Key Elements, Tools and Best Practices for the Development of
Public-Private Partnerships in Infrastructure

RESILIENT PUBLIC-PRIVATE PARTNERSHIPS

A REGIONAL AND MULTI-SECTORAL TOOLKIT FROM PREPARATION TO SUSTAINABLE PROJECT FINANCING

ABEL BID

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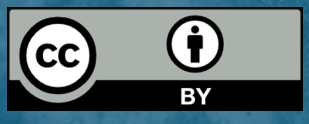

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ACKNOWLEDGMENTS

The **Toolkit** presented here is designed to provide a comprehensive approach to environmental sustainability and climate resilience in the development of infrastructure under the Public-Private Partnerships (PPP) scheme, relying on a multi-sectoral perspective and a fiscal commitment that covers the entire life cycle of the projects, where its effective implementation requires national climate action and the strengthening of regional governance.

It builds on an initial effort by the **Inter-American Development Bank** (IDB), in collaboration with the **Development Bank of Jamaica** (DBJ) and **Rebel**, to provide a pragmatic approach with solutions to assess climate risks and offer resilient opportunities in the preparation of PPP projects in Jamaica.

In this new version, the IDB's Public-Private Partnerships Single Window (PPPSW), together with Rebel, expands the original scope, preserving the focus on environmental sustainability and climate resilience and based on this, builds a vision of regional application, with a multi-sectoral perspective, under an exercise of maximum responsibility in terms of the management, use, and allocation of public resources.

The authors of version 2.0 of the Toolkit are Elisa Donadi and Andrea Arciniegas (Rebel) and Ancor Suárez-Alemán and Enrique Domínguez (IDB).

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This joint effort and work provide a Toolkit that government project teams in Latin America and the Caribbean can use to comprehensively address climate resilience throughout the life cycle of PPP projects, from a fiscal sustainability approach and a multi-sectoral perspective.

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TEXT BOXES

LIST OF ABBREVIATIONS

CBA	Cost-Benefit Analysis
CRA	Climate Risk Assessment
EBRD	European Bank for Reconstruction and Development
ECLAC	Economic Commission for Latin America and the Caribbean
UNFCCC	United Nations Framework Convention on Climate Change
PPC	Public-Private Comparator
EIA	Environmental Impact Assessment
GDP	Gross Domestic Product
IADB	Inter-American Development Bank
IMF	International Monetary Fund
IPCC	Intergovernmental Panel on Climate Change
ISDR	International Strategy for Disaster Reduction
LAC	Latin America and the Caribbean
NIA	National Infrastructure Agency
PPP	Public-Private Partnerships
MDPI	Multidisciplinary Digital Publishing Institute
VfM	Value for Money
NPD	National Planning Department
NPV	Net Present Value
PBC	Performance Based Contracting
PGRD	Disaster Risk Management Project (acronym in Spanish)
PMM	Performance Measurement Matrix
SDGs	Sustainable Development Goals
WMO	World Meteorological Organization
RfP	Request for Proposals
TCFD	Task Force on Climate-related Financial Disclosures
UNDP	United Nations Development Programme
UNDRR	United Nations Office for Disaster Risk Reduction
WRI	World Resources Institute

INTRODUCTION

WHY CONSIDER CLIMATE RESILIENCE IN THE PPP CONTEXT?

According to the World Meteorological Organization's (WMO) 2022 Report on Latin America, 2021 was a record year for extreme weather events. In that period, three examples stand out with significant costs for the region: (i) the third most active Atlantic hurricane season on record; (ii) Brazil's Rio Negro reached its highest water level in 102 years; and (iii) Chile faced the longest and most severe mega-drought in the last 1,000 years (World Bank, 2022).

Although efforts have been made at the international level to reverse the meteorological deterioration and environmental impact (Paris Agreement of 2015 at the 21st Conference of the Parties -COP- and the Glasgow Climate Pact in 2021 at the 26th COP), it is estimated that extreme weather conditions will continue to affect communities and the economy of Latin America and the Caribbean. The following are some additional examples to those already mentioned and their effects on loss of value: (i) Floods in the Brazilian provinces of Bahia and Minas Gerais, with costs of more than US$ 3.1 billion and affecting almost one million people; these provinces are only part of the challenge facing Brazil, where companies are losing an average of US$ 22 billion a year (1.27% of Gross Domestic Product or GDP) due to disruptions caused by climate phenomena, especially extreme floods (ibid). (ii) Central America, in contrast to Brazil, experiences a "Dry Corridor," which extends from Panama to southern Mexico; this has accounted for more than US$10 billion in losses over the past 30 years due to continuous drought and significant rainfall variability (ibid). (iii) Caribbean Small Island Developing States (SIDS) are similarly vulnerable. In 2017, category 5 hurricanes Irma and Maria caused widespread damage, from which many countries are still recovering. According to reports, damage to infrastructure in Antigua and Bermuda and St. Maarten reached more than 85% destruction following Irma (PAHO and WHO, 2017). The country that suffered the most from the impact of Hurricane Maria was Dominica, with more than 90% of the island's infrastructure destroyed and severe damage to electricity, drinking water and telecommunications systems. Total damage and economic losses are estimated at 225% of its GDP (Lewis, 2022).

In general terms, it is estimated that the annual cost to Latin America and the Caribbean caused by climate phenomena and natural disasters amounts to at least 1% of regional GDP and up to 2% of GDP in some particularly affected countries (World Bank, 2022), in addition to the negative impact of the COVID-19 pandemic. In this context, according to the IDB Macroeconomic Report for Latin America and the Caribbean, published in 2023, in the countries of the region, the pandemic produced a decrease of 7% of GDP in 2020. To mitigate its impact, record levels of fiscal spending accompanied this decrease, leading to fiscal deficits of 7.4% of GDP and sovereign debt levels of 74% of GDP in the region's median country.

A report by the Multidisciplinary Digital Publishing Institute (MDPI), published in 2022, estimates that by 2100, increased hurricane activity in the Atlantic will be responsible for between US$ 26 billion and US$ 53 billion annually in infrastructure damage. For countries, the direct impact of extreme weather events on infrastructure represents more than 1% of their respective GDPs (ibid.).

The vulnerability of Latin America and the Caribbean to climate catastrophes is significant, partly due to existing infrastructure deficits. IDB estimates indicate that the region would need to invest 3.12% of its GDP in the coming years to achieve the Sustainable Development Goals (SDGs) by 2030 and cover the economic infrastructure deficit, without considering social infrastructure requirements (Brichetti et al., 2021).[1] In any case, not investing is not an option: If the countries of the region do not invest more, and strategically, in developing and maintaining infrastructure, they could lose up to 15% of potential GDP growth over the next 10 years (Suárez-Aleman and Silva Zúñiga, 2020).

The costs are substantial, as are the benefits associated with investing in resilient infrastructure. One way to mitigate these significant losses is to invest in more resilient infrastructure, capable of resisting and responding favorably to extreme weather events. As an example, a study published by the World Bank for Latin America and the Caribbean estimates that, in the case of transportation alone, investing in resilient infrastructure could generate savings of up to US$ 6 billion in annual losses (estimated savings of US$ 12 for every US$ 1 invested in resilience - return greater than 1,000%) (World Bank, 2022).

Considering the costs and infrastructure deficit in the region, climate resilience should become a characteristic feature of all future sectoral development plans and their respective infrastructure projects. That is, the countries of the region should design a public policy strategy aimed at the development of resilient infrastructure, based on best practices and international agreements (2015 Paris Agreement and Climate Pact, among others).

Traditionally, public investment in the region, far from being resilient, is insufficient to meet infrastructure needs, high in carbon, and inefficient in terms of the best use and allocation of resources (Serebrisky and Suárez-Alemán, 2019). Additionally, the traditional bias against public capital investment, as well as the fiscal challenges it faces, indicate that the space for closing the infrastructure gap through public sector investment is very limited. It is therefore critical to leverage private sector participation to close the sustainable infrastructure gap (Watkins et al., 2019)[2] and, to this end, well-prepared and structured Public-Private Partnerships (PPPs) are an essential tool - and with the potential to generate significant benefits and savings through efficiency gains in public spending.

1. For example, in the health sector, investment needs are estimated at US$ 153 billion for new hospitals, equipment and modernization of existing infrastructure (IDB 2018).

2. Sustainable infrastructure refers to infrastructure projects that are planned, designed, constructed, operated, and decommissioned in a manner that ensures economic and financial, social, environmental (including climate resilience) and institutional sustainability throughout the project life cycle.

Through proper planning, PPPs can generate innovative contractual schemes that guarantee better development, operation and maintenance of infrastructure assets and services in times of crisis, preserve investment levels in a context of fiscal challenges, and place particular emphasis on the dimensions of social, environmental, institutional and economic-financial sustainability (Suárez-Aleman and Silva Zúñiga, 2020).

Closing the quantitative and efficiency gap in sustainable infrastructure requires not only developing more and better assets (roads, solar farms, water treatment systems, parks, schools, hospitals, among others), but also transforming the way in which infrastructure as a whole is conceived, prepared, structured, developed and maintained, understanding its sustainability and its contribution to sustainable development in a comprehensive manner. Not considering systematically the consequences of climate change for a country's infrastructure is an exercise in economic and social irresponsibility.

Failure to consider key elements for climate resilience in the preparation phase, as well as the development and implementation of adaptation and mitigation measures throughout the life cycle of the projects, could compromise not only the quality and sustainability of the assets, but even their economic and financial viability - and, therefore, the availability of key services for the economic and social development of the different regions. Thus, the sectoral promotion of resilient and sustainable infrastructure projects should not be seen as an isolated and independent strategy, but as part of an exercise of maximum responsibility regarding the proper management of public resources (Domínguez and Suárez-Alemán, 2023).

The very nature of PPP projects generates an adequate space for the inclusion of the different dimensions of sustainability that will be discussed here - social, environmental, institutional and economic-financial -, when they:

- **Consider full life-cycle costs:** PPPs require public officials to consider the long-term costs of infrastructure investments (and therefore their funding). This creates greater discipline in the infrastructure development process: private parties must look beyond the construction phase to assess costs over the life of the project (about 25-30 years). These private parties are incentivized to think about all potential risks and costs, including those related to climate. As a result of this view of the project life cycle and its risks, PPPs can result in infrastructure projects that are better designed and better able to withstand climate and natural disaster events, as well as their long-term economic, financial, and fiscal consequences.

- **Offer innovative solutions:** The development of PPPs requires coordination among many stakeholders (e.g. the concessionaire, the government, the financial investors, the operator), each of which brings different perspectives and incentives. The result of this coordination and negotiated effort to carry out a PPP project can lead to more innovative infrastructure solutions in the

face of current and future climate and natural disaster risks, incorporating different (but coordinated) sustainability mandates from both the public perspective, as well as requirements for development and financing by the private sector (firm sustainability mandates).

- **Require a robust risk assessment:** At the core of any good PPP project is an ongoing and robust risk assessment, where potential project risks are identified at each stage of their life cycle, assigned to the party best able to manage them, and mitigation or elimination solutions are designed for those with the highest probability of occurrence and impact. Therefore, including a climate and natural disaster risk analysis as part of this process will be essential to complete the risk profile that PPP project concessionaires must consider to guarantee the availability of services and increase their benefits.

- **Include investor due diligence:** By their nature, PPPs provide private financing and therefore involve a counterparty performing due diligence. Lenders are looking for profitable projects that will perform optimally throughout their life cycle and generate the revenue stream necessary to service their debt. Since the materialization of climate and natural disaster risks would affect a project's ability to operate and generate revenues, PPP contracts should explicitly state how to identify them and which party should manage them.

In summary, the Toolkit favors the development of infrastructure under the Public-Private Partnership contracting scheme from a focus on environmental sustainability and climate resilience, a multi-sectoral perspective and a fiscal commitment that encompasses the entire life cycle of the projects. In this way, the Toolkit extends its scope from the initial preparation to the financing of projects and points out the importance of ensuring sound public finances.

LAC AMONG THE PIONEERS OF THE SUSTAINABILITY AGENDA

The interest in advancing a sustainable project preparation agenda has led several countries in the region to work intensively to strengthen their regulatory, institutional, and planning frameworks for the development of sustainable infrastructure through PPPs that are resilient to climate change and natural disasters.

Jamaica, for example, is the only country in the world that has incorporated climate resilience and natural disaster risk management into its PPP policy, with the support of the Inter-American Development Bank and Rebel. As a direct consequence of this effort, the Caribbean country recently received a US$ 764 million loan from the International Monetary Fund (IMF) to strengthen physical and fiscal resilience to climate change by implementing climate and natural disaster resilient projects, as well as measures to decarbonize its economy and manage transition risks by adjusting its policy and operational implementation (International Monetary Fund, 2023).

Following this line of work, the National Infrastructure Agency (NIA) of Colombia has developed, together with the IDB, a toolkit to integrate climate resilience in transportation PPPs, and recently, the National Planning Department (NPD) of Colombia integrated a multisectoral framework under the four pillars of sustainability (Rebel, 2022). Currently, the Inter-American Development Bank is working hand in hand with **Chile** and **Peru** to reinforce sustainability components in the development of bidding specifications for sustainable financing (Chile), as well as in the mainstreaming of sustainability dimensions (social, environmental, institutional, and economic-financial) in PPP guidelines (Peru). This joins the efforts of countries such as **Brazil** and **Mexico**, which have made strong progress in the preparation of sustainable infrastructure projects.

Work carried out to date in countries such as Jamaica, Colombia, Chile, Brazil, and Peru points to a series of good practices linked to the effective preparation of sustainable infrastructure PPP projects, with a multisectoral approach, which led to the creation of this Toolkit as a tool for coordinating and disseminating best practices throughout the region. Based on the efforts and experiences of the countries mentioned above, this document seeks to generalize existing resources and principles by applying a regional and multisectoral approach aimed at providing tools for all countries in Latin America and the Caribbean, with the potential to be adapted to different infrastructure sectors (e.g., water and sanitation, transportation, energy and the social sector) in different regulatory and institutional contexts.

In addition, the Toolkit, based on the methodological framework set forth in the document Fiscal Sustainability of PPPs (Domínguez and Suárez-Alemán, 2023), provides a particular tool to contribute to greater **fiscal sustainability**, highlighting the importance of preparing fiscally responsible projects, incorporating climate and natural disaster risk in the evaluation of fiscal commitments (direct and contingent liabilities) to estimate their impact, finding mechanisms to ensure that, during the operation and maintenance stage, there is optimal funding from a regulatory and institutional framework that provides certainty to stakeholders and establishes sound guidelines for the development of PPPs.

In this sense, this Toolkit seeks to build on the work done in the region and provide guidance on how to incorporate climate resilience and natural disaster management in PPPs for all countries and sectors. In this way, it aims to assist government project teams in Latin America and the Caribbean in comprehensively addressing climate resilience throughout the life cycle of PPP projects, from a multi-sectoral point of view. With this Toolkit in hand, LAC can continue to be a world leader in the promotion, creation and implementation of sustainable infrastructure designed to withstand the new reality of extreme weather and climate events.

It is important to note that this document is part of a repository of tools offered by the IDB's PPP Single Window aimed at promoting and facilitating the development of efficient and sustainable PPPs.

STRUCTURE OF THE TOOLKIT

The Toolkit is organized into four sections that correspond to the main phases of the PPP project life cycle: initial assessment, structuring, transaction, and contract management. The Toolkit provides recommendations and decision support tools for incorporating climate and natural disaster risk assessment and climate resilience considerations into the different phasess of the PPP project life cycle:

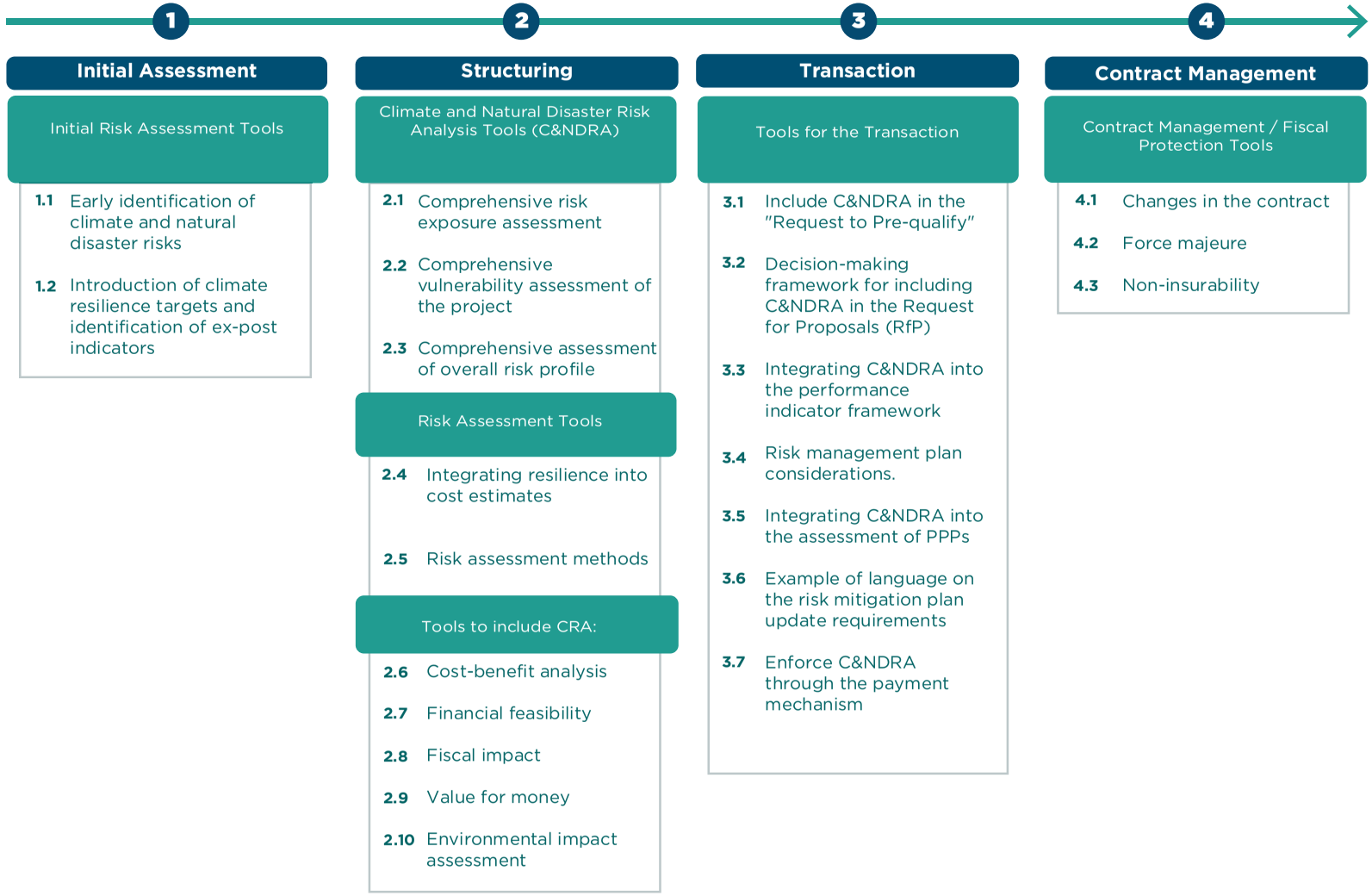
1. Initial Assessment Phase of the PPP Project: The climate change and natural disaster resilience tool integrated into this phase seeks to guide project stakeholders in the initial assessment of how climate and natural disaster risks may affect the project. Ideally, this initial assessment should be carried out in parallel with the initial assessment of the technical, land, economic-financial, fiscal, social, and environmental components.

2. PPP Structuring Phase: The tools in the Structuring Phase aim to help stakeholders think about how to incorporate climate resilience considerations into the various technical, financial, economic, fiscal, social, and environmental analyses undertaken to determine whether the project is feasible and best executed under the PPP modality.

3. PPP Transaction Phase: The tools in this phase will help stakeholders think about how to incorporate climate resilience considerations, strengthening elements aimed at promoting climate resilience, such as contract design, qualification of bidders, project bidding and evaluation of bids received. During this phase, the aim is to encourage bidders to (i) incorporate a climate focus in their proposals, (ii) develop infrastructure based on sustainable infrastructure labels, such as those used in the Climate Policy Initiative, and, therefore, (iii) access financing with preferential conditions (e.g., thematic bonds).

4. PPP Contract Management Phase: The tools in the Contract Management Phase are intended to help governments and project planners think about how to follow up on commitments related to climate and natural disaster risks made during the Transaction Phase and manage any unforeseen climate-related or natural disaster risks that occur during the PPP life cycle, in order to support the sustainability of projects and, ultimately, ensure quality services. It also provides a reflection on the definition of force majeure, non-insurability, and the flexibility of contracts in the face of climate change.

Figure 1. Climate and Natural Disaster Resilience Toolkit Framework for PPPs



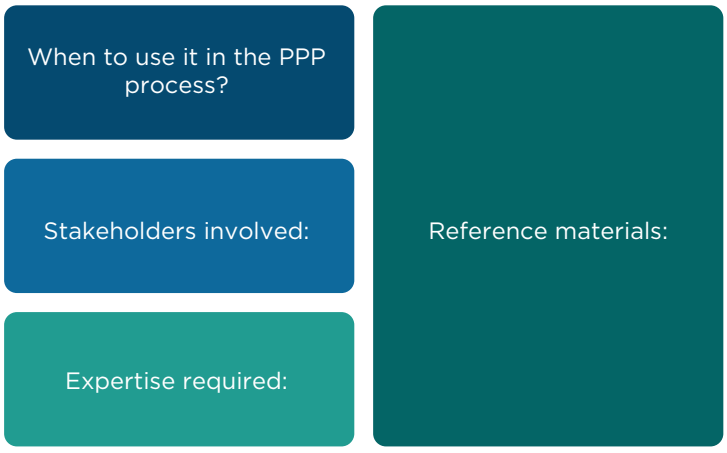
WHAT TO EXPECT FROM THE TOOLKIT?

The Toolkit is a dynamic document, providing a set of guidelines based on best practices identified to date. However, because incorporating climate resilience and natural disaster management into the PPP lifecycle is a relatively new objective for governments, it may be expanded in the future.

The tools included offer frameworks and suggestions that will help incorporate climate resilience and natural disaster risk management considerations into the standard analyses and procedures of the PPP process. Each tool can be adapted to the guidelines, directives, methodologies and procedures of the contracting authorities and public entities of the different Latin American and Caribbean countries and for each sector. It should be noted that the Toolkit **seeks to promote the integration of climate resilience into existing studies and procedures in each jurisdiction**, but not to duplicate efforts or generate structural changes or parallel requirements to those already established. In this sense, the Toolkit **does not seek to replace but rather to complement** the progress made by each country in terms of climate resilience and disaster risk management.

Throughout the Toolkit there is a clear delineation of which teams and stakeholders can benefit from each tool, according to their responsibilities and roles. Each tool includes guidelines on when it should be used, a list of stakeholders who could benefit from the tool and/or provide relevant information, guidance on the expertise required for its application, and regional and international reference materials (see Figure 2). The information provided for eachtool is not exhaustive and can be adjusted according to the needs of the project or jurisdiction in question.

Figure 2. What information can be found in the Toolkit?



WHAT CONSIDERATIONS ARE NOT INCLUDED IN THE TOOLKIT?

It is important to note that the purpose of the Toolkit is not to provide general recommendations for public policy guidelines that governments should implement to ensure that their infrastructure projects are resilient to climate change and natural disasters. However, the Toolkit represents a key resource to inform the development of these public policies aimed at promoting resilience to climate change and disaster risk management. Effective application of the Toolkit must be supported by a commitment to climate action at the national and regional levels that is reflected by strengthening local governance and regulatory frameworks, such as effective changes to PPP regulations (e.g., Jamaica) or development of green taxonomies (e.g., Colombia). Reinforcing public policies has significant benefits both for promoting compliance with commitments on climate resilience and natural disaster management, as well as for facilitating access to other forms of sustainable financing.

KEY DEFINITIONS

There are several definitions of climate and disaster risk. The exact vocabulary used may differ among experts and stakeholders. The Toolkit is based on the definitions of the United Nations Office for Disaster Reduction of the United Nations (UNISDR, 2009) and the Intergovernmental Panel on Climate Change (IPCC) (IPCC, 2018):

Adaptation: In natural systems, the process of adjustment to the actual climate and its effects. Human intervention can facilitate adjustment to the expected climate and its effects.

Hazard: A physical event, phenomenon, human activity and/or dangerous condition that may cause death or injury, property damage, disruption of social and economic activity or environmental degradation. These include latent conditions that may result in future hazards/dangers, which may have different origins: natural (geological, hydrometeorological and biological) or anthropogenic (environmental degradation and technological hazards). Hazards can be individual, combined, or sequential in their origin and effects. Each is characterized by its location, magnitude or intensity, frequency, and probability.

Climate change: Climate change refers to a change in the state of the climate that is identifiable (e.g., by statistical evidence) in the variations in the mean value or in the variability of its properties, which persists over long periods, usually decades or longer. Climate change can be due to natural internal processes or external forces, such as changes in solar cycles, volcanic eruptions and persistent anthropogenic changes in atmospheric composition or land use. The United Nations Framework Convention on Climate Change (UNFCCC), in Article 1, defines climate change as “change of climate attributed directly or indirectly to human activity that alters the composition of the global atmosphere and that is in addition to natural climate variability observed over comparable time periods”. The UNFCCC thus differentiates between climate change attributable to human activities that alter atmospheric composition and climate variability attributable to natural causes.

Climate: Climate is usually defined narrowly as the average state of the weather and, more rigorously, as a statistical description of atmospheric weather in terms of the mean values and variability of the corresponding magnitudes over periods ranging from months to thousands or millions of years. The usual average period is 30 years, as defined by the World Meteorological Organization (WMO). The magnitudes are almost always surface variables (e.g., temperature, precipitation, or wind). In a broader sense, climate is the state of the climate system in both classical and statistical terms.

Capacity: The combination of all available strengths and resources within a community, society or organization that can reduce the level of risk, or the effects of an event or disaster.

Disasters: Severe disruptions of the normal functioning of a community or a society due to hazardous physical phenomena interacting with vulnerable social conditions, resulting in widespread adverse human, material, economic or environmental effects that require immediate emergency response to meet essential human needs, and which may require external support for recovery.

Exposure: The situation of people, infrastructure, housing, production capacities and other tangible human assets located in hazard-prone areas.

Mitigation: Human intervention aimed at reducing emissions or enhancing greenhouse gas sinks.

Mitigation measures: In the context of climate policy, mitigation measures are technologies, processes or practices that contribute to mitigation. For example, renewable energy (RE) technologies, waste minimization processes, and practices that promote the use of public transportation.

Resilience: The ability of social, economic, and environmental systems to cope with a hazardous event, trend, or disturbance by responding or reorganizing in ways that maintain their essential function, identity, and structure, while retaining the capacity to adapt, learn and transform.

Climate or disaster risk: Potential for adverse consequences to occur for which something of value is at risk and in which an outcome or the magnitude of the outcome is uncertain. In the context of climate impact assessment, the term risk is often used to refer to the potential for adverse consequences of a climate-related hazard, or of adaptation or mitigation responses to that hazard, on life, livelihoods, health and well-being, ecosystems and species, economic, social, and cultural assets, services (including ecosystem services), and infrastructure. Risks are derived from the interaction of vulnerability (of the affected system), exposure over time (to the hazard), as well as the hazard (climate-related) and the probability of its occurrence.

Vulnerability: Conditions determined by physical, social, economic, and environmental factors or processes that increase the susceptibility of a community to the impact of hazards.

1. CLIMATE RESILIENCE IN THE INITIAL PPP PROJECT ASSESSMENT PHASE

WHY IS CLIMATE RISK IMPORTANT DURING THIS PHASE?

The first step in the PPP process is to identify suitable projects. During this Initial Assessment Phase, it is necessary for the project team to **conduct a preliminary climate and natural disaster risk assessment and understand whether these may affect the project**. The importance of this initial assessment is to prevent and/or make modifications to the project concept in a timely manner. If not mitigated, the effects of climate change and natural disasters will increasingly affect the operational, financial, environmental, fiscal and social performance of the project (European Commission, 2016).

In general terms, the objective of a preliminary risk analysis is to qualitatively assess the effects of climate change and natural disasters on the project and its beneficiaries. In this sense, understanding the climate and natural disaster risks of the project at an early stage can help the project team to determine:

- Whether the costs/benefits that will be faced by both the private and public parties will favor the continuity of the project (a project with a high climate risk could be considered too risky and costly).
- Whether adaptability and/or mitigation measures such as changing the location and/or scope of the project (to minimize risk) need to be applied; also, explore whether these would exert additional fiscal pressures and/or avoid compliance with regulatory limits (fiscal rules/limits).
- Whether climate and disaster risks affect the decision to follow a traditional contract model or a PPP scheme.
- What are the analyses that are required in depth in the next Structuring Phase.

The application of this tool in the Initial Assessment Phase provides a knowledge base for the next phases of the PPP project and allows the project team to become familiar with the issue of climate and natural disaster risk, so that in the future they will view the project through this additional lens.

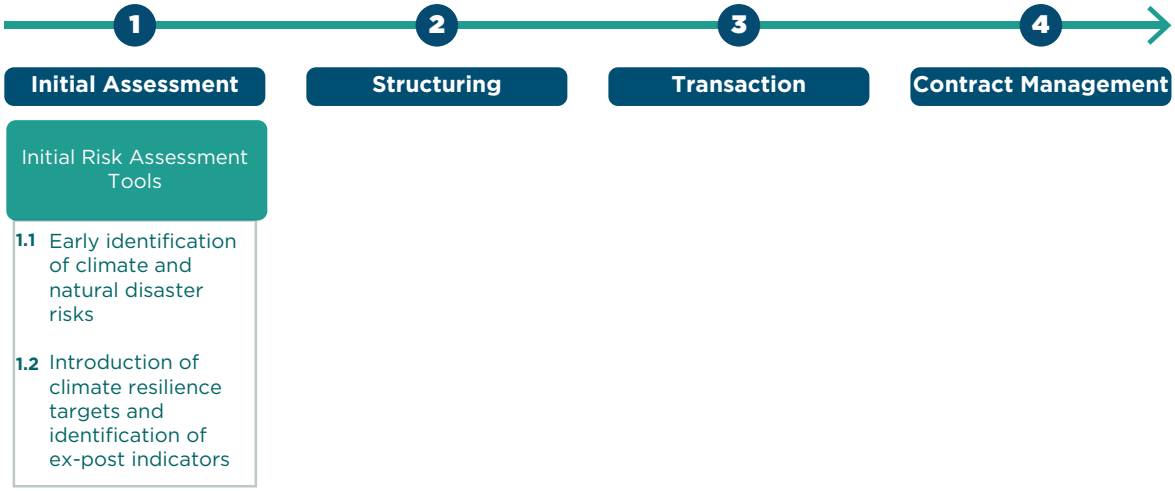
The Initial Assessment Phase includes an early identification **tool for climate and natural disaster risks** that allows for a preliminary evaluation of the project's risk profile, based on the UNDRR's conceptualization of climate and natural disaster risk. As illustrated in Figure 3, risk is estimated based on the level of the hazard (type of event), the project's exposure to the hazard and the project's vulnerability to the hazard.

Figure 3. Conceptualization of climate and natural disaster risks

In addition, this Initial Assessment Phase contains a tool that offers suggestions for setting climate and natural disaster resilience related targets in the early stages of project development, as well as ex-post performance indicators. At a minimum, there should be an objective to assess climate and natural disaster risks in the project (climate and natural disaster risk analysis). These objectives could be expanded as the project requires mitigation measures, particularly when the risk profile is medium to high. The exercise offered by this tool should be confirmed during project structuring to confirm whether climate and natural disaster risks are indeed present.

Figure 4 provides a summary of the tools at this phase, which will be described in detail below.

Figure 4. Summary of the Initial Assessment Phase Tools



TOOL 1.1: EARLY IDENTIFICATION OF CLIMATE AND NATURAL DISASTER RISKS

This tool is intended to help project teams understand, at a preliminary level, (i) the risk profile of the project and (ii) which climate and natural disaster risks could affect the project and therefore require further analysis at later stages.

Tool 1.1 is an early climate and natural disaster risk identification tool that is applied at an early project stage where, in many cases, detailed project information is not yet available. Therefore, the tool is not designed to provide a detailed risk assessment, but rather to support further analysis and consultation in order to bolster the integration of resilience measures at later stages. The tool also links project teams to publicly available digital tools to assist with preliminary climate and natural disaster risk analysis.

As mentioned above, risk is estimated as a function of the hazard, the exposure of the project to the hazard, and the vulnerability to the hazard.

Exposure

In general terms, the proximity of the project to the source of the hazard (or its zone of influence) is the main parameter used to determine the level of exposure. Exposure considers both the frequency of occurrence of the hazard in the project area (probability of occurrence) and the intensity (the level of disruption caused by the hazard), taking into account current and future climate conditions.

Vulnerability

Vulnerability is generally defined in terms of two dimensions: the project's susceptibility to the hazard and its adaptive capacity. The vulnerability of a project to a climate or natural disaster hazard must be examined in relation to the way in which the hazard affects four dimensions of its operation:

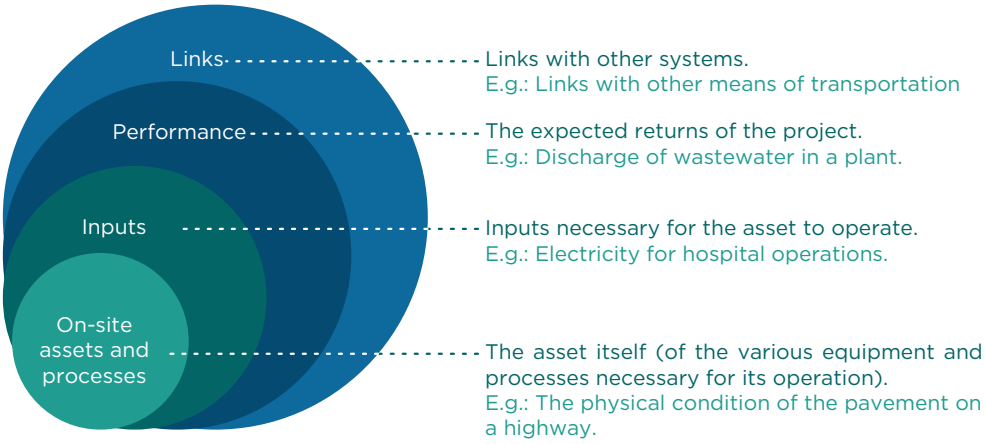
- The project's on-site assets;
- Inputs necessary for the provision / operation of services of the asset;
- The expected return; and
- Links to other systems (European Commission, 2016).

Figure 5 below presents a 'project function' framework for examining project vulnerabilities in relation to the four dimensions. As an example, and under a multi-sector application, Table 2 applies the vulnerability dimensions to the health sector (hospital) and the water and sanitation sector (wastewater treatment plant) for flood risk.

Performing the analysis using this framework can help project teams ensure that they are examining project vulnerability from a variety of dimensions. However, it is important to note that not all projects will require assessment of all four dimensions. For example, some projects, such as a road, will not have many required inputs.

When evaluating projects for which some dimension is not relevant, it should be excluded from the analysis. The benefits of structuring the analysis in this way may also be realized during the Structuring Phase, when project risk allocation strategies are decided. This is because this analysis of the project's role framework can lead teams to a clearer understanding of its most vulnerable aspects, which facilitates the choice of mitigation strategies. As a guide, this framework should not be applied rigidly as part of the vulnerability analysis by project teams.

Figure 5. Project Role Framework for Vulnerability Assessment

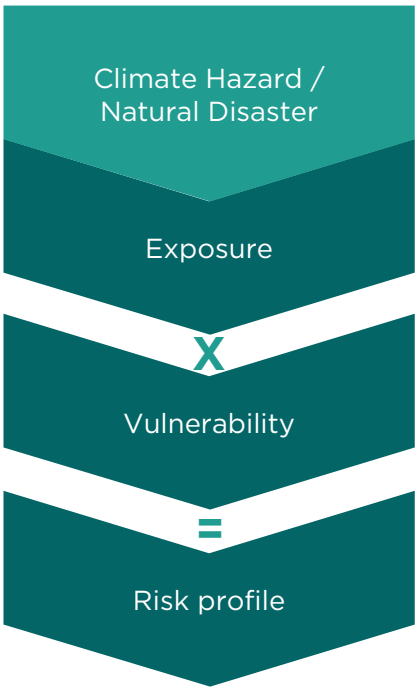


The early pre-qualification tool in the Initial Assessment Phase allows the user to conduct a preliminary assessment of the project's risk profile (see Figure 6). The depth of the climate and natural disaster risk assessment in this Initial Assessment Phase is preliminary, comparable to the technical, economic, and financial pre-feasibility assessments that are performed as part of the development of a PPP project. This initial analysis serves as a first exploration of the feasibility and viability of a project prior to making a major investment of time, human capital, and fiscal resources for its preparation.

It is important to note that **the tool at this phase can be used for both PPP projects and traditional public investment projects** because climate and natural disaster risks can be identified regardless of the contracting model chosen. Likewise, in the case of PPPs, regardless of whether it is a public or private initiative, it is highly recommended that the preliminary analysis of climate and disaster risks be integrated as part of the process and methodology used by the public entity to ensure the sustainability of the projects and fiscal viability.

Thus, it is recommended to explore whether actions aimed at favoring climate resilience and adaptation efforts would entail additional fiscal pressures and/or avoid compliance with limits established in the rule (rules with fiscal limits).

Figure 6. Project Risk Profile



In this regard, the early detection tool allows, at a preliminary level to:

- Identify **threats** that could potentially affect the project;
- Determine the **exposure of** the project to the identified threats;
- Determine the **vulnerability** of the project to climate hazards from various perspectives; and
- Understand which **risks require further analysis** and whether the project is **classified as "Medium-High" to "High" risk**.

Tool 1.1 answers, at a preliminary level, the following questions:

1. What are the hazards that could affect the project area and what is the likelihood of their occurrence in the project area now and in the future?
2. How significant would the damage to the project be if the climate or natural disaster threat were to occur?
3. What is the project's preliminary risk profile for each of the identified hazards? What is the project's overall preliminary climate and natural disaster risk profile?

The Task Force on Climate-related Financial Disclosures (TCFD) created by the Financial Stability Board establishes a framework for categorizing climate-related risks. The two main categories include risks related to the physical impacts of climate change and the financial and reputational risks associated with the transition to a low-carbon economy. This Toolkit focuses on physical risks, which are classified as severe and chronic. Severe risks are induced by hazards related to extreme weather events, including floods, tropical cyclones, and hurricanes.

Chronic risks refer to hazards that arise from gradual, medium and long-term changes in weather patterns, such as droughts or sea level rise (Task Force on Climate-Related Financial Disclosures, 2022). There are also several risks not directly caused by climate factors, such as tsunamis and earthquakes.

Figure 7 below provides a (non-exhaustive) list of chronic and severe physical hazards, as well as non-climate related hazards.

Figure 7. Risk List (Non-exhaustive)

Risks due to changes in the weather	
Severe - Related to extreme weather events	
Floods	Forest fires
Hurricanes	Lightning
Tropical Cyclones	Landslides
Storms	
Chronic - Related to gradual changes in climate.	
Sea level rise	Drought
Heat waves	
Non-climate related risks	
Threats not directly caused by climate factors	
Tsunami	Earthquake
Volcanic eruption	

While the level of exposure, vulnerability, and impact depend on the specific asset and its characteristics (e.g., location), Table 1 identifies the main risks by infrastructure sector and their impact on assets, service provision and communities.

Text Box 1. Main Climate Risks by Sector

Main Climate Risks for the Transport, Energy, and Social Sectors

Transportation Sector

Rising sea levels, precipitation and extreme temperatures are the main meteorological phenomena that impact land, air and maritime transportation systems in many regions, affecting their performance, safety and reliability. According to estimates by the Economic Commission for Latin America

and the Caribbean (ECLAC), around 7,000 km of roads in the region would be damaged by a one-meter rise in sea level. Likewise, the United Nations Development Programme (UNDP) indicates that CARICOM members would lose almost 600 km of roads and one in four airports (Fioravanti and Lefevre, 2018).

For transportation assets located in **coastal areas**, sea level rise, and extreme storms can result in storm surges and flooding with significant impacts on roads, bridges, railways, ports and airports. In the case of assets located in inland areas, heavy rainfall can cause flooding and landslides or, conversely, droughts can increase the risk of forest fires with catastrophic effects on transportation networks.[3] In general, the impacts of the aforementioned meteorological phenomena can interrupt or damage vital connections that provide access to health care, education, and other opportunities. The cost of the materialization of these climate risks varies from country to country. In the case of Belize, for example, the fiscal pressure generated by reconstruction costs is significant because the value of the road network represents 142% of the country's GDP.

Social Sector

The hospital sector has also faced the impact of extreme weather events that affect physical facilities, service delivery, and supply chains. The main climate hazards impacting the hospital sector are fires, extreme temperatures, droughts, sea level rise, floods, hurricanes and cyclones. Around the region, multiple hospitals have had to be evacuated due to extreme storms, and others have been permanently closed as a result of wildfires. According to a report by Marsh McLennan, the main impacts of climate risks on the hospital sector include service interruptions due to power or water outages, equipment damage, and supply chain disruption (Marsh McLennan, 2022).

Energy Sector

The power generation sector is particularly vulnerable to climate risks and the impact of climate change due to its high dependence on water availability (as a resource) for fuel and cooling. Therefore, **increases in temperature and changes in precipitation patterns** can have significant impacts on power systems.

In a study by the World Resources Institute (WRI), it is estimated that the European Bank for Reconstruction and Development (EBRD) will experience a 3.3% loss in annual generation from thermal and hydropower assets in its portfolio by 2030 under a moderate climate change scenario (rising water temperature and intensifying water stress) (Luo, 2021).

3. Climate Change Impacts on Transportation | US EPA.

Figure 8. Considerations for the Application of Tool 1.1

When to use it in the PPP process?

From the moment the PPP project is identified to the initial evaluation by the project team. It is useful both when identifying PPP projects and during the public investment project selection process.

Stakeholders involved:

Project team
As this is a preliminary climate and natural disaster risk analysis based on information available online, the participation of climate (hydrology and meteorology), environmental and disaster risk management experts is considered optional. However, it may be useful to identify one or more external climate specialists to act as critics, supporting the interpretation of hazard maps, particularly for teams with little experience in climate and natural disaster risk assessment.

Expertise required:

Technical understanding of the project and specific sector, climate expertise, and ability to handle basic climate tools and maps.

Reference materials:

The following free digital tools and information platforms may be relevant:

- ThinkHazard!
- World Bank's Climate Change Knowledge Portal
- Global Facility for Disaster Reduction and Recovery Hazard Data Repository
- World Bank Data Catalogue
- The World Bank's Climate and Disaster Risk Assessment Toolkit
- World Bank Latin America and the Caribbean Risk Profiles

In turn, the following methodological guidelines can facilitate the assessment of the preliminary risk profile of the project:

- Disaster risk and climate change assessment methodology for IDB projects: Technical reference document for teams in charge of IDB projects (Barandiarán et al., 2019).
- Guidelines for project managers turning vulnerable investments into resilient ones (European Commission, 2016).
- Climate Resilient Public Private Partnerships: A Toolkit for Decision Makers (Frisari et al., 2020).

Steps for Tool 1.1 Application

1 **Research available sources of climate hazard maps and data repositories:** The project team should conduct a review of hazard maps, climate models, and national and regional data repositories to determine if the project is located within the zone of influence of a hazard. This review will allow the project team to identify potential hazards that could affect the project, their probability of occurrence, and their intensity (i.e., exposure). Figure 7 presents a (non-exhaustive) list of hazards that could be relevant and should be considered by the team at the time of consultation. In terms of available sources, the following paragraphs provide examples of repositories and databases that may be useful for specific hazards:

- IPCC database for precipitation and temperature indicators.
- NASA database for sea level rise projections.
- UNDRR database for river flooding.
- Pyrenean Institute of Ecology database for droughts (Standardized Precipitation and Evapotranspiration Index).
- WRI Aqueduct database for coastal flooding.

2 **Rating the project's exposure to hazards:** Based on the information gathered in Step 1, the project team should preliminarily determine the project's exposure to the identified hazards. To carry out this step, project teams can leverage different methodologies.

- **Methodologies used in digital tools and climate maps:** Each of the tools that defines the level of exposure of a geographic area to a hazard employs a specific methodology. For example, the ThinkHazard! digital tool provides an overview of the hazards affecting a given geographic area. ThinkHazard! uses four levels to classify the exposure of a geographical area to 11 threats. The levels (high, medium, low and very low) are determined based on the intensity of the hazard at a given frequency. In the case of river flooding, for example, the high level refers to the fact that potentially damaging river flooding is expected to occur at least once in the next 10 years. The parameters vary for each of the hazards. Also, as described in Table 2, the World Bank's Early Climate Risk Assessment Tool provides an alternative methodology.

- **Methodologies proposed by climate experts on the task force:** If the task force has climate and natural disaster management experts, alternative or nationally established methodologies may be used.

- **Methodology used in the Toolkit:** Alternatively, the Toolkit provides a project exposure scoring methodology based on low, medium-low, medium-high and high levels.[4]

EXPOSURE LEVEL	DEFINITION
Low	**No** climate or natural disaster hazards are likely to occur during the construction and/or operational life of the project
Medium-Low	The threat(s) **is likely** to occur **at least once** during the implementation (construction) period and/or operational life of the project
Medium-High	The hazard(s) **is likely** to occur **several times** during the implementation (construction) period and/or operational life of the project
High	The hazard(s) **is likely** to occur **recurrently** during the construction period and/or operational life of the project

3 **Document climate risk exposure:** Regardless of the methodology applied, it is recommended that the project team document the project's level of exposure to identified hazards. Table 1 presents an example of a template for documenting the initial assessment of the project's exposure to hazards. The template is available in Appendix 1.

4. In this case, the scoring methodology is developed in accordance with the IDB Disaster Risk and Climate Change Assessment Methodology for IDB Projects: Technical Reference Document for IDB Project Teams (Barandiarán et al., 2019) and expert opinion.

Text Box 2. World Bank's Early Climate Risk Assessment Tool[5]

Application of the World Bank's Early Climate Risk Assessment Tool

The World Bank has an early identification tool for current and future climate and natural disaster risks that provides a preliminary assessment to assist teams in considering short- and long-term risks at an early stage of the project. The tool applies an exposure-impact-adaptive capacity-based framework to characterize risks. The tool is based on climate and geophysical risk information, which is complemented by users' knowledge of the project components and their understanding of the sector and context. Once applied, the tool produces a summary report to the user.

It should be noted that this is an early identification tool that does not present a detailed analysis but rather aims to support additional consultations, a dialogue with experts, and additional analysis. According to the World Bank the early assessment tool is a good option for users who are already aware of the climate and natural disaster risks that could affect their project. The early assessment tool is categorized by sector, including energy, urban development, transportation, water, among others.
A sample report for a water supply and sanitation project is available through this link.

Table 1. Example of the Initial Threat Exposure Assessment Template

Name of the Project: _____

NUM	THREATS	SCORING: [SPECIFY METHODOLOGY USED]
1	*Threat (specify):*	
2	*Threat (specify):*	

4 **Gather relevant project information:** Following the preliminary exposure assessment, the vulnerability assessment requires an understanding of the conceptual details of the project. Therefore, information that is available should be gathered or, if possible, a reconnaissance visit to the project. Should be made in order to learn about the characteristics of the geographical area and the requirements for project development. Among the documents that should be studied (subject to availability) are:

- Project map;
- Geotechnical studies or description of geotechnical conditions;
- Preliminary alignment / footprint / design; and
- Any conceptual studies available at this phase of the project (technical, property, social and environmental studies).

5. For more information, see https://climatescreeningtools.worldbank.org/rapid-assessment-tool.

It is also beneficial to include comments from technical and climate experts on the site and project characteristics in relation to hazard maps, comparative information about other projects, and considerations of experiences at the project site.

5 It is recommended that the team consider the 'project functions' framework illustrated in Figure 5. In addition, the following table provides a series of guiding questions for assessing project vulnerability.

PROJECT ASPECTS	QUESTIONS
On-site assets and processes	What are the key on-site assets that are critical to the operation of the infrastructure and the delivery of related services?
Project-related inputs	Are there key inputs (e.g., water, power, maintenance) that are necessary for the project to operate? What are these key inputs? If you have the information when performing the analysis, how long will it take to get the inputs back up and running if there is a total or partial interruption of the inputs?
Project performance	Is the project expected to generate any outputs? What services will the project (stop) providing: Electricity? Urban transport? Hospital services? Would it have a critical impact on the population if the project's products/services were affected?
Links with other systems	Is the project linked to other critical infrastructure systems? For example, does the operation of the infrastructure project require connections to key transport links or transmission lines?

Table 2 provides examples of vulnerability dimensions applied to the health sector, and the water and sanitation sector.

6 **Rating the potential damage to the project from hazards:** Based on the findings of the previous steps, the project team should document and rank the vulnerability of the project to hazards. The Toolkit provides a project vulnerability scoring methodology based on Low, Medium-Low, Medium-High and High levels.[6]

6. Note: In this case, the scoring methodology is developed in accordance with the Disaster Risk and Climate Change Assessment Methodology for IDB Projects: Technical Reference Document for IDB Project Teams (Barandiarán et al., 2019) and expert opinion.

EXPOSURE LEVEL	DEFINITION
Low	The elements of the project (assets, inputs, outputs and linkages) **are not affected** by the specific threat.
Medium-Low	**An element** of the project (asset, inputs, operation and linkages) is **somewhat vulnerable** to the particular threat.
Medium-High	**More than one element** of the project (asset, inputs, operation and linkages) is **vulnerable** to the particular threat.
High	**Several or all elements of the project** (asset, inputs, operation and linkages) **are highly vulnerable** to the specific threat.

Table 2 also presents an example of a template for documenting the vulnerability assessment based on the project's performance dimensions. The template is available in Appendix 2.

Note: It is important to note that the assessment at this phase is qualitative, so that the teams can efficiently advance to the Project Structuring Phase and thus carry out a more comprehensive risk analysis.

Table 2. Examples Of Multi-Sector Vulnerabilities: Health Sector and Water and Sanitation Sector

DIMENSIONS VULNERABILITY	MATERIALIZED HAZARD: FLOODING	
	HOSPITAL	WASTEWATER TREATMENT PLANT
On-site assets and processes	Flooding can cause damage to a hospital's electrical wiring due to excessive moisture and corrosion	Flooding can damage the wastewater treatment system's chemical and fuel supply tanks, which are necessary for its operation.
Inputs	Insulation and termination faults / electrical outages	Damage to tanks can slow down or completely stop the supply of chemicals or fuel to the facility.
Performance	Unintentional shutdown of cold storage systems (damage to entire stocks of vaccines and other medical supplies) Damage to computer equipment and loss of patient records	It could result in backflow or discharge of highly contaminated raw sewage.

DIMENSIONS VULNERABILITY	MATERIALIZED HAZARD: FLOODING	
	HOSPITAL	WASTEWATER TREATMENT PLANT
Links	Increased number of patients and care required in nearby hospitals to supply the demand not met by the affected hospital	Low availability of treated water for industrial use, cleaning, or consumption.

Table 3. Example of the Initial Project Vulnerability Assessment Template

Name of the Project: _____

NUM	THREATS	IF THE 'PROJECT OPERATION' FRAMEWORK IS APPLIED, INCLUDE THE IMPORTANCE OF ON-SITE ASSETS, INPUTS, PERFORMANCE AND LINKS	IF THE 'PROJECT OPERATION' FRAMEWORK IS USED, DESCRIBE THE POSSIBLE DAMAGE CAUSED TO THE ASSET ON-SITE, THE INPUTS, PRODUCTS, AND LINKS
		Score: Low | Medium-Low | Medium-High | High	Description
1	*Mass Movements*	*E.g., Medium*	*E.g. Affects the pavement (active) impeding the circulation of vehicles (project performance), hindering the circulation of the population to other larger road arteries in the country (link with other systems)*
2	*Threat (specify):*		
3	*Threat (specify):*		

7 **Integrate the results of the preliminary exposure and vulnerability assessment:** Project teams should document hazards according to the level of vulnerability and exposure in a risk matrix. Table 4 provides an example of a risk matrix template. The template is available in Appendix 3.

8 **Rate the resulting risk profile and determine where it falls between "Medium-Low" and "High":** The climate risk assessment template helps project teams reach a preliminary conclusion on whether a project has a low, medium-low, medium-high and high risk of climate change related impacts.

The Toolkit provides a methodology for scoring the overall project risk profile based on acceptable, tolerable and severe risks.[7]

7. Methodology adapted from Frisari et al. (2020).

RISK LEVEL	HOW DOES THIS RELATE TO PROJECT RISK?
Acceptable: Low | Low Medium-Low | Low Low | Medium-Low	If **ALL** risks fall into this category, the project is considered **LOW** risk or **ACCEPTABLE**. The project team can proceed with the development of the project without the need for additional studies or measures beyond those that would be carried out for the PPP project. However, it should be noted that this is a high-level risk assessment and therefore the climate and natural disaster risks of the project need to be monitored as the project is developed and implemented.
Tolerable: High | Low Medium-High | Low Medium-High | Medium- Low Medium-Low | Medium- High Low | Medium-Low Low | Medium- High Low | High	If **ANY** climate or geophysical risk falls into this category, the project is considered **TOLERABLE**. The project team is encouraged to expand the assessment through additional studies, consultation, and dialogue. It is important to especially monitor these risks because they are part of a fairly broad category.
Severe: Medium-Low | High Medium-High | Medium-High Medium-High | High High | Medium-Low High | Medium-High High - High	If **ANY** climate risk falls into this category, the project is considered high risk or **SEVERE**. The project team is recommended to conduct a more detailed risk assessment and consider measures to manage or reduce those risks.

Table 4. Example of the Initial Risk Profile Assessment Template

LEVEL OF EXPOSURE					
	High (H)				*e.g Mass movements (a project is highly exposed and vulnerable to mass movements)*
	Medium - High (MH)				
	Medium - Low (ML)				
	Low (L)	*e.g Mass movements (a project is not exposed or vulnerable to mass movements)*			
		Low (L)	Medium - Low (ML)	Medium - High (MH)	High (H)
		LEVEL OF VULNERABILITY			

9 **Evaluate the risk matrix:** Once the risk matrix has been developed, project teams are encouraged to define measures to mitigate climate and natural disaster risks. When moving to the next phase, the risk mitigation potential is a relevant decision factor. For example, the following may be reconsidered:

- The overall project risks may be too high, which could lead to the conclusion that the project is not worthwhile and should not proceed to the Structuring Phase.
- The specific location of the project may increase the risk profile due to high exposure and high vulnerability. Some projects may offer the opportunity to relocate to a site with lower exposure and vulnerability.
- Project schedule may result in a high-risk profile or introduce uncertainties. Project delays may create an opportunity to obtain more information or specific changes in the project environment that reduce the risk profile.

- Project scope/design may result in a higher risk profile than necessary to achieve the underlying public objectives. Changes to the scope or preliminary design may reduce its vulnerability.

Table 5 provides a template for developing the initial action plan against climate and natural disaster risks, based on identifying preliminary mitigation measures for each risk. The template is available in Appendix 4.

Table 5. Example of an Initial Action Plan Template in Relation to Climate and Natural Disaster Risks

NUM	THREAT / RISK LEVEL	MARK THE EXPOSURE-VULNERABILITY CLASSIFICATION WITHIN EACH CATEGORY			LIST THE MEASURES TO BE TAKEN (IF THE PROJECT OPERATION ANALYSIS IS USED, CONSIDER THE POSSIBILITY OF ORGANIZING THE MEASURES BY: ON-SITE ASSETS, INPUTS, PERFORMANCE, LINKS)
		Severe	*Tolerable*	*Acceptable*	
1	*Threat (specify)*				
2	*Threat (specify)*				
...	*...*				

The results of Tool 1.1 allow the visualization of climate and natural disaster risks and their comparison with each other, facilitating the identification and therefore the prioritization of the highest risks to the project. Based on the methodology used in the Toolkit, if the project receives a score of "Medium" to "High" in the level of exposure or vulnerability to one or more hazards, a more comprehensive risk analysis should be carried out in the next phase of the project life cycle (Structuring Phase).

By identifying and prioritizing the main climate and natural disaster risks early on the Project Evaluation Phase, it's possible to determine if there's enough fiscal leeway in case any of these risks occur. This approach also helps to analyze and choose the most suitable contracting model. As mentioned in the document Fiscal Sustainability of PPPs (IDB 2023), in order to guarantee sound public finances, it is essential to optimally manage risks from the project preparation phase and, based on this, ensure that the fiscal impact is in line with the fiscal rules or regulations established by each government in the region.

For the next phase, it is recommended that resources be focused on threats with a medium to high risk score and adequate time and expertise be set aside for review. Project teams should consider, at a minimum:

- Assess project exposure and vulnerability in more detail in the specific area (e.g. flood modeling);
- Engage external advisors if the project team does not have specific expertise in climate hazards and mitigation;
- Design the project considering the hazards identified and periodically re-evaluate the vulnerability of the design solution; and
- Compile best practices to mitigate the identified risk and set aside time to analyze it and support the development of the project.

Products of Tool 1.1

- List of climate hazards and natural disasters relevant to the project.
- Template for preliminary assessment of the level of exposure of the project to hazards.
- Template for preliminary assessment of the level of vulnerability of the project to hazards.
- Preliminary assessment of the project risk profile.

TOOL 1.2: INTRODUCTION OF CLIMATE RESILIENCE TARGETS AND IDENTIFICATION OF EX-POST INDICATORS

The following tool aims to **provide guidance for the development of climate and natural disaster resilience objectives**, if identified (see Tools 1.1 and 2.1-2.3), in **order to develop ex-post evaluation indicators.**

Why are ex-post evaluation indicators important? Ex-post evaluation indicators play an important role in infrastructure projects and PPPs, especially in emerging issues such as climate resilience to natural disasters. These indicators can have multiple benefits, including ensuring the long-term sustainability, functionality, and adaptability of the project in a context of climate change and natural disasters. In addition, ex-post evaluation indicators can support national and international climate change and natural disaster objectives as well as leverage green finance.

How do ex-post project indicators differ from PPP contract performance indicators? Although impact evaluation indicators and performance indicators may share some common objectives (e.g., strengthening project resilience and adaptive capacity), the measurement of these objectives may vary. Some differences between these two types of indicators are shown in the box below.

Table 6. Difference in Performance Indicators and Ex-Post Evaluation Indicators

FEATURES	PERFORMANCE INDICATORS	EX-POST EVALUATION INDICATORS
Target	Ensure resilience and adaptability of the project and application of best practices through contractual clauses.	Ensure resilience and adaptability of the project and application of best practices through project structuring and transaction.
Who is the target audience?	Concessionaire.	Public entity/national government/project work team.

FEATURES	PERFORMANCE INDICATORS	EX-POST EVALUATION INDICATORS
Payment or penalty regime	It can help drive sustainable financing. Monetized payment or penalty through compliance with performance indicators.	It can help drive sustainable financing. Improved governance. Enables compliance with strategic objectives of the project or government. Sound public finances.
Specifications	Based on results under the concessionaire's legal contract (e.g., annual projection and update of risk analysis and climate and natural disaster risk mitigation plan every 3 years).	It can be results-based (e.g., reduction in the probability of interruption of operations due to the materialization of climate risk).

Figure 9. Considerations for the Application of Tool 1.2

When to use it in the PPP process?:

During early stages of the project. When identifying a medium to high climate or natural disaster risk profile, based on Tools 1.1 and 2.1-2.3.

Stakeholders involved:

Project team, external consultants, climate change and natural disasters team.

Expertise required:

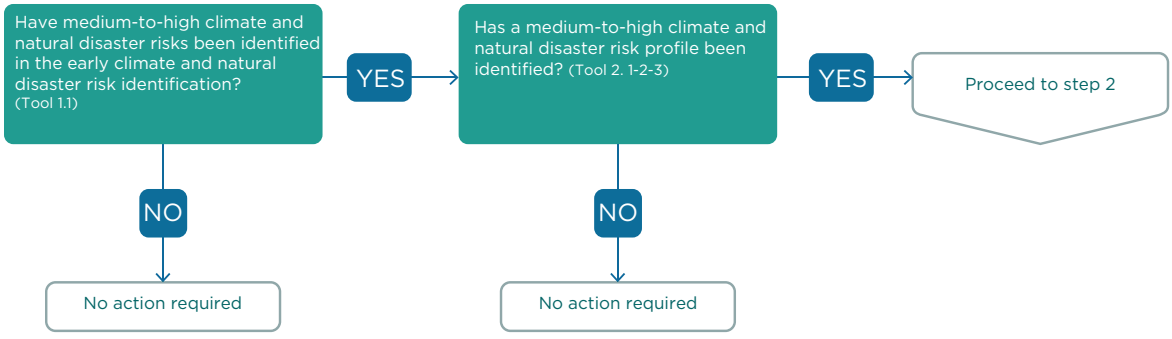
Experience in the development of strategic objectives and ex-post performance indicators.

Reference materials:

- Developing Key Performance Indicators for Climate Change Adaptation and Resilience Planning (Duke University, 2022).
- Criteria and indicators on climate resilience in the development and implementation of rural agricultural development programs (Ruiz Muller, 2021).

Steps for the Inclusion of Climate and Natural Disaster Risk Indicators in the Ex-Post Assessment

1 Determine whether medium to high climate and natural disaster risks are identified in the project (Tools 1.1 and 2.1-2.3)



2 **Identify project objectives:** During this activity, it is important to identify whether the project objectives are aimed at meeting good practices (institutional improvements), whether they are aimed at improving the bankability of the project (e.g., green finance), or whether they are aimed at achieving public policy objectives (e.g., meeting the objectives of the 26th COP Climate Pact).

3 **Develop ex-post performance indicators:** Even though it may be possible to identify climate and natural disaster resilience objectives early in the project, it is important to confirm them during project structuring to address any changes in scope or study results that occur during the Structuring Phase. Below are some examples of ex-post indicators according to the project objectives.

- Good practice objectives: Was a climate and natural disaster risk analysis developed? And, if so, were climate and natural disaster risk mitigants incorporated into the feasibility studies? Was climate resilience incorporated into the contractors' evaluation criteria? Were the fiscal implications of climate and natural disaster risks considered? And, was a comprehensive fiscal profile of the project developed?

- Project bankability objectives: Were the protocols and criteria for sustainable financing followed? Percentage of sustainable financing achieved in the project out of the total demanded.

- Public policy objectives: Does the project comply with climate resilience and adaptation objectives adopted in bilateral, multilateral or international agreements (Paris Agreement 2015, the Climate Pact at the 26th COP, among others)?.

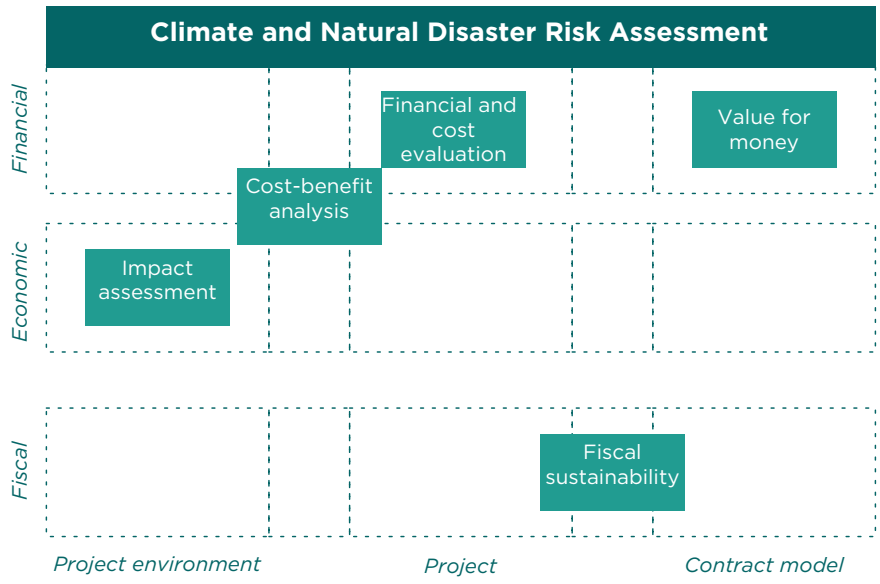
4 **Review the objectives during the Structuring Phase:** Ensure that the reality of the project follows the guidelines of the objectives established at the beginning of the project.

2. CLIMATE RESILIENCE IN THE STRUCTURING PHASE

The objective of the Structuring Phase is to determine whether the project in question is feasible and represents the best possible use of public resources by structuring it as a PPP - that is, whether it generates value for money. While the analysis performed during the Initial Project Appraisal Phase examines potential climate and natural disaster risks on a preliminary basis, during the Structuring Phase, the project will undergo a more thorough assessment of its technical, financial, economic, environmental, social, fiscal and property feasibility. The project's market attractiveness, value for money and affordability will also be examined. To answer these questions, the project will undergo a series of rigorous analyses, including a Financial Feasibility Analysis, Cost-Benefit Analysis and Value for Money Study.

All the analyses require an understanding of the various costs and benefits of a project, as well as the associated risks and uncertainties. One category of risks and uncertainties is climate and natural disaster risk and uncertainty related to climate change. Therefore, a **climate risk assessment - either as a stand- alone analysis or as part of an overall risk analysis** - is an essential exercise and an indispensable input for all the above analyses, especially for those projects with a medium to high risk profile. At this phase, the assessment of climate and natural disaster risks is accompanied by an identification, evaluation, and consideration of mitigation measures.

Figure 10. Relationship Between Climate Risk Assessment and Project Feasibility Studies



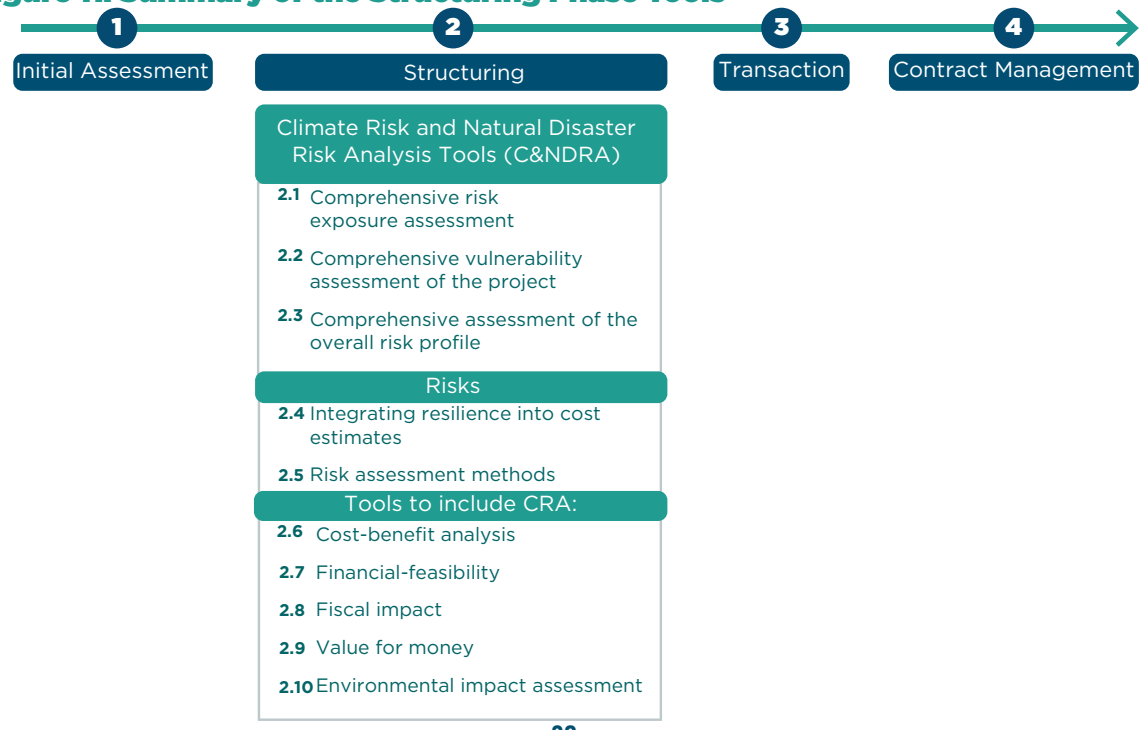
In addition to the analyses aimed at confirming whether the project in question is feasible and whether it is better to carry it out under a PPP scheme, the government usually initiates the structuring of the project. Structuring refers to the activities undertaken by the contracting authority to mitigate project risks and advance matters that are the government's responsibility prior to the procurement of the contract. This begins with due diligence of the risks and obstacles that may threaten the success of the project (some of which may be climate-related as identified during the Initial Assessment Phase).

For example, if geotechnical risks pose a high uncertainty to the project outcome, project teams may conduct further geotechnical testing, review potential sites available for the facility and/or obtain preliminary environmental clearances. Climate risk assessment falls into the same category. Typically, it is considered efficient for the government to perform these structuring activities, because doing so avoids a situation in which multiple suppliers must perform the same due diligence activities that lead to high transactional costs.

In the Structuring Phase it is crucial that the climate resilience measures adopted in the project are congruent with the fiscal goals of the governments, as well as with their strategies and/or investment plans. To this end, it is necessary to consolidate the analysis and estimation of costs, efficiently allocate risks between the public and private parties and, finally, adjust the funding to favor the affordability of the projects.

Based on the above, **this section provides several tools that project teams and other PPP project stakeholders can use during the Structuring Phase to assess climate risks and uncertainties and incorporate them into the standard PPP assessments performed during this phase.**

Figure 11. Summary of the Structuring Phase Tools



TOOL 2.1: COMPREHENSIVE ASSESSMENT OF EXPOSURE TO CLIMATE AND NATURAL HAZARD RISKS

Based on the results of the preliminary risk assessment performed during the Initial Project Assessment Phase, project teams will need to conduct a comprehensive hazard assessment for those climate events previously identified as "severe" or "tolerable" in Tool 1.1.

This tool is intended to **assist project teams and other stakeholders in further analyzing hazard exposure and likelihood of occurrence** by requiring users to review existing local studies relevant to determining climate risk in the project area, as well as forecasting climate and natural disaster hazards.

Tool 2.1 answers the question:

What is the probability that climate hazards will occur?

Project teams shall:

- Address critical questions about each threat;
- Identify the severity of the threat;
- Examine other key considerations; and
- Determine the probability of occurrence.

Figure 12. Considerations for the Application of Tool 2.1

When to use it in the PPP process?

Before or in parallel to feasibility studies.

Expertise required:

Technical expertise in sector projects and experience in climate change and modeling.

Stakeholders involved:

Multidisciplinary work team

Experts in the structuring of projects in the sector Risk, climate change and geotechnical experts.

External climate expert(s) and/or some governmental institutions specialized in the risks identified in the Initial Assessment Phase (e.g., hydrology and meteorology agencies).

*The specialists can be from national entities or external consultants, who act as critics and can, for example, assist the project team in interpreting the hazard maps.

Reference materials:

- Climate Resilient Public Private Partnerships: A Toolkit for Decision Makers (Frisari et al., 2020).
- Climate Toolkits for Infrastructure PPPs, World Bank (World Bank, 2022).
- Guideline for Project Managers: Making vulnerable investment climate resilient (European Commission, 2016).
- Disaster risk and climate change assessment methodology for IDB projects: Technical reference document for teams in charge of IDB projects (Bariandiarán et al., 2019).
- Climate-Resilient Infrastructure Officer Handbook (Global Center on Adaptation, 2021).

Steps for the Application of Tool 2.1

1 **Expansion of data sources:** Task teams should expand data sources. Publicly available climate maps and preliminary in-country studies are a good start for the Initial Assessment Phase. However, they may not have the resolution, granularity and level of accuracy needed to comprehensively capture hazards in the project area. Therefore, it is highly recommended that the team of experts:

Identify local meteorological climate data that provide sufficiently detailed information on the intensity and probability of occurrence of the hazard in the project area.

Review, if available, previous models/studies of the main hazards in the geographic area (e.g. city, town, municipality, watershed, etc.) and sectors.

- Consider both past and current trends as well as new climate and natural disaster risks that are likely to develop or worsen due to climate change.

2 **Conduct an in-depth analysis:** Using the results of the previous step as a starting point, the analysis should be deepened by researching and reviewing previous models and studies of the main hazards in the geographical area or even, if applicable, similar projects in the area. Relevant information should be gathered, including:

- Project-specific geophysical or hydro-meteorological data, the city or country,
- Other local studies,
- Project pre-feasibility or preliminary technical feasibility studies and environmental impact assessment.

Document-based research could be complemented by on-site inspections, preferably by teams with geoscience and engineering expertise.

It should be noted that current project features or changes to the natural ecosystem because of project development may increase climate and natural disaster risks. For example, vegetation removal may exacerbate flooding, landslides, and wind damage from hurricanes, and increase heat island effects. Therefore, the exacerbation of risk due to the nature of the project must be analyzed, which requires the involvement of environmental and engineering experts. The experts may rely on the prefeasibility studies or on the preliminary results of the technical and environmental feasibility studies in combination with the data collected at this phase.

3 **Finalize the hazard exposure assessment:** Work teams should document the comprehensive hazard exposure assessment. Table 7 provides a template for executing the comprehensive project exposure assessment, including key considerations by threat and indicative exposure levels. A printable version

of the template is available in Appendix 5.

In alignment with the above tools, the following scoring methodology is proposed for climate hazard exposure based on low, medium-low, medium-high and high levels.[8]

LOW	MEDIUM-LOW	MEDIUM-HIGH	HIGH
Natural hazards **are not likely** to occur during the construction and/or operational life of the project	The threat(s) **is likely to occur at least once** during the implementation (construction) period and/or operational life of the project	The hazard(s) **is likely** to occur **several times** during the implementation (construction) period and/or the operational life of the project	The hazard(s) **are likely** to occur **recurrently** during the execution (construction) period and/or the operational life of the project
OR, ALTERNATIVELY,			
Between 0 and 5% probability of occurrence per (period) or every (time)	Between 5 and 15% probability of occurrence per (period) or every (time)	Between 15 and 30% probability of occurrence per period or each time	>30% probability of occurrence per period or every time

It is also recommended that teams organize a workshop to discuss and agree on the identified threats, key considerations and probability of occurrence. Based on the discussion, teams should make appropriate changes to ensure a holistic and accurate assessment. Considerations per threat may include:

- Past events and frequency;
- Impacts of climate change on threat severity and frequency;
- Effects of local conditions on exposure to hazards; and
- Effects of project implementation on exposure to hazards.

The outcome of the workshop should be an overview of climate and natural disaster risks and an assessment of their probability of occurrence, now and in the future.

8. The scoring methodology is developed in accordance with Barandiarán et al. (2019), the European Union climate resilience guidelines and expert opinion.

Table 7. Example of the Comprehensive Threat Exposure Assessment Template

Name of the Project: _____

NUM	THREAT	DESCRIPTION	KEY CONSIDERATIONS	EXPOSURE
1	*E.g. River flooding*	*Be as specific as possible when describing the hazard.* *For example, flood wave between XX and XX, especially during the months from XX to XX.*	*Examples of key considerations:* • *Past events and frequency* • *Will predicted climate change in the area influence the severity and frequency of the threat?* • *Will the project increase the risk of the threat?* • *Is the project located in a particularly exposed location? If yes, please explain (e.g., areas already below sea level, coastal areas, and islands, etc.)*	*According to expert opinion on the severity and frequency of the threat.* *Use the scoring methodology described in step 3.*
	Threat (specify)			

Output Tool 2.1: Comprehensive Evaluation of Project Exposure.

TOOL 2.2: COMPREHENSIVE PROJECT VULNERABILITY ASSESSMENT

This tool **aims** to i**dentify and understand how different project components will be affected by climate and natural disaster events at a comprehensive level**. Users will have to determine and measure the vulnerability of each element based on sectoral and climate knowledge.

In this regard, **Tool 2.2** answers the question:

How significant would the damage to the project be if the threat were to occur?

Figure 13. Considerations for the Application of Tool 2.2

When to use it in the PPP process?

Before or in parallel to feasibility studies.

Expertise required:

Technical expertise in sector projects and experience in climate change and modeling.

Stakeholders involved:

- Multidisciplinary work team;
- Experts in project structuring in the sector;
- Risk, environmental, climate change and geotechnical experts;
- External climate expert(s) and/or some governmental institutions specialized in the risks identified in the Initial Assessment Phase (e.g. hydrology and meteorology agencies).
- Engineering experts in the sector.

Reference materials:

- Climate Resilient Public Private Partnerships: A Toolkit for Decision Makers (Frisari et al., 2020).
- Climate Toolkits for Infrastructure PPPs, World Bank (World Bank, 2022).
- Guideline for Project Managers: Making vulnerable investment climate resilient (European Commission, 2016).
- Disaster risk and climate change assessment methodology for IDB projects: Technical reference document for teams in charge of IDB projects (Bariandiarán et al., 2019).
- Climate Resilient Infrastructure Officer Handbook (Global Center on Adaptation, 2021).

Steps for Tool 2.2 application

1 **Gather relevant project information:** For the project vulnerability assessment, it is essential to gather more information specific to the project or the project area. Additional information could include the prefeasibility or feasibility technical study, preliminary environmental assessment, initial project designs, among other inputs.

Table 8 provides an example of a template for performing the climate and natural disaster risk assessment that will be used throughout the Structuring Phase. Teams are encouraged to complete the information in columns “A” through “G” as they progress through the risk analysis. It is suggested that the results of Tool 2.1 be transferred to columns A and B. The template is available in Appendix 6.

Regarding vulnerability, project teams should develop a vulnerability assessment using the information collected on the project. As a guide, Table 9 provides a list of guiding questions on the vulnerability of the project to identified hazards.

Table 8. Example of a Comprehensive Climate and Natural Disaster Risk Analysis Template

	A.	B.	C.	D.	E.	F.	G.
NUM	THREAT AND DESCRIPTION	EXPOSURE	DESCRIPTION OF VULNERABILITY	IMPACT	EVALUATION	MITIGATION	ALLOCATION
1							
2							
3							
4							
5							
...							

Incorporate the results of the evaluation of Tool 2.1 in columns A "Threat and Description" and B "Exposure".

Use expert judgment to describe project components that may be affected by the hazard (project functions, geographic vulnerabilities, physical characteristics, social/economic considerations).

Use expert judgment to describe and rate the impacts of vulnerability components.

Table 9. Guiding Questions for Assessing Project Vulnerability to Climate and Natural Disaster Risks

CATEGORY	KEY QUESTIONS
Project functions	• Will critical assets be affected by the threat? • Will the inputs necessary for the project to operate be affected by the threat? In the event of total/partial interruption of the inputs that make the asset work: • What is the duration of the project and how long will it take to get the project inputs up and running? • Would the expected outcome (service) be affected by the hazard? If the intended products/services were to fail due to the hazard: • What is the duration of the interruption? How long would it take to rehabilitate services? • Are there changes in the quality of services? Would this affect other external systems? • What is the importance of the service for the neighboring communities?

CATEGORY	KEY QUESTIONS
Geographic/ environmental vulnerabilities	• Are there other inherited natural conditions in the project area that may exacerbate project vulnerability? For example, if one of the identified hazards is tropical storms, some additional natural conditions that may exacerbate project vulnerability may include flood-prone and coastal areas • What would be the effect of total/partial service interruption on the natural ecosystem in the surrounding areas?
Physical characteristics	• Are there specific areas of the project that are vulnerable to hazards? For example, one section of the road may be prone to flooding while another section may be affected by landslides • Are some project components more vulnerable than others?
Economic and social considerations	• To what extent is the project essential to the surrounding communities? What is the impact on the lives of surrounding citizens if there is a total/partial disruption of services? • How important is the project to the economy of the surrounding communities? • What is the effect on the local economy if there is a total/partial disruption of services?

2 **Analyze climate and natural disaster risk impacts:** The next step is to define and measure the impact of each hazard on the project. It is recommended that teams describe project vulnerabilities by component (project functions, geographic vulnerabilities, physical characteristics, social/economic considerations, and environmental considerations) and incorporate these descriptions in Table 8, column C "Vulnerability". Based on this analysis, the impact should be rated.

The Toolkit provides a methodology for scoring project vulnerability to climate and natural disaster hazards.[9]

LEVEL OF VULNERABILITY	DEFINITION
Low	Elements of the project are not affected by the specific threat. For example, water shortages are not expected to affect airport passenger services.

9. The scoring methodology is developed in accordance with Barandiarán et al. (2019), the European Union climate resilience guidelines and expert opinion.

LEVEL OF VULNERABILITY	DEFINITION
Medium-Low	Some element of the project is somewhat vulnerable to a particular hazard and its impact is not critical to service delivery, the environment or the population. For example, wildfires occurring close to a school could affect its partial operation.
Medium-High	Several project components are somewhat vulnerable to a specific threat and the impact could be critical for the provision of services, the environment, or the population. For example, tsunamis can produce flooding and generate partial or total destruction of port infrastructure due to the impact and erosion of incoming and outgoing currents.
High	Several project components are somewhat vulnerable to a particular hazard and their impact would be critical to service delivery, the environment, or the population. For example, a hospital located near the sea would be very sensitive to a hurricane surge.

However, it is essential to give experts flexibility in qualitatively and/or quantitatively rating vulnerability levels and providing some level of description, where appropriate.

3 **Finalize the climate risk vulnerability assessment:** As a final step, teams are encouraged to conduct a workshop with specialized experts and other stakeholders. The workshop provides teams with the opportunity to discuss vulnerabilities as well as the impacts of the vulnerability components of the project and scoring.
The outcome of the workshop should be an overview of climate and natural disaster risks and an assessment of their impact.

Text Box 3. Climate Risk Assessment for a Port Project

Detailed climate risk assessment for a port project
A climate risk assessment was performed for a port project using a 20-year historical baseline period and considering two future climate scenarios (one extreme and one intermediate) to project climate risks to the year 2100. The project team used local weather data to correct for biases in the global climate projection and used multiple high-resolution climate models to estimate the intensity of potential risks. The climate analysis identified "high" risks to port expansion, including:

- ✓ Extreme temperature (increase in the number of days with a recorded temperature above 35 degrees Celsius to 13 days by 2050 and six months by 2100)
- ✓ Drought (multiplication of extremely dry conditions)
- ✓ Sea level rise (0.68-1.04 m by 2100)

The impact of the increase in average temperature and humidity on the working conditions of port workers and operations due to drought-induced changes in loading patterns (vulnerability) was also analyzed.

Output Tool 2.2: Comprehensive Vulnerability Assessment of the Project

TOOL 2.3: GLOBAL CLIMATE AND NATURAL DISASTER RISK PROFILE ASSESSMENT

The third and final phase of the climate and natural disaster risk assessment **aims** to **(i) assess the climate and disaster risks and the overall climate risk profile of the project, (ii) determine a high-level mitigation plan, and (iii) to provide an allocation of various risks.**

Regarding item (iii), it should be noted that, for projects developed under traditional schemes, more prescription or specifications are required from the project teams during feasibility studies. For PPPs, the teams will rely heavily on the bidders to come up with innovative ideas on how to develop the project in a technically and financially efficient manner. These considerations also apply to climate risk. As mentioned above, project teams are encouraged to conduct preliminary and comprehensive climate risk analysis for both PPPs and projects implemented under traditional schemes.

In this regard, **Tool 2.3 answers the question:**

What is the total value of climate risks and how can they be mitigated? What is the optimal allocation?

Figure 14. Considerations for the Application of Tool 2.3

When to use it in the PPP process?

Before or in parallel to feasibility studies.

Expertise required:

Technical expertise in sector projects and experience in climate change and modeling.

Stakeholders involved:

- Multidisciplinary work team;
- Project structuring experts in the sector;
- Risk, environmental, climate change and geotechnical experts;
- External climate expert(s) and/or some governmental institutions specialized in the risks identified in the Initial Assessment Phase (e.g. hydrology and meteorology agencies).
- Engineering experts in the sector.

Reference materials:

- Climate Resilient Public Private Partnerships: A Toolkit for Decision Makers (Frisari et al., 2020).
- Climate Toolkits for Infrastructure PPPs, World Bank (World Bank, 2022).
- Guideline for Project Managers: Making vulnerable investment climate resilient (European Commission, 2016).
- Disaster risk and climate change assessment methodology for IDB projects: Technical reference document for teams in charge of IDB projects (Bariandiarán et al., 2019).
- Climate Resilient Infrastructure Officer Handbook (Global Center on Adaptation, 2021).

Steps for the Application of Tool 2.3

1 **Define conclusions and recommendations on the climate and natural disaster risk profile of the project:** In this step the team members will define the conclusions and recommendations of the in-depth climate and natural disaster risk assessment. Therefore, it is necessary that they are very familiar with the project and have expertise in climate risks and natural disaster management. The results of the in-depth exposure and vulnerability assessments should be compiled and consolidated.

It is also recommended that a workshop be held to assess the overall climate and natural disaster risk profile and to identify possible risk mitigation measures and propose risk allocation. This can be combined with the vulnerability assessment workshop.

2 **Assessing climate and natural disaster risk:** The assessment of risk (especially climate and natural disaster risk) is often considered extremely complex and one of the most difficult project analyses. An introduction to the various risk assessment methods that can be used is presented in Tool 2.5.

However, a detailed assessment of climate and natural disaster risk is often not necessary, especially when the main objectives of risk assessment are to define an appropriate risk management plan and to identify the optimal allocation of risks. The level of effort devoted to climate risk assessment depends largely on available technical capacity, financial resources, project complexity, time constraints and, above all, the relevance of risk assessment for risk evaluation purposes.

3 **Mitigate climate and natural disaster risk:** The comprehensive climate and natural disaster risk assessment is expected to define the risk profile of the project. However, the team does not have to accept the risk profile and can attempt to define mitigation measures to reduce it. In this effort and under a framework of fiscal discipline, it will be necessary that, for the project risk profile and/or mitigation measures to be implemented, additional costs are always considered, and risk allocation is optimal.

During the transition from the Initial Assessment Phase to the Structuring Phase, the risk mitigation potential is a relevant decision factor, e.g., to:

Reconsider the overall project: The risk profile may be too high, which may lead to the conclusion that the project is not worthwhile and should not advance to the Structuring Phase.
Reconsider location: The specific project location may increase the risk profile due to high exposure and vulnerability. Some projects may offer the opportunity to be relocated to a site with lower exposure and reduced vulnerability.
Reconsider timing: Project timing can lead to a high-risk profile or introduce uncertainty. Delaying the project could create an opportunity to gather

more information or for specific changes in the project environment that reduce its risk profile.

Reconsider scope/design: The scope and design of the project may lead to a higher risk profile than necessary to achieve the underlying public objectives. Changes to the scope or preliminary design can reduce its vulnerability. Box 4 presents an example of how assessing the project's risk profile can result in reconsidering its design.

4 **Allocate climate and natural disaster risks:** If the project is expected to go forward as a PPP, one of the next crucial steps will be to develop the risk allocation that defines the structure of the PPP. A generally accepted principle is that risk should be allocated based on the ability and willingness of the various parties to manage it. The climate and natural disaster risks that the concessionaire has the greatest ability to manage are transferred and those that the government has the greatest ability to manage are retained.

This allocation principle requires market survey and discussions between the government, developer, subcontractors, insurers, and financial institutions to inform the optimal risk allocation that generates the highest return. The outcome depends largely on the risk appetite of the private sector and the estimated profitability of the project.

5 **Consider other project studies:** As part of this step, it is necessary to analyze and define the implications of the risk assessment on other project evaluations and studies. The following tools in the Structuring Phase provide guidance on how to incorporate climate and natural disaster risks into cost estimation, risk assessment, cost-benefit analysis, financial feasibility analysis, fiscal assessment, value-for-money study, and environmental impact assessment.

Text Box 4. Risk Profile Assessment of an Urban Transit Project

The use of hydraulic flood models to simulate extreme flooding events and their impact on the design of Phase 2 of a rapid bus project

A city is facing severe flooding that has displaced more than 2,000 households and caused economic losses equivalent to 4% of GDP. The bus rapid transit (BRT) was built in a high-risk flood zone. The project team developed hydraulic flood models that confirmed that the area in which the BRT is located is susceptible to river flooding T=10 years (exposure). The modeling exercises allowed the development of a wide range of flood scenarios (high and low impact) to measure the exposure of the BRT system under current and projected climate conditions, as well as the impact on travel times, service provision and the physical condition of the asset (vulnerability).

The assessment also identified the potential financial and fiscal impacts of the materialization of climate risks. As a result of the risk profile identified in the analyses, Phase 2 of the project upgraded the BRT design to protect it from the flood levels projected in the model scenarios (risk profile).

Output: Comprehensive assessment of the climate and natural disaster risk profile of the project.

TOOL 2.4: INCORPORATING CLIMATE AND DISASTER RESILIENCE CONSIDERATIONS INTO COST ESTIMATES

Many of the analyses developed during the Structuring Phase to evaluate and structure the potential PPP project require the input of cost data. For example, the financial feasibility analysis and cost-benefit analysis require knowledge of various costs associated with the project. In the face of climate and natural disaster risks or the need to incorporate more resilience measures into a project, some of these cost elements will deviate from the norm: they are likely to be higher. Therefore, when collecting data of costs to feed into these various analyses, it is important to ensure that each cost element incorporates the necessary premiums for resilience-related actions.

The following tool **provides a framework that can help project teams think through how climate resilience measures or analyses will affect various costs throughout the Structuring and Transaction Phases of the project.**

Figure 15. Considerations for the Application of Tool 2.4

When to use it in the PPP process?

During the development of pre-feasibility or technical feasibility studies.

Stakeholders involved:

Multidisciplinary work team, climate advisors; climate team, technical team.

Expertise required:

• Project-related knowledge; knowledge of climate, technical knowledge of construction costs and operation and maintenance costs.

Table 10. Incorporation of Climate Resilience Considerations in Cost Estimates

PHASES	CONSIDERATIONS	EX. COST RESULTS
Structuring and Transaction	• Climate risk assessment. • Assessment of the impact of climate risk on the project. • Design according to climate resilience standards.	*During this phase, design based on the "climate resilience standard" is likely to shift the design costs by +5%.*

PHASES	CONSIDERATIONS	EX. COST RESULTS
Construction	• Inclusion of capital cost estimates for construction to climate resilience standards. • Appropriate climate risk mitigation measures in capital cost estimates. • Variation in construction costs.[10] • Consideration of nature-based solutions to mitigate climate or natural disaster risks. • Cost of construction delay due to extreme weather event. • Damage/repair costs.	*During this phase, building based on the "climate resilience standard" is likely to shift construction costs by +5%.*
Operation and Maintenance (O&M)	• Higher maintenance costs. • Higher/lower operating cost. • Additional cost of disaster response. • Higher/additional insurance cost. • Frequent replacements due to more severe weather.	*During this phase, the cost of insurance is likely to be higher.* *In a road project, there are higher maintenance costs due to more repairs.* *In a hospital project, there are higher energy costs due to cooling and ventilation systems.*
Financing	• A higher interest rate due to a higher risk margin. • Additional financing cost.	*During this phase, the cost of financing is likely to be higher due to a higher margin of risk for any sector.*

Text Box 5. Review of Technical Specifications on a Main Bridge

Sea level rise considerations in the technical specifications of a bridge

The project team developing a major bridge PPP identified sea level rise as a potential risk to the operation of the asset. Through 100-year projections of sea level rise, the technical design specifications were re-evaluated, resulting in raising the original bridge design by one meter. The changes to the technical design specifications resulted in a 10% increase in the capital cost of the project.

10. Where weather and natural disaster risks that are likely to be covered by insurance, the cost of insurance may be included as a valuation of those risks. To avoid double counting, such weather and natural disaster risks should not be valued as separate risks.

TOOL 2.5: RISK ASSESSMENT METHODS FOR CLIMATE RESILIENT PPPS

Up to now, the tools presented have analyzed the identification of potential climate and natural disaster risks: the probability of a hazard occurring multiplied by the potential impact it would have. **Once these risks have been identified, it is important to assess them in the context of the PPP project itself: how will the various identified risks affect the project's revenue streams or costs?** This analysis is an important element for other analyses in the Structuring Phase, such as the financial feasibility and cost-benefit analysis, and should therefore be carried out with caution.

There are several methods for performing risk assessment. While this tool does not go into each method in depth, it provides project teams with guidance on how to select the most appropriate method for their project, their resources, and the guidelines of the jurisdiction where the project is being developed.

Figure 16. Considerations for Application of Tool 2.5

When to use it in the PPP process?

In parallel with the feasibility studies.

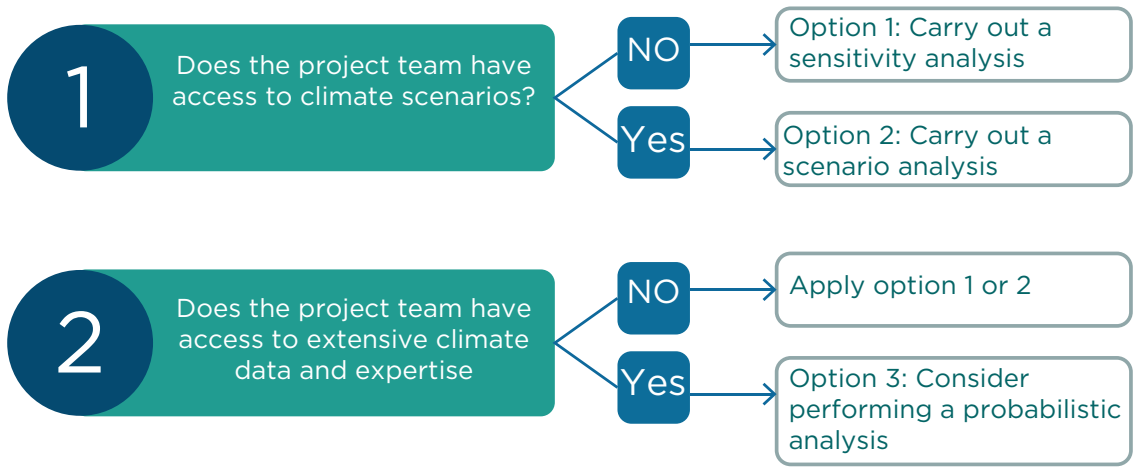
Stakeholders involved:

Multidisciplinary work team; climate advisors; climate, technical, and financial team.

Expertise required:

Knowledge related to the project and the development of a risk analysis; technical knowledge on climate change hazards and natural disasters.

Figure 17. Guiding Questions: Choosing the Optimal Risk Analysis Method



Risk Assessment Methods

Scenario analysis: Assessment of potential future developments by considering possible sets of comprehensive outcomes (sometimes referred to as "alternative

worlds"). In the case of climate risk, this could be the assessment of various climate change, intervention, and impact scenarios. From a formally defined and agreed baseline, all costs and benefits (CBA) or revenues (financial analysis) of the scenarios will be defined. The project is sound if the results are positive in all scenarios.

When to use it: This is the recommended option especially if there are formally recognized climate scenarios. This option can help standardize risk analysis in PPP projects.

Sensitivity analysis: Assessment of how changes in a specific model variable affect model results. In the case of climate risk, this could be an impact analysis of a climate risk event (with a defined financial impact).

When to use: If the project team does not have access to climate scenarios, this method can be used. This analysis represents the second-best option.

Probabilistic analysis: A group of techniques that incorporate variability and uncertainty into the risk assessment process. It provides estimates of the range and probability of the hazard, exposure, or risk of all scenarios, rather than a single point estimate (deterministic approach).

When to use: If the project team has access to a large amount of climate data and expertise, this method can be used. It is a more costly exercise.

For cases where a probabilistic analysis can be developed, the Toolkit seeks to adapt the risk assessment to existing methodology. However, it is possible that, due to the nature of climate and natural disaster risks, some classifications, methods or steps of the assessment may need to be adapted.

Steps for the Application of Tool 2.5

1. **Identify the area to assess:** Risk assessment starts by identifying which risks are to be evaluated (for this, it is important to refer to Appendix 6). For the exposure and impact columns (columns B and D, respectively), all risks that fall into the "medium" to "high" category, both in terms of risk exposure and risk impact, should be considered. These risks are those that are referred to as "assessable risks". It is important to mention that all risks in the assessable zone should be quantified regardless of their allocation (public or private party), since, even if some risks are transferred to the private party, to some extent they will be part of the concessionaire's business case and will affect the project's finances (e.g. construction costs), value for money (efficiency of the PPP contract model) and fiscal impact and affordability (through the payment mechanism).

2. **Determine the type of variable:** Typically, risks are associated with the pre- operational stage and are characterized as discrete risks; that is, they are cross-sectional risks, and their valuation is materialized in the form of cost overruns.

On the other hand, risks in the operational stage are characterized as systematic risks or risks where valuation is linked to time (time series) and is associated with income. For the valuation of climate and disaster risks, which may fall into the category of geological risks, it is suggested to analyze them both in the pre-operational stage and in the operational stage, since they can have a subtle effect on the project (a hurricane that occurs once during the pre-operational or operational life of the project) and in a systematic way (landslides that occur, on average, every five years). For this reason, it is suggested that the teams develop a risk assessment, treating each climate risk independently.

3 **Data collection:** The data collection on climate hazard exposure and vulnerabilities of the project can be taken from the results of Tools 2.1-2.4, which can serve as a starting point for climate and natural disaster risk assessment.

4 **Modeling of variables and calculation of risk:** Depending on the categorization of the variables (cross-section or time series), a specific probabilistic analysis will be applied.

TOOL 2.6: INCLUDING CLIMATE RISK IN THE SOCIO-ECONOMIC ANALYSIS / COST-BENEFIT ANALYSIS

Potential PPP projects are usually subjected to a socioeconomic analysis or cost-benefit analysis (CBA) to understand the full social benefits or costs of the project. The CBA compares all the benefits and costs of an infrastructure project with the no-project scenario, also known as the "no-build" alternative. Thus, it answers the questions "are we better off with or without the project?" Or "does the project create economic value?". To answer these questions, it is necessary to understand all the positive and negative impacts of a project to society.

Climate risks and change can influence CBA costs and benefits. **This tool is intended to provide guidance on how to ensure that climate-related impacts on costs and benefits are included in the analysis.** The idea is to first conduct a CBA for the project and then examine how different climate scenarios may impact the CBA.

Figure 18. Considerations for Application of Tool 2.6

When to use it in the PPP process?

Prior to or in parallel with other feasibility studies that can inform this study. For example, the technical feasibility would determine the costs to be incorporated into the CBA.

Stakeholders involved:

Multidisciplinary work team; economic and financial advisors.

Expertise required:

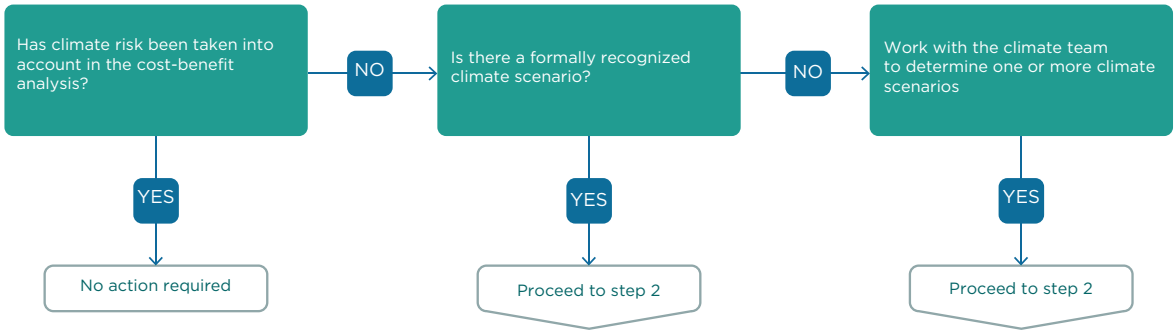
Economic and CBA knowledge; project knowledge; technical knowledge; understanding of the results of the project- specific climate and natural disaster risk analysis (Tools 2.1-2.4).

Reference materials:

- Manual of economic evaluation of transportation projects, Inter-American Development Bank (de Rus Mendoza et. al, 2006).
- Manual: Economic evaluation of transportation projects (Government of Spain, 2016).
- Cost Benefit Analysis in World Bank Projects, (World Bank, 2010).

Steps for Incorporating Climate Risk into the CBA

1 **Determine whether climate and disaster resilience has been incorporated in the cost-benefit analysis:**



2 **Determine how climate risk may influence cost estimates over the years for each climate scenario.**
Method: Expert evaluation and review of Tool 2.4 and Text Box 6 findings.

3 **Determine how climate risk may influence the expected benefits over the years for mitigation actions under each climate scenario.**
Method: Assessment of mitigation actions for each climate scenario.

4 **Based on updated estimates of costs and benefits, determine the results by climate scenario.**
Method: Financial modeling.

5 **Perform a double-entry verification:** For example, if a cost for property damage and business interruption is estimated, enter either the cost of insurance (if these risks are insured), or the material and interruption costs, if not.
Method: Workshop with technical experts and financial modeling.

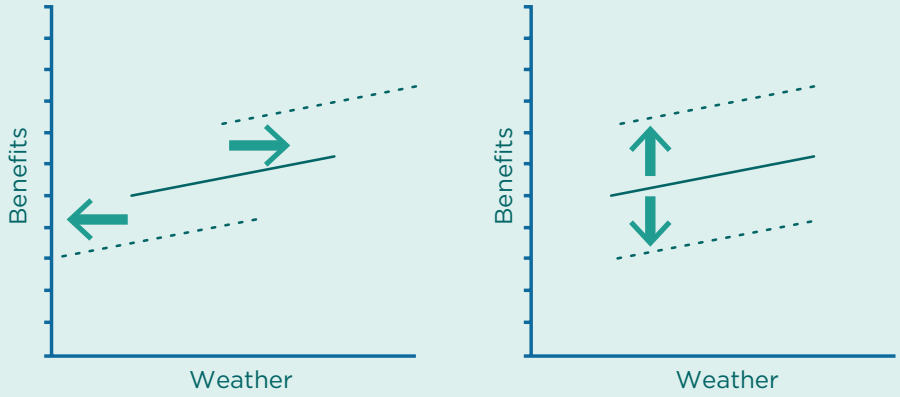
6 **Draw general conclusions on the economic viability of the projects, including the outcome of the scenarios.**
Method: Expert evaluation.

Text Box 6. Effect of Climate and Natural Disaster Risks on Cost-Benefit Analysis

1. Question: How do the following costs change in the selected climates scenarios?

- Maintenance costs: This includes more repairs due to increased storm incidents, higher temperatures, increased flooding, etc.
- Operating costs: Includes, for example, higher costs associated with heating, ventilation and air conditioning systems, increased insurance premiums, etc.
- Replacement costs: For example, are there likely to be more frequent replacements due to more severe weather events?

2. Question: How do the potential benefits change in the selected climate scenarios?
Is it likely that profits will increase/decrease (see graph of the right)?
Will climate scenarios affect the timing of certain benefits, i.e., will they occur sooner or later? (see chart on the left).



TOOL 2.7: INCLUDING CLIMATE RISK IN THE FINANCIAL FEASIBILITY ANALYSIS

In PPP projects, financial analysis is an important step in the due diligence process. Both the contracting authority and the private party will need to understand the expected financial performance. For the contracting authority, the financial analysis will determine its fiscal commitments; that is, the direct and/or contingent liabilities it will have to fund.

The financial evaluation developed includes an assessment of the project's cash flow before financing; that is, the expected cash income generated by the project

minus the expected cash expenditures. The result of the financial evaluation is the net present value (NPV) and the internal rate of return (IRR).[11]

Climate and natural disaster risks to the project and/or project options designed to make the project more resilient to climate change will likely affect the cost and revenue inputs into the financial model and analysis. The following tool **provides a framework for determining how to include climate and natural disaster risk as part of a financial analysis at the Structuring Phase.**

Figure 19. Considerations for Application of Tool 2.7

When to use it in the PPP process?

During the development of the financial model and analysis in the Structuring Phase.

Expertise required:

Financial/commercial experience; project knowledge; technical knowledge; understanding of the results of the project- specific climate risk analysis.

Stakeholders involved:

Stakeholders involved: Multidisciplinary work team; climate advisors; climate, technical, and financial team.

Reference materials:

• Caribbean PPP Toolkit - Module 4, Chapter 7 (World Bank, 2017).

Steps for Incorporating Climate Risk into the Financial Analysis

1 **Determine whether climate and disaster resilience has been incorporated into the financial analysis:**

2 **Determine the business case based on common business, design, technical, and financing considerations.**
Method: Expert evaluation and financial modeling.

3 **Review each cost and revenue line item and determine if weather influences the technical, commercial, and financing assumptions of the project, see Table 7.**
Method: Meetings with technical experts.

4 **Define alternative considerations for each climate scenario.** If alternative considerations are not available, determine risk margins (or deductions) for the overall cost and revenues by subcategories.
Method: Workshop with technical experts and financial modeling.

11. For more information, refer to Caribbean PPP Toolkit (World Bank, 2017).

5 **Perform a double-entry verification:** For example, if a cost for property damage and business interruption is estimated, enter either the cost of insurance (if these risks are insured) or the material and interruption costs, if they are not.
Method: Workshop with technical experts and financial modeling.

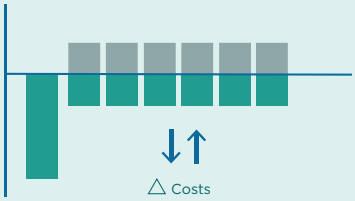
6 **Draw general conclusions on the financial feasibility of the project, including the outcome of the scenarios.**
Method: Expert evaluation.

Text Box 7. Determining the Impact of Climate and Natural Disaster Risks in the Costs and Revenues Associated with a PPP Project

Question: How do project costs change in the climate change scenarios?
[See Tool 2.4 for a summary of cost changes].

How different climate scenarios will affect the:

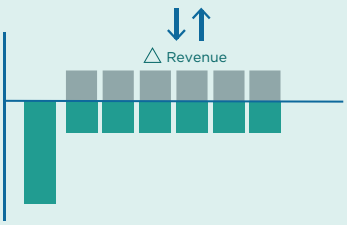
- Preparation and transaction stage costs
- Construction stage costs
- Operating stage costs
- Financing costs



The change in these costs will have an impact on the expenses associated with the project throughout its life cycle.

Question: How do revenue projections change under climate scenarios?
Considering the effect of:

- Delays in completion
- Business interruptions
- Service/quality problems



Climate and disaster risks, if they materialize, are likely to impact project construction and operations. There may be construction delays, reduced quality of service, or total loss of it. These examples would have a negative impact on revenue projections. Regarding project and climate scenarios, there may be cases where climate changes are beneficial to the project and, as a result, to project revenues. The objective of a financial analysis that takes into account climate and natural disaster risks is to make an informed assessment of how various risks may affect project revenues and costs, and, then allocate optimal funding (sound public finances).

Text Box 8. Climate Resilience in the Feasibility of a Wastewater Treatment Project

Consideration of climate change in the feasibility of a wastewater treatment plant

The feasibility study developed for a solid waste treatment project aimed to assess the viability of the project and propose an optimal value-for-money solution. Unlike conventional feasibility studies, the project explicitly considered the assessment of climate change impacts in the technical design of the project. To understand the initial and long-term capacity of the plant, the study assessed the likelihood of climate change affecting water availability and thus the average plant revenue flow during dry weather. One of the potential impacts of climate change on the plant is associated with the wet weather peak flow that results from stormwater inflow to the sewer network and may increase with extreme rainfall and flooding and thus exceed the hydraulic capacity of the plant during peaks.

The changes in the technical components were incorporated in the financial model, and therefore, in the calculation of the potential availability payment of the future concessionaire (forecast for funding).

TOOL 2.8: INCLUDING CLIMATE AND NATURAL DISASTER RISKS IN THE FISCAL ASSESSMENT

Once the financial viability of the project has been assessed, at the prefeasibility or feasibility level, and it has been considered "bankable" from the private sector's point of view, the contracting authority must evaluate the consequences of the project for the public sector under a fiscal control approach, based on the estimation of its impact and guaranteeing its affordability (IDB 2023).
This involves determining the financial flows that the government expects:

1. Receive from the private party (concession rights); and/or
2. Pay the private party:
   a. Direct Liabilities: availability payments, funding the feasibility gap, grants, among others; and
   b. Contingent liabilities: Commitments subject to a probability of occurrence and with potential impact on public finances that may occur in different scenarios (a higher or lower growth rate of demand, the occurrence of risk events, delay in project execution, among others).

When calculating financial flows, the estimation of fiscal commitments (direct and contingent liabilities) should consider climate and natural disaster risks, as well as their management costs (mitigation, transfer, elimination, etc.), to favor optimal funding and ensure the fiscal affordability of the projects.

For each PPP project, the competent authority, typically the Ministry of Finance or equivalent entity, must ensure its fiscal sustainability throughout the life cycle: (i) during the evaluation and structuring of the project; (ii) at the transaction phase; and (iii) during the signing and handling of the contract, in particular if any contingent liability materializes.

Thus, governments should apply a dynamic and comprehensive fiscal methodological framework that follows up on the project at each stage of its development and can estimate its impact and ensuring its affordability through continuous monitoring and supervision. As mentioned in the document Fiscal Sustainability of Public-Private Partnerships (IDB 2023), the objective is to promote fiscal planning processes around the infrastructure to be developed, favoring mechanisms to prepare projects, allocate resources and guarantee, through continuous supervision and maintenance, the availability and quality of services.

However, most governments conduct an annual budgeting process with short-term budget horizons (at most three to five years of planning). In the case of PPPs, most contracts have budgetary implications beyond this duration (extending to 20 to 30 years); in fact, most PPP projects do not involve any budgetary expenditure in the first three to five years after approval (time required for contracting and construction). **Thus, the objective of this tool is to promote fiscal sustainability by providing guidance on incorporating climate and natural disaster resilience into the assessment of direct and contingent liabilities.**

Figure 20. Considerations for Application of Tool 2.8

When to use it in the PPP process?

At various Phases of the project life cycle:

(i) during the Structuring Phase (pre-feasibility and/or feasibility), prior to the start of the transaction process

(ii) during the Transaction Phase, prior to signing the contract

(iii) during the Contract Management Phase

Stakeholders involved:

Project team, economic advisors, approval of the Ministry of Finance or equivalent.

Expertise required:

Economic and CBA knowledge; project knowledge; technical knowledge; understanding of the results of the project- specific climate and natural disaster risk analysis (Tools 2.1- 2.4).

Reference materials:

- PPP Fiscal Assessment Model PFRAM 2.0 (International Monetary Fund).
- Caribbean Public Private Partnership (PPP) Toolkit (World Bank, 2017).
- The Process of Analyzing Fiscal Feasibility (APMG International).

Text Box 9. Direct Liabilities vs. Contingent Liabilities

Direct liabilities (e.g., availability payments, payment for accomplished milestones) are accurately identified for the entire duration of the PPP contract once the contractual and financial close has been reached (except for (i) the portion of the payment that is subject to inflation adjustment and

(ii) changes requested by the contracting authority after contract close). Even during structuring, these can be estimated with reasonable certainty. Therefore, the potential challenge of direct liabilities is not their uncertainty, but their duration, as they are spread over an extended period (typically between 15 to 30 years). This may result in a lack of knowledge regarding the full tax burden of the project over its lifetime.

Contingent liabilities, on the other hand, are uncertain and not periodic. Contingent liabilities are not specific to PPP projects and are also present in conventionally contracted projects (although they are rarely explicitly estimated). In fact, the transfer of construction and availability risk to the concessionaire under a PPP agreement eliminates several contingent liabilities for the government (e.g., cost increases due to design errors or the impact of rising input prices). However, PPP contracts also introduce new contingent liabilities that are not present in conventionally contracted projects (e.g., minimum demand guarantee).

TYPE	DESCRIPTION	EXAMPLE OF IMPLICATIONS FOR LIABILITIES DUE TO THE INTRODUCTION OF CLIMATE RESILIENCE
Direct liabilities	When the unit or debt or (public entity) is obliged, under specific circumstances, to provide funds (in cash or financial instrument) or other resources to another unit or contractor (MEFP FMI 2014). Contractual payments are typically fixed (and predictable) payments made by the government to a private party. Typically translates as: • Availability payments • Payments for accomplished milestones • Commercial viability deficit payments.[12]	• Changes in construction costs, through increased technical specifications. • Changes in operation and maintenance costs, on the one hand, more preventive. maintenance, and less reactive maintenance • Changes in financing costs, from leveraging sustainable financing (e.g., green). • Changes in insurance costs, incorporating possible medium to high risks in risk policies.

12. Commercial viability deficit payments may be provided by the government when a project is economically feasible (measured by cost-benefit analysis) and desirable, but not commercially viable (as measured by financial analysis).

TYPE	DESCRIPTION	EXAMPLE OF IMPLICATIONS FOR LIABILITIES DUE TO THE INTRODUCTION OF CLIMATE RESILIENCE
Contingent liabilities	Obligations that do not arise unless a specific, singular event or events occur in the future (GFSM IMF 2014). These are unpredictable governmental commitments that may be incurred when an uncertain risk materializes. Typically translates as: • Government guarantees on risk variables • Force majeure • Termination payments	• Payment of government guarantees in the event of an unforeseen weather event that partially closes the operation of the project. • Payment of government guarantees for the occurrence of an unforeseen weather event that totally closes the operation of the project for a prolonged period (force majeure). • Payment for early termination due to force majeure event.

Steps for Incorporating Climate Risk into Fiscal Analysis

1 **Determine whether climate and disaster resilience has been incorporated in the fiscal analysis:**

2 **Identify and evaluate direct and contingent liabilities in the cash flow of the government.**
Method: Expert assessment and review of Tool 2.4, 2.5 and 2.7 findings.

3 **Incorporate direct and contingent liabilities in the government's cash flows.**
Step 3.1 - Incorporate tax revenue projection: Typically, a projection of tax revenues for the duration of the PPP contract is required. Some government financial reports may include a medium-term projection (three to four years). One simplification technique is to assume that the subsequent revenue growth rate is equal to the jurisdiction's gross domestic product (GDP) growth rate. Method: Financial modeling.

4 **Identify tax rules (if any)**
Step 4.1 - Compare fiscal commitments: Project the commitments made and the fiscal budget allocated per year for the contracting authority. This comparison should clearly indicate the availability of budgetary room to accommodate direct liabilities, as well as the provisions needed to meet contingent liabilities.
Method: Financial modeling.

5 **Communicate (for Transaction Phase only):** If the contracting authority is subject to fiscal rules by regulation, it may choose to communicate this in the request for proposals, or even to determine a maximum price that cannot be exceeded under penalty of non-compliance with the proposal.

The advantage of communicating a budget ceiling is that it provides an opportunity to "test" its cost estimate, and minimizes the risk that the agency will have to abort the procurement process due to the absence of affordable proposals.

The advantage for bidders is that they have more certainty that the project will go ahead, provided they are able to stay within the budget. If the budget is unrealistic, they can communicate this at an early stage before a lot of effort is put into preparing and evaluating the proposals.

Some jurisdictions are concerned that communicating an affordability ceiling may reduce competition and encourage bidders to submit bids close to that ceiling. This concern is often not valid, as long as the evaluation criteria consider price as a relevant factor and there is competitive pressure.

An important consideration is whether the budget ceiling should be indicative. To be absolutely certain that the budget will not be exceeded, an affordability ceiling should be imposed. This clearly communicates to bidders that they must stay within the fiscal parameters and adjust their design and performance levels accordingly. The risk is that if the space is too restrictive, bidders will be deterred from submitting a proposal. When imposing a budget limit, the contracting authority should ensure that it is realistic and provides information on the assumptions that have been considered in determining the amount of the limit.

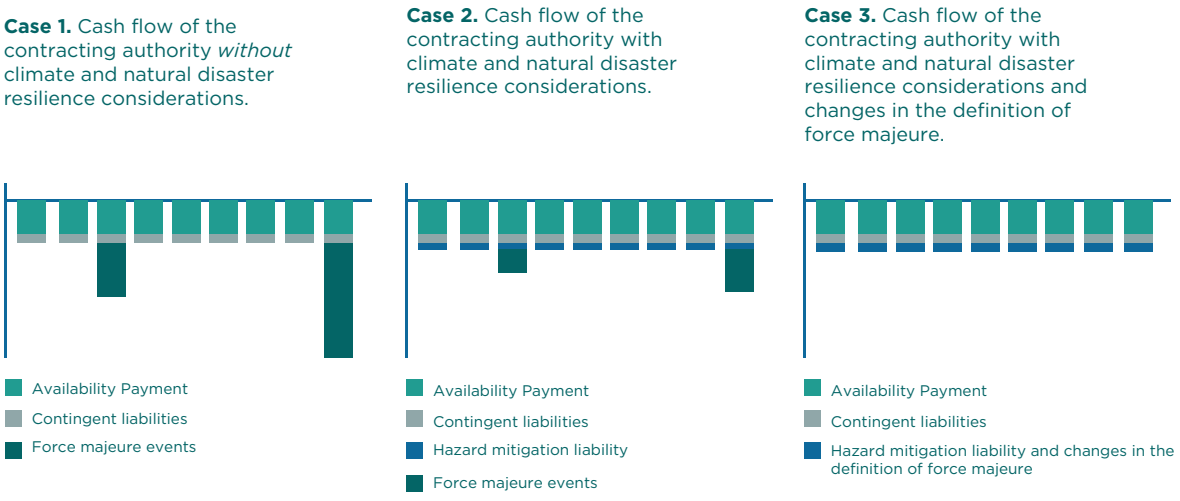
To the extent that fiscal parameters are very tight, it may be useful to also allow bid variations that allow bidders to stay within the cap by reducing the scope of the project.
Method: Incorporation of bidding documents.

TOOLS FOR OPTIMIZING FISCAL COMMITMENTS IN CLIMATE AND NATURAL DISASTER-RESILIENT PPPS

On the one hand, climate and natural disaster risk mitigation measures will have an impact on project costs, which will later be reflected in the payment mechanism, and thus also in the fiscal responsibility of the contracting authority. On the other hand, building climate and natural disaster resilient infrastructure will avoid damages in the event of future materialization (force majeure events) that are normally allocated to the public party, providing more stability in the governments' cash flow. At the same time, there is the potential for projects to access sustainable financing.

Redefining clauses such as force majeure and insurability (see Tools 4.2 and 4.3) can also promote fiscal sustainability. For example, governments can identify specific threats relevant to the project area and request insurance from the concessionaire for them. Should the threats materialize, the government would not be financially responsible for the force majeure event. Figure 21 presents the difference between government cash flow without and with climate and disaster risk mitigation measures (incorporation of Tools 2.1 to 2.9), as well as with the definition of force majeure (incorporation of Tool 4.2).

Figure 21. Contracting Authority Cash Flows Under Different Scenarios



TOOL 2.9: INCLUDING CLIMATE AND NATURAL DISASTER RISK IN THE VALUE FOR MONEY ASSESSMENT

The contracting authorities base their decision to implement a project as a PPP upon sufficient evidence that the implementation of a project under this modality will generate added value for the company, the public sector, and society. The

'Value for Money' (VfM) ratio of a PPP can materialize in two ways: (i) when it provides greater value, but at the same cost (as an alternative), or (ii) when it provides the same value, but at a lower cost.[13]

The VfM assessment is a standard analysis performed by PPP project teams to determine whether the project in question delivers more value to society as a PPP or through some other procurement method. It may involve a qualitative assessment, a quantitative assessment, or a combination of both. The quantitative assessment consists of a comparison of all anticipated costs and risks under the PPP and non-PPP procurement methods. Like the other analyses, the VfM assessment ideally considers all risks and uncertainties, including those associated with climate and natural disasters. More specifically, the VfM should consider the extent to which climate and natural disaster risks and uncertainties are expected to affect the differences between PPP and non-PPP procurement, also referred to as "value drivers," as this is ultimately what this assessment is about.

The following tool provides guidance on how to include climate and natural disaster considerations in the VfM assessment.

Figure 22. Considerations for Application of Tool 2.9

When to use it in the PPP process?

When conducting the VfM assessment, considering the medium to high climate and natural disaster risks of tools 2.1-2.3.

Expertise required:

Financial/commercial expertise, project knowledge; technical knowledge; understanding of the results of the project-specific climate and natural disaster risk analysis (Tools 2.1 to 2.3)

Stakeholders involved:

Project team; financial and technical advisors, climate and natural disaster experts.

Reference materials:

- PPP Certification Guide, Chapter 16: Value for Money Assessment (APMG International).
- Caribbean PPP Toolkit - Module 4 Business Case (World Bank. 2017).

Steps for Incorporating Climate Risk into Financial Analysis

1 Determine whether climate and natural disaster resilience scenarios were considered in the VfM study:

13. For more information, refer to Caribbean PPP Toolkit (World Bank, 2017).

2 **Determine the costs and risks (and, potentially, revenues) of PPP and non-PPP contracting, without specific consideration of climate and natural disaster risks and following general VfM methodologies.**
Method: Expert evaluation and financial modeling.

3 **Review each cost, risk, and revenue potential and determine whether climate and natural disaster risks influence these assumptions** (see Table 10).[14]
Method: Meetings with technical experts.

4 **Define alternative assumptions for each climate scenario.** If alternative assumptions are not available, determine risk margins (or deductions) for the overall cost and revenues by subcategories.
Method: Workshop with technical experts and financial modeling.

5 **Perform a double-entry verification:** For example, if a cost for property damage and interruption of the operation is estimated. Enter either the cost of insurance (if these risks are insured), or the cost of property damage and interruption, if they are not.
Method: Workshop with technical experts and financial modeling.

6 **Draw general conclusions on the VfM analysis and contracting model with the highest VfM.**
Method: Expert evaluation.

Text Box 10. Considerations for a VfM Assessment Incorporating Climate Risk

Performing a **VfM assessment that incorporates climate and natural disaster risk** requires an understanding of:

1. In general terms, how does climate risk affect a project's costs and revenue?
2. For PPP projects, as it filters through the "PPP value drivers," how does this climate risk affect a project's risk-adjusted costs and revenues? (see Table 11).

14. Steps 1 to 5 are not critical to the VfM assessment, as the objective of this analysis is ultimately to decide on the optimal procurement model and, if climate or natural disaster risk does not influence the different procurement models, they do not need to be taken into account during the VfM assessment. In other words, completeness of expected costs and risks is less relevant than completeness about expected differences between delivery models. Other analyses, such as CBA or financial feasibility analysis do require a thorough assessment of climate and natural disaster risks and uncertainties.

Table 11. How can climate and disaster risk considerations affect the value drivers in the value-for-money study?

VALUE DRIVER	HOW CAN CLIMATE RISK CONSIDERATIONS INFLUENCE THE VALUE DRIVER?	RESULT	CONDITIONS
Performance - based contracting (PBC)	The PBC leaves room for the concessionaire to think about the most efficient and effective way to deal with climate risk (e.g., for mitigation measures, disaster response, reconstruction).	Better quality Lower cost	• Transfer of responsibility for climate risk mitigation. • Sufficient flexibility in design standards to develop optimally resilient solutions. • Define SMART (Specific, Measurable, Achievable, Relevant, and Time-bound) performance indicators for disaster response and climate risk mitigation. • Robust payment mechanism around climate risk performance indicators.
Risk allocation	Transferring climate risk to the concessionaire may be beneficial if the concessionaire is better able to manage the risk (e.g., has more experience with that risk and the asset; optimal combination of mitigation and response measures).	Reduced risk	
Integrated service and life cycle optimization	Lower cost: Lower costs due to life cycle integration. For example, encourage weather proof design to reduce response and repair costs.	Lower cost	
Performance -based payment mechanism	The financial incentive can stimulate better mitigation and preparedness for climate and natural disaster risks, as well as faster and higher quality response and repairs.	Risk reduction Better quality	
Private financing	Reduced risk/better quality: additional pressure from private investors encourages good climate risk management and high yields to ensure repayment/return.	Risk reduction Better quality	• Ensuring continuous knowledge sharing with the financial sector. • To guarantee the same climate assumptions.

VALUE DRIVER	HOW CAN CLIMATE RISK CONSIDERATIONS INFLUENCE THE VALUE DRIVER?	RESULT	CONDITIONS
Transaction costs	Including climate risk potentially requires more data and expertise, additional studies and adjustments to standard documentation, which increases preparation time and budget	Higher costs	To reduce the negative effect: • Standardization of methods, data and studies. • Create capabilities and build a network of learning and experience. • Adjust the standard documentation with considerations of weather risk.
Inflexibility	Long-term contractual requirements may have to be modified to a costly extent over time, as climate risk is not yet certain and standards could change	Higher costs	To reduce the negative effect: • Introduce mechanisms that consider clauses allowing for specific changes in the contract. • Consider future changes in standards, etc., in contractual requirements/result specifications.

TOOL 2.10: INCLUDING CLIMATE RISK IN THE ENVIRONMENTAL IMPACT ASSESSMENT

A thorough assessment of the environmental issues associated with the project helps to ensure that these are explicitly addressed and integrated into the decision to proceed with the project as a PPP. It also helps ensure that no unmanageable environmental or social obstacle prevent the project from achieving its objectives. This analysis allows the project teams to anticipate any problems, avoid them as much as possible, minimize them or compensate for them to avoid any unnecessary delays in the project schedule.

Most people readily recognize the relevance of climate risk assessment for environmental impact assessment. However, many think of climate risk exclusively in the context of environmental impact assessment, whereas climate risk assessment is relevant to all analyses. The environmental impact assessment focuses on the impact that climate and natural disaster risks have on the project environment, the financial feasibility analysis examines the impact of risks on the project itself, and the cost-benefit analysis considers both. The integration of climate and natural disaster risks into environmental impact assessment (EIA) is an emerging practice. **This tool provides some guiding questions, at a high level, to help project teams integrate climate into their EIA.**

Figure 23. Considerations for Application of Tool 2.10

When to use it in the PPP process?

When conducting environmental and social assessments (for projects with medium to high climate and natural disaster risks).

Expertise required:

Environmental and social knowledge; project knowledge; technical knowledge; understanding of the results of the project-specific climate and natural disaster risk analysis (tools 2.1-2.3)

Stakeholders involved:

Project team - environmental group; environmental and social advisors, climate team.

Reference materials:

• This "Guide for Integrating Climate Change into the EIA Process" focuses on Caribbean countries and contains several diagrams highlighting how they can be streamlined into the EIA (World Bank, 2004).

• The Columbia University Law website offers several resources on integrating climate change into Environmental Assessments.

Text Box 11. Checklist on Integrating Climate and Natural Disaster Risks into the EIA

- ✓ Does the environmental impact assessment consider the impact of the project on the environment under current and future climate conditions?
- ✓ Are the same climate scenarios applied as those used in the technical, financial, and economic feasibility of the EIA?
- ✓ Does the EIA contain suggestions for mitigation measures including the respective change in impact, with and without climate change?
- ✓ Has the environmental impact assessment been reviewed by climate and natural disaster risk experts?

Text Box 12. Climate Resilience in Consulting Firms' Terms of Reference

Resilience to climate change and natural disasters in the terms of reference of consulting firms for a wastewater treatment plant

For the development of a wastewater treatment plant, a municipal government engaged a multilateral agency as lead advisor for the transaction. The multilateral agency, at the government's request, issued terms of reference (ToR) for the consulting firm to conduct the technical, environmental, and social due diligence and feasibility study. The ToR incorporated key tasks and requirements related to climate resilience.

The ToR required the consulting firm to consider the impact of climate change in the feasibility study. For example, through an assessment of projected inflows to the treatment plant that considered the impact of climate change on expected flows.

The selected consulting firm stated that the explicit inclusion of climate resilience in the ToR prompted them to address these elements within their proposal and, at a later stage, during the preparation of the studies.

Where in-house expertise is not available, the inclusion of climate resilience in the ToR of consulting firms ensures that the external consulting team (i) provides the necessary experience and skills to adequately consider climate resilience, and (ii) prioritizes climate and disaster risk management among its tasks.

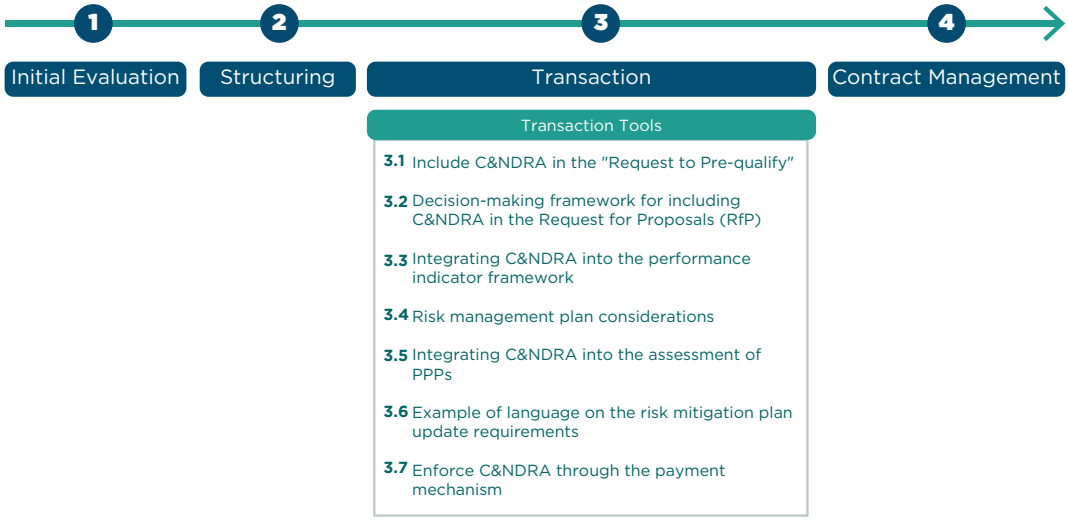
3. CLIMATE RESILIENCE IN THE PPP TRANSACTION PHASE

During the Transaction Phase, the government selects the private party that will implement the PPP. This phase builds on the analysis of the Structuring Phase to determine the actual terms of the contract and concludes when the PPP reaches financial close, i.e. when the contracting authority has selected and signed a contract with a private party (commercial close), and the private party has secured the necessary financing and can begin to deploy it on the project (financial close) - where the sustainability component may have played a key role in securing sustainable financing.[15]

This phase offers many opportunities for the project team to incorporate climate and natural disaster resilience considerations, including in contract design, qualification of bidders, project bidding, and evaluation of bids received. As much of the project-related analysis will have been completed, the project team should have a good understanding of the climate and disaster risks involved. When incorporating climate resilience measures into the PPP contract and proposal evaluation, project teams should consider the transaction costs involved, both on the public side (i.e., is there government funding capacity? Are there fiscal rules and are their limits being met? Are new provisions made for operation and maintenance of the asset?) and the private side (i.e., is what the government asks for in terms of climate resilience so costly as to diminish private interest?).

The following section of the Toolkit offers several possible decision-support tools that **PPP project planners and teams can use during the Transaction Phase to ensure that climate and natural disaster resilience is taken into account.**

Figure 24. Summary of the Transaction Phase Tools



15. For a description of the market for sustainable infrastructure financing in Latin America and the Caribbean, please see Caribbean, see Álvarez-Pagliuca et al. (2022).

TOOL 3.1: INCLUDING CLIMATE RESILIENCE IN THE INVITATION TO PRE-QUALIFY

In most PPP bidding processes in Latin America and the Caribbean, pre- qualification criteria are established, which helps to ensure that a competent company with the appropriate capacity to manage the project is selected. Often, but not always, this review of the capacity of bidding teams takes place in the pre- qualification phase, prior to the public bidding phase. This prequalification and bidding process is also known as two-stage procurement. The invitation to pre-qualify is intended to filter out for both the contracting authority and potential bidders those teams that are not sufficiently qualified to carry out the project and helps to ensure that the number of bidders is manageable, which avoids overwhelming the contracting authority during the evaluation process.

Generally, prequalification requires the evaluation of bidding teams according to specified pass/fail qualification requirements. Only bidding teams that meet the qualification requirements can proceed to the next phase of public bidding for the PPP. Alternatively, governments may specify qualification criteria, to allow for subsequent pre-selection based on capability.[16]

The following tool provides guidance on how to consider incorporating climate resilience at the invitation to pre-qualify stage, particularly as part of the prequalification criteria. As the objective during this stage is to determine whether the competencies of potential bidding teams are appropriate, this tool focuses on how to gather information to understand whether potential bidding teams have experience and qualifications in relation to climate and disaster risk management. It is important to note that by considering climate resilience in bidding processes, project teams could benefit companies with sustainable infrastructure labels, which could contribute to the financial closure of projects.

Figure 25. Considerations for Application of Tool 3.1

When to use it in the PPP process?

Use this tool to consider the inclusion of climate resilience considerations in the invitation to qualify document.

Expertise required:

Project knowledge; technical knowledge; understanding of the results of the project-specific climate and natural disaster risk analysis.

Stakeholders involved:

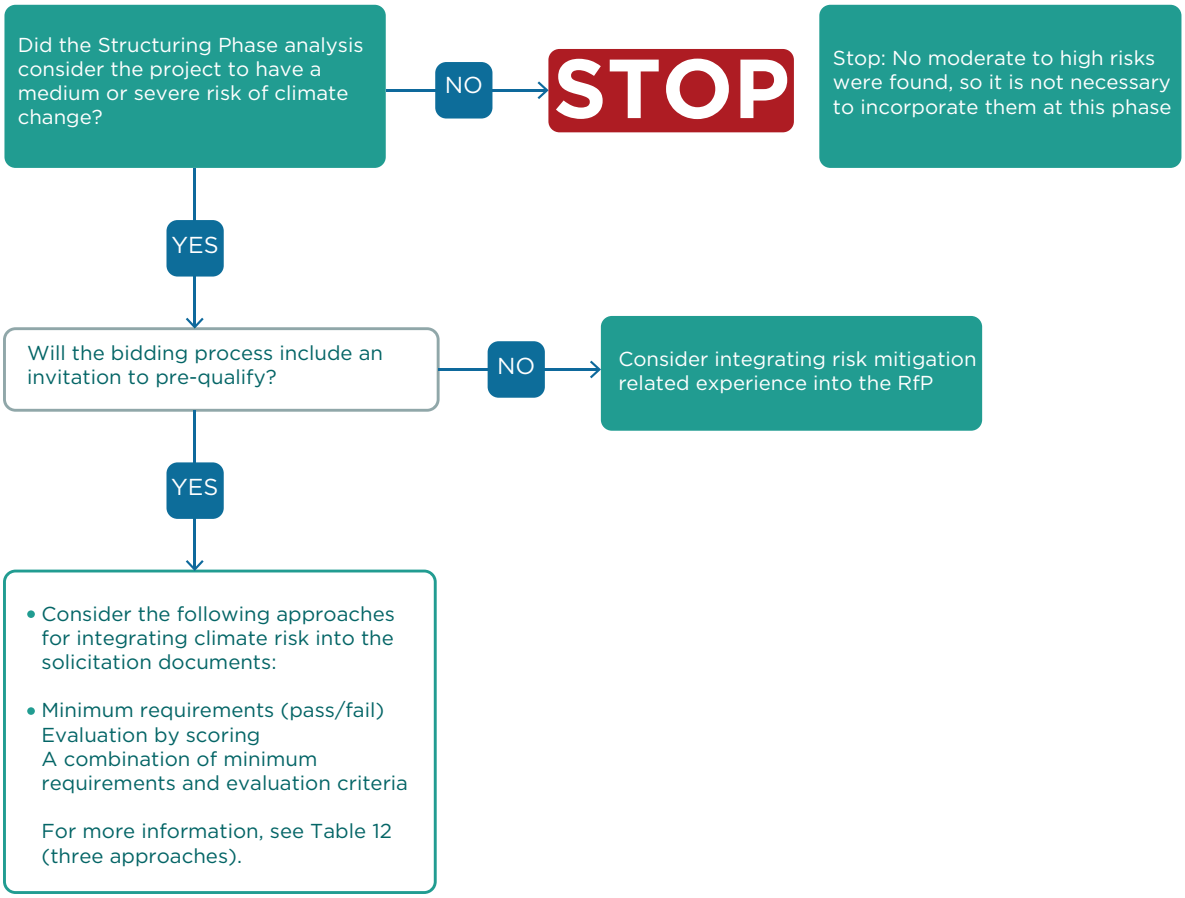
Project team, external consultants.

Reference materials:

• PPP Reference Guide - Qualification of bidders (World Bank, Asian Development Bank and Inter-American Development Bank, 2017).

16. For more information, see the following link in PPP Knowledge Lab.

Figure 26. Decision-Making Framework for Including Climate and Natural Disaster Resilience in the Invitation to Pre-qualify



Note: The "Invitation to Pre-qualify" phase focuses on the evaluation of the bidders, to determine whether they have the necessary experience and capacity to carry out and manage the PPP. The "Competitive Bidding" phase, which is the second phase of the evaluation process, focuses on the evaluation of the proposals: do the relevant documents exist and are they of sufficient quality?

Table 12 below presents some examples of how to approach the different methods for evaluating proposals at this stage of the bidding process.

Table 12. Approaches for Evaluating the Bidder's Climate Resilience and Natural Disaster Management Experience at the Request for Proposal Stage

APPROACH 1. MINIMUM REQUIREMENT (PASS/FAIL)	
REQUIREMENT	Respondent teams should demonstrate sufficient experience in managing projects with a similar climate risk profile.
MEASUREMENT	The evaluation of qualifications will be based on the submissions received in accordance with Section [x] of this Invitation to Pre-qualify. Participating teams must submit all information in accordance with Section [x] of this Invitation to Pre-qualify. The Contracting Authority, at its sole discretion, shall have the right to request clarification from each of the participating teams.
REQUIREMENTS FOR PRESENTATION	Section [x] Provide the complete submission form [y] for the projects of reference. Identify, for each member of the team, a maximum of five reference projects to the extent necessary to provide the necessary information related to the project in question. Based on the reference projects that have proven to be the most relevant for this subsection, describe the team's experience and capabilities: 1. ... 2. ... 3. ... 4. Management of projects with a similar climate risk profile; 5. ...
APPROACH 2. EVALUATION BY SCORE	
REQUIREMENT	When evaluating the pre-qualification documents, the following selection criteria, with their corresponding weightings, will be considered to calculate an overall score (100 pts): 1. ... 2. ... 3. ... 4. Level of previous experience in projects with a similar climate risk profile, as well as experience in the effective mitigation of climate and disaster risks in such projects (50 points). 5. ...
MEASUREMENT	The assessment of qualifications will be based on the submissions received in accordance with Section [x] of this request to submit qualifications. The competing teams must submit all information in accordance with Section [x] of this Invitation to Pre-qualify. The Contracting Authority, at its sole discretion, shall have the right to request clarifications from each Bidder.

APPROACH 2. EVALUATION BY SCORE	
REQUIREMENTS FOR PRESENTATION	Section [x] Provide the completed submission form [y] for the reference projects. Each respondent team member will identify a maximum of five reference projects to the extent necessary to provide information related to the reference project. Based on the reference projects that prove to be most relevant for this subsection, describe the respondent team's experience and capability in: 1. ... 2. ... 3. ... 4. Manage projects with a similar climate risk profile; 5. ...
APPROACH 3. EVALUATION BY SCORE & MINIMUM REQUIREMENT (PASS/FAIL)	
REQUIREMENT	When evaluating the pre-qualification documents, the following selection criteria, with their corresponding weightings, will be taken into account to calculate an overall score (100 pts): 1. ... 2. ... 3. ... 4. Degree of previous experience in projects with a similar climate risk profile, as well as in the effective mitigation of climate and disaster risks in such projects (50 points). 5. ... Each Request for Proposal must achieve a score of at least 70% for each individual part of the submission and associated sub-criterion.
MEASUREMENT	The assessment of qualifications will be based on the submissions received in accordance with Section [x] of the invitation to submit qualifications. The competing teams must submit all information in accordance with Section [x] of this Invitation to Pre-qualify. The Contracting Authority, at its sole discretion, shall have the right to request clarifications from each Bidder.

APPROACH 3. EVALUATION BY SCORE & MINIMUM REQUIREMENT (PASS/FAIL)	
REQUIREMENTS FOR PRESENTATION	Section [x] Provide the completed submission form [y] for the reference projects. Each respondent team member will identify a maximum of five reference projects to the extent necessary to provide information related to the reference project. Based on the reference projects that prove to be most relevant to this subsection, describe the respondent team's experience and capability in: 1. ... 2. ... 3. ... 4. Manage projects with a similar climate risk profile; 5. ...

TOOL 3.2: DECISION-MAKING FRAMEWORK FOR INCLUDING CLIMATE RESILIENCE IN THE PPP REQUEST FOR PROPOSALS (RFP)

PPPs offer a way to introduce private sector innovation in the provision of public services. This is possible because PPPs are defined in terms of outcomes. This feature of PPPs can be useful for a contracting authority wishing to develop climate and disaster resilient infrastructure assets and to deliver them efficiently. Broadly speaking, there are two main routes for the contracting authority to benefit from private sector innovation and introduce the concept of resilience into its projects: (i) set minimum requirements for PPPs to achieve certain climate resilience objectives; or (ii) include climate resilience considerations in the evaluation of bidding teams' proposals.

The following framework provides guidance on how to think about a spectrum of the level of discretion that would be granted by the contracting authority to the private sector to meet climate resilience objectives.

Figure 27. Considerations for Application of Tool 3.2

When to use it in the PPP process?

In the Structuring and Transaction Phases

Stakeholders involved:

Project-related technical specialties (e.g., energy engineer, transportation planner, etc.); legal and contracting specialties.

Expertise required:

Project knowledge; technical knowledge; understanding of the results of the project specific climate and natural disaster risk analysis.

Reference materials:

• For this decision-making framework, it is important to consider Tools 3.1 and 3.3 of this Toolkit.

Table 13. Approaches to Evaluate the Bidder's Climate Resilience Experience in the Request for Proposal Stage

	WHEN TO USE?	REQUIREMENTS FOR USE
APPROACH 1. MINIMUM REQUIREMENT (PASS/FAIL)	If the contracting authority is clear on what it is looking for with respect to requirements related to climate and natural disaster resilience, then the use of some form of minimum requirements either as pass/fail criteria during contracting or as requirements during the Contract Management Phase may be a way to achieve this.	Experience on the part of the contracting authority or external consultants to establish the minimum requirements.
APPROACH 2. EVALUATION BY SCORING	If the contracting authority wishes to (i) have bidders differentiate themselves in terms of climate resilience during the procurement and/or (ii) confirm that the bidders' approach is suitable and/or appropriate for the entity.	
APPROACH 3. EVALUATION BY SCORING & MINIMUM REQUIREMENT (PASS/FAIL)	If the contracting authority wishes to offer flexibility to bidders, but the public objective is not considered important enough to affect the evaluation score.	

TOOL 3.3: INTEGRATING CLIMATE RESILIENCE INTO THE PERFORMANCE, QUALITY, AND SERVICE LEVEL INDICATOR FRAMEWORK

The PPP contract should clearly specify the results expected from the private party in terms of availability, quality, and level of services (hereafter "performance indicators") to be provided. This could include defining the required maintenance standards for a road or defining the required quality of service and connection expansion targets for utilities provided directly to users. Performance indicators are usually specified in the Technical Appendix of the PPP contract, in terms of expected outcomes or required outputs (e.g. quality of hospital service). Performance indicators, based on outcomes rather than prescriptive specifications (e.g., type of construction materials), allow bidders to be innovative in responding to contract requirements.[17]

This tool provides a **guiding framework on how to think about the development of expected performance indicators to ensure that climate resilience is taken into account.**

17. For more information, see the following link in the PPP Knowledge Lab.

Figure 28. Considerations for Application of Tool 3.3

When to use it in the PPP process?

This high-level decision-making framework is useful when structuring the PPP contract.

Stakeholders involved:

External advisors, including legal, technical, financial, climate change and natural disaster teams.

Expertise required:

Project knowledge; technical knowledge; understanding of the results of the project-specific climate and natural disaster risk analysis.

Reference materials:

- Guidelines for the application of service level measurement guidelines, quality standards and environmental criteria for road infrastructure projects developed under the public-private partnership scheme.
- Geographic Information Center guidance note on performance specifications.
- PPP Reference Guide - Performance Requirements.

Under a PPP procurement, when the procuring agency communicates its requirements to the private sector to call for bids, mechanisms such as the negotiation process, payment mechanism, performance evaluation and performance indicators are used, rather than a set of prescriptive specifications. Performance indicators are best designed with an understanding of the contracting authority's requirements, the needs of the infrastructure asset itself, the link between the requirements and the payment mechanism and performance evaluation procedures, and how changes to the project will be managed. The following framework sets out, on the left-hand side, the key issues that PPP project planners need to consider when designing performance indicators (availability, quality, and level of service), while the right-hand side examines how climate resilience considerations might be incorporated into this process. Table 14 provides additional guiding questions.

Table 14. Considerations for Incorporating Climate and Natural Disaster Resilience into Performance Indicators

PROJECT CONSIDERATIONS	CLIMATE AND NATURAL DISASTER CONSIDERATIONS
Project Goals	• Has a climate and disaster risk assessment been performed? • Could climate and disaster risks affect project objectives?
Design and Construction Standards Service Standards and Requirements	• Can climate risks be addressed through design and construction standards? • Can climate and disaster risks be addressed through service requirements?
Performance indicators based on, Availability Quality Service level	• Can monitoring and incentivizing climate and disaster risk mitigation follow the definition of availability, quality and level of service?

The following are guiding questions to facilitate integration of climate resilience in the performance specifications.

	QUESTIONS RELATED TO THE PROJECT
How to get started	• Do climate and natural disaster risks determine the degree to which key project objectives are met? Could climate and disaster risks have a negative impact on the project environment? • Is the project location particularly exposed to climate risk? • Can the project location be changed to reduce climate risk?
Development of design and construction standards	• Are certain standards (use of certain materials or prescriptive design requirements) necessary to effectively mitigate climate and disaster risks? • Is there an evaluation process to ensure compliance with these standards at the end of the asset's construction?
Develop availability requirements	• Are certain availability requirements associated with climate risk mitigation important enough to be included in the definition of availability (meaning that failure to meet these requirements would pre-qualify as critical and should have serious financial implications)?
Elaboration of performance standards	• Are any less critical performance requirements necessary? • Is there a way to make performance dynamically track changing climate risks over the life of the contract? For example, by requiring the development and periodic updating of 1) a disaster response plan and 2) a maintenance plan that addresses climate and natural disaster risks.

Text Box 13. Checklist for the Integration of Climate and Natural Disaster Risks in Performance Indicators

Climate and natural disaster resilience testing

- ☑ Have performance indicators integrated the findings of any project-related climate resilience assessments?
- ☑ Have the performance indicators been reviewed by climate and natural disaster risk experts, as well as legal, contracting and engineering experts?

Verification of expected results

- ☑ Do the performance indicators state the requirements of the specification in a complete, clear, concise, logical, and unambiguous manner?

- Do the performance indicators contain sufficient information for potential bidders to decide and cost how they will meet the specifications?
- Do the performance indicators contain only the essential features or characteristics of the requirements?

Text Box 14. Example of SMART[18] and non-SMART Objectives for Schools under PPP contracts[19]

	SMART	NON-SMART
Specific	Renovate educational units under category 5 hurricane resistant construction standards.	Renovate educational units to achieve a good level of quality.
Measurable	Ensure that educational units are structurally sound, with adequate ventilation, lighting, and thermal comfort.	Ensure that all educational units are suitable for classes.
Attainable	Maintain the inside temperature at [X] degrees when the outside temperature is between [Y] and [Z] degrees.	Ensuring that the internal temperature is always kept cool.
Relevant	Ensure that temperature control system malfunctions are rectified within eight hours during business hours and 16 hours outside of business hours.	Ensure that temperature system failures are repaired within a short period of time.
Time-bound	Maintain a fault log and report periodically (e.g. monthly).	Submit an annual performance report.

Text Box 15. Climate Resilience in Performance Indicators

Resilience to climate change and natural disasters in the performance indicators of a project of 10 elementary schools

For the development of a 10-school project, the state government performed a comprehensive analysis of climate and natural disaster risks in the project areas, where high hurricane risk, category 5, was identified. The state government took appropriate steps to incorporate mitigation measures at the project Structuring and Transaction Phases, including its performance indicators, to ensure resilience to potential hurricanes during the life of the project. Among the indicators are:

18. SMART objectives are specific, measurable, attainable, relevant and time-bound, as stated in García Canales et al. (2021).

19. https://documents.worldbank.org/en/publication/documents-reports/documentdetail/995241468337913618/how-to-engage-with-the-private-sector-in-public-private-partnerships-in-emerging-markets.

TYPE OF STANDARD WITH RESPECT TO THE LIFE CYCLE	CATEGORY	PERFORMANCE INDICATOR
Design and construction standard	Availability	The design and construction of schools certified to withstand category 5 hurricanes and serve as shelter for 1,200 people.
Design and construction standard	Quality	Nature-based solutions (certain types of vegetation to help deflect hurricane winds) to mitigate the technical needs for schools to withstand a Category 5 hurricane.
Service delivery standard (O&M)	Service level	Guarantee the provision of uninterrupted access to water, electricity and sanitation services during the hurricane season, specifically between the months of May and October.

TOOL 3.4: DISASTER RISK MANAGEMENT PLAN CONSIDERATIONS

A Disaster Risk Management Plan (DRMP) can help manage the impacts of relevant risks that could not be transferred or mitigated. These types of risks, such as the inevitable destruction following a category 5 hurricane, are best managed through a DRMP. When accepting proposals for a PPP infrastructure project, the government may request the private party to develop, or jointly develop with the contracting authority, a DRMP as a way of ensuring that there is adequate foresight on how to manage the possible eventuality of the risk. This tool **provides drafting language that project teams can use to request these plans from bidders.**

Figure 29. Considerations for Application of Tool 3.4

When to use it in the PPP process?

In the Structuring and Transaction Phases.

Stakeholders involved:

Project team, external consultants and experts on climate risks and natural disasters.

Expertise required:

Example (airport) of emergency disaster template.

Reference materials:

- Technical expertise related to the project (e.g. energy engineer, transportation planner, etc.);
- Legal and contracting specialties;
- Results of the analysis of the business case study phase;
- Knowledge of disaster response and climate change.

Table 15. Disaster Risk Management Plan Considerations

OPTION	DESCRIPTION	PROS	CONS	WHEN TO USE?	PPP DRAFT AGREEMENT
Before hiring	The national disaster risk unit of [country] prepares a DRMP and prescribes it to bidders.	Simple approach Uniformity of disaster response plans. Low transaction costs.	No creative input from bidders.	The [country's] national disaster risk unit has a strong DRMP. The national disaster risk unit of the [country] wants to homogenize the DRMP. The national disaster risk unit of the [country] does not want/need bidders to differentiate in the development of DRMP.	The concessionaire shall apply the DRMP according to the appendix [x]. Technical appendix [x] is developed by the Government.
During hiring	The contracting authority invites bidders to develop DRMP and evaluates them.	Leveraging the expertise and creativity of the private sector.	High transaction costs, both for public and private parties.	The contracting authority considers that the private sector can offer high levels of creativity. Government wants bidders to differentiate in the development of DRMP.	The concessionaire shall implement the DRMP plan according to the technical appendix [x].
After hiring	The contracting authority requires bidders to develop a DRMP plan following the selection of the preferred bidder.	Leverage private sector expertise and creativity. No additional transaction costs.	There is no certainty about a plan in the selection of the preferred bidder.	The contracting authority has a robust DRMP. The contracting authority does not require bidders to differentiate in the development of disaster response plans.	Prior to the effective date, the contracting authority and the concessionaire shall jointly develop a DRMP in accordance with Clause [x]. Or Within 45 calendar days of the effective date, the concessionaire shall provide for the review and approval of the contracting authority, which shall not be unreasonably or arbitrarily withheld, a DRMP pursuant to Clause [x].

Sample "Request for Proposals" Draft to Include Disaster Response Plans

Each bidder shall submit a complete Business Plan / Technical Proposal / Project Management Plan, including, among others, the requested contents detailed in Annex [x]

Calendar [x] Business Plan / Technical Proposal / Project Management Plan.

COMPONENTS	DESCRIPTION
...	...
...	...
...	...
Disaster risk management plan	Demonstrate an effective disaster response approach that: • It is based on the plans of the [country's] national disaster risk unit, more specifically, [x]and [y], and conforms to them. • Distinguishes between the construction phase and the operation phase. • It focuses on climate and natural disaster risks that were identified as "high" and "medium" in the (the climate and disaster risk assessment dated [z] performed by the national disaster risk unit of the [country]).
...	...

Sample Wording for PPP Contract

Prior to the Effective Date, the Contracting Authority together with the [country] National Disaster Risk Unit and the Concessionaire shall jointly develop a disaster response plan in accordance with Clause [x].
Or,
Within 45 calendar days from the Effective Date, the Concessionaire must provide, for review and approval (which must not be unreasonably or arbitrarily withheld) by the Contracting Authority, a DRMP plan in accordance with Clause [x].

TOOL 3.5: INTEGRATING CLIMATE RESILIENCE INTO THE PPP ASSESSMENT

PPP proposals are evaluated according to the criteria set out in the RfP. As presented in Tool 3.2, the promotion of climate resilience actions through evaluation gives greater discretion to the PPP private party in the design of the solution. Depending on the objectives of the contracting authority, more or less discretion will be given to the private party or bidders. As illustrated in Figure 31, the decision on whether to include climate resilience as a stand-alone criterion or sub-criterion depends on its importance and relevance to the project itself (e.g., whether or not climate risk is a serious issue for the project). While the goal is for all projects to be climate resilient, the relevance of the climate risks identified in the previous steps varies depending on the project itself.

Figure 30. Considerations for Application of Tool 3.5

When to use it in the PPP process?

In the Structuring and Transaction Phase.

Expertise required:

Project knowledge; technical knowledge; understanding of the results of the project-specific climate and natural disaster risk analysis.

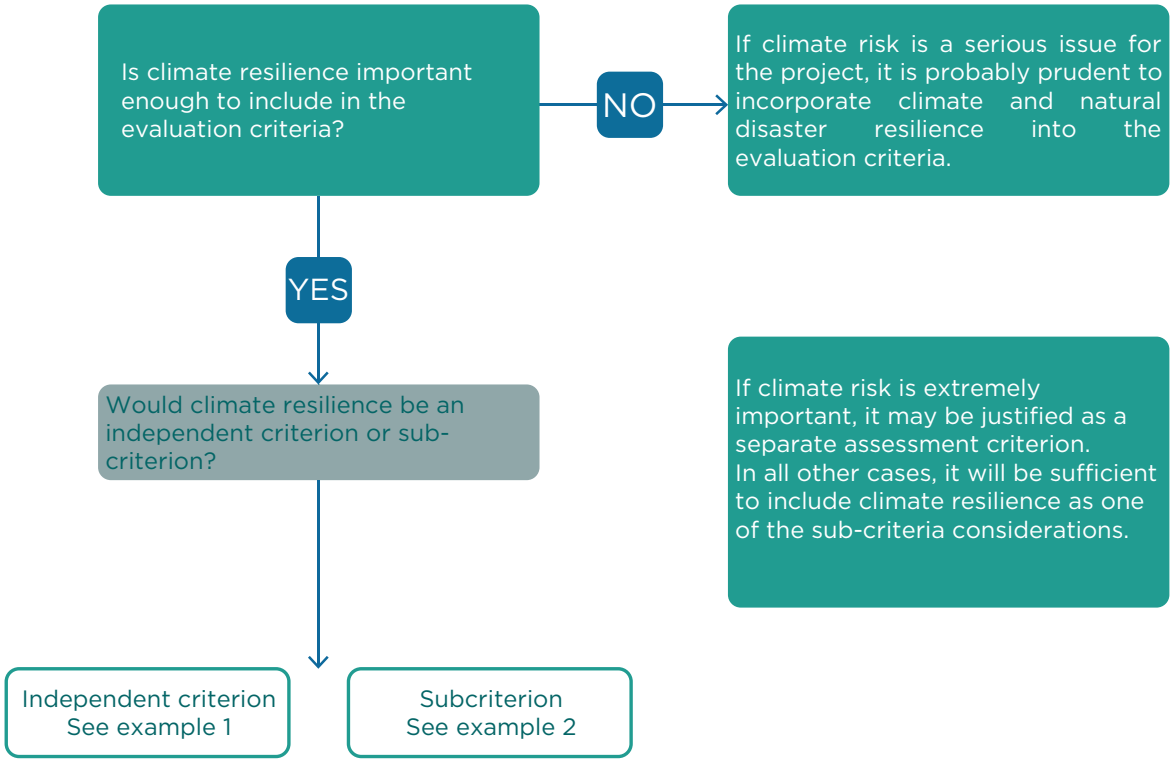
Stakeholders involved:

Project team, external consultants.

Reference materials:

- For this decision-making framework, it is important to consider tools 3.1 and 3.2.

Figure 31. Steps for Integrating Climate Resilience into the PPP Assessment



Example 1: Climate Resilience as an Independent Criterion

When requesting proposals for PPP projects in the RfP, the contracting authority will list all necessary submission requirements (what documents are needed and in what format), as well as how the content of the bid will be evaluated. All criteria used to evaluate a bid will be explained in the RfP so that bidders know which parts of their proposals will be evaluated and taken into account for scoring and what is needed to meet them. In the evaluation process, the government may evaluate project proposals based, in part, on the quality of their climate or disaster risk mitigation plans.[20] The following table shows examples of evaluation criteria, where climate resilience is listed as a stand-alone criterion.

20. For more information on the tenders, please consult the following link to APMG International.

Table 16. Example of the Incorporation of Climate Resilience in the Evaluation Of PPPs as a Stand-Alone Criterion in the Evaluation

DOCUMENT	WEIGHTING	EVALUATION CRITERION		SCORE
Financial Proposal	**50%**	E.g., availability payment or revenue sharing risks		50.0
Technical Proposal	**20%**	Construction	Quality and reliability in project design	8.0
			Flexibility in the construction period	6.0
			Proposed warranty methods	4.0
			…	2.0
	10%	Operations	Reliability of processes and operating manuals	5.0
			Media commitments	4.0
			…	1.0
	10%	Maintenance	Quality of maintenance methodology/manuals	8.0
			…	2.0
	5%	Environmental plan / social	Details of the environmental and social management plan	3.0
			…	2.0
	5%	Climate and natural disaster resilience	Feasibility of climate and natural disaster risk management plan	3.0
			…	2.0
Total	**100%**			**100.0**

Example of RfP Draft:

The bidder shall provide a climate and natural disaster risk mitigation plan that, at a minimum, details a proposed mitigation response for all "critical" climate and natural disaster risks identified by the Government of [xx] during the project pre-qualification phase. The bidder may wish to provide different responses for different climate scenarios.

Example 2: Climate Resilience as a Subcriterion

Another way to evaluate bidders' proposals for their consideration of climate and natural disaster risk management is to require that they include climate resilience in the other technical reports required as part of the RfP package. This means that the parts of the submission covering construction, operation and maintenance plans would include discussion of climate resilience and how the bidder intends to address it. The submission requirements will clearly state what is expected for each of these reports and how they will be scored. Indicative evaluation criteria, where climate resilience is a sub-criterion, are shown below.

Table 17. Example of incorporating climate resilience in the evaluation of PPPs as a sub-criterion

DOCUMENT	WEIGHTING	EVALUATION CRITERION		SCORE
Financial Proposal	**50%**	E.g., availability payment or revenue sharing risks		50.0
Technical Proposal	**20%**	Construction	Quality, reliability and **adaptability** in project design	8.0
			Flexibility in the construction period	10.0
			...	2.0
	10%	Operations	Reliability of operational processes and manuals. **Evidence that procedures reflect considerations for disruptions caused by weather.**	5.0
			Media commitments	4.0
			...	1.0
	10%	Maintenance	Quality of maintenance methodology/manuals	8.0
			Capacity to respond to climate hazards	2.0
	5%	Environmental / social plan	Details of the environmental and social management plan	3.0
			...	2.0
	5%	Climate and natural disaster resilience	Feasibility of climate and natural disaster risk management plan	3.0
			...	2.0
Total	**100%**			**100.0**

NOTE: When included as a sub-criterion, the RfP should clearly state that the various technical reports; e.g., operation and maintenance or design reports, require climate resilience to be included and how it will be evaluated.

Example of an RfP Draft:

"The bidder's design functionality report shall address the flexibility of the project to adapt to increased risks associated with climate change".	*"The proponent's operations and maintenance plan will include how operational shutdowns due to hazards associated with climate change (e.g., hurricanes) will be addressed. It shall also include a proposed maintenance methodology that takes climate change into account".*	*The bidder's "Environmental and Social Management Plan" will include a discussion of how the plan will respond in the event of a climate threat affecting the project area.*

TOOL 3.6: EXAMPLE OF LANGUAGE ON THE REQUIREMENT TO PERIODICALLY UPDATE THE CLIMATE AND NATURAL HAZARD RISK MITIGATION PLAN

If the contracting authority decides to require a climate and disaster risk mitigation plan as part of the bid submission, it may expect the concessionaire to update these plans periodically to consider the most recent and updated climate data. When drafting the PPP contract, the contracting authority could include a requirement that the private party submit a new "Climate Risk Mitigation Plan" every 3 to 5 years. The following tool provides an **example of wording on the requirement to periodically update the climate and disaster risk mitigation plan.**

Figure 32. Considerations for Application of Tool 3.6

When to use it in the PPP process?

At the Transaction Phase.

Expertise required:

Understanding of government processes; technical expertise related to the project and climate resilience (e.g., energy engineer, transportation planner, etc.); contracting and legal specialties.

Stakeholders involved:

Project team, external consultants, climate change and natural disasters team.

Reference materials:

- Draft Guidance on PPP Contractual Provisions (World Bank, 2019).

Sample Wording for Including the Requirement for Periodic Updating of Climate and Disaster Risk Mitigation Plans as Part of the PPP Contract

Include in the PPP contract:
Every [insert #, or range of #s] years, the concessionaire is required to update its Climate and Disaster Risk Mitigation Plan so that it takes into account the most current climate data available for the project area.

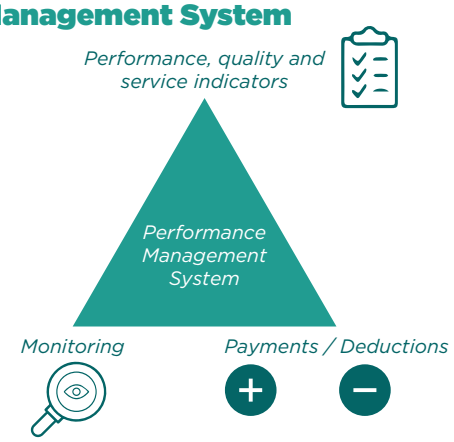
TOOL 3.7: ENFORCING CLIMATE RESILIENCE THROUGH AVAILABILITY PAYMENTS

The availability payment defines how the private party will be remunerated. Linking bonuses or penalties to the availability payment serves as an incentive for certain actions, such as the promotion of climate resilience by the private party and the efficient allocation of risk in the PPP contract. The following tool provides guidance on how the availability payment can help incentivize the private sector partner to manage the climate and disaster risk associated with the project.[21]

For the PPP to work, it is necessary to have an appropriate performance management system in place, including:

- Clear specifications of the products / expected results and the performance (performance indicators);
- Strong incentive structures (payments/deductions); and
- Robust supervision (monitoring).

Figure 33. Performance Management System



This tool highlights how this performance management system can be used to incentivize the private party to incorporate more climate resilience actions into the project. Clear specifications and incentives alone are not enough; an effective monitoring system is needed.

Figure 34. Considerations for Application of Tool 3.7

When to use it in the PPP process?

In the Structuring and Transaction Phases.

Stakeholders involved:

Project team, external consultants, climate change and natural disasters team.

Expertise required:

Understanding of government processes; technical expertise related to the project and climate resilience (e.g., energy engineer, transportation planner, etc.); legal and contracting specialties.

Reference materials:

- Revenue Regime and Payment Mechanisms (APMG International).
- PPP Knowledge Lab: PPP Reference Guide - Payment Mechanisms (website).

21. For more information, see the following link at PPP Knowledge Lab.

Pathways for the Use of "Availability Payments" in PPP Contracts to Enforce or Incentivize Climate Resilience Objectives

1 **Include critical performance standards in the definition of "availability":** The PPP contract should clearly specify what is expected of the concessionaire through "key performance indicators" (KPIs) or targets. These KPIs, which should be objective, measurable and realistic, are usually included in an annex to the main PPP contract.

Performance indicators related to climate resilience could pertain to resilient design and construction standards or facility management standards (which is discussed in Tool 3.2b), as well as requirements for updating climate risk mitigation or disaster response plans.

In structuring a payment mechanism for an availability payment PPP, the government could consider including climate resilience considerations as part of its definition of "availability". In a PPP contract, the government should only pay for the asset as long as it is available. What "available" means is defined in the contract. The definition is usually based on two criteria: (i) whether the asset is physically available for use and (ii) status criteria. Climate resilience considerations could be included in the "status criteria" aspect of the definition of "availability".

2 **Use of the definition of default to apply payment deductions:** The PPP agreement could include climate resilience considerations in its definition of what constitutes a "performance failure" and these failures could be linked to specific payment penalties, enforced through the payment mechanism. Examples of "performance failures" related to climate resilience could include:

> *Failure to develop, submit, implement, and update during the term of the PPP contract, all management plans as per "Section X" of the PPP contract. These include the Commissioning Plan, Life Cycle Plan, Environmental Management Plan, Energy Management Plan, Crisis Management Plan, Climate Risk Mitigation Plan and Disaster Response Plan.*

3 **Use of default and termination procedures:** The definition of default by the concessionaire usually includes the persistent breach of any obligation in the PPP agreement and therefore "automatically" includes reference to the minimum climate resilience requirements and the climate risk mitigation plan included as an annex. The occurrence of this "persistent breach" triggers a procedure whereby the concessionaire is allowed to remedy the breach within an agreed timeframe or the PPP contract will be terminated.

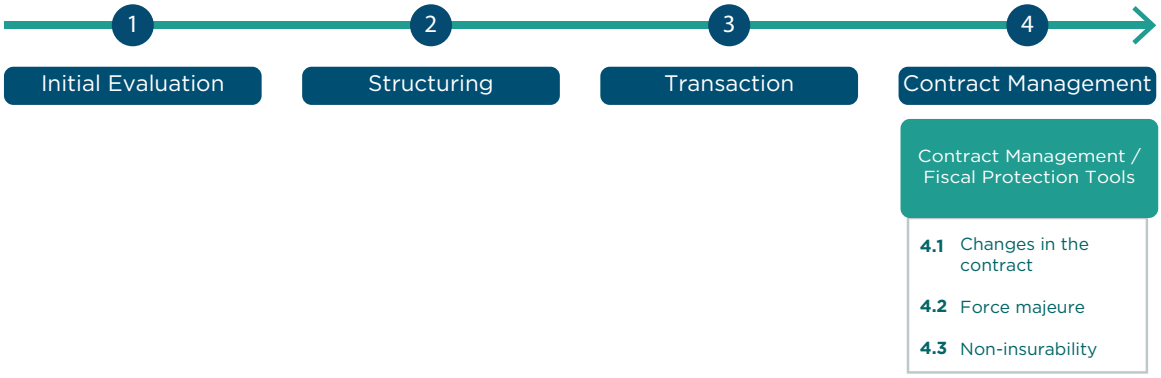
4. CLIMATE RESILIENCE IN THE PPP CONTRACT MANAGEMENT PHASE

Once the Transaction Phase is completed, the project implementation and Contract Management Phase begins. During this phase, the contracting authority, in addition to allocating sufficient resources for the operation and maintenance of the project, must ensure that the guidelines agreed in the contract are met and that new developments or changes in general - and also specifically changes in the climate risk profile - are responded to efficiently and adequately, without interruptions in the provision of services.

In terms of climate resilience considerations, this phase will require the monitoring of any climate-related agreements that were established during the Transaction Phase and the management of any unforeseen climate and natural disaster risks that occur. For projects that are considered medium to high level, it is desirable to include climate change experts as part of the contract management team.

This section provides three decision-making tools that PPP project planners and teams can use during the Contract Management Phase to ensure that climate resilience continues to be taken into account.

Figure 35. Summary of the Contract Management Phase Tools



TOOL 4.1: CLIMATE RESILIENCE IN A FLEXIBLE REGIME OF CONTRACT CHANGES

This tool is intended to guide teams when determining mechanisms to modify the PPP contract for climate resilience reasons. Given that infrastructure PPP contracts have a long duration, often up to 25-30 years, it is inevitable that changes to the contract will occur; specifically regarding works, services, or service delivery.

Such changes may be necessary as a result of new climate circumstances - such as higher rainfall levels or more extreme droughts - that could not have been fully foreseen or quantified when the PPP agreement was signed. In addition, some climate and natural disaster hazards can be sudden and extreme. For example, storm surges that inundate coastal areas in the event of a hurricane. In these circumstances, it is likely that the services or service delivery, and consequently the contract itself, will need to be adapted quickly.

Generally, to manage any type of change in a PPP contract, it is helpful to build in some flexibility and outline clear roles and procedures for executing changes at the time of drafting. The contract management team should be familiar with this process, be able to evaluate proposed changes, and can keep careful records. Changes that are implemented in the interest of making the PPP more resilient to climate and natural disasters could lead to best practices. Project planners should try to make the process as streamlined as possible, perhaps even simpler than other types of changes, while ensuring that proposed changes for climate and disaster resilience are reviewed and approved by climate change experts.

Figure 36. Considerations for Application of Tool 4.1

When to use it in the PPP process?

Use it as a reference guide when evaluating potential financing and risk transfer mechanisms to ensure that a PPP project is resilient to climate and natural disasters.

Expertise required:

Understanding of government processes;

Technical expertise related to the project and climate resilience (e.g., energy engineer, transportation planner, etc.);

Contracting and legal specialties.

Stakeholders involved:

Project team, external consultants, climate change and natural disasters team, legal team.

Reference materials:

• APMG Certification Guide, Chapter 8, Section 7: Variation Management (APMG International).

The following are guiding questions on how to think about implementing mechanisms to modify the PPP contract for climate resilience reasons.

Figure 37. Guiding Questions for Managing the "Flexible Change Rate Regime"

Drafting of the PPP contract	PPP Contract Management
Objectives of the "flexible change regime": To the extent possible, anticipate potential changes to the project (services or infrastructure) related to climate change. If these changes can be identified in advance, they should be prepared and included in the PPP contract. It is important to ensure that change management procedures are clearly identified.	**Objectives of the "flexible change regime":** To ensure that the contract management team understands the contract; that variation requests are clear and complete; that there are clear roles and responsibility for change management; and that any changes have a clear audit process.
Guiding questions: In the identification and feasibility study phases, was a climate risk analysis conducted, and are there any climate-related phenomena likely to affect the project? Are there any potential climate-related changes or variations in the infrastructure asset that can be anticipated (e.g., a higher seawall that is not effective under current climatic conditions, but might be if sea level rises)? Can these be pre-identified and priced as part of the PPP contract? Is it possible to have a separate process for climate-related changes that is more streamlined (in terms of number of approvals or documents needed)? For any type of change to the PPP contract, does the process require an explanation of how the proposed change affects the project's resilience to climate change?	**Guiding questions:** Does the contract management team include someone with climate change expertise to help review changes to the contract and how they will affect the project's resilience to climate change? If not, is climate change expertise easily accessible?

TOOL 4.2: FORCE MAJEURE DEFINITION CHECKLIST

Normally, in PPP contracts, the concessionaire assumes the risk of any default, even if the cause of the default is beyond the concessionaire's control. Consequently, much time is spent analyzing the risks that may arise during the life of the PPP contract and the extent to which the concessionaire should be exempt from poor performance, or from a breach caused by "supervening events", i.e. events beyond the control of the parties. Over time, this has resulted in most jurisdictions adopting a three-tier risk approach, as follows:

- **Compensation Events:** Whereby the grantor (in this case the contracting authority) assumes the risk; the grantor pays compensation to the

developer and grants any other form of contractual compensation necessary to leave the developer in the position it was in before the Compensation Event occurred ("no better, no worse").

- **Relief Events:** Often called Delay Events when they occur during the construction phase, for which the concessionaire is expected to bear the financial risk but is granted relief from other consequences of default that such events cause. They are, by nature, insurable events or are not expected to continue for many days.

- **Force Majeure Events:** Events beyond the control of the parties that make it impossible to fulfill all or a substantial part of the project obligations. The definition usually focuses on events that are not insurable and are catastrophic in nature. Generally, each party assumes its own consequences in the event of force majeure within the terms of the contract.

  - Given that force majeure events could have a severe impact on national accounts and compromise public finances, it would be possible to redefine the contractual clauses and thus limit their fiscal implications.
  - As stated in Tool 2.8 Including Climate and Natural Disaster Risk in the Fiscal Assessment, such a redefinition would favor fiscal sustainability through risk mitigation/elimination and, therefore, its contingent liability.

Weather and natural disaster risks are usually treated as force majeure events, and both parties share the risk of their occurrence. However, it can often make sense to apply a sharper focus to certain climate/natural disaster risks in order to assign higher levels of risk to the private party. This has been done, for example, in Japan, where experience from previous natural disasters has allowed them to rate earthquakes in the force majeure clauses of their PPP contracts based on their seismic intensity. If an earthquake is of lower seismic intensity, it is not considered force majeure. Chile, another earthquake-prone country, has excluded earthquakes in the definition of a force majeure.[22] In these cases, the responsibility for managing the consequences of climate risks falls more heavily on the private party and, in Japan's experience, such a transfer of responsibility can result in faster and more efficient response times than if the public sector were solely responsible.[23] This is likely to be because the private party has taken risk into account in the design and planning phases.

The following tool provides guiding questions for project teams seeking to ensure that climate change and natural disaster events are adequately addressed in the definition of "Force Majeure" in the PPP contract.

22. Concession Law and Regulations of Public Works of Chile (Concession Law of Public Works of Chile). Link

23. See World Bank (2017).

Figure 38. Considerations for Application of Tool 4.2

When to use in the PPP process?

Use when providing a definition of force majeure when drafting the PPP contract: refer to if/when a force majeure event occurs.

Stakeholders involved:

Project work team, external consultants, climate change and natural disasters team, legal team.

Expertise required:

- Understanding of government processes.
- Technical expertise related to the project and climate resilience (e.g., energy engineer, transportation planner, etc.);
- Contracting and legal specialties

Reference materials:

- Resolution and Force Majeure Provisions in PPP Contracts (Allen & Overy and Epec, 2013).
- Guidance on PPP Contractual Provisions (World Bank, 2019).
- Resilient Infrastructure Public-Private Partnerships (PPPs): Contracts and Procurement The Case of Japan (World Bank, 2017).

Redefining Force Majeure: Key Principles for Including Climate Risks

What to include in the definition?
Events associated with weather risk that cannot be foreseen and managed by the concessionaire.

Qualifying weather risk events: Where certain natural or climate change-related events occur regularly (such as seasonal rains that result in flooding) and should have been part of the concessionaire's due diligence, the degree of such events should be specified so that only "exceptional" occurrences qualify as force majeure. For example, floods of a magnitude that do not occur more frequently than once every [100] years or earthquakes above a specified seismic intensity.

What should be excluded from the definition?
Failure to comply with the risk mitigation plan prescribed by the agency or prepared by the developer and included in the PPP agreement.

Defining Force Majeure: Guiding Questions for Including Weather Risks[24]

1 **Does the contracting authority have the contractual freedom under the law governing the PPP to: (i) define the concept of force majeure; (ii) specify its consequences?**

a) Yes: skip to question 2.

b) No: seek to ensure that climate risk mitigation measures are incentivized through assessment procedures, performance requirements, payment mechanisms, and required insurance.

24. For more information, see the following link.

2 **Does the contracting authority follow an open approach to define force majeure?** This means that "Force Majeure" includes all events beyond the reasonable control of the affected party, which satisfy certain criteria such as "foreseeability" and "avoidance" and that prevent the affected party from fulfilling its obligations. Even with such a broad approach, it is customary to list certain events under this definition, which are intended for illustrative purposes and are not considered exhaustive.

a) Yes: the project team, legal advisors, and climate team should discuss whether there are climate risks associated with the project that could perhaps be mitigated and transferred to the private party rather than included as part of the definition of force majeure. With an open-ended, all- encompassing approach, the government may be in a position of taking on more climate risk than necessary.

b) No: skip to question 3.

3 **Does the contracting authority follow an approach to defining force majeure that includes an exhaustive list of specific events or circumstances?**

a) a) Yes: when drawing up this list, make sure that the events listed are beyond the control of the affected party and prevent it from complying. Generally, countries that choose to define force majeure in this way establish a very limited list of events.[25] Generally, the events listed here are those that are not insurable.

b) No: see question 2.

4 **Did the results of the climate risk assessment performed during the Structuring Phase identify any climate risks with a high probability of occurrence?**

a) Yes: work together with climate change experts and the legal team to determine whether:

1. Any of these events may be excluded from the definition of force majeure;

2. Any such event can only be included if it qualifies, i.e., it is included if it occurs to a certain degree (e.g., precipitation of a certain level);

3. Bidders may be required to develop a risk mitigation plan as part of their technical proposal, the preferred bidder's version of which will be included in the agreement, non-compliance with which is excluded from the definition of force majeure.

b) No: discuss with climate change experts to determine whether all climate risks that may affect the project should be included in the definition of force majeure.

25. For example, the PF2 guidelines of the Netherlands and the United Kingdom.

Text Box 16. Application of Force Majeure in the Power Purchase Agreement of a Hydroelectric Power Plant

Weather risk in force majeure clauses in the power purchase agreement (PPA) for a hydroelectric power plant

With support from a multilateral bank, a government implemented a portfolio of small-scale renewable energy generation PPP projects with a total installed capacity of approximately 158 MW. One of the projects is a hydropower plant that provides an example of how force majeure clauses can provide an opportunity to spread climate risk appropriately in PPP contracts. In the hydropower plant's power purchase agreement force majeure was defined as: "earthquake, flood, storm, cyclone or lightning" or "fire, explosion, mudslide or chemical contamination". Any weather risks excluded from the list were to be insured by the concessionaire.

TOOL 4.3: EXAMPLE OF LANGUAGE FOR THE DEFINITION AND PROCEDURE OF NON-INSURABILITY

The following tool is intended to **provide some sample language that project teams and their legal counsel can use as a starting point for defining "non-insurability" in PPP contracts and their enforceability.**

Due to the volatility and uncertainty of climate change, the risk of extreme events is becoming increasingly common. This poses several challenges for insurers: The risks are uncertain but involve potentially high losses. The insurance industry is actively trying to get ahead of the curve in terms of responding to climate change-related catastrophes. However, there is a possibility, given the long duration of a PPP contract, that a weather-related event will become "uninsurable" at some point in the life of the contract and, therefore, the contracting entity will need to estimate fiscal provisions.

Non-insurability does not mean that the market is uninsurable, but rather that a) there is no insurance available in the international market from insurers with adequate credit ratings or insurers of good reputation; and b) insurance premiums are excessively high (not simply more expensive); for example, at such a level that the risk is generally not insured in the international insurance market with reputable insurers by contractors from the same country.

The inclusion of a non-insurability clause in the PPP contract helps to make it inherently more resilient to climate and natural disasters, while at the same time protecting the contracting authority from absorbing 100% of the non-insurability of such risks (these are usually shared between the public and private parties and, in such a case, under a fiscal discipline approach, the optimal funding should be estimated). In doing so, the uncertainty surrounding climate and natural disaster risks and the difficulty of insuring them is recognized.

Figure 39. Considerations for Application of Tool 4.3

When to use in the PPP process?

Use in the definition of force majeure when drafting the PPP contract: refer to if/when a force majeure event occurs.

Stakeholders involved:

Project work team, external consultants, climate change and natural disasters team, legal team.

Expertise required:

Understanding of governmental processes;

Technical expertise related to the project and climate resilience (e.g., energy engineer, transportation planner, etc.);

Contracting and legal specialties

Reference materials:

• Climate Resilient Public Private Partnerships: A Toolkit for Decision Makers (Frisari et al., 2020).

• Climate resilience toolkit: public-private transport partnerships in Colombia (Rebel, 2022).

Example of Wording: Meaning of Non-Insurable Risk

A "non-insurable risk" occurs when:

the insurance is not available in the recognized domestic/international insurance market with reputable insurers (including the minimum credit rating specified in the project agreement) in respect of that risk at the time the insurance is sought; or
the insurance premium to be paid to insure this risk is excessively high, so that the risk is generally not insured in the international insurance market with reputable insurers.

Example of Wording: Procedures for Non-Insurable Risk[26]

a) *If one of the parties considers that a risk, covered by the required insurances, is or will be non-insurable, it shall immediately notify the other party in writing, detailing how the risk qualifies as "non-insurable".*

b) *If the parties agree or it is determined, through the dispute resolution procedure, that the risk at issue is non-insurable, and the fact that the risk is non-insurable is not attributable to the actions of the private party or a subcontractor, the private party is not obliged to take out insurance against that risk as long as that risk is and remains non-insurable.*

c) *The [insert " Contracting Authority"] shall then deduct from the service fee an amount equal to the premium due immediately before the insurance ceased to be insurable. The [insert "Contracting Authority"] may also consider any other modification of the rights and obligations of the individual arising from the unavailability of the corresponding required insurance.*

26. Australian Government (2008).

d) *If the insurable-risk materializes, the ["Contracting Authority] will:*

- **a.** *Payment to the private party of an amount equal to the insurance proceeds that would have been paid if the corresponding insurance were available;*
- **b.** *[optional] if the installation is totally or substantially damaged or destroyed, terminate the project agreement, in which case:*
  - **i.** *The [optional] compensation will be paid based on the termination for convenience;*
  - **ii.** *The [optional] indemnity will be paid in case of force majeure;*
- **c.** *[optional] implement a government-initiated modification to remove the affected party from the project site provided that, upon implementation of the modification, the private party would be no worse off had the non-insurable event not occurred.*

e) *When a risk is non-insurable, the private party should periodically approach the insurance market to determine whether the risk remains non-insurable and advise the government. If insurance becomes available again, the private party must effect such insurance.*

Text Box 17. Application of Non-Insurance in a Hospital Project

All-risk policy and application of non-insurability in a hospital project

As part of the prerequisites to reach financial close during the Transaction Phase, a hospital project contracted an All-Risks policy to cover the construction and operation stage of the project. During the construction period, landslides occurred resulting in significant disruptions and delays. Following the landslide, a dispute arose as to whether the expenses incurred as a result of the delay were to be borne by the insurer because there was uncertainty as to whether the definition of insured property extended to the land. As discussed in example wording (b), through a dispute resolution procedure, the risk in question was determined to be uninsurable and the concessionaire agreed to share the costs of the delay with the contracting authority.

BIBLIOGRAPHY

Allen & Overy, & Epec (2013). Termination and force majeure provisions in PPP contracts.

Alvarez Pagliuca, C., Martínez Álvarez, J., Pereira Dos Santos, P., Serebrisky, T., & Suárez-Alemán, A. (2022). Financiamiento sostenible de la infraestructura económica y social en América Latina y el Caribe: tendencias, actores e instrumentos (Sustainable financing of economic and social infrastructure in Latin America and the Caribbean: Trends, Actors and Instruments). IDB Working Paper No. 036. Washington, DC: Inter-American Development Bank.

APMG International.
a. The process of analyzing fiscal feasibility.
b. Revenue Regime and Payment Mechanism.
c. Variation Management.

World Bank (2004). Guide to the integration of climate change adaptation in the environmental impact assessment (EIA). World Bank Guidelines. Washington, DC: World Bank.

World Bank (2010). Cost-benefit analysis in world bank projects. Washington, DC: Independent Evaluation Group (World Bank).

World Bank (2017a). Caribbean public-private partnerships (PPP) toolkit: Developing infrastructure and improving service delivery. Washington, DC: World Bank.

World Bank (2017b). Resilient infrastructure public-private partnerships: Contracts and procurement - the case of Japan. Washington, DC: World Bank.

World Bank (2019a). Draft guidance on PPP contractual provisions . Washington, DC: World Bank.

World Bank (2019b). Guidance on PPP contractual provision. Washington, DC: World Bank.

World Bank (2022a). A roadmap for climate action in Latin America and the Caribbean, 2021-2025. Washington, DC: World Bank.

World Bank (2022b). Climate toolkits for infrastructure PPPs. Washington, DC: World Bank.

World Bank, Asian Development Bank and Inter-American Development Bank (2017). PPP Reference Guide (version 3).

Barandiarán, M., Esquivel, M., Lacambra Ayuso, S., Suarez, G., & Zuloaga, D. (2019). Metodología de evaluación del riesgo de desastres y cambio climático para proyectos del BID: Documento técnico de referencia para equipos a cargo de proyectos del BID (Disaster risk and climate change assessment methodology for IDB projects: Technical reference document for teams in charge of IDB projects). Technical Note No. 01771. Washington, DC: Inter-American Development Bank.

Brichetti, J. P., Mastronardi, L., Rivas, M. E., Serebrisky, T., & Solís, B. (2021). The infrastructure gap in Latin America and the Caribbean: Investment needed through 2030 to meet the sustainable development goals. IDB Monograph No. 962. Washington, DC: Inter-American Development Bank.

Center on Global Adaptation (2021). Climate-resilient infrastructure Officer Handbook.

European Commission (2016). Guidelines for project managers: Making vulnerable Investments Climate Resilient. Brussels: European Commission.

de Rus Mendoza, Betancur Cruz, O., & Campos Méndez, J. (2006). Evaluación económica de proyectos de transporte (Economic evaluation of transportation projects). Washington, DC: Inter-American Development Bank.

Domínguez, E., & Suárez-Alemán, A. (2023). Sostenibilidad fiscal de las asociaciones público-privadas: elementos clave y buenas prácticas para una gestión fiscal responsable en infraestructura económica y social a lo largo de todo el ciclo de vida de proyectos en América Latina y el Caribe (Fiscal sustainability of public-private partnerships: key elements and good practices for responsible fiscal management in economic and social infrastructure throughout the life cycle of projects in Latin America and the Caribbean). Monograph No. 1087. Washington DC: Inter- American Development Bank.

Duke University. Developing key performance indicators for climate change adaptation and resilience planning. Durham, NC: Nicholas Institute for Environmental Policy Solutions at Duke University.

Environmental Protection Agency (2023). Climate change impacts on transportation. Washington DC: EPA.

Fioravanti, R., & Lefevre, B. (2018). “This is how the transport sector is being affected by climate change” . IDB Blogs:

International Monetary Fund. PPP Fiscal Assessment Model PFRAM 2.0.

International Monetary Fund (2023). “IMF executive board approves US$968 million under the precautionary and liquidity line arrangement and US$764 million under the resilience and sustainability facility for Jamaica”. Press Release.

Washington, DC: International Monetary Fund.

Frisari, G. L., Mills, A., Silva Zuniga, M. C., Shepherd, C., Ham, M., Donadi, E., et al. (2020). Climate resilient public private partnerships: A toolkit for decision makers.

García Canales, F., Guijarro de Vicente, F., Llorente Galán, F., & Calandria García, L. (2021). Asignación de responsabilidades, herramientas y procesos de monitoreo óptimos para un adecuado desempeño y transparencia en asociaciones público- privadas (Assigning responsibilities, tools and optimal monitoring processes for adequate performance and transparency in public-private partnerships). IDB Monograph No. 928. Washington, DC: Inter-American Development Bank.

Australian Government (2008). National public private partnership guidelines, volume 3: Commercial principles for social infrastructure.
Government of Spain (2016). Economic evaluation of IPCC transport projects.
(2018). Glossary.
Lewis, C. T. (2022). Climate change and the Caribbean: Challenges and vulnerabilities in building resilience to tropical cyclones. Climate (Basel), 10(11), 178.

Luo, T. (2021). "With Power Generation vulnerable to climate impacts, investors must understand physical risks". World Resources Institute Blogs.

Marsh McLennan (2022). Feeling the heat: How healthcare providers can meet the climate challenge. New York: Marsh McLennan.

PAHO and WHO. (2017). Huracanes Irma y María: Acciones de respuesta en el sector de la salud (Hurricanes Irma and Maria: Response actions in the health sector). Desastres: Perspectivas y Mitigación en las Américas (Disasters: Perspectives and Mitigation in the Americas). Washington, DC: Pan American Health Organization (PAHO); World Health Organization (WHO).

Rebel (2022). Caja de herramientas para resiliencia climática: las asociaciones público-privadas de transporte en Colombia (Climate resilience toolbox: public-private transport partnerships in Colombia). IDB Monograph No. 1055. Washington, DC: Inter-American Development Bank.

Serebrisky, T., & Suárez-Alemán, A. (2019). La provisión de servicios de infraestructura en América Latina y el Caribe: ¿Puede la región hacer más y hacerlo mejor? (The provision of infrastructure services in Latin America and the Caribbean: Can the region do more and do it better?) IDB Monograph No. 758. Washington DC: Inter-American Development Bank.

Suárez-Alemán, A., & Silva Zúñiga, M. (2020). "La infraestructura sostenible bien planificada es un catalizador para la reactivación económica" ("Sustainable infrastructure well. planned is a catalyst for economic revival"). IDB Blogs:

UNISDR (2009). Terminología sobre reducción del riesgo de desastres (Disaster risk reduction terminology). Geneva: UNISDR.

Watkins, G. G., Contreras Casado, C., Silva Zuniga, M. C., Bhattacharya, A., Jeong, M., & Amin, A. (2019). Atributos y marco para la infraestructura sostenible (Attributes and framework for sustainable infrastructure). Technical Note No. 01653. Washington, DC: Inter-American Development Bank.

World Bank. Climate and Disaster Risk Identification Tools.

APPENDICES

APPENDIX 1:

INITIAL THREAT EXPOSURE ASSESSMENT TEMPLATE

Name of the Project: _____

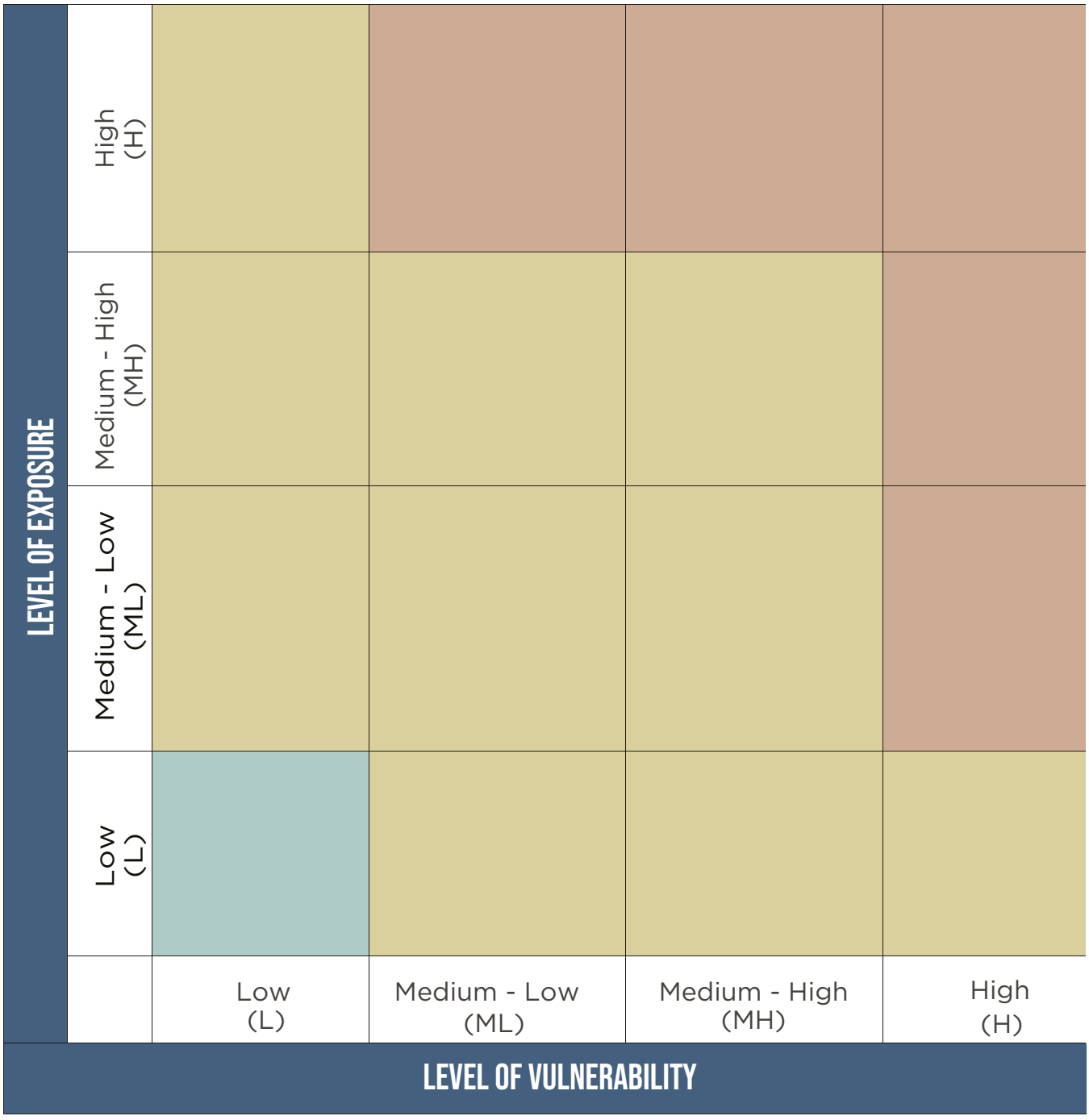
NUM	THREATS	SCORING: [SPECIFY METHODOLOGY USED]
1	*Threat (specify)*:	
2	*Threat (specify)*:	
3		
4		
5		
6		
7		
8		
...		

APPENDIX 2:
INITIAL PROJECT VULNERABILITY ASSESSMENT TEMPLATE

Name of the Project: _____

NUM	THREATS	IF THE 'PROJECT OPERATION' FRAMEWORK IS APPLIED, INCLUDE THE IMPORTANCE OF ON-SITE ASSETS, INPUTS, PERFORMANCE AND, LINKS	IF THE 'PROJECT OPERATION' FRAMEWORK IS USED, DESCRIBE THE POSSIBLE DAMAGE TO BE SUFFERED TO THE ASSET ON-SITE, THE INPUTS, PRODUCTS AND LINKS
		Scoring: Low | Medium | High	Description
1	*Mass Movements*	*E.g., Medium*	*E.g. Affects the pavement (asset) impeding the circulation of vehicles (project performance), hindering the circulation of the population to other larger road arteries in the country (link with other systems).*
2	*Threat (specify)*		
3	*Threat (specify)*		
4			
5			
6			
7			
8			
...			

APPENDIX 3:
INITIAL RISK PROFILE ASSESSMENT TEMPLATE



APPENDIX 4:
INITIAL CLIMATE RISK ACTION PLAN TEMPLATE

NUM	THREAT / RISK LEVEL	MARK THE EXPOSURE-VULNERABILITY CLASSIFICATION WITHIN EACH CATEGORY			LIST THE MEASURES TO BE TAKEN (IF THE PROJECT OPERATION ANALYSIS IS USED, CONSIDER THE POSSIBILITY OF ORGANIZING THE MEASURES BY: ON-SITE ASSETS, INPUTS, PERFORMANCE, LINKS)
		Severe	*Tolerable*	*Acceptable*	
1	*Threat (specify)*				
2	*Threat (specify)*				
3					
4					
5					
6					
7					
8					
...	*...*				

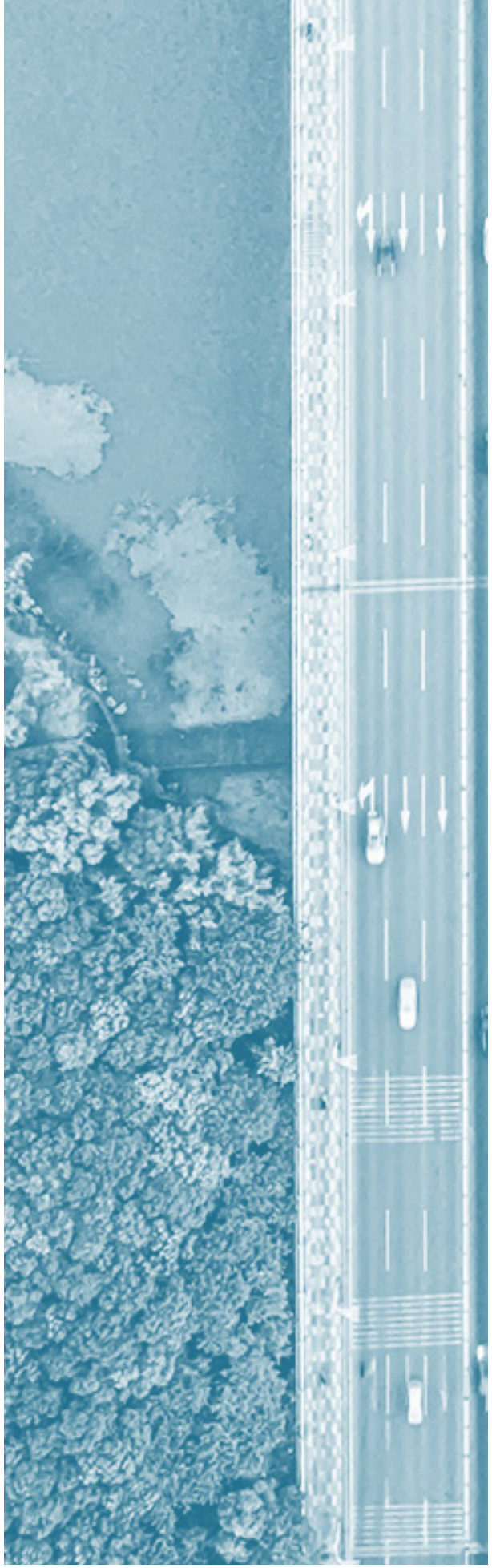
APPENDIX 5:
COMPREHENSIVE THREAT EXPOSURE ASSESSMENT TEMPLATE

Name of the Project: _____

NUM	THREAT	DESCRIPTION	KEY CONSIDERATIONS	EXPOSURE
1	*Threat (specify)*			
2				
3				
4				
5				
6				
7				
8				
...				

APPENDIX 6:
COMPREHENSIVE CLIMATE RISK ANALYSIS TEMPLATE

	A.	B.	C.	D.	E.	F.	G.
NUM	THREAT AND DESCRIPTION	EXPOSURE	VULNERABILITY DESCRIPTION	IMPACT	EVALUATION	MITIGATION	ALLOCATION
1							
2							
3							
4							
5							
6							
7							
8							
...							



ABEL BID