulnerabilities to reflect their magnitude. Use the template below, use such table for each climate extreme and hazard identified. The table below has given examples of some consequences, the proponent may add more columns as necessary and omit any driver of vulnerability that is irrelevant.

Table 5. 4: Estimates for Consequences (Impacts) of Climate Event[31]

Scale	Consequences							
	Environment		Economic		Social		Physical	
	Water	Ecosystem	Infrastructure Damage	Financial Impact on Stakeholders	Health and Safety	Loss of Livelihood	location	Materials
Catastrophic								
Major								
Medium								
Minor								
Insignificant	X	X	M	M				

Scoring Methodology:

- Assessment indicators aligning 1-20% - Rating 1
- Assessment indicators aligning 21-40% - Rating 2
- Assessment indicators aligning 41-60% - Rating 3
- Assessment indicators aligning 61-80% - Rating 4
- Assessment indicators aligning 81-100% - Rating 5

5.3: Overall Risk

Based on the findings in the previous steps, identify the overall risk. Make use of the scale below to see what the likelihood and consequence of the event is and where is falls.

Table 5. 5: Climate Risk Assessment Scale[32]

[31] Adapted from Climate Lens - General Guidance: Infrastructure Canada
[32] Source: Australian Geomechanics Society (2000) taken from Disaster Risk Assessment for Project Preparation: A Practical Guide and Climate Lens - General Guidance: Infrastructure Canada

Likelihood	Consequences (Impacts)				
	Catastrophic	Major	Medium	Minor	Insignificant
Almost certain	VH	VH	H	H	M
Likely	VH	H	H	M	L-M
Possible	H	H	M	L-M	VL-L
Unlikely	M-H	M	L-M	VL-L	VL
Rare	M-L	L-M	VL-L	VL	VL
Not credible	VL	VL	VL	VL	VL

Note: VH = very high; H = high; M = medium; L = low and VL = very low risks

The color code will supplement in taking the decisions[33]

Color	Actions
Red	Immediate controls required
Orange	High priority control measures required
Yellow	Some controls required to reduce risks to lower levels
Green	Controls likely not required
No color	Risk events do not require further consideration

5.4: Identifying Adaptation Options

The previous step identified the key project vulnerabilities to climate change. In this step multiple adaptation options that are both structural and non- structural are identified and evaluated for most significant risks considering both present and future climate conditions. consultation. The next step involves prioritizing and selecting adaptation options that are most economically viable, socially acceptable and environmentally sound. Since it is a multidisciplinary process, it is advice to consult all relevant stakeholders and subject experts including any NGO that has worked in the region. For ease, a multi-criteria analysis can be done as given in the **Table 5.8**, that will help to choose the optimal option through scoring[34].

The steps involved in identifying adaptation option include:

1. Identify all potential adaptation options
2. Conduct consultations
3. Conduct multicriteria analysis to shortlist most feasible options
4. Prioritize and select adaptation and reflect it in the project design

Table 5. 6: Template for Structural and Non- Structural Adaptation Options for Key Vulnerabilities to Climate Change

Key vulnerabilities	Structural options	Non- structural

[33] Climate Lens - General Guidance: Infrastructure Canada
[34] Adapted from Adapted from Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security Sector

Table 5. 7: Template for Prioritized Adaptation Options to Address Key Vulnerabilities to Climate Change

Key vulnerabilities	Prioritized adaptation options

Table 5. 8: Example of Criteria for Choosing Adaptation Options

*5=very high, 4=high, 3=medium, 2=low, 1 =very low

Source: Yu, W. 2010. *Climate change Risks and Food Security in Bangladesh.* London: Earth Scan.[35]

Assessment Indicators	Descriptions	Rating*					
		N/A	5	4	3	2	1
Policy and Institution							
Consistency and relevance with adaptation and sector policy goals	This will cover the degree of relevance of the options to the national policy, sector policy plans and programs						
Acceptability by implementation agency (e.g., agricultural extension)	Acceptability of the options to different organs of the implementing agencies						
Technical capacity of institution to implement adaptation options	All refer to the assessment of the implementing agency to implement adaptation options						
Physical capacity of institution to implement adaptation options							
Financial capacity of institution to implement adaptation options							
Socioeconomic							
Acceptability by the community	Assess the familiarity and acceptability of the options to the community						
Sustainability of adaptation	Community will continue adaptation after withdrawal of support						
Probability of success in increasing adaptive capacity	Asses the degree to which an option contributes to welfare						
Economic and Financial							
Financial and technical affordability	As determined in the course of project design and feasibility analysis						
Economic returns	Assess the degree to which the option contributes to welfare						
Environmental							
Application and compatibility with local area farming system	Eco-specific applicability to field conditions						
Soil characteristics	Soil quality and its characteristics to support the option						
Land use	Degree of harmony with existing land use						
Water availability	Assess the degree to which the option contributes to water availability						
New pests and diseases	Possibility of intrusion of new pests and diseases as a result of the option						
	Total Scores						

[35] Taken from Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security Sector

This adaptation assessment activity will result in three different types of decisions regarding timing of actions[36]:

Decision Type 1: A climate proofing investment of the proposed project during the design and appraisal phase. The different options identified will fall into one of the categories given in the table below:

Table 5. 9: Different Options Identified During Decision Type 1

no-regret	Atleast one option out of multiple climate proofing options identified that regardless of nature and extent climate change and its uncertainty in the future will still deliver net positive economic benefits since it addresses present climate conditions
low-regret	These options involve costs of climate proofing to offset future climate risks, but these costs are small relative to costs avoided in future and the benefits gained
high regret	The cost of these options is really high at a later point in time, or in other words, these options are not possible at a later point in time
co-benefits/ win-win	These options not only enhance resilience of the projects to climate change but also provide mitigation benefits as well as additional social, economic and environmental benefits

Decision Type 2: In this type of decision the climate investment is not done now but is planned for future when the conditions indicate it to be best time to climate proof. However, the project is designed in such a way that it can be climate proofed later on. For example, building base of sea dikes for potential future storm surges.

Decision Type 3: In this type of decision no investment is done on climate proofing the design, however changes in climate variables and their impact on the project are monitored so that climate proofing can be done when needed. This happens either because costs are higher than expected benefits, climate proofing cost now and in future are same or the expected benefits will be small[37].

5.4.1 Overall Action Plan

Based on the findings of the study, develop an overall action plan for the selected adaptation option to climate proof the project. This plan will supplement PC-I and PC-II documents. A template for this plan is given below. You can add more rows and columns as per the project requirements.

[36] Adapted from Guidelines for Climate Proofing Investment in Agriculture, Rural Development, and Food Security Sector
[37] Ibid

Table 5. 10: Template to Document Overall Adaptation Plan

Adaptation Option	Responsible party/person	Schedule	Expected results	Indicators	Cost /Budget
Identified and selected option to build project's resilience to climate change	*The organization, individual, or entity responsible to carry out the adaptation measure*	*Management plans, and timing of implementing the adaptation option including any due diligence required*	*Expected outputs of the adaptation measure*	*What indicators will be used to track changes?*	*The Estimated cost of the adaptation measure*

Chapter 6: Climate Mitigation Assessment (CMA)[38]

Climate change mitigation assessment is necessary for projects likely to contribute to greenhouse gas emission. But in general, it is recommended for all projects to screen if project will impact its surrounding and, hence, necessary mitigation actions can be taken timely. In this assessment, the proponents are required to calculate potential emissions for two scenarios 1) baseline or emissions in the absence of project, and 2) emissions in the presence of project. There difference between these two emissions will give net emissions that will inform if the project is likely to increase emissions or decrease emissions. This assessment is also important as CARA, since it is not necessary that mitigation was already a part of or was planned to be a part of the project. This exercise will be an additional effort to reduce GHG emissions from major sources of GHG on your project.

Important considerations include:

1. Defining the project boundary;
2. Defining project's useful life;
3. Energy source mix in the region;
4. For emission factors, use national database, if not maintained use emission factors provided by Intergovernmental Panel on Climate Change (IPCC) and alter according to your sector and region;
5. Be mindful of any potential carbon sinks in the region offsetting the emissions and include these GHG removals in your calculations (such as a nearby forest);
6. Focus on major and largest sources of emissions from your project;
7. All sources of emissions to be considered throughout the project lifecycle (PLC) (construction, operational and post-completion) before prioritizing them for assessment (Refer to ***Section I Chapter 3***. for few selected major sources of emissions). Include all the substantial sources of emissions in the assessment.

6.1: Baseline GHG Emissions

In this step year wise emission trajectory is computed that will form the baseline or business as usual (BAU) emissions. These are the emissions expected in the absence of the proposed project and calculated till the project's lifespan. Fill out the Table 6.1 for baseline scenario.

(Note: Calculating emissions quantitively from projects of different nature will be a challenging task in absence of a national GHG accounting tool. It is suggested to follow the guidelines provided by IPCC to calculate the emissions from projects relating to energy and IPPU sectors as a priority (refer to Section I Chapter 3 for list of GHG and mitigation assessment resources). Give details and reference of the methodology adopted in the assessment report. While selecting the tool, make sure it calculates emissions annually and gives final result in $MTCO_2e$ units.

A list of tested GHG accounting tools will be developed and included in the forthcoming sector-specific version of handbook. These tools will help quantify emissions sources from different

[38] Adapted from Climate Lens - General Guidance: Infrastructure Canada

sectors. The data challenges will also be overcome by updating and sharing more details on the data resources as they become available. In case of projects for which it is difficult to quantify emissions, carry out a qualitative assessment instead).

Table 6. 1: Template for Emissions and Removals for Baseline Scenario [39]

Year	Total net emissions in baseline scenario (E)	Total net removals in baseline scenario (R)	Total net baseline emissions and removals (E-R)
Year 1			
Year 2			
Year 3			
Year n			
Lifespan Totals			

6.2: Project GHG Emissions

Similar to the previous step, calculate yearly emissions as a result of the project. Fill out the table below for project scenario.

Table 6. 2: Template for Emissions and Removals for Project Scenario [40]

Year	Total emissions in project scenario (E)	Total removals in project scenario (R)	Total net project emissions and removals (E-R)
Year 1			
Year 2			
Year 3			
Year n			
Lifespan Totals			

6.3 Net GHG Emissions

In this step, calculate the net yearly change in emissions and removals and fill them in the table below:

Table 6. 3: Template for Net Change in Emissions and Removals [41]

Year	Total net emissions and removals in project scenario (A)	Total net emissions and removals in baseline scenario (B)	Total net change in emissions and removals (A-B)
Year 1			
Year 2			
Year 3			
Year n			
Lifespan Totals			

[39] Climate Lens - General Guidance: Infrastructure Canada
[40] Ibid
[41] Ibid

Estimate net cumulative GHG emissions over the project lifespan. Fill out the table below:

Table 6. 4: Net Increase/ Reduction in GHG Emissions Cumulative Over Project Lifespan[42]

GHG Mitigation Assessment of Lifetime GHG Emissions		
Baseline scenario emissions, Lifetime (cumulative)		*CO_2e value in Tonnes*
Estimated project emissions, Lifetime (cumulative)		*CO_2e value in Tonnes*
Net emissions	**REDUCTION or INCREASE**	***CO_2e value in Tonnes***

The proponents are required to calculate cost per tonne which will relate to the spending used for reducing emissions. For this calculation, information is needed on 1) net GHG emission reductions, 2) total cost incurred for construction and O&M during the project lifetime, and 3) indicator such as Total project cost (construction cost and O&M costs over lifetime) / cumulative GHG reductions over the asset's expected lifespan.

6.4: Identifying Mitigation Options

If the result of the previous section indicates net increase in emissions, the proponents are required to identify and screen various mitigation options through stakeholder consultations, prior mitigation assessments and literature. Apply criteria to these options to select the most feasible one. Example of criteria is given in the table below[43]:

(Note: The table is given as an example only, you may prepare a criterion that best suits your project requirements)

Table 6. 5: Example Criteria to use for Identifying Mitigation Option

Examples of Criteria	**Mitigation Option 1**	**Mitigation Option 2**	**Mitigation Option 3**
Mitigation Potential (Million Tons CO_2e) Mitigation Potential Score (0=lowest, 10=highest)			
Direct Unit Costs ($/Ton CO_2e)			
Direct Total Costs (Million $) Direct Total Cost Score (0=highest, 10=lowest)			
Reliance on Local Technologies (0=bad-10=good)			
Reliance on Domestic Energy Sources (0=bad-10=good)			

[42] Climate Lens - General Guidance: Infrastructure Canada
[43] https://unfccc.int/sites/default/files/resource/module-c-notes1_rev_2021%20%201.pdf

Potential for poverty alleviation (0=bad-10=good)			
Potential for improving air quality (0=bad-10=good)			
Technical Feasibility (0=bad-10=good)			
Political/Social Popularity (0=bad-10=good)			
Adaptation Co-benefits Yes=10			
Totals			
Overall Rank (1=best to 10=worst)			

6.4.1 Overall Action Plan

Based on the findings of the study, develop an overall action plan for the selected mitigation option and strategy to climate proof the project. This plan will supplement PC-I and PC-II documents. A template for this plan is given below. You can add more rows and columns as per the project requirements.

Table 6. 6: Template to Document Overall Mitigation Plan

Mitigation Option	Responsible party/person	Schedule	Expected results	Indicators	Cost /Budget
Identified and selected option to reduce GHG emissions	*The organization, individual, or entity responsible to carry out the Mitigation measure*	*Management plans, and timing of implementing the Mitigation option including any due diligence required*	*Expected outputs of the Mitigation measure*	*What indicators will be used to track changes?*	*The Estimated cost of the Mitigation measure*

Chapter 7: Climate Indicators for Monitoring and Evaluation (CIME)

The M&E design should be initiated during PC- formulation that should include monitoring and evaluation of one or more climate indicators. This requires that climate indicators (mitigation or adaptation) should be rooted in the Result based Monitoring Framework. These indicators will monitor and track progress of interventions that contributes towards reducing vulnerability towards a low carbon pathway and/or reducing vulnerability to impacts of climate change.

7.1: Developing Indicators

Depending on the nature of the project, the project will fall in one of the following categories:

1. **Project promoting Mitigation**: essential for GHG accounting and decarbonizing the project. Any project with objective to reduce GHG emissions will qualify as a mitigation indicator such as switching to 40% EVs to reduce emissions. Additionally, it is not necessary for the project to only take into account GHG emissions to qualify as mitigation indicator, indicators can include for example, amount of MW generated through renewable energy, number of green technology or energy efficient appliances sold, and number of incentives to promote green and low emission development.
2. **Project promoting Adaptation**: Developing M&E or adaptation is trickier than mitigation since a project activity reducing vulnerability in one context or locations may have a different impact in another context or location. Hence the indicators to be adopted should be context-specific such as location, beneficiaries, and sector. The adaptation indicators should be designed considering three core capacities of resilience: Absorptive Capacity, Adaptive Capacity, and Transformative Capacity[44]. The M&E in this case will require longer timeframes and will also be difficult to track in the absence of the risk.
3. **Other projects that need to be climate proofed**: these projects don't have mitigation or adaptation has primary objective, but the M&E system can have a mitigation and/or adaptation indicator (adopted as a consequence of resilience and mitigation assessments) that will help to track the progress of the mitigation and/or adaptation measures adopted.

7.2: Basic Requirements and Considerations for Tracking Climate Change in M&E

1. Data and sources, conduct site visits in case of high-risk projects
2. Decide how often the data will be collected and reported
3. Baseline

[44] World Bank: **Absorptive Capacity**: The ability of people, assets, and systems to prepare for, mitigate, or prevent negative impacts of hazards to preserve and restore essential basic structures and functions (eg. Number of grain storage sheds strengthened with climate resilient walls (Number)). **Adaptive Capacity**: The ability of people, assets, and systems to adjust, modify or change characteristics and actions to moderate potential future impacts from hazards, so as to continue to function without major qualitative changes (e.g., Number of farmers with access to new irrigation system in an area previously dependent on rainfall (Number)). **Transformative Capacity:** The ability of the intervention to create a fundamentally new system so as to avoid negative impacts from hazards (eg., Increase in household income from shifting to less climate dependent livelihoods (Percentage).

4. Scale (national, provincial, district, local)
5. Using information already available and links to existing M&E systems or learn from them
6. Links to national climate change targets and SDGs
7. Resources needed: sufficient budget for M&E and human resources
8. Pilot the M&E system designed and also adapt it if changes are needed
9. Ensure stakeholder engagement throughout the process
10. Select indicators that are SMART (Specific, Measurable, Achievable, Relevant and Time-bound)
11. Measure the progress at all stages i.e output, outcome and impact through indicators to identify project's performance and sustainability.
12. It is advised to have atleast one mitigation or adaptation indicator at all stages of project's logic design, do not make the process burdensome, fewer and only relevant indicators are better than many indicators that are non-relevant
13. Design indicators based on the resilience and mitigation objectives set as a result of resilience and mitigation assessments
14. Indicators can be quantitative (measured in numerical terms) or qualitative (collect data through consultations, surveys)
15. Conduct capacity building and training to collect data and reporting
16. Identify problems and changes and adjustments needed in proposed M&E through mid-term evaluations

The M&E should be rooted in the project's logical framework.

Table 7. 1: Indicators in Project Logical Framework

Activities	Outputs	Output Indicators	Outcomes	Outcome Indicators	Impact	Impact Indicators
Tasks undertaken to produce outputs	Resulting products and services from activities	Measure change directly related to the activities	What will be achieved from outputs	Measure change in medium to long term	What is the core or overall aim	Measure long term impact of the project

7.3 Examples of Mitigation Indicators

These indicators help track and measure the implementation of measures that aim to reduce or limit GHG emissions or enhance GHG sinks[45]

Example: Increase in reforested land area and percentage of passenger using public transport etc.

[45] World Bank

7.4 Examples of Adaptation Indicators

These indicators help track and measure the implementation of measures adopted to build resilience of people, processes and overall ecosystem to climate change, as well as to monitor progress of adaptation strategies and polices[46]. They can also include gender sensitive indicators since gender plays an important role in shaping vulnerability and adaptive capacity such as measuring benefits to male or females as a result of adopting climate change policy[47].

Examples: No. of Farmers adopting drought resilient seeds, and institutional capacity and training etc.

[46] World Bank
[47] https://www.adaptation-undp.org/sites/default/files/uploaded-images/module_8_indicators_etf_online_0.pdf