

# CLIMATE RESILIENT PUBLIC PRIVATE PARTNERSHIPS: A TOOLKIT FOR DECISION MAKERS



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# TABLE OF CONTENTS

<b>Introduction</b> .....	08
Key Definitions .....	15
<b>Section 1 Climate resilience in the PPP Project Identification Stage</b> .....	18
Tool 1.1 Screening level assessment of climate risk exposure .....	25
Tool 1.2 Screening level assessment of project vulnerability .....	33
Tool 1.3 Screening level assessment of the overall climate risk profile .....	40
<b>Section 2 Climate resilience in the PPP business case stage</b> .....	45
Tool 2.1 Comprehensive assessment of climate risk exposure .....	49
Tool 2.2 Comprehensive assessment of project vulnerability .....	55
Tool 2.3 Comprehensive assessment of the overall climate risk profile .....	62
Tool 2.4 Embedding climate resilience considerations into cost estimates .....	68
Tool 2.5 Risk valuation methods for ‘climate-resilient’ infrastructure PPPs .....	70
Tool 2.6 Including climate risk in socio-economic analysis / cost benefit analysis .....	73
Tool 2.7 Including climate risk in financial feasibility analysis / business case .....	78
Tool 2.8 Including climate risk in a value for money assessment .....	81
Tool 2.9 Including climate risk in environmental impact assessment .....	88
<b>Section 3 Climate resilience in the PPP transaction stage</b> .....	91
Tool 3.1 Including climate resilience in ‘Request for Qualifications’ .....	93
Tool 3.2 High-level decision framework for including climate resilience in PPP contracts .....	97
Tool 3.3 Integrating climate resilience into PPP output specifications decision framework .....	99
Tool 3.4 Considerations for requiring ‘disaster response plans’ .....	105
Tool 3.5 Embedding climate resilience into PPP evaluation .....	108
Tool 3.6 Sample language on requirement to periodically update climate risk mitigation plan.....	113

Tool 3.7 Enforcing climate resilience through the PPP payment mechanism.....	115
Tool 3.8 Potential for blended financing options .....	118
Tool 3.9 Potential for innovative funding mechanisms .....	128
Tool 3.10 Potential for innovative financing options 111 .....	134
<b>Section 4 Climate resilience in the PPP contract management stage .....</b>	<b>138</b>
Tool 4.1 Climate resilience in the change regime .....	140
Tool 4.2 Checklist for force majeure definition.....	142
Tool 4.3 Sample language for un-insurability definition and procedure .....	146
<b>Appendix A: Screening-level Hazard Exposure Assessment Template .....</b>	<b>149</b>
<b>Appendix B: Screening-level Hazard Vulnerability Assessment Template .....</b>	<b>151</b>
<b>Appendix C: Screening-level Vulnerability Assessment Template.....</b>	<b>152</b>
<b>Appendix D: Screening-level Climate Risk Matrix Template .....</b>	<b>153</b>
<b>Appendix E: Comprehensive Hazard Exposure Assessment Template .....</b>	<b>154</b>
<b>Appendix F: Comprehensive Climate Risk Assessment Template .....</b>	<b>155</b>

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# FOREWORD

This “Toolkit for Climate Resilient Infrastructure PPP” and the accompanying report “Improving Climate Resilience in Public Private Partnerships in Jamaica” are the result of an 18-month project of the Climate Change Division at the IDB in collaboration with the Public-Private Partnership team at Development Bank of Jamaica and IMG Rebel.

The aim has always been to provide DBJ’s PPP professionals and, ultimately PPP professionals in the Caribbean Region, with pragmatic, practical solutions to integrate the assessment of climate risks and resiliency opportunities in the preparation of infrastructure projects through Public Private Partnerships (PPPs).

The need to consider climate change issues in the provision of infrastructure services through PPPs originates from two key observations in the context of Jamaica, but easily extendible to other climate vulnerable countries in Latin America and the Caribbean: On one side, these countries face many risks associated with climate change, with their infrastructure stock vulnerable to hazard events like hurricanes and landslides, as well as to chronic slow changes as sea

level rise and perturbations in temperature and precipitations patterns. At the same time, Jamaica and many countries as such have been seeking to develop and build its infrastructure with an increased role for the private sector, developing Public Private Partnerships models that are constantly evolving in the region. As very long-dated contractual relationships, the success of PPPs is highly dependent on an accurate, sustainable and efficient distribution of risks and benefits between the public and private counterparts of the transaction – risk distribution that could be significantly perturbed by climate change, making the task of structuring efficient 20-30 years PPP contracts incredibly difficult if those risks are not identified, assessed and managed throughout the whole process of structuring a PPP transaction.

This project was borne then of an effort supported by IDB and the Government of Jamaica to understand how, if at all, Jamaica currently considers climate change within its PPP policies and project development processes and what steps the country can take to ensure that it does so. Considering

the high potential for replication for such instruments, and the common challenges that several climate vulnerable countries face when developing their infrastructure projects, this companion Toolkit has been developed, including decision support tools for policy makers and developers partaking in the PPP development process and which applies to Jamaica as well as any country government seeking to ensure their PPPs are more resilient, was developed in conjunction with this effort. Report and Toolkit as well have been developed following the typical structure of the PPP process, from Project Identification, to the Business Case, the Transaction Structuring and the Management of the Contract during the whole life of the PPP project. In each phase, climate change risks may arise, as well as opportunities for an improved design for resilient and/or more productive infrastructure, and it would be important for such cases that risks and opportunities alike would be considered and followed-through in the different phases of the transaction to ensure, for example, that critical aspects identified in the project preparation

phase are then included in the preparation of the tender documents and, as well, inform the performance indicators in the contract management phase.

The analysis for the report and toolkit has identified several instruments and tools already used to address climate change issues in the context of infrastructure production – albeit not always in a systematic way – that could be integrated in the PPP process in a more institutionalized and standardized manner, identifying options for a low-cost and seamless implementation in a Resilient PPP model. The Toolkit, finally, is to be considered a living document; we hope it could provide initial guidance to professionals implementing PPP projects in the region, while being open to improvements and updating as we collect evidence on other instruments that can be used to manage climate change risks and/or create resiliency opportunities for the infrastructure of the Latin America and the Caribbean.

## INTRODUCTION

## Overview

The world's changing climate has led to an increase in extreme weather events like disastrous heat waves, deadly wildfires, more frequent and more intense hurricanes. These events can cause a myriad of damages, putting human settlements at risk and dislocating populations. They also put the world's critical infrastructure systems at risk of damage or destruction. This costs money. Especially Small Island Developing States (SIDS) are increasingly at risk. For example, between 2000 and 2017, it has been estimated that the annual average damage and loss from flood, hurricane and droughts has cost Jamaica an average of 1.3% of GDP (PIOJ). Hurricane Maria, the Category 5 hurricane that devastated Dominica, the U.S. Virgin Islands, and Puerto Rico in September 2017, inflicted roughly \$90 billion in damages on the island of Puerto Rico alone, leaving residents without water, electricity and cell phone coverage for weeks. Examples of how extreme events cause destruction and inflict damage on infrastructure are endless.

Alongside these increasing climate risks, many countries, particularly emerging economies, desperately need

more and better infrastructure. Public Private Partnerships— *“a long-term contract between a private party and a government entity, for providing a public asset or service, in which the private party bears significant risk and management responsibility, and remuneration is linked to performance”*<sup>1</sup> — are gaining importance in many developing countries as a way to finance infrastructure assets. However, to date, the traditional risk allocation frameworks for PPPs include limited consideration for climate change risks. This failure to consider climate risks is further exacerbated by a lack of knowledge and appropriate incentive structures in dealing with adaptation and long-term resilience for infrastructure PPP arrangements.

There is increasing need for decision makers involved in the public investment process including that of PPPs to both understand how climate change risks could affect their investments and how to mitigate those risks through proper planning, incentive structures and financial instruments. The following toolkit provides a series of decision support tools to help planners involved in the PPP development process think about incorporating climate resilience considerations.

<sup>1</sup>PPP Knowledge Lab [<https://pppknowledgelab.org/>]



# Why Consider Climate Resilience in the context PPPs?

With constrained public budgets and large infrastructure gaps, PPPs are growing in importance as an infrastructure delivery solution for many governments, including those in the Caribbean. The key features of a typical PPP project, which make them an attractive procurement solution for meeting public infrastructure needs, also lend themselves well to incorporating climate resiliency considerations.

For example, PPPs:

## 1 / Consider Life-cycle costs

PPPs require public officials to consider the long-term costs of infrastructure assets. This creates greater discipline in the infrastructure procurement process—private parties must look beyond just the construction phase to evaluate the costs over the life of the project (so 25-30 years). These private parties are incentivized to think about all potential risks and costs, including those related to climate change. As a result of this more lifecycle view of the project and its risks, PPPs may lead to better designed infrastructure projects which are more able to withstand climate events.

## 2 / Offer Innovative Solutions

Developing PPPs requires coordinating among many stakeholders (e.g. developer, government, financial investors, operator), each bringing different perspectives and incentives. The result of this coordination and the negotiated effort to deliver a PPP project may lead to more innovative infrastructure solutions in the face of climate related risks.

## 3 / Include Lender's Due Diligence

By their nature, PPPs bring in private finance and as a result they bring in an extra set of eyes performing due diligence. Lenders want to see that the project can perform well over its life and service its debt. Climate risks, which materialize, can impact a project's ability to operate and generate revenue. As a result, many lenders to PPP arrangements are examining climate risks.

## 4 / Require Robust Risk Assessment

At the heart of every good PPP project is a robust risk assessment that evaluates all possible risks to the projects and assigns them to the party best able to manage them. Including an analysis of climate and disaster risk as part of this existing process only makes sense, as PPP project developers are seeking to understand any/all risks which may disrupt services and undercut their returns.

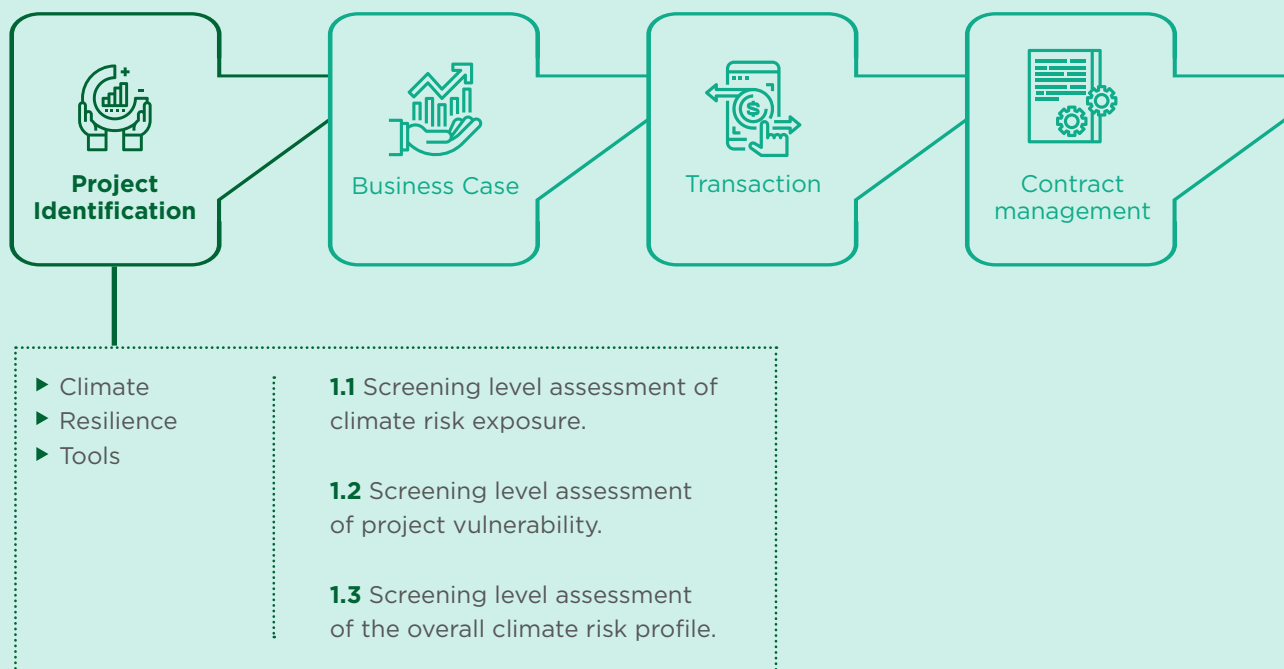
# Structure of the Toolkit

## 1 / Embedding Climate Resilience at the PPP Project Identification Stage

The toolkit is organized into four sections, according to the four main steps of a PPP process – project identification, business case development, transaction, and contract management. Each of the four sections includes a series of decision support tools to help project planners think about embedding climate resilience considerations into the PPP development process.

The decision support tools in this section of the toolkit will help governments and project planners think through, at a high-level, how climate risks can affect the potential project. The tools in this section could be used to help evaluate climate risks for PPP projects or any type of public investment project, as at the identification stage, the process for large projects is the same for both procurement routes.

**Figure 1** Tools for Embedding Climate Resilience at the PPP Project Identification Stage

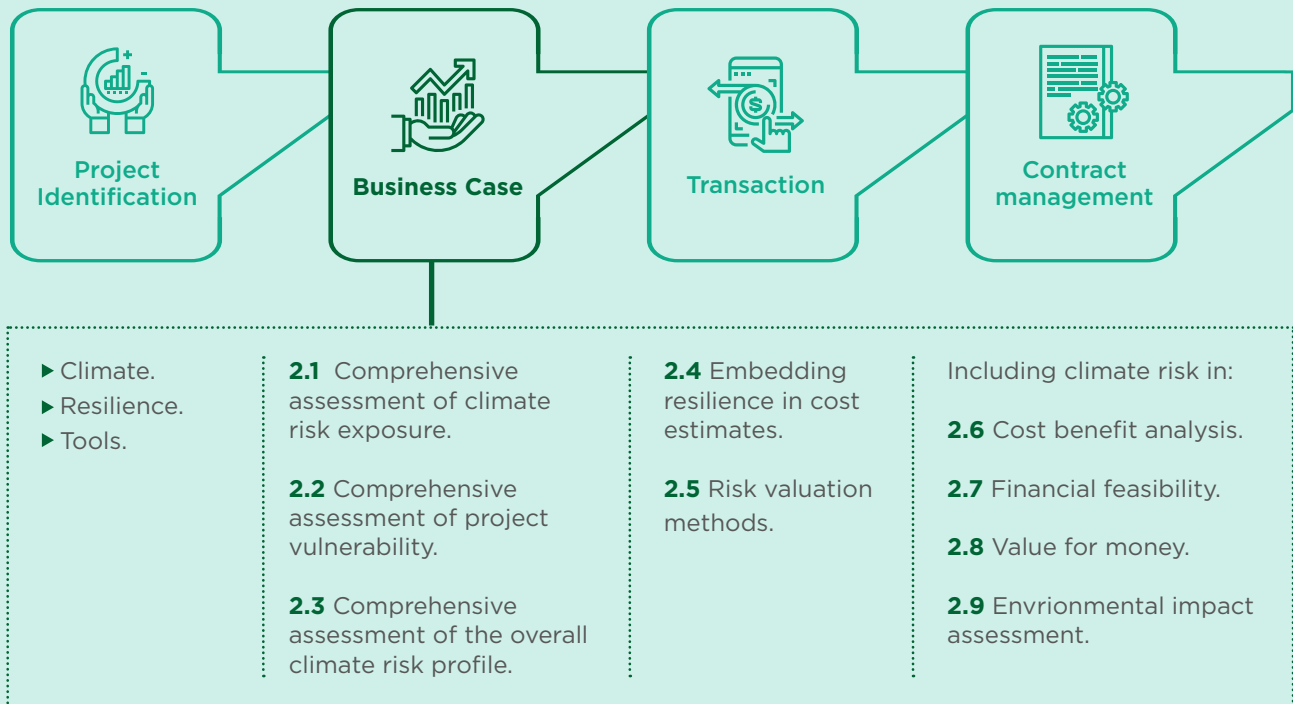


## 2 / Embedding Climate Resilience at the PPP Business Case Stage

The decision support tools in this section of the toolkit will help governments and project planners think through how to embed climate resilience considerations into the various

technical, financial, economic, environment analyses conducted to determine if the project is viable and best delivered as a PPP.

**Figure 2** Tools for Embedding Climate Resilience at the Business Case Stage



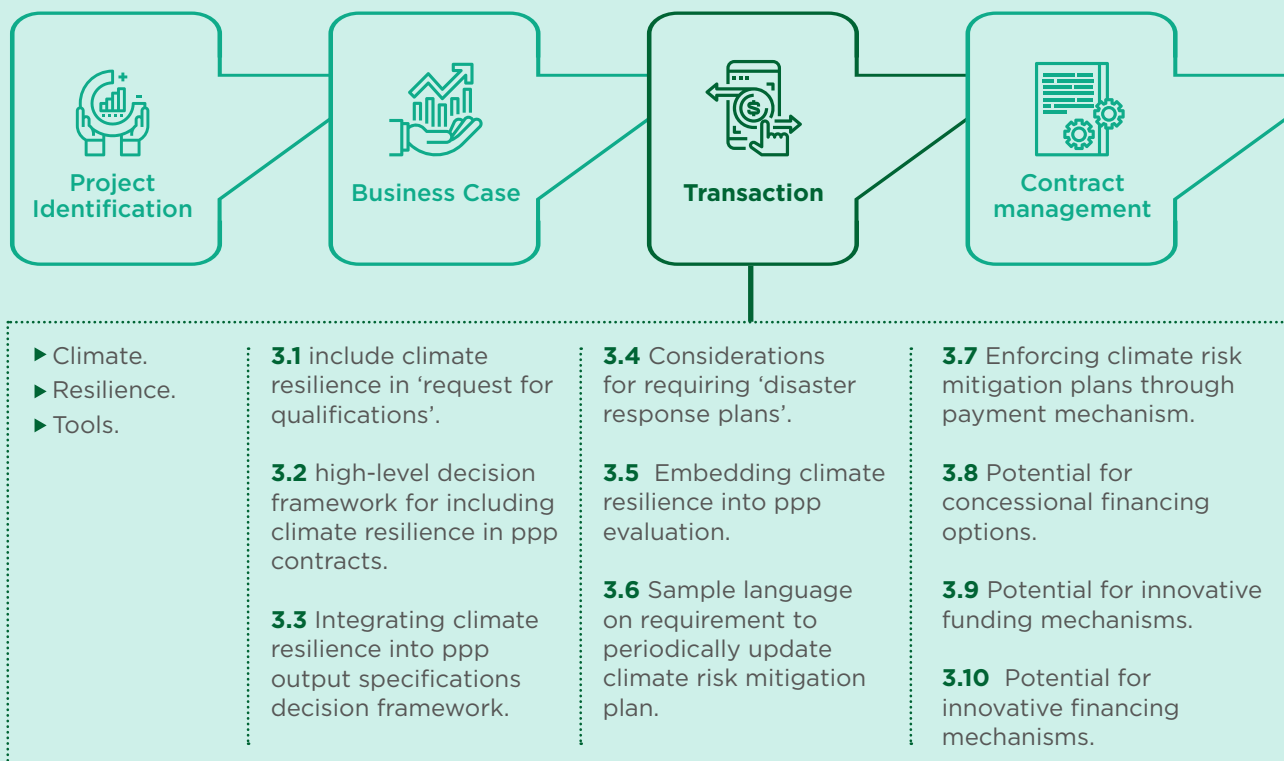
# 3 / Embedding Climate Resilience at the PPP Transaction Stage

The decision support tools in this section of the toolkit will help governments and project planners think through how to embed climate

resilience considerations into designing the contract, qualifying bidders, tendering the project, and evaluating bids received.

**Figure 3**

**Tools for Embedding Climate Resilience at the PPP Transaction Stage**



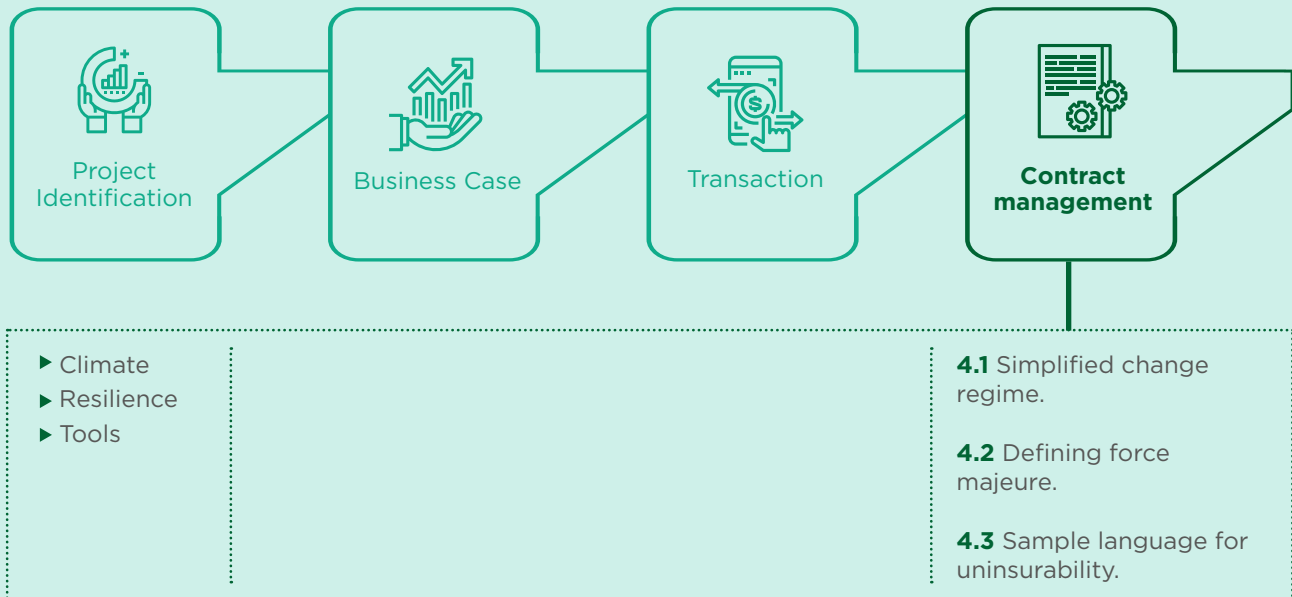
# 4 / Embedding Climate Resilience at the PPP Contract Management Stage

The decision support tools in this section of the toolkit will help governments and project planners think through how to track any climate-related agreements set during

the Transaction Stage and manage any unforeseen climate-related risks that occur over the life of the PPP.

**Figure 4**

**Tools for Embedding Climate Resilience at the PPP Contract Management Stage**



## How to Read the Toolkit

As building resilience to a changing climate into the PPP planning process is a relatively new goal for many governments and project planners, and thus not many 'best practice' examples of how to develop a climate resilient PPP exist, it is advised to read this toolkit with an 'open-mind' and an attitude of 'proactivity'.

The tools included offer frameworks and suggestions that will help build climate resilience considerations into the standard analyses and procedures of the PPP process. Each tool provides summary information about what the tool aims to help achieve and includes suggested expertise that could help in the tool's implementation. Often, the guidance for the enclosed tools suggest including climate change expertise as part of the tool's implementation, as the tool may require an analysis of climate data.

# Important Considerations not Covered in the Toolkit

This toolkit was developed as a companion document to the Policy Recommendations on Improving Climate Resilience in PPPs for the Government of Jamaica. While it picks up on the policy recommendations for Jamaica, it does not go into detail on the policy changes governments can make to ensure that their infrastructure PPPs are climate resilient. Notably the following toolkit does not cover with much depth, the following two important policy-related points:

- 1/** Overlap between PPP policies and Climate-related policies: To ensure that Infrastructure PPPs are climate resilient, it would make sense for governments to develop their disaster risk management and climate resiliency policy alongside their PPP policies. There is overlap between these two policy areas; they should not be developed in isolation.
- 2/** Engineering codes and standards and operational codes: A review of engineering

codes and standards and operational codes could go a long way toward ensuring climate resiliency. PPPs often involve large-scale capital investment in public infrastructure, committing resources to an expensive asset, which will operate for decades. How the asset is designed and where it is built can greatly impact how resilient it is to climate change. This toolkit offers many ideas for how to include climate resiliency considerations as part of the PPP project lifecycle; though, as its focus is more at the project level and not at the policy level, it does not discuss the importance of design standards (e.g. for windspeeds of over 100 mph) and operational codes. While a discussion of this does not feature in this toolkit, it would make sense for governments to examine their engineering design standards and operational codes. Changes to these will impact all projects— both publicly procured and PPP — and can be an effective way to promote climate resiliency aims.

# Key definitions<sup>2</sup>



In human systems, the process of adjustment to actual or expected climate and its effects, in order to moderate harm or exploit beneficial opportunities. In natural systems, the process of adjustment to actual climate and its effects; human intervention may facilitate adjustment to expected climate and its effects.



Climate in a narrow sense is usually defined as the average weather, or more rigorously, as the statistical description in terms of the mean and variability of relevant quantities over a period of time ranging from months to thousands or millions of years. The classical period for averaging these variables is 30 years, as defined by the World Meteorological Organization. The relevant quantities are most often surface variables such as temperature, precipitation and wind. Climate in a wider sense is the state, including a statistical description, of the climate system.



Climate change refers to a change in the state of the climate that can be identified (e.g., by using statistical tests) by changes in the mean and/or the variability of its properties and that persists for an extended period, typically decades or longer. Climate change may be due to natural internal processes or external forcings such as modulations of the solar cycles, volcanic eruptions and persistent anthropogenic changes in the composition of the atmosphere or in land use. Note that the Framework Convention on Climate Change (UNFCCC), in its Article 1, defines climate change as: ‘a change of climate which is attributed directly or indirectly to human activity that alters the composition of the global atmosphere and which is in addition to natural climate variability observed over comparable time periods.’ The UNFCCC thus makes a distinction between climate change attributable to human activities altering the atmospheric composition and climate variability attributable to natural causes.

<sup>2</sup>IPCC, 2018: Annex I: Glossary [Matthews, J.B.R. (ed.)]. In: Global Warming of 1.5°C. An IPCC Special Report on the impacts of global warming of 1.5°C above pre-industrial levels and related global greenhouse gas emission pathways, in the context of strengthening the global response to the threat of climate change, sustainable development, and efforts to eradicate poverty [Masson-Delmotte, V., P. Zhai, H.-O. Pörtner, D. Roberts, J. Skea, P.R. Shukla, A. Pirani, W. Moufouma-Okia, C. Péan, R. Pidcock, S. Connors, J.B.R. Matthews, Y. Chen, X. Zhou, M.I. Gomis, E. Lonnoy, T. Maycock, M. Tignor, and T. Waterfield (eds.)]. In Press



## Mitigation

A human intervention to reduce emissions or enhance the sinks of greenhouse gases.



## Climate/ Disaster Risk

The potential for adverse consequences where something of value is at stake and where the occurrence and degree of an outcome is uncertain. In the context of the assessment of climate impacts, 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 such a hazard, on lives, livelihoods, health and well-being, ecosystems and species, economic, social and cultural assets, services (including ecosystem services), and infrastructure. Risk results from the interaction of vulnerability (of the affected system), its exposure over time (to the hazard), as well as the (climate-related) hazard and the likelihood of its occurrence.



## Mitigation Measures

In climate policy, mitigation measures are technologies, processes or practices that contribute to mitigation, for example, renewable energy (RE) technologies, waste minimization processes and public transport commuting practices.



## Resilience

The capacity of social, economic and environmental systems to cope with a hazardous event or trend or disturbance, responding or reorganizing in ways that maintain their essential function, identity and structure while also maintaining the capacity for adaptation, learning and transformation. This definition builds from the definition used by Arctic Council (2013).



# 1



# PROJECT IDENTIFICATION STAGE TOOLS

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**1.1/** Screening Level Assessment of Climate Risk Exposure.

**1.2/** Screening Level Assessment of Project Vulnerability.

**1.3/** Screening Level Assessment of the Overall Climate Risk Profile.

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# **SECTION 1**

## **CLIMATE RESILIENCE IN THE PPP PROJECT IDENTIFICATION STAGE**

## Why is climate risk important during this stage?

The first step in the PPP process is to identify suitable projects. Generally, as PPPs are a type of public investment, most successful PPP projects originate from the broader public investment process. It is during this process that the government's priority projects are screened for their technical, financial, and economic feasibility ("is this a good project?") as well as for the value for money of a PPP approach ("would PPP be the optimal delivery model for this project?"). The result of this Identification Stage is generally a high-level project concept and outline business case.

During this Identification Stage, governments can and should also assess how climate risks may affect the potential project. Left unmitigated against, the effects of climate change will increasingly affect the operational, financial, environmental, and social performance of large, fixed infrastructure assets.<sup>3</sup>

Understanding the climate risks involved in the project can help governments determine:

**I/** Whether they want to pursue the project at all (a project with high climate risk might be determined as too risky);

**II/** Whether the project location and/or scope needs to be changed (in order to minimize the risk);

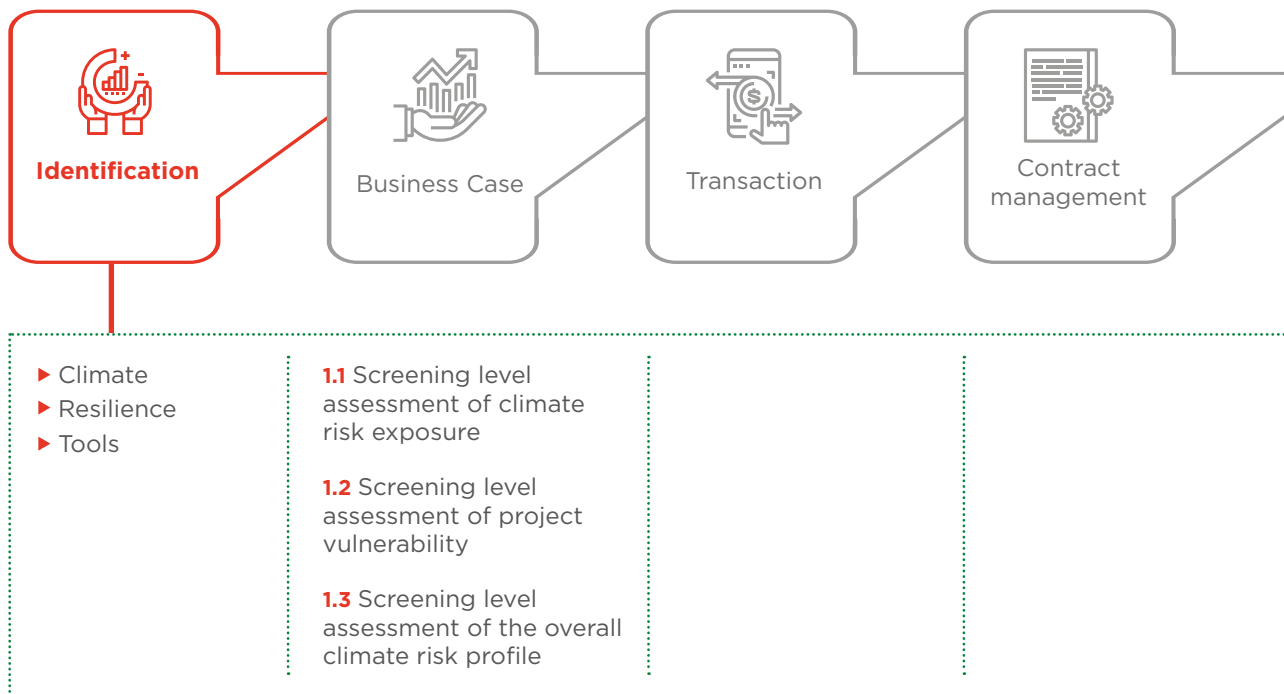
**III/** whether the climate risks affect the decision to pursue a traditional delivery model or a PPP structure;

**IV/** which in-depth analysis is required in the next stage (in order to reserve appropriate time, expertise, and budget).

In addition to the above, carrying out these tools provides the members of the project team with an understanding of project's exposure to climate risk. They are sensitized to the topic of climate risk and will look at the project through this additional lens going forward, which will help make the project more resilient. It also forms an important knowledge basis for the next Stages of the PPP project development (especially the climate risk tools).

With the help of the three tools summarized in this part of the toolkit, governments can assess a project's climate risk on a high level. These three tools are based on the general definition of disaster and climate risk and lead the user from understanding the project's exposure to hazards, to understanding its vulnerability to these hazards, and on to understanding the intensity of the risk.

<sup>3</sup>Guidelines for Project Managers: Making vulnerable investments climate resilient. European Commission. 2013. Accessible here: <https://climate-adapt.eea.europa.eu/metadata/publications/guidelines-for-project-managers-making-vulnerable-investments-climate-resilient>



The next section provides an understanding of definition of climate risk and the relation to the three tools.

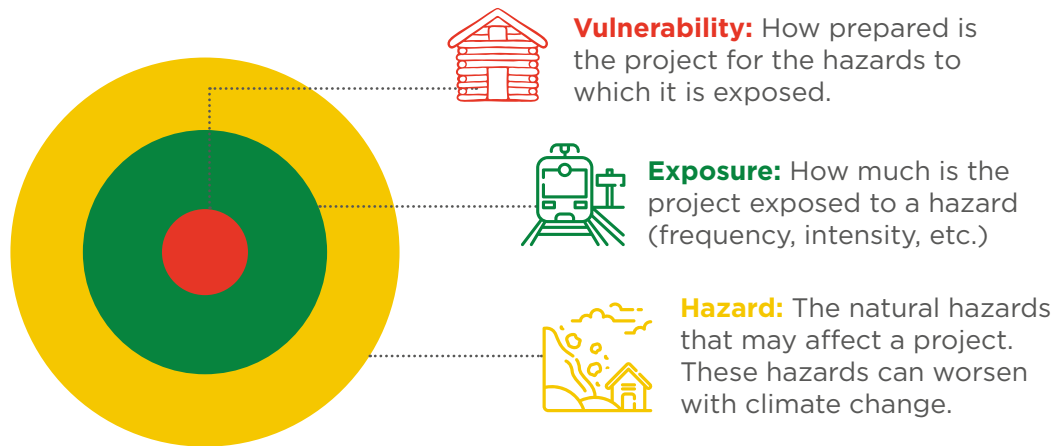
## The understanding of Climate Risk in this toolkit<sup>4</sup>

There are various definitions of disaster and climate risk. The exact vocabulary used may differ among experts and stakeholders.

To provide readers of this toolkit with an overview, the definitions of the UN, the IDB and the EU have been included in the textboxes on the following pages.

This toolkit does not strictly follow one of these definitions but applies a practical understanding of climate related risk, as depicted in the illustration below:

<sup>4</sup>Barandiaran, Melissa et al. Disaster and Climate Change Risk Assessment Methodology for IDB Projects IDB 2019



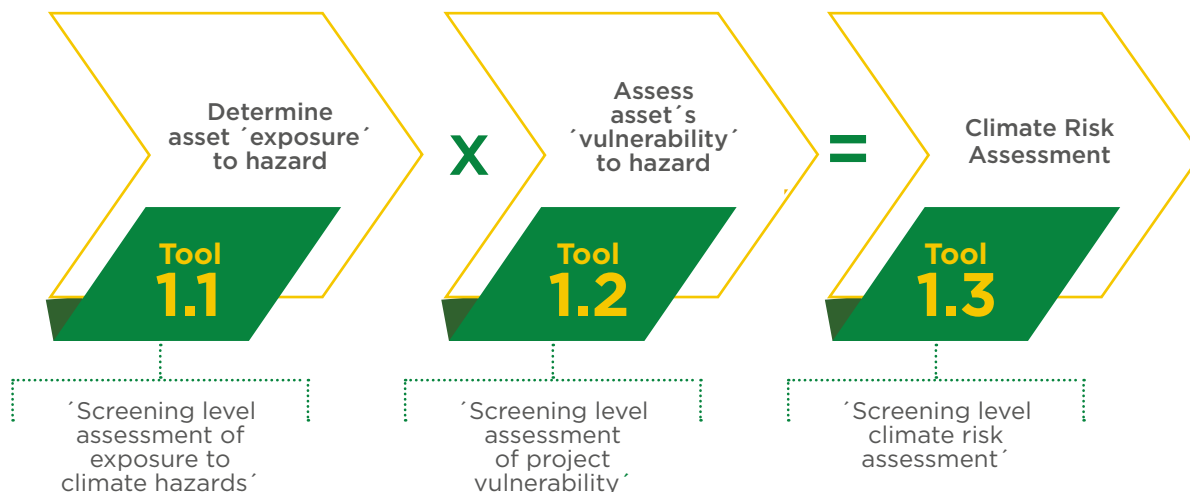
The three tools presented in the following chapters help the users to focus on the climate risks relevant to the project:

- ▶ **Tool 1.1** considers the EXPOSURE of the project to various climate risk events (hazards)  
**Key question it tries to answer:** What is the likelihood of occurrence of various climate risk events (hazards) in my project area now, and in the future?
- ▶ **Tool 1.2** assesses the VULNERABILITY of the project to various climate risk events

(hazards) to which it is exposed.

**Key question it tries to answer:** How significant would the damage to my project be if any of the climate risk events (hazards) would occur?

- ▶ **Tool 1.3** concludes on the RISK LEVEL per hazard of the project  
**Key question it tries to answer:** What is the project's risk profile for each of the hazards and combined?



## Risk assessment in two stages

The climate risk assessment in this Identification Stage can be considered a high-level assessment, or ‘screening’ of the risks – comparable to the preliminary technical, economic and financial feasibility assessments conducted as part of developing a PPP project. High-level assessment or preliminary studies serve as a first exploration of a project viability prior to making further investment in acquiring permits or conducting more in-depth assessments.

The next stage in the PPP project development is the Business Case Stage. In that next stage, the risk assessment is carried out in more detail, focusing on those risks identified during the Identification stage. Therefore, the tools in this section of the toolkit help to prioritize and set the focus for the Business Case Stage.

Therefore, the tools in this level of the toolkit help to prioritize and set the focus for the Business Case Stage.

# BOX 1.1

## DEFINITIONS OF DISASTER RISK ACCORDING TO THE UN

According to the United Nations Office for Disaster Risk, disaster risk refers to “the potential loss of life, injury, destroyed or damaged assets which could occur to a system, society or a community in a specific period of time, determined (...) as a function of hazard, exposure, vulnerability and capacity”. This relationship is illustrated below.





## ***Hazard***

A process, phenomenon or human activity that may cause loss of life, injury or other health impacts, property damage, social and economic disruption or environmental degradation.

Natural hazards are predominantly associated with natural processes and phenomena.



## ***Vulnerability***

The conditions determined by physical, social, economic and environmental factors or processes which increase the susceptibility of an individual, a community, assets or systems to the impacts of hazards.



## ***Exposure***

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



## ***Capacity***

The combination of all the strengths, attributes and resources available within an organization, community or society to manage and reduce disaster risks and strengthen resilience.

More information and further definitions on disaster risk can be found here: <https://www.unisdr.org/we/inform/terminology>



# TOOL 1.1

## SCREENING LEVEL ASSESSMENT OF CLIMATE RISK EXPOSURE






This tool is the first of three that the project team is advised to use in order to assess the project's climate risk. For an introduction to these three tools and the rationale for applying them, the user is advised to study the Introduction to this section.

- ▶ **Tool 1.1.** considers the EXPOSURE of the project to various climate risk events (hazards)
- ▶ **Key question it tries to answer:**  
What is the likelihood of occurrence of

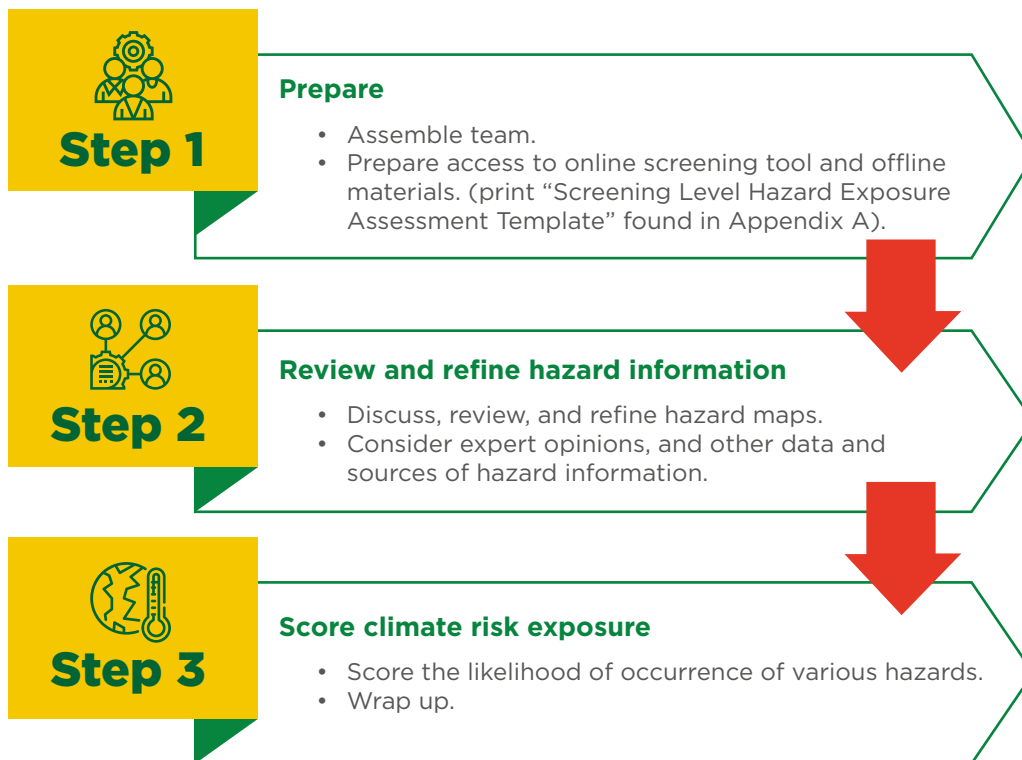
various climate risk events (hazards) in my project area now and in the future?

- ▶ **Output:** Review of hazard maps and hazard exposure list (input for Tool 1.2).

This tool aims to help project planners identify the relevant hazards to which the project is exposed. It is not a hazard assessment tool in itself, though provides the user with a structured decision-making framework, which links to publicly available digital tools to conduct a climate hazard assessment.

 <p><b>When in PPP process to use</b></p> <p>Helpful to use when identifying PPP projects, as well as during public investment management project screening process.</p>	 <p><b>Expertise Required</b></p> <p>Project knowledge; ability to use online climate tools, e.g, IDB Climate Risk Assessment Methodology or the UNISDR tools.</p>
 <p><b>Length of time to implement</b></p> <p>8-10 hours</p>	 <p><b>Reference Materials</b></p> <p>IDB Climate Risk Assessment Methodology; EU Climate Risk Assessment Methodology; UNISDR Databases; Caribbean Climate Online Risk and Adaptation Tool, experts' judgement.</p>
 <p><b>Stakeholders involved</b></p> <p>Project Team; Enterprise Team; Advisors; Climate Team.</p>	

## Overview of Tool 1.1



## Step 1 / Prepare



### Step 1

#### Prepare

- Assemble team.
- Prepare access to online screening tool and offline materials. (print “Screening Level Hazard Exposure Assessment Template” found in Appendix A).

**Assemble team:** The core team should include members with expertise regarding project specifics and the project preparation process (project manager). It should also include team members with climate risk and climate change expertise, who can develop and interpret climate hazard maps. If the project team is unable to find someone with climate change expertise to be a part of the core team, it may make sense to identify an external climate expert, or climate experts, to serve in a ‘peer review’ capacity, and who can help the project team interpret hazard maps, for example. While not entirely necessary, taking such measures, especially for project teams new to examining and contemplating climate risks, can serve as a helpful way to build capacity and understanding on the topic.

**Research available online sources:** Using the template provided in Appendix A, which contains a comprehensive list of climate and

geophysical hazards, research hazard data with a view towards identifying that hazard’s likelihood of occurring in the project area. The team may wish to make use of the IDB’s support tool (see Box 1.2 below), which generates a set of ‘hazard maps’. Alternatively, the team can review relevant websites or databases with hazard information, such as the following:

- ▶ UN Office for Disaster Risk Reduction ‘DesInventar’ database of hazards for over 89 countries: <https://www.desinventar.net>
- ▶ The Global Risk Data Platform (GRDP): Covering up to 10 natural hazards events globally: <https://preview.grid.unep.ch/>
- ▶ The Global Assessment Report on Disaster Risk Reduction: Provides information from multiple agencies on global risk of natural hazards: <https://risk.preventionweb.net/capreviewer/main.jsp?tab=0>

# Box 1.2

## IDB SUPPORT TOOL HAZARD COMPONENT

The IDB Disaster and Climate Change Risk Assessment Methodology provides comprehensive guidance in the development of climate risk assessments for IDB projects. As the IDB methodology provides various approaches for developing climate risks assessments, users are encouraged to refer to such methodology for best practices and further guidance.

One particular section of the IDB methodology is highly relevant for Tool 1.1. The screening section of the IDB methodology provides an easy-to-use and pre-determined list of

screening questions to help project teams assess the climate risks. This tool provides a compilation publicly available climate maps from different sources. Currently, the IDB tool is under construction, though should be available by request from IDB member countries to the IDB's Climate Change Team.

For more information of the IDB methodology, visit: <https://publications.iadb.org/en/executive-summary-disaster-and-climate-risk-assessment-methodology-idb-projects-technical-reference>.

**Select and identify local data:** Reviewing any available national or regional climate models can lead to a more accurate understanding of hazard exposure. Publicly available global hazard maps are a great start for screening-level assessment, but regional or country maps tend to be more accurate, as the hazards are studied in a smaller geographical area.

Please note: The more often the project team uses the tool(s), the less time this preparatory step will cost, as some sub-steps might not be necessary anymore.

# Box 1.3

## WHERE TO FIND HAZARD DATA?

During this phase, project teams may not have thorough hazard information for the project or the project area available; therefore, the project teams will likely need to rely heavily on some of the assumptions found in global public climate models. Such models can be a combination of historical and forecasting data as well as climate change related assumptions.

As mentioned in Textbox 1.2, the IDB's screening tool of the climate risk assessment methodology provides a comprehensive compilation of climate models (both geophysical and hydrometeorological) to assist project teams during this stage. However, since most climate models are publicly available information, the project teams can also access to a variety of platforms where they can find group or individual hazard layers. Some of the most notable sources include, but are not limited to:



### ***The Global Risk Data Platform (GRDP)***

offers spatial data information on global risk from natural hazards. Users can visualize, download or extract data on past hazardous

events, human & economical hazard exposure and risk from natural hazards. It covers tropical cyclones and related storm surges, drought, earthquakes, biomass fires, floods, landslides, tsunamis and volcanic eruptions. For more information on the DRDP, visit: <https://preview.grid.unep.ch/>



### ***The Global Assessment Report on Disaster Risk Reduction***

this platform is the effort of multiple agencies to share spatial data information on global risk from natural hazards. Users of the platform can visualize, download or extract data on past hazardous events, human & economical hazard exposure and risk from natural hazards. It covers major hazards, initially tropical cyclones and earthquakes and as it becomes available, information related to storm surges, drought, floods, landslides, tsunamis and volcanic eruptions.

For more information, visit: <https://risk.preventionweb.net/capreviewer/main.jsp?tab=0>

**Prepare offline materials:** To prepare for Steps 2 and 3, gather and prepare offline materials. This includes printing the hazard screening list template, as provided in Appendix A as well as

any supporting information that could be used as evidence to assess project's vulnerability to a climate hazard and score project's climate risk.

## Step 2/ Review and refine hazard information & Step 3/ Score Climate Risk Exposure



### Step 2

#### Review and refine hazard information

- Discuss, review, and refine the hazard maps.
- Consider expert opinions, and other data and sources of hazard information.



### Step 3

#### Score climate risk exposure

- Score the likelihood of occurrence of various hazards.
- Wrap up.



#### Note

If project teams conclude that a workshop setting would be a beneficial format in which to review project's exposure to climate hazards – for example if the project will be large and costly - it might make sense to conduct one workshop for tools 1.1, 1.2 and 1.3 during which project participants review a project's exposure, vulnerability and climate risk at once.

**Review and refine:** The goal of this step is to get the best possible understanding of the potential hazards and their likelihood of occurrence. While the information generated in Step 1 is important, even more important is discussing it and, if necessary, refining it. The approach taken to ‘review and refine’ is dependent on time and resources available. For larger projects where the added costs are not too burdensome as a percent of total project costs, it is probably most efficient and well-suited to conduct this step 2 of ‘review and refine’ and the subsequent step 3 of ‘scoring’, in a workshop setting which includes the core project team and any external peer reviewers. This would enable more efficient transfer of information between participants with different viewpoints and skills (e.g. project-related, climate-related, engineering, local expertise, etc). However, conducting a workshop itself requires resources, so for smaller projects (<\$100M), it may be sufficient for the project team/project leader to prepare this information his/herself, and to validate the findings with other experts during the ‘Business Case Stage’ for projects identified as having medium to high risk.

**Consider expert opinions, and other data and sources of hazard information:** Through ‘peer review’ network, other sources of information, or workshop setting gather the following feedback:

- a/** Expert reflection on the hazard data (including any maps),
- b/** Comparison with other climate and hazard information,
- c/** Discussion and agreement on the project’s exposure to the hazard

**Score hazards on screening level hazard list:**

Based on the findings of Step 2, workshop participants or project team/project leader should score the project’s exposure to the identified hazards, using the template provided in Appendix A, according to a simple three-point-methodology.

**Example of the Hazard Template**

Project Name		
N°	Hazards	Likelihood of occurrence: High (3pts)   Medium (2pts)   Low (1pt)
	<b>Geophysical</b>	
1	<i>Seismic</i>	
2	<i>Volcanic</i>	
3	<i>Landslide</i>	
4	<i>Hurricane-wind</i>	
...		
	<b>Hydrometeorological</b>	
11	<i>Drought</i>	
12	<i>Heatwave hazard under RCP 4.5</i>	
13	<i>Heatwave hazard under RCP 8.5<sup>5</sup></i>	
14	<i>Riverine flooding</i>	
...		

<sup>5</sup>RCP refers to Representative Concentration Pathways’ (RCPs) - climate change model developed by the Intergovernmental Panel on Climate Change. The RCPs measures Green House Gases in watts per square meter pathway and level by 2100. For more information, visit: [https://sedac.ciesin.columbia.edu/ddc/ar5\\_scenario\\_process/RCPs.html](https://sedac.ciesin.columbia.edu/ddc/ar5_scenario_process/RCPs.html)

**Scoring methodology<sup>6</sup>** : Use the following legend to score the exposure to the hazard at low, medium or high level.

Exposure Level	Definition	Score
<i>Low</i>	If natural hazards are not likely to occur during construction and/or operational life of the project.	1
<i>Medium</i>	If the hazard is likely to occur at least once during the execution (construction) period and/or the operational life of the project.	2
<i>High</i>	If hazards may occur several times during the execution (construction) period and/or the operational life of the project.	3

**Wrap up:** When completing Tool 1.1, the project team should pause and reflect before continuing to Tool 1.2. In addition to summarizing the main findings and outputs, it is recommended to that the project team:

- ▶ Identify knowledge gaps (e.g. regarding floods in the project area or regarding newer engineering standards, which may apply to the project), and actions to address these.

- ▶ Assess the process used to work through tool 1.1 with a view towards learning for the next project.
- ▶ Outline the next steps for the climate risk assessment, conducted in Tool 1.2.

<sup>6</sup>Methodology adapted from: Adapted from: IDB Disaster Risk Policy Guidelines, 2008. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=360026>



# TOOL 1.2

## SCREENING LEVEL ASSESSMENT OF PROJECT VULNERABILITY

As the second, of three, screening level climate risk assessment tools, this tool seeks to examine the project's vulnerability to various climate hazards. For example, this tool will help project teams determine whether a hazard common to a country (e.g. flooding), matters for the particular project. This tool provides a framework to help project teams examine this. While ideally, especially for those countries new to examining climate risks, it would be helpful to have access to climate change experts, during this screening level phase it may be possible for project teams without much climate expertise to work through these tools on their own. For an introduction to these three tools and the rationale for applying them, the user is advised to study the **Introduction** to this section of the toolkit.

- ▶ **Tool 1.2:** assesses the VULNERABILITY of the project to various climate risk events to which (hazards) it is exposed.

- ▶ **Key question it tries to answer:**  
How significant would the damage to my project be if any of the climate risk events (hazards) would occur?
- ▶ **Output:** Hazard-Vulnerability Assessment (input for **Tool 1.3**)

This tool builds on Tool 1.1 and aims to help guide project teams through a structured process to determine the project's vulnerability to climate hazards from various vantage points. This tool offers users an option to examine the project as a function of its lifecycle; thus, a project's vulnerability to particular climate hazard is examined with regards to how such hazard affects the project's onsite assets, required inputs (e.g. water), expected outputs (e.g. power), and links with other systems.<sup>7</sup> While this additional step is not necessary it may be a helpful one for project teams to take to ensure that






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<sup>7</sup>This concept comes is based on the Non-paper Guideline for Project Managers: Making vulnerable investment climate resilient. Available at: <https://climate-adapt.eea.europa.eu/metadata/guidances/non-paper-guidelines-for-project-managers-making-vulnerable-investments-climate-resilient/guidelines-for-project-managers.pdf>

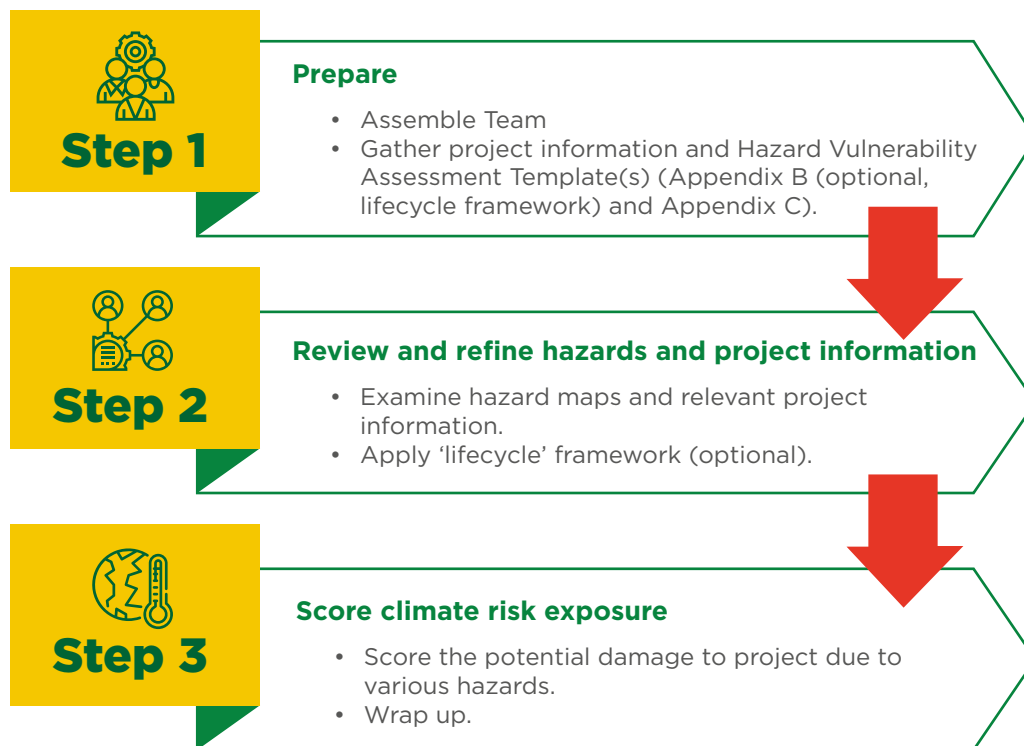
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they consider many vantage points when determining how particular climate hazards could impact a project.

This framework is elaborated further below, as is the scoring methodology.

 <p><b>When in PPP process to use</b></p> <p>During the project identification stage.</p>	 <p><b>Expertise Required</b></p> <p>Project Expertise and Climate Expertise.</p>
 <p><b>Length of time to implement</b></p> <p>A few hours.</p>	 <p><b>Reference Materials</b></p> <p>EU Guidelines for Project Managers: Making vulnerable investments climate resilient (2013)</p>
 <p><b>Stakeholders involved</b></p> <p>Project Team; Enterprise Team; Advisors; Climate Team.</p>	

## Overview of Tool 1.2



## Step 1 / Prepare



### Prepare

- Assemble Team
- Gather project information and Hazard Vulnerability Assessment Template(s) (Appendix B (optional, lifecycle framework) and Appendix C).

**Assemble Team:** It would make sense to use the same team as assembled for Tool 1.1. As mentioned in Tool 1.1 it is ideal for this team to include members who have expertise on the project specifics, the project preparation process (project manager) as well as team members with climate risk and climate change expertise, who have the ability to develop and interpret climate hazard maps. If the project team is unable to find someone with climate change expertise to join the core team, it may make sense to identify an external climate expert, or climate experts, to serve in a peer review capacity, who can help the project team interpret hazard maps, for example. While not entirely necessary, taking such measures, especially for project teams new to examining climate risks, can serve as a helpful way to build capacity and understanding on the topic. This step requires team members to use educated judgement to determine how vulnerable the project is to each to the hazards identified as part of the work conducted under Tool 1.1.

### Gather relevant project information:

The vulnerability assessment requires an understanding of project specifics. Therefore,

relevant project information should be gathered, including:

- ▶ Project map.
- ▶ Geotechnical studies or description of geotechnical conditions.
- ▶ Preliminary alignment / footprint / design

**Project-Hazard Vulnerability Checklist:** To prepare for Steps 2 and 3, offline materials should be gathered. This includes printing of the lifecycle-based vulnerability assessment template provided in Appendix B and the screening-level hazard vulnerability assessment template in Appendix C, or customized versions of these templates. [The template provided in Appendix B corresponds with the lifecycle framework. Completing this template would likely help project teams develop a more complete picture of which climate hazards affect the project, and specifically, which aspects of the project are affected. Working through this template is optional.]

## Step 2 / Review and Refine Hazards and Project Information



### Review and refine hazards and project information

- Examine hazard maps and relevant project information.
- Apply 'lifecycle' framework (optional).

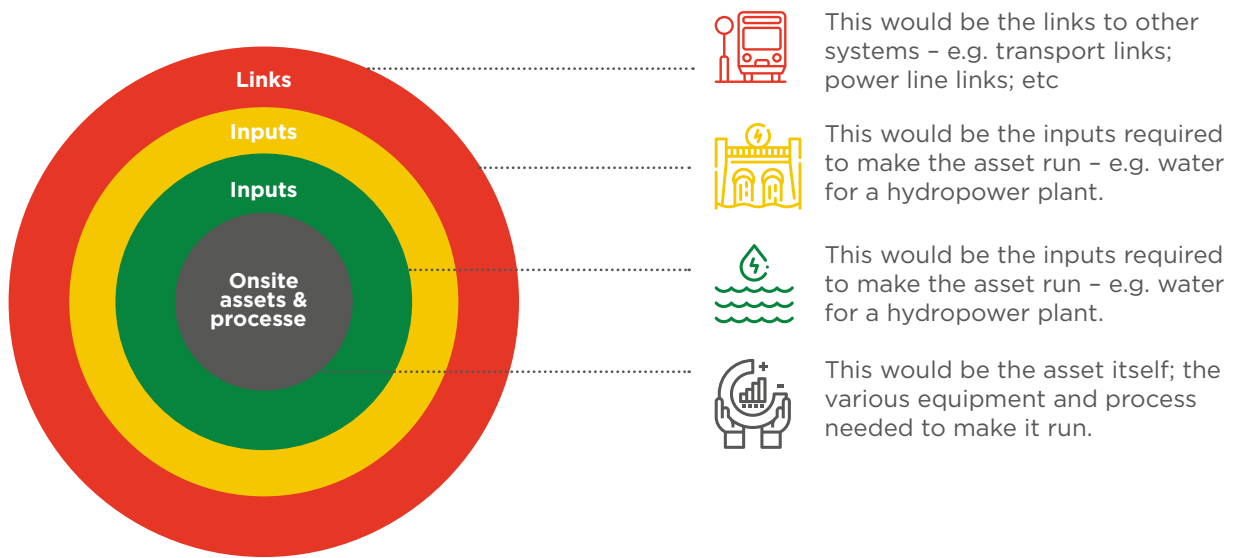
**Review and Refine:** The goal of this step is to get the best possible understanding of the potential damage specific hazards would cause. The approach taken to 'review and refine' is dependent on time and resources available. For larger projects where the added costs are not too burdensome as a percent of total project costs, it is probably most efficient and well-suited to conduct this step 2 of 'review and refine' and the subsequent step 3 of 'scoring', in a workshop setting with the core project team and any external peer reviewers. This would enable more efficient transfer of information between participants with different viewpoints and skills (e.g. project-related, climate-related, engineering, local expertise, etc). However, conducting a workshop itself requires resources, so for smaller projects (<\$100M), it may be sufficient for the project team/project leader to prepare this information his/herself, and to validate the findings with other experts during the 'Business Case Stage' for projects identified as having medium to high risk.

During this step, the project team should seek to obtain:

- a/** Expert reflection on the project site and characteristics in relation to the hazard maps,
- b/** Comparison with other projects,
- c/** Consideration of experiences on the project site,

**d/** Discussion and agreement on the vulnerability of the project,

**(Optional) Apply 'lifecycle' framework:** if during this step the project teams would like to have a very clear understanding of how exactly a potential hazard can affect the project, they can choose to apply the 'lifecycle framework'. Working and thinking through this framework, project teams will examine the project's vulnerability through four lenses relating to its value chain: i) onsite assets and processes; ii) inputs; iii) outputs; and iv) links. Organizing the review in this way, can help project teams ensure that they are examining the project's vulnerability from all dimensions. Not all projects will require all lenses – e.g., some projects, perhaps a road, will not have many required inputs. When evaluating such projects, which lack a lens, exclude that lens from the analysis. This is an optional step, though one project teams may want to consider, especially if the project is large (i.e. costly). Structuring the analysis in this way could also provide benefits during the business case stage when project risk allocation strategies are decided. This is because this lifecycle framework analysis may lead project teams to more clearly understand particular aspects of the project that are vulnerable, which could make choosing mitigation strategies easier.



The table below provides guiding questions can be used to evaluating the project’s vulnerability to climate risks.

Project aspect	Guiding questions
On-site assets and processes	<ul style="list-style-type: none"> <li>• What are the key onsite assets critical to the functioning of the infrastructure and delivery of related services?</li> </ul>
Project related inputs	<ul style="list-style-type: none"> <li>• Are there any key inputs – e.g. water, power, maintenance – to make the project run? What are these key inputs?</li> </ul>
Expected project outputs	<ul style="list-style-type: none"> <li>• Is the project expected to generate any outputs? What services will the project (stops) providing – electricity? Urban transport? Airport services?</li> <li>• Would it be a critical impact to the population if the project outputs are affected?</li> <li>• of the affected population?</li> </ul>
Links to other systems	<ul style="list-style-type: none"> <li>• Does the project link with any other critical infrastructure systems? For example, does the functioning of the infrastructure project require links with key transport links? Or transmission lines?</li> </ul>

Appendix B includes a template for a lifecycle-based vulnerability assessment. The value of this optional assessment is that it guides project planners through a very structured and comprehensive analysis of potential impacts of climate hazards on the project – from several angles. As this assessment is optional and not

a required input to other tools, its real value comes in the form of the thinking it generates. Thus, teams may consider taking notes while using this framework to examine projects. These notes can help inform how climate risks are treated in later stages of the PPP project cycle.

## Step 3/ Score Climate Risk Vulnerability



**Step 3**

**Score climate risk exposure**

- Score the potential damage to project due to various hazards.
- Wrap up.

**Score climate risk vulnerability:** Based on the findings of Step 2, the project team will score the vulnerability of the project to the identified hazards at low, medium or high level.

(distinguishing between geophysical and hydrometeorological) as well as a field to fill in the score. For a print ready version of this list, see Appendix C.

**Scoring template:** The template included below, includes the list of hazards

Project Name	
N°	Hazards
	<b>Geophysical</b>
1	<i>Seismic</i>
2	<i>Volcanic</i>
3	<i>Landslide</i>
4	<i>Hurricane-wind</i>
...	
	<b>Hydrometeorological</b>
11	<i>Drought</i>
12	<i>Heatwave hazard under RCP 4.5</i>
13	<i>Heatwave hazard under RCP 8.5</i>
14	<i>Riverine flooding</i>
...	

Significance of damage if climate risk event occurs: High (3pts); Medium (2pts); Low (1pt)

**Scoring methodology<sup>8</sup>** : Use the following legend to score the project's vulnerability at low, medium or high level.

Vulnerability Level	Definition	Score
<i>Low</i>	Project aspect not affected by a particular hazard, e.g., water scarcity is not expected to affect airport passenger services.	1
<i>Medium</i>	Project aspect somewhat vulnerable to particular hazard, e.g., wildfires that come near airport could affect functioning of airport.	2
<i>High</i>	Project aspect very vulnerable to a particular hazard, e.g., airport located near sea would be very sensitive to a hurricane storm surge.	3

<sup>8</sup>Methodology adapted from: Adapted from: IDB Disaster Risk Policy Guidelines, 2008. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=360026>

# TOOL 1.3

## SCREENING LEVEL ASSESSMENT OF THE OVERALL CLIMATE RISK PROFILE






This final screening level, climate risk assessment tool, helps project teams come to a high-level conclusion of whether a project is at a low, medium or high risk for impacts from climate change. This tool builds on the information and outputs of Tools 1.1 and 1.2. For an introduction to these three tools and the rationale for applying them, the user is advised to study the **Introduction** to this section.

- ▶ **Tool 1.3:** concludes on the RISK LEVEL per hazard of the project.
- ▶ **Key question it tries to answer:** What is the project's risk profile for each of the hazards? What is the project's overall climate-related risk profile (i.e. a combined assessment)?
- ▶ **Output:** Visualization of the climate risk in a matrix to prioritize.

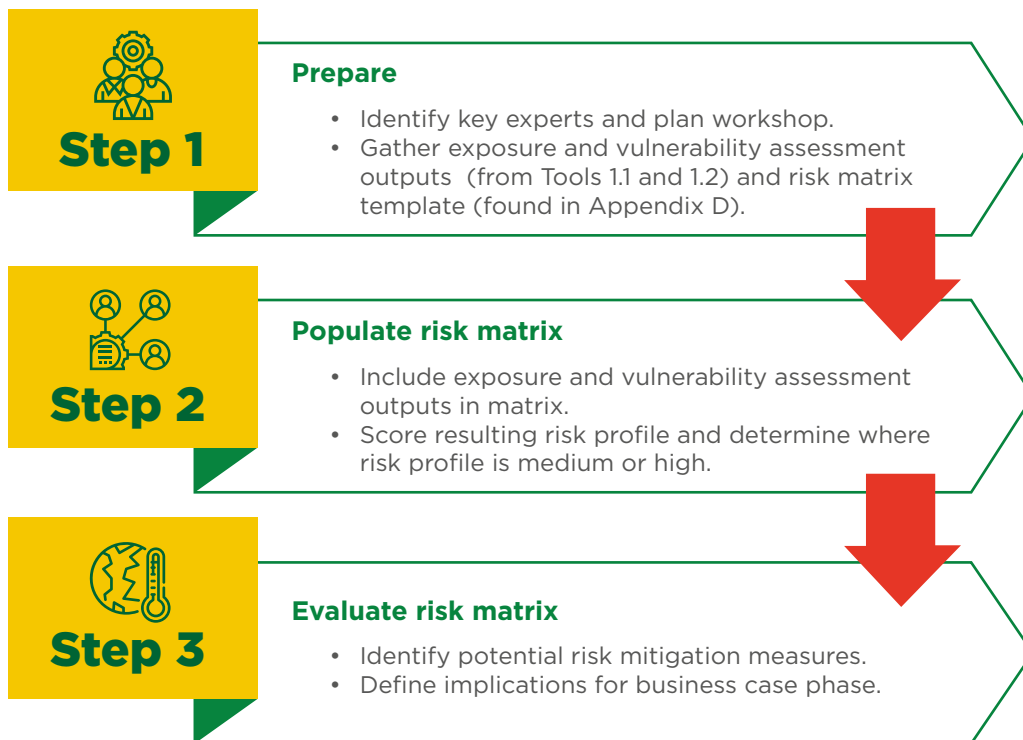
This final tool in the Project Identification Stage combines the outputs of Tools 1.1 and 1.2. By visualizing the climate risks in relation to each other, it helps to identify the largest risks to the project and therefore can help teams to prioritize which risks need addressing.

The goal of this step is to understand: i) which risks merit further analysis and ii) whether the project as a whole is classified as 'Medium' to 'High' risk. If any of the elements of exposure and vulnerability are scored 'Medium' to 'High', climate risk should be further assessed in the next phase of the project cycle (feasibility / business case stage).



 <p><b>When in PPP process to use</b></p> <p>During the project-identification stage.</p>	 <p><b>Expertise Required</b></p> <p>Climate risk expertise.</p>
 <p><b>Length of time to implement</b></p> <p>An hour.</p>	 <p><b>Reference Materials</b></p> <p>EU Guidelines for Project Managers: Making vulnerable investments climate resilient (2013).</p>
 <p><b>Stakeholders involved</b></p> <p>Project Team; Climate Advisors; Climate Team.</p>	

## Overview of Tool 1.3



## Step 1/ Prepare



### Prepare

- Identify key experts and plan workshop.
- Gather exposure and vulnerability assessment outputs (from Tools 1.1 and 1.2) and risk matrix template (found in Appendix D).

**Assemble Team:** It would make sense to use the same team as assembled for Tools 1.1 and 1.2. As mentioned in Tool 1.1 it is ideal for this team to include team members with expertise regarding the project specifics, the project preparation process (project manager) and team members with climate risk and climate change expertise, who have the ability to develop and interpret climate hazard maps. If the project team is unable to find someone with climate change expertise to be a part of the core team, it may make sense to identify an external climate expert, or climate experts, to serve in a peer review capacity, who can help the project team interpret hazard maps,

for example. While not entirely necessary, taking such measures especially for project teams new to examining climate risks, can serve as a helpful way to build capacity and understanding on the topic. This step requires team members to use educated judgement to determine how vulnerable the project is to each of the hazards identified in Tool 1.1.

**Gather project information:** The results of the exposure and vulnerability assessments (e.g. outputs of Tools 1.1 and 1.2), as well as the risk matrix template (Appendix D) are required for this step.

## Step 2 Populate risk matrix



### Populate risk matrix

- Include exposure and vulnerability assessment outputs in matrix.
- Score resulting risk profile and determine where risk profile is medium or high.

**Populate risk matrix:** With outputs of Tools 1.1. and 1.2 in hand, plot hazards on risk matrix by the project’s level of vulnerability to that hazard as well as the project’s exposure to that hazard, thereby identifying the project’s overall climate risk profile.

**Scoring template:** The template below includes the outcomes of the exposure assessment in the columns and the outcomes of the vulnerability assessment in the rows. For a print ready version of this matrix, see **Appendix D.**

		Exposure (results tool 1.1)		
		Low	Medium	High
Vulnerability (results Tool 1.2)	Low			
	Medium			
	High			e.g. project is highly vulnerable and highly exposed to Landslides; so just write: “Landslides” in this box

**Scoring methodology<sup>9</sup>:** Use the following legend to score the project’s overall climate risk profile at low, medium or high level.

Risk Level
Low (low-low)
Medium (low-medium; medium-low; medium-medium; high-low; low-high)
High (high-medium; medium-high; high-high)

<sup>9</sup>Methodology adapted from: Adapted from: IDB Disaster Risk Policy Guidelines, 2008. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=360026>

## Step 3/ Evaluate risk matrix



### Evaluate risk matrix

- Identify potential risk mitigation measures.
- Define implications for business case phase.

**Risk mitigation:** Whereas the screening-level risk assessment is expected to provide an accurate impression of the climate risk profile of the project as we know it at this stage, the project team does not have to accept this climate risk profile but can try to define mitigation measures in order to reduce climate risks. In transitioning from the identification stage to the business case stage, the potential for risk mitigation seems a relevant decision factor, for example as follows:

- ▶ Reconsider project overall: The climate risk profile may be too high, which may lead to the conclusion that the project is not worth pursuing and the project will not move into the business case stage.
- ▶ Reconsider location: The specific project location may increase the risk profile due to a high exposure and high vulnerability. Some projects may offer an opportunity for relocation to a site with a lower exposure and reduced vulnerability.
- ▶ Reconsider timing: The timing of the project may lead to a high-risk profile or introduce uncertainties. Delay of the project may create an opportunity for more information or specific changes in the project environment that reduce the 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 goals. Changes in the scope or preliminary design may reduce its vulnerability.

**Plan for business case stage:** If the project moves on to the business case stage, the project team will need to start planning for that stage, specifically focusing on further climate risk assessment. It is recommended to focus resources on hazards with a medium or high-risk score and to reserve adequate time and expertise for their review. Project teams should at least consider:

- ▶ Assessing the exposure and vulnerability of the project in more detail at the specific location (e.g. flood modelling on 1m2 level);
- ▶ Hiring external advisors to the extent specific hazard and mitigation expertise is not available within the project team;
- ▶ Designing the project with the identified hazards in mind and periodically re-assessing vulnerability of the design solution; and
- ▶ Gathering best practices to mitigate the identified risk and reserving time to analyze and feed into project development.

# 2



# BUSINESS-CASE STAGE TOOLS

- 
- 2.1** Comprehensive Assessment of Climate Hazards.
  - 2.2** Comprehensive Assessment of Project Vulnerability.
  - 2.3** Comprehensive Assessment of the Overall Climate Risk Profile.
  - 2.4** Embedding Climate Resilience Considerations into Cost Estimates.
  - 2.5** Risk Valuation Methods for 'Climate-Resilient' Infrastructure PPPs.
  - 2.6** Including Climate Risk in Socio-Economic Analysis / Cost Benefit Analysis.
  - 2.7** Including Climate Risk in Financial Feasibility Analysis / Business Case.
  - 2.8** Including Climate Risk in a Value for Money Assessment.
  - 2.9** Including Climate Risk in Environmental Impact Assessment.
-



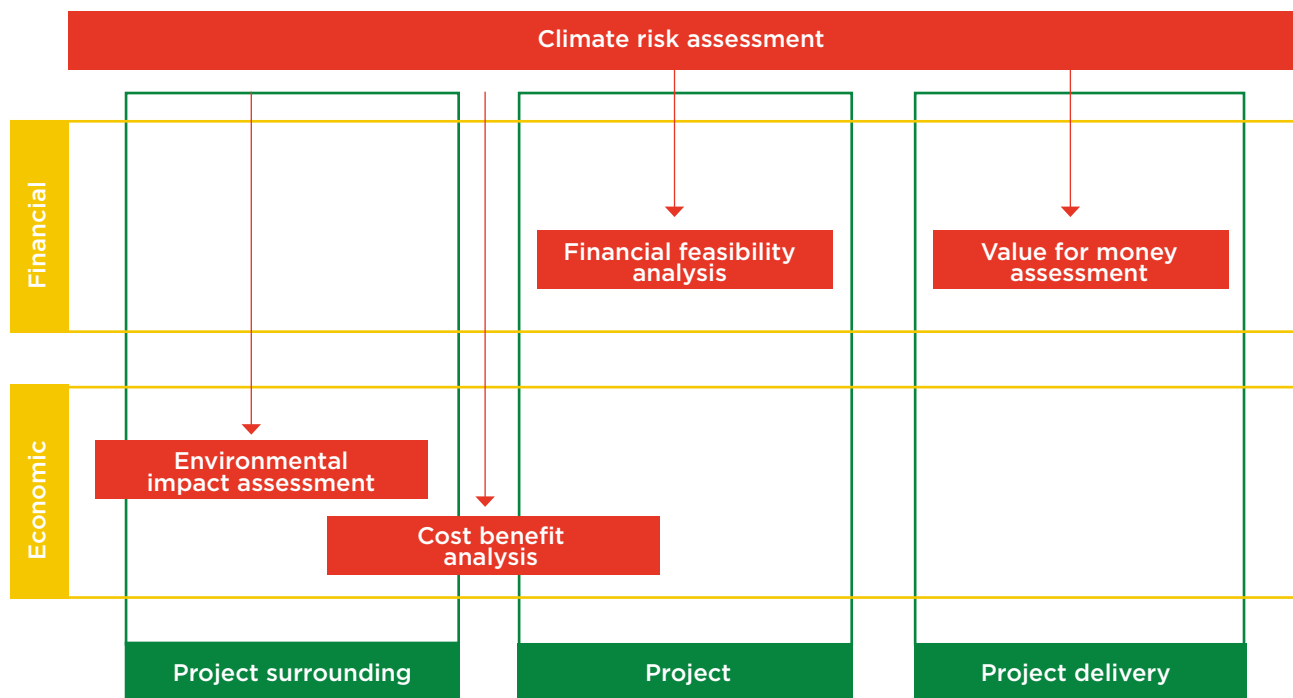
# **SECTION 2**

## **CLIMATE RESILIENCE IN THE PPP BUSINESS CASE STAGE**

The purpose of the Business Case Stage is to determine whether the project under consideration is feasible and whether it is best delivered as a PPP. Analysis undertaken during the project identification stage screened potential projects for this at a high-level. During the business case stage, the project will undergo more in depth technical, financial, economic, environment and social viability assessments. The project will also be examined for its attractiveness to the market, value for money and affordability. To answer these questions, the project undergoes a series of rigorous analyses, most importantly the

‘Financial Feasibility Analysis’, ‘Cost Benefit Analysis’ and ‘Value for Money Assessment’.

These analyses all require an understanding of the various costs and benefits of a project, but also of the associated risks and uncertainties. One category of these risks and uncertainties is climate risk and uncertainty regarding climate change. Therefore, a climate risk assessment – either as a stand-alone analysis or as part of a comprehensive risk analysis – is an essential exercise and an indispensable input to all these analyses, especially for those projects with a medium or high-risk profile.



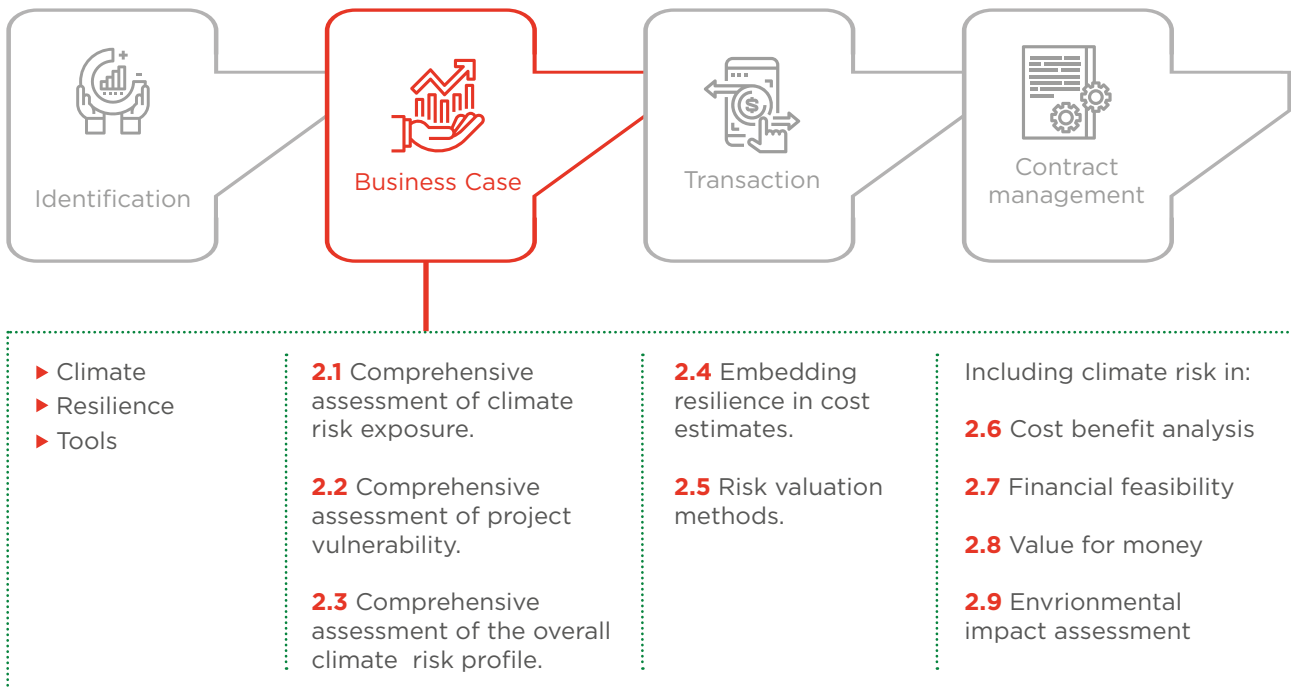
In addition to the analyses that are intended to confirm if the project under consideration is feasible and whether it is best delivered as a PPP, the government typically initiates further project preparation. Preparation refers to the activities handled by the government to mitigate project risks and advance matters that are the responsibility of the government

before the contract is procured. This starts with a due diligence of risks and obstacles that may threaten the success of the project – some of these risks may be climate-related, such as those that will have been identified during the project-screening phase and as part of Tool 1.3. For example, if ‘geotechnical’ risks present serious 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. It is typically considered efficient for the government to execute these preparation activities, as doing so avoids a situation where multiple bidders undergo the same due diligence activities leading to high transaction costs. Preparation activities may continue

during the next stage. They should be finalized within the timeline estimated in the procurement plan and before the procurement is launched.

This section of the Toolkit provides several tools that PPP project planners and teams can use during the Business-Case Stage to assess climate risks and uncertainties and to incorporate them in the standard PPP assessments conducted during this stage.





# TOOL 2.1

## COMPREHENSIVE ASSESSMENT OF CLIMATE RISK EXPOSURE

Based on the results of the of the screening level risk assessment during the project identification stage, project teams will need to conduct a comprehensive assessment of hazards for those geophysical and hydro-meteorological events<sup>10</sup> previously identified as having a medium or high score in Tool 1.3 “Screening-level climate risk assessment”.


- ▶ **Tool 2.1** considers the EXPOSURE of the project to various climate risk events (hazards)
- ▶ **Key question it tries to answer:** What is the likelihood of occurrence of various climate risk events (hazards)?
- ▶ **Output:** Hazard list and likelihood of occurrence table (input for Tool 2.2)

The following tool aims to help project teams deepen their analysis of hazard exposure and likelihood of occurrence, by requiring users to review local existing/relevant studies to determine climate risk in the project/project area as well as climate hazard forecasting. Users (project teams) will need to:

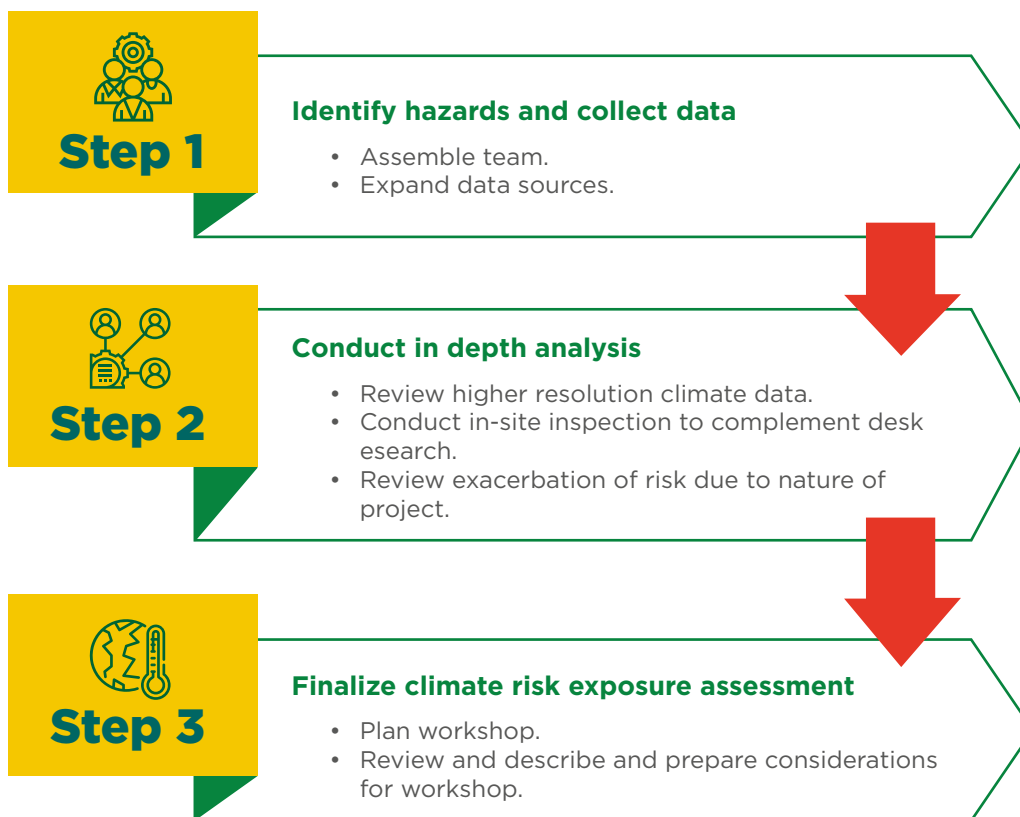
- ▶ Address critical questions per hazard in the predetermined ‘Comprehensive Hazard Exposure Assessment Template’ found in Appendix E.
- ▶ Identify the severity of the hazard,
- ▶ Examine other key considerations,
- ▶ And determine likelihood of occurrence.

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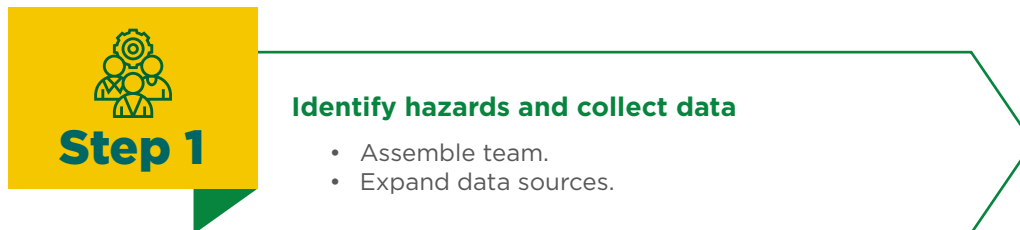
<sup>10</sup>These are the 21 hazards listed in the templates in Appendices A, B and C.

 <p><b>When in PPP process to use</b></p> <p>Before or in parallel to feasibility studies.</p>	 <p><b>Expertise Required</b></p> <p>Climate risk expertise.</p>
 <p><b>Length of time to implement</b></p> <p>A few hours to a couple days.</p>	 <p><b>Reference Materials</b></p> <p>IDB Climate Risk Assessment, EU climate risk assessment methodology.</p>
 <p><b>Stakeholders involved</b></p> <p>Project Team; Climate Advisors; Climate Team.</p>	

## Overview of Tool 2.1



## Step 1 / Identify hazard and collect data



**Assemble team:** It would make sense to use the same team as assembled for Tool 1.1. As mentioned in Tool 1.1 it is ideal for this team to include members with expertise regarding the project specifics, the project preparation process (project manager) as well as team members with climate risk and climate change expertise, who have the ability to develop and interpret climate hazard maps. If the project team is unable to find someone with climate change expertise to join the core team, it may make sense to identify an external climate expert, or climate experts, to serve in a peer review capacity, who can help the project team interpret hazard maps, for example. While not entirely necessary, taking such measures, especially for project teams new to examining climate risks, can serve as a helpful way to build capacity and understanding on the topic. This step requires team members to use educated judgement to determine how vulnerable the project is to each of the hazards identified in Tool 1.1.

**Expand data sources:** Publicly available climate data layers are a good start at

the screening-level stage of climate risk assessment; however, such layers do not provide the resolution necessary to capture hazard events in the project area or even specific regions of a country. Therefore, it is highly advised for the climate expert team:

- ▶ To identify local meteorological climate data layers providing sufficiently detailed information about the severity and likelihood of hazard in the project area;
- ▶ To review, if available, previous models/studies of the main hazards in the geographic area, the city, town, municipality, basin, etc.; and
- ▶ To consider past, and current trends, but most importantly, to consider new climate hazards that are likely to develop or be exacerbated due to climate change.

## Step 2 / Conduct in-depth analysis



### Step 2

#### Conduct in depth analysis

- Review higher resolution climate data.
- Conduct in-site inspection to complement desk research.
- Review exacerbation of risk due to nature of project.

#### Identify and review detailed climate hazard data:

Using the results from the previous stage (i.e. the outputs of Tools 1.1, 1.2 and 1.3) as a starting point, deepen the analysis by researching and reviewing previous models/studies of the main hazards in the geographic area, city, town, municipality, or even similar projects in the area, if applicable. Relevant information should be gathered, including:

- ▶ Project, city, or country-specific geophysical or hydrometeorological data;
- ▶ Other local studies;
- ▶ Project pre-feasibility studies or preliminary technical feasibility and environmental impact assessment; and
- ▶ If site inspection occurred, report of the findings of site inspection.

**Conduct on-site inspection:** Exposure maps of observed climate-related hazards from the screening-level assessment (see output of

**Tool 1.1** specifically, though outputs of **Tools 1.2** and **1.3** are helpful to have on hand) could be supplemented by carrying out dedicated on-site inspections, preferably by teams with expertise in geosciences, and engineers. In addition to historic information, climate models should be used to forecast climate risk in the project area.

#### Review exacerbation of risk due to nature of project:

Existing project characteristics or the changes in the natural ecosystem resulting from the development of the project may increase climate risks, e.g. vegetation removal may exacerbate flooding, landslides, and wind damage from hurricanes, and increase heat island effects. This analysis requires involvement of environmental and engineering experts. The experts can rely on pre-feasibility studies or preliminary results of technical and environmental feasibility studies in combination with the data gathered in this step.



### Step 3

#### Finalize climate risk exposure assessment

- Plan workshop.
- Review and describe and prepare considerations for workshop.

**Plan workshop:** Considering that this workshop – as well as the expected results from the workshop – is highly technical, it is strongly recommended to have specialized climate risk experts and geoscientists present. In preparation for the workshop the project leader can prefill the hazard table by drafting

key considerations per hazard as well as including indicative levels of exposure.

**Hazard table:** The table below is a template for the comprehensive hazard exposure assessment. For a print ready version of this template, see [Appendix E](#).

N°	Climate hazard	Description	Key Considerations	Likelihood (score)
1	<i>Seismic</i>	Be as specific as possible when describing the hazard. For example, Flooding surge between XX ml and XX, particularly during the months of XX through XX.	Examples of key considerations: <ul style="list-style-type: none"> <li>• Previous events and frequency.</li> <li>• Will climate change forecast in the area impact the severity and frequency of the hazard?</li> <li>• Will the project exacerbate the hazard risk?</li> <li>• Is the project in a particularly exposed location? If so, explain (e.g. areas already below sea level, coastal zones and islands, etc.</li> </ul>	Use expert judgement on severity and frequency of the hazard.
2	<i>Volcanic</i>			
3	<i>Landslide</i>			
4	<i>Hurricane-wind</i>			
...	...			

**Hold workshop and complete hazard table:**

Based on the compilations of all the findings gathered, the expert team will:

- ▶ Discuss and describe hazards identified, key considerations, and likelihood of occurrence;
- ▶ Use the hazard exposure assessment template provided in Appendix E to document the identification of hazards and assessment of their likelihood of occurrence.

conducted research prior to the workshop will present the critical considerations incorporated in the hazard table to the group. Based on the available information, the workshop participants should challenge the key considerations, add, and/or make pertinent changes to ensure a holistic and accurate assessment. Considerations per hazard may include:

- ▶ Previous events and frequency.
- ▶ Impacts of climate change on the severity and frequency of the hazard.

**Discussion of key considerations methodology:**

Any subgroups that have

- ▶ Effects of local conditions on the exposure to hazards.; and
- ▶ Effects of implementation of the project on the exposure to hazards.

**Scoring methodology:** Use the following scoring method – adapted from EU climate resilience guidelines<sup>11</sup>– to score the project’s hazard exposure:

1	2	3	4	5
Rare	Unlikely	Moderate	Likely	Almost certain
Hazard unlikely to occur	Given current practices and procedures, this hazard is unlikely to occur	Hazard has occurred in a similar country / setting	Hazard is likely to occur	Hazard is very likely to occur, possibly several times
OR				
5% chance of occurring per (period) or every y (time)	20% chance of occurring per (period) or every y (time)	50% chance of occurring per (period) or every y (time)	80% chance of occurring per (period) or every y (time)	95% chance of occurring per (period) or every y (time)

**Key considerations and scoring approach:**

Depending on the size of the team, the assessment and scoring can be done in a plenary session or in subgroups followed by a plenary session in which the outcomes are shared, discussed, and agreed with the entire group.

The outcome of the workshop should be a comprehensive overview of the climate risks and an assessment of their likelihood of occurrence, now and in the future, that will serve as input for the following exercises.

<sup>11</sup>Guidelines for Project Managers: Making vulnerable investments climate resilient. European Commission. 2013. Accessible here: <https://climate-adapt.eea.europa.eu/metadata/publications/guidelines-for-project-managers-making-vulnerable-investments-climate-resilient>

# TOOL 2.2

## COMPREHENSIVE ASSESSMENT OF PROJECT VULNERABILITY

Similar to **Tool 1.2** from the identification stage “screening-level vulnerability assessment,” this tool aims at identifying and understanding how different project components will be affected by climate risk events. Users will need to determine and measure the vulnerability of each element based on sectoral and climate expertise.

- ▶ **Tool 2.2:** assesses the project’s VULNERABILITY to various climate risk events (hazards) to which it is exposed and potential damage when risk events occur
- ▶ **Question:** How significant would the damage to my project be if any of the climate risk events (hazards) would occur?
- ▶ **Output:** Project vulnerability and impact assessment (input for **Tool 2.3**)



### When in PPP process to use

In parallel to feasibility studies.



### Length of time to implement

A few hours, to a couple days (a few conversations)



### Stakeholders involved

Project Team; Climate Advisors; Climate Team, sectoral engineers, environmental team.



### Expertise Required

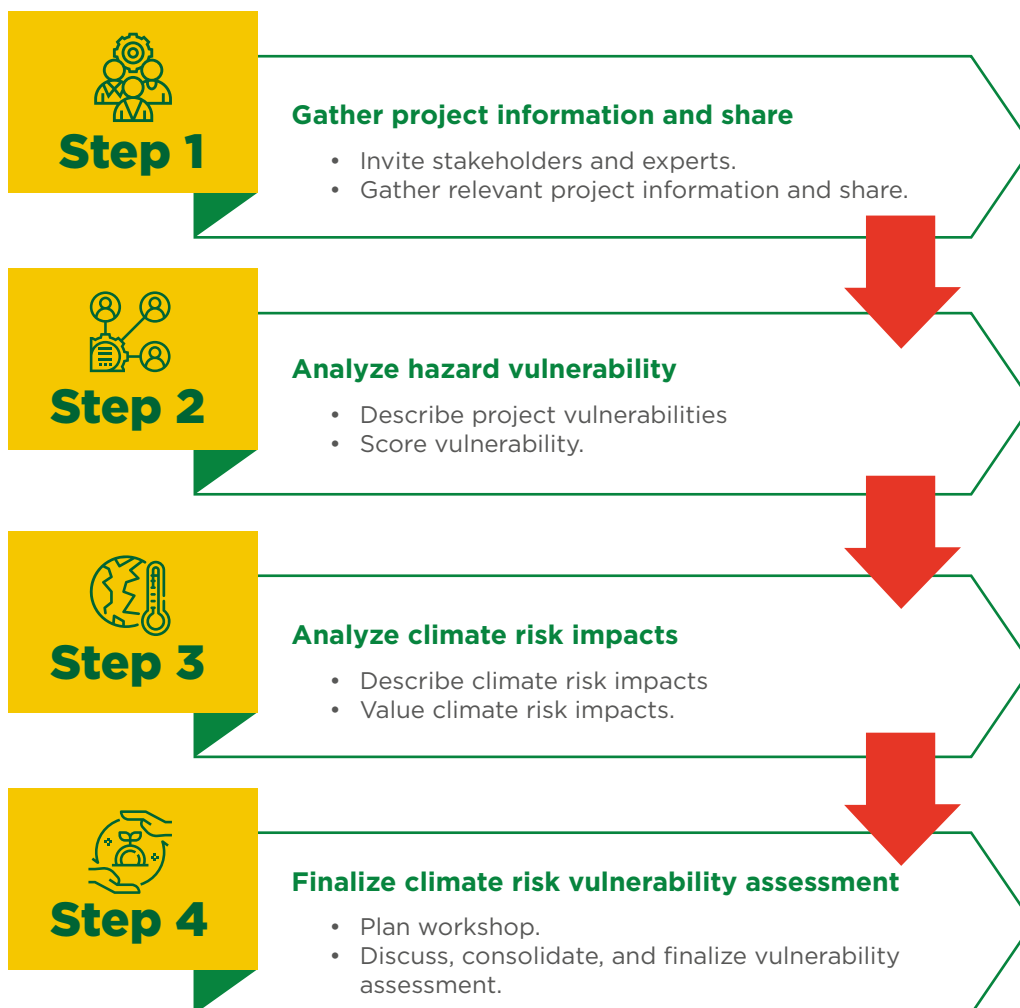
Climate risk expertise / engineering-technical expertise.



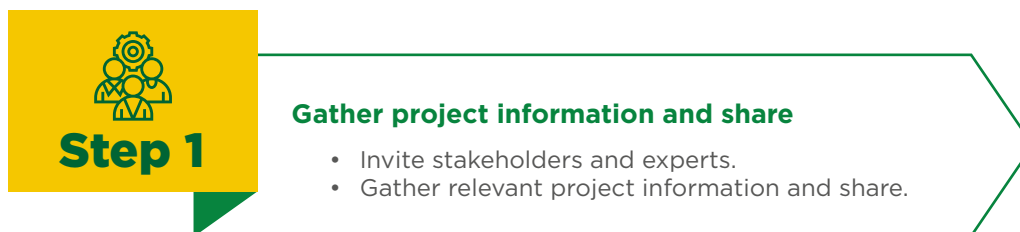
### Reference Materials

IDB Climate Risk Assessment, EU climate risk assessment methodology.

## Overview of Tool 2.2



## Step 1 / Gather project information and share





**Invite stakeholders and experts:** For the next two steps (vulnerability and climate risk assessment), it is critical to make sure the relevant stakeholders and experts are involved in the evaluation process, including but not limiting to sector-specific engineering experts, environmental experts and climate experts.


**Gather relevant project information and share:** The team lead should gather further information specific of the project or project area. Additional information could include the technical pre-feasibility or feasibility study, the preliminary environmental assessment, initial project designs, among other project

materials. The team lead should share the collected data with the different stakeholders so each team member can prepare the vulnerability assessment.

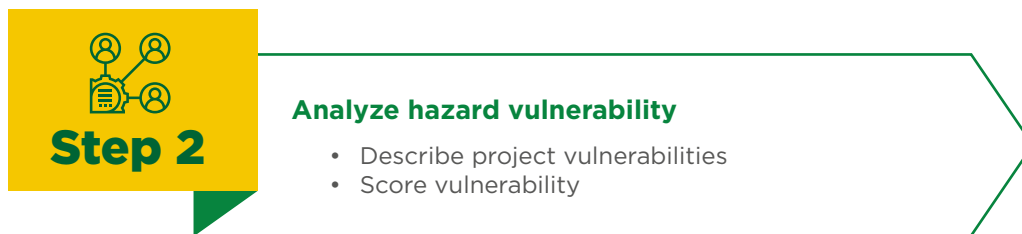
**Distribute template for climate risk assessment:** The climate risk assessment table (**Tool 2.2**) provided in **Appendix F** will be used for the remainder of the climate risk assessment in the Business Case Stage. As a first step, the team lead should summarize the results of Tool 2.1 and copy them over to Columns A and B, thus transferring over the ‘climate hazards identified and their likelihood’, as per the snapshot below:

N°	A. Climate hazard	B. Likelihood	C. Vulnerability	D. Impact	E. Valuation	F. Mitigation	G. Allocation
1							
2							
3							
4							
5							
...							

It is important to incorporate the results from comprehensive hazard exposure assessment (Tool 2.1) in the climate hazard and likelihood columns.



## Step 2 / Analyze hazard vulnerability



**Describe Project Vulnerabilities:**

**a/ Conduct preliminary vulnerability**

**assessment:** During this step, and using the inputs received from the team lead, teams should regroup by discipline and conduct a preliminary vulnerability assessment prior to the plenary workshop.

**b/ Answer key questions related to**

**vulnerability:** As a starting point, stakeholders and experts should ask themselves how the various hazards identified in step 2.1 would affect the project, focusing their own areas of expertise. Guiding questions may include:

Category	Key questions
Project functions	<ul style="list-style-type: none"> <li>▶ Would the critical assets be affected by the hazard?.</li> <li>▶ Would the inputs required to make the project function be affected by the hazard?.</li> <li>▶ Would the expected output (service) be affected by the hazard?.</li> <li>▶ If the expected outputs / services would fail due to the hazard, would this affect other external systems?.</li> </ul>
Geographical/ environmental vulnerabilities	<ul style="list-style-type: none"> <li>▶ Are there additional inherited natural conditions in the project area that may exacerbate the project vulnerability? For example, if the one of the hazards identified is tropical storms, some additional natural conditions that may exacerbate the project vulnerability may involve:                             <ul style="list-style-type: none"> <li>• Project area below sea level.</li> <li>• Flood prone areas.</li> <li>• Coastal zones.</li> <li>• Steep slopes.</li> <li>• ...</li> </ul> </li> </ul>
Physical characteristics	<ul style="list-style-type: none"> <li>▶ Are specific areas of the project vulnerable to the hazard? For example, a section of the road may be prone to floods while another section of the road may be affected by landslides.</li> <li>▶ Are some project components more vulnerable than others in the project? (e.g. critical bridges that connect a section of a road).</li> </ul>
Economic / social considerations	<ul style="list-style-type: none"> <li>▶ How essential is the project to the surrounding communities?.</li> <li>▶ Will the quality of life in the surrounding areas be affected if the project would fail?.</li> <li>▶ How important is the project to the economy of the surrounding communities?</li> </ul>

**C/ Describe project vulnerabilities:** Each team member should describe the project vulnerabilities per component - project functions, geographical vulnerabilities, physical characteristics, social/economic

considerations, and environmental considerations –and incorporate these descriptions into the Climate Risk Assessment Template, column C. “Vulnerability.”

N°	A. Climate hazard	B. Likelihood	C. Vulnerability	D. Impact	E. Valuation	F. Mitigation	G. Allocation
1							
2							
3							
4							
5							
...							

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

**Score vulnerability:** It is essential to give flexibility to experts in qualitatively and/or quantitatively scoring the vulnerability levels

and provide some level of description when it applies. An illustration of a qualitative scoring methodology is provided below:

Vulnerability Level	Definition
<i>Low</i>	Project component not affected by a particular hazard, and there is no significant impact e.g., water scarcity is not expected to affect airport passenger services.
<i>Medium</i>	Project component somewhat vulnerable to particular hazard, and there is impact that is not critical to providing services, environment, or population e.g., wildfires that come near airport could affect partial functioning of airport.
<i>High</i>	Project component very vulnerable to a particular hazard, and there is impact that is critical to providing services, environment, or population e.g., airport located near sea would be very sensitive to a hurricane storm surge. The nearby community highly depends on the airport operations as provider of basic product.

## Step 3 /Analyze climate risk impacts



**Step 3**

**Analyze climate risk impacts**

- Describe climate risk impacts
- Value climate risk impacts

**Describe climate risk impacts:** The next step is to define and measure the impact on the project of every single vulnerability. Some vulnerabilities may present similar impacts. It

is recommended to follow the components identified during the vulnerability assessment, guiding considerations may include:

Category	Key questions
Project functions	<ul style="list-style-type: none"> <li>▶ Full / partial interruption of inputs that make the asset function                             <ul style="list-style-type: none"> <li>• If interruption, length of interruption</li> <li>• Time that will take for project inputs to function again</li> </ul> </li> <li>▶ Full / partial interruption of project services                             <ul style="list-style-type: none"> <li>• If interruption of services, length of interruption</li> <li>• Time to rehabilitate services</li> <li>• Changes of quality of services</li> <li>• Importance of service to the surrounding communities</li> </ul> </li> </ul>
Geographical/ environmental vulnerabilities	<ul style="list-style-type: none"> <li>▶ What would be the effect of full / partial service interruption in the natural ecosystem of the surrounding areas?</li> </ul>
Physical characteristics	<ul style="list-style-type: none"> <li>▶ Full / partial damage to the infrastructure:                             <ul style="list-style-type: none"> <li>• Severity of the damage</li> <li>• Time to recuperate the asset(s)</li> </ul> </li> </ul>
Economic / social considerations	<ul style="list-style-type: none"> <li>▶ What is the effect on the local economy if total/partial interruption of services occurs?</li> <li>▶ What is the impact on the life of the citizens in the surrounding areas if total/ partial interruption of services occurs?</li> </ul>

N°	A. Climate hazard	B. Likelihood	C. Vulnerability	D. Impact	E. Valuation	F. Mitigation	G. Allocation
1				↑			
2							
3							
4							
5							
...							

Use expert judgement to describe the impacts of the vulnerability components. Try to be as precise as possible as this will later help with the mitigation plan and further assessment.

**Value climate risk impacts:** In addition to qualitative scoring approaches, full quantification and/or valuation of the impact may be useful or necessary. This is

generally considered complex and one of the most challenging project analyses. Tool 2.5 discusses an introduction to various risk valuation methods that can be used.

## Step 4 / Finalize climate risk exposure assessment



### Finalize climate risk vulnerability assessment

- Plan workshop.
- Discuss, consolidate, and finalize vulnerability assessment.

**Plan workshop:** Considering that this workshop – as well as the expected results from the workshop – is highly technical, it is strongly recommended to have specialized climate risk experts and geoscientist. In preparation for the workshop the project leader can prefill the vulnerability and impact columns of the climate risk assessment table.

### Discuss, Consolidate and finalize vulnerability assessment:

**a/** Hold workshop and complete climate risk assessment table: Based on the compilations of all the findings gathered, the expert team will:

- ▶ Discuss and describe the vulnerabilities as well as the impacts of the vulnerability components of the project;

- ▶ Use the climate risk assessment table template provided in Appendix F to document the vulnerabilities and impacts.

**b/** Key considerations and scoring approach: Depending on the size of the team, the assessment can be done in a plenary session or in subgroups followed by a plenary session in which the outcomes are shared, discussed, and agreed with the entire group.

The outcome of the workshop should be a comprehensive overview of the climate risks and an assessment of their likelihood of occurrence, now and in the future, that will serve as input for the following exercises. If project teams are using the templates provided at the end of this step columns A - D of the 'Comprehensive Climate Risk Assessment' Template (Appendix E) should be complete.

# TOOL 2.3






## COMPREHENSIVE ASSESSMENT OF THE OVERALL CLIMATE RISK PROFILE

The third and final step of the climate risk assessment aims at 1) valuing the climate risks and the overall climate risk profile of the project 2) determining a high-level mitigation plan, and 3) proposing an indicative allocation of the various risks.

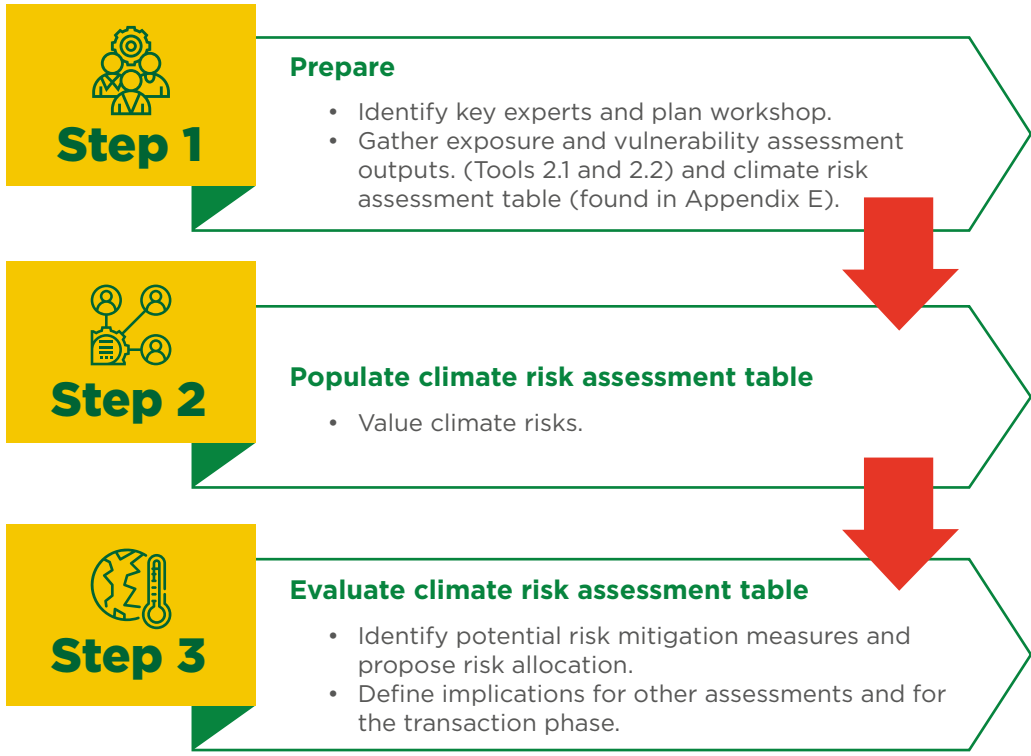
On the last point, it is important to note that projects under traditional delivery methods, tend to require more prescription or specifications from project teams during feasibility studies, whereas in PPPs, project teams will rely heavily on bidders to propose innovative ideas in how to develop the project from a technical and financial efficient point of view. These considerations are also applicable to climate risk. As mentioned at the beginning of the chapter, it is advised that project teams conduct screening-level and comprehensive climate risk assessments for both PPP and non-PPP projects. When it comes to risk

mitigation however, the procuring agency is expected to be more prescriptive for non-PPP projects and more flexible for PPP projects, thus allowing bidders to come up with risk mitigation solutions to the various climate risks.

- ▶ **Tool 2.3:** Values the climate risk; identifies a high-level climate risk mitigation plan; allocates climate risks.
- ▶ **Questions:** what is the aggregate value of the climate risks?; how can they be mitigated?; and what is the optimal allocation?
- ▶ **Output:** Comprehensive climate risk assessment (input for Tools 2.4 – 2.9 and other project stages)

 <p><b>When in PPP process to use</b></p> <p>In parallel to feasibility studies.</p>	 <p><b>Expertise Required</b></p> <p>Climate risk expertise.</p>
 <p><b>Length of time to implement</b></p> <p>A few days to several weeks.</p>	 <p><b>Reference Materials</b></p> <p>IDB Climate Risk Assessment, EU climate risk assessment methodology.</p>
 <p><b>Stakeholders involved</b></p> <p>Project Team; Climate Advisors; Climate Team.</p>	

## Overview of Tool 2.3



## Step 1 / Prepare



### Step 1

#### Prepare

- Identify key experts and plan workshop.
- Gather exposure and vulnerability assessment outputs. (Tools 2.1 and 2.2) and climate risk assessment table (found in Appendix E).

#### Identify key experts and plan workshop:

**a/** Project Expertise Required: This step requires team members with a good familiarity of the project and with climate risk expertise. In this step, the team members will define the conclusions and recommendations of the in-depth climate risk assessment. Considering the strategic nature of this exercise, the involvement of senior staff is recommended.

**b/** Plan workshop: The workshop to assess the overall climate risk profile and identify potential risk mitigation measures and propose risk allocation can be combined with the vulnerability assessment workshop (**Tool 2.2**). It could be useful to plan an additional meeting with the project leadership and / or senior staff from project

stakeholders to confirm the conclusions and recommendations, either specifically focusing on the climate risk or – often more likely – to discuss the project identification stage findings.

**Gather exposure and vulnerability assessment outputs and climate risk assessment table:** The project lead will collect and consolidate the outputs of Tool 2.1 (the completed **“Comprehensive Hazard Exposure Assessment”**; see Appendix E for template) and of Tool 2.2 (the partially completed **“Comprehensive Risk Assessment Table”**; columns ). These outputs as well as any notes from the workshops associated with tools 2.1 and 2.2 should be shared with the stakeholders prior to the workshop.

## Step 2 / Populate Climate Risk Assessment Table



### Step 2

#### Populate climate risk assessment table

- Value climate risks.



Full valuation of the risk profile may be useful or necessary, for example when feeding into the financial feasibility study and/or the cost benefit analysis. Risk valuation is generally considered extremely complex and one of the most challenging project analyses. Climate risks may be among the most challenging to value. **Tool 2.5** discusses an introduction to various risk valuation methods that can be used. The level of effort spent on the

climate risk valuation depends largely on the available technical capacity, financial resources, project complexity, time constraints and – most importantly – the relevance of the risk valuation for the purpose of the risk assessment. Often a detailed climate risk valuation is not necessary, especially when defining a proper risk management plan and identifying the optimal risk allocation are the main objectives of the risk assessment.

## Step 3 / Evaluate Climate Risk Assessment Table



### Evaluate climate risk assessment table

- Identify potential risk mitigation measures and propose risk allocation.
- Define implications for other assessments and for the transaction phase.

**Risk mitigation:** Whereas the comprehensive climate risk assessment is expected to provide an accurate assessment of the climate risk profile of the project as we know it at this stage, the project team does not have to accept this climate risk profile but can try to define mitigation measures in order to reduce climate risks. In transitioning from the Identification Stage to the Business Case Stage, the potential for risk mitigation seems a relevant decision factor, for example as follows:

- ▶ Reconsider project overall: The climate risk profile may be too high, which may lead to the conclusion that the project is not worth pursuing and the project will not move into the business case stage.
- ▶ Reconsider location: The specific project location may increase the risk profile due to a high exposure and high vulnerability. Some projects may offer an opportunity

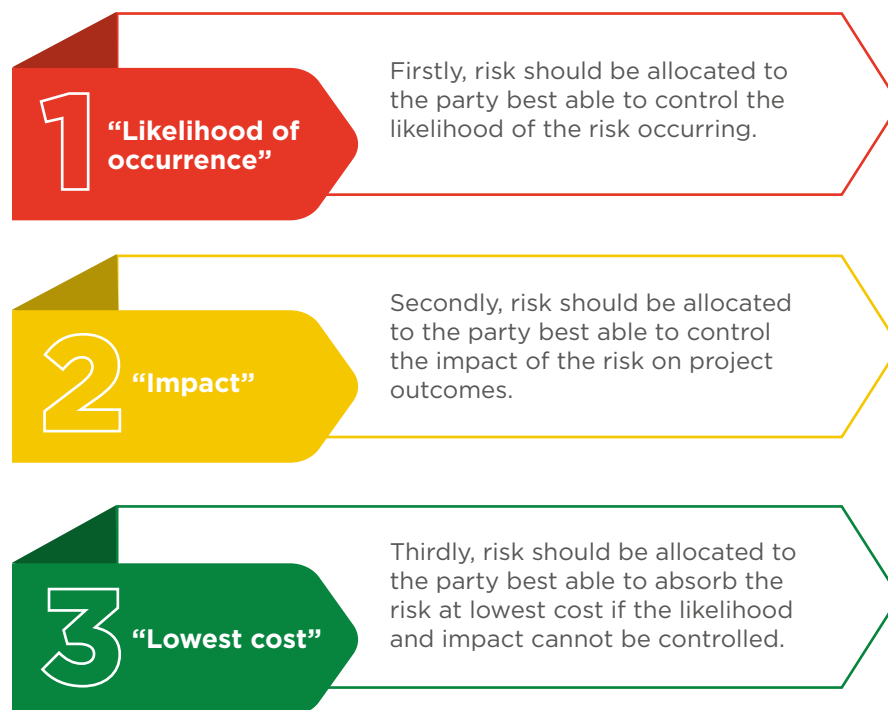
for relocation to a site with a lower exposure and reduced vulnerability.

- ▶ Reconsider timing: The timing of the project may lead to a high-risk profile or introduce uncertainties. Delay of the project may create an opportunity for more information or specific changes in the project environment that reduce the 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 goals. Changes in the scope or preliminary design may reduce its vulnerability.

**Risk allocation:** If the project is expected to move forward as a PPP, one of the most crucial next steps will be to develop the risk allocation that defines the PPP structure. A generally accepted principle is that risk should

be allocated on the basis of both the ability and willingness of different entities to manage each risk. Risks that the developer is more capable of managing are transferred; risks that the government is more capable of managing are retained. The same is true for climate risks.

The PPP reference guide of the World Bank's *Public-Private Infrastructure Advisory Facility* (PPIAF) summarizes the risk allocation principles in three steps as shown in the figure below.<sup>12</sup>



This allocation principle requires an assessment of marketability for sponsors, subcontractors, and financial institutions. Continuous discussions between the government on the one hand, and developer, subcontractors, insurers, and financial institutions on the other hand will help structure a risk allocation that is both workable and optimal for the creation of maximum value for money. The outcome

depends heavily on the private sector’s risk appetite; this willingness to accept risks can change over time due to better information on risks.

Even though it may be clear that the private sector is not able to control a certain risk it may still create value for money if (part of) that risk is transferred, by letting the developer share in the cost consequences of

<sup>12</sup>PPIAF, Public Private Partnership Reference Guide. 2012. <http://wbi.worldbank.org/wbi/news/2012/04/10/now-available-public-private-partnerships-reference-guide-version-10>

such an event. Whereas the developer may not be able to fully control the probability of the event happening, it can take risk mitigation measures to reduce the probability of the occurrence and can also influence the potential damage by designing vandalism proof assets to reduce the costs of repair. Providing these incentives aligns the interests of the developer with those of the government to minimize the negative financial effects of climate risks.

**Other assessments:** Material climate risks will need to be taken into account in other assessments and studies. Tools 2.4 through 2.9 provide guidance on how to incorporate climate risks in:

- ▶ Cost Estimates;
- ▶ Risk valuation;
- ▶ Socio-Economic Analysis/ Cost Benefit Analysis;

- ▶ Financial Feasibility Analysis/Business-Case;
- ▶ Value for Money Assessment; and
- ▶ Environmental Impact Assessment.

**Plan for transaction stage:** If the project moves on to the Transaction Stage, the project team will need to start planning for that stage, specifically focusing on further climate risk assessment studies and the drafting of the procurement documentation. At the end of the Business Case Stage the procuring agency can determine if more in-depth analysis would be useful or necessary. The agency can also determine which mitigation measures are best carried out in the transaction stage. In addition, the procuring agency should define what it expects from the bidders in the PPP procurement. These expectations will in turn inform the structuring of the RFQ and RFP documentation, as further discussed in tools 3.1 through 3.3.

# TOOL 2.4

## EMBEDDING CLIMATE RESILIENCE CONSIDERATIONS INTO COST ESTIMATES

Many of the analyses developed during the Business Case Stage to appraise and structure the potential PPP project require inputting cost data. For example, the financial feasibility analysis and the cost benefit analysis require understanding various costs associated with the project. In the face of climate risks or the need to build more resilience measures into a project, some of these cost items will deviate from their norm – it is likely that they will be higher. Thus, when gathering cost data to feed into these various analyses, it is important to ensure that each cost item embeds any needed premiums for climate resilience-related actions. The following tool provides a framework, which can help Project Teams think about how climate resilience measures or analyses will affect various costs throughout the Business Case Stage.



### When in PPP process to use

In parallel to feasibility studies.



### Length of time to implement

A few hours, to a couple days (a few conversations).



### Expertise Required

Project related expertise; Climate Expertise.



### Stakeholders involved

Project Team; Climate Advisors; Climate Team.

Cost item	Potential additional / adapted costs of:	Narrative of how climate resiliency aims will affect costs
Preparation and transaction phase costs.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Assessing climate risk.</li> <li><input type="checkbox"/> Assessing impact of climate risk on project.</li> <li><input type="checkbox"/> Designing to climate resilient standards.</li> </ul>	e.g. during this phase, designing to 'climate-resilient standard' is likely to increase design costs (by xx).
Construction phase costs.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Inclusion of constructing to climate resilient standards in capital cost estimates.</li> <li><input type="checkbox"/> Inclusion of appropriate climate risk mitigation measures in capital cost estimates.</li> <li><input type="checkbox"/> Higher/ additional insurance cost.<sup>13</sup></li> <li><input type="checkbox"/> Cost of construction delay, due to extreme weather event.</li> <li><input type="checkbox"/> Damage/ repair cost.</li> </ul>	e.g. during this phase, designing to 'climate-resilient standard' is likely to increase design costs (by xx).
Operational costs.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Higher maintenance cost (e.g. due to more repairs).</li> <li><input type="checkbox"/> Higher/lower operational cost (e.g. higher energy cost for HVAC).</li> <li><input type="checkbox"/> Additional disaster response cost.</li> <li><input type="checkbox"/> Higher/ additional insurance cost.</li> <li><input type="checkbox"/> More frequent replacements due to more severe weather.</li> </ul>	
Financing cost.	<ul style="list-style-type: none"> <li><input type="checkbox"/> Higher interest rate due to higher risk mark-up.</li> <li><input type="checkbox"/> Additional financing cost due to changes in repayment schedule due to extreme weather events (e.g. leading to business interruption).</li> </ul>	

<sup>13</sup>For climate risks that are likely to be covered by insurance, the cost of insurance can be included as a valuation of those risks. To avoid double-counting, those climate risks should then not be separately valued as risks.

# TOOL 2.5

## RISK VALUATION METHODS FOR 'CLIMATE-RESILIENT' INFRASTRUCTURE PPPS

Other tools in this toolkit have discussed identifying possible climate risks—the probability of a hazard occurring multiplied by the possible impact it would have. Once those risks have been identified, it is important to value them within the context of the PPP project itself. How will the various identified risks affect the project's revenue streams or costs? This analysis is important building block to other 'Business-Case' Stage analyses like the financial feasibility and cost benefit analysis; thus, it is important to conduct it carefully.

Several methods exist for performing risk valuation. While this tool does not delve into each of the methods in detail, it provides Project Teams with guidance on how to select the method best suited to their project and resources.



### When in PPP process to use

In parallel to feasibility studies.



### Length of time to implement

A few hours, to a couple days (a few conversations).



### Stakeholders involved

Project Team; Climate Advisors; Climate Team.



### Expertise Required

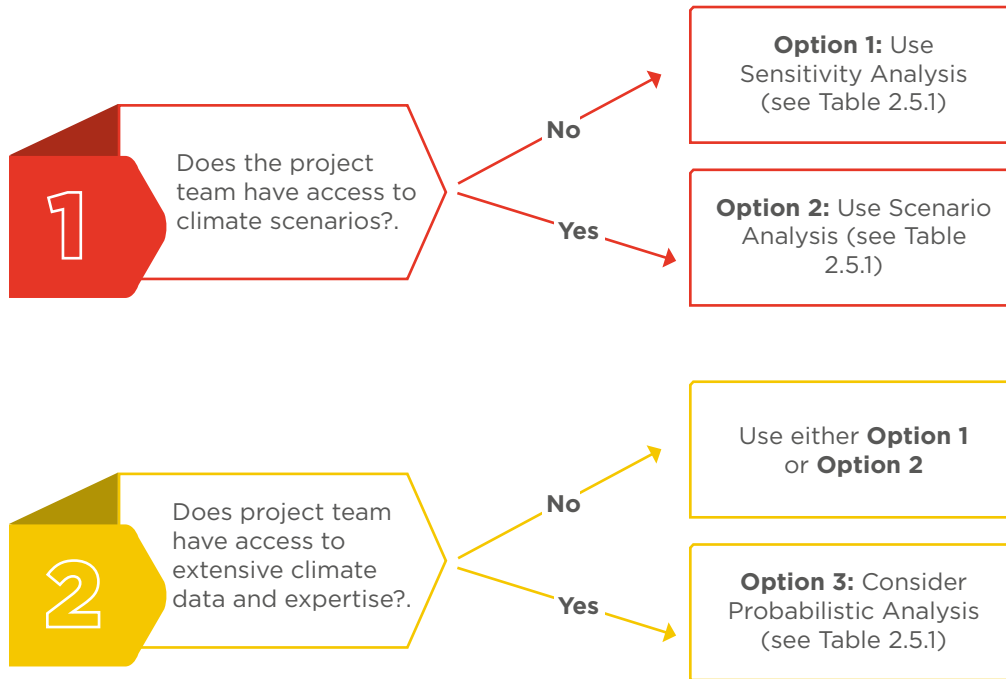
Project related expertise; Climate Expertise.



### Reference Materials

IDB Climate Risk Assessment Methodology.

## Guiding Questions/ Choosing the Optimal Risk Analysis Method



**Table 3.1** Table 2.5.1: Risk Analysis Methods

Method	Description	When to Use
Scenario Analysis	Assessment of possible future developments by considering alternative possible comprehensive sets of outcomes (sometimes called “alternative worlds”). In the case of climate risk, it could be the assessment of various climate change scenarios, intervention, and impacts. Based on an officially defined and agreed baseline, all costs and benefits (CBA) or revenues (financial analysis) will be defined for the scenarios. The project is robust if the outcomes are positive in all scenarios.	This is the recommended option – especially if officially defined climate scenarios exist. This option can help standardize the analysis of risk in PPP projects.
Sensitivity Analysis	Assessment of how changes in a specific model variable impacts the output of the model. In the case of climate risk, it could be the assessment of the impacts of the occurrence of a climate risk event (with a defined financial impact).	If the project team does not have access to climate scenarios this method can be used. This is 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 likelihood of a hazard, exposure or risk of all scenarios, rather than a single point estimate (deterministic approach)	If the project team has access to extensive climate data and expertise. This is a more costly exercise.



# TOOL 2.6

## INCLUDING CLIMATE RISK IN SOCIO-ECONOMIC ANALYSIS / COST BENEFIT ANALYSIS

Generally, potential PPP projects undergo a Socio-Economic Analysis or Cost Benefit Analysis (“CBA”) to understand the full societal benefits or costs of the project. The CBA compares all the benefits and costs of an infrastructure project against the situation without a project, also known as the “no-build” alternative and therefore answers the questions “are we better off with or without the project?” or “is the project creating economic value?”. Answering these questions

requires an understanding of all the positive and negative impacts of a project to society.

Climate risks and climate change can have an impact on the costs and benefits in the CBA. This tool seeks to provide guidance on how to ensure that climate related impacts on costs and benefits are included in this analysis. It entails first conducting a CBA for the project and then examining how various climate scenarios might have an impact on that CBA.



**When in PPP process to use**

When assessing economic cost and benefits of the project as part of the feasibility study.



**Length of time to implement**

Depending on availability of data and expertise, from a couple of hours to a couple of days



**Stakeholders involved**

Project Team; Economic and Technical Advisors, Climate Team



**Expertise Required**

Economic/CBA expertise; project knowledge; technical knowledge; understanding of the outputs of project specific climate risk analysis (tools 2.1-2.3)

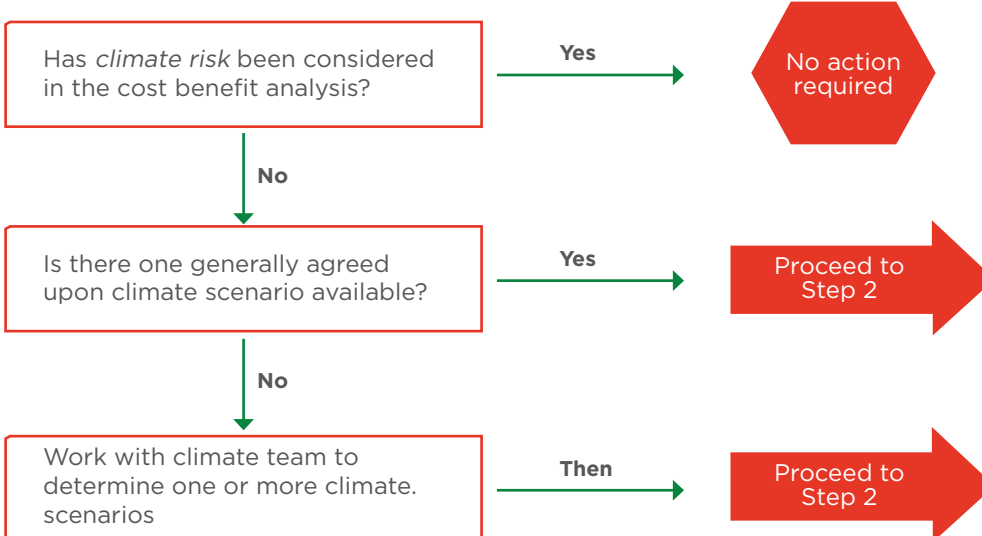


**Reference Materials**

IDB Guidance and Materials on Economic Analysis: <https://www.iadb.org/en/topics-effectiveness-improving-lives/economic-analysis-overview>

**Step 1**

**Determine Climate Risk/Climate Scenario**



**Step 2****Conduct CBA with  
Climate Risk Assumptions****Step 0  
(before)**

Determine economic costs and benefits without climate risk.

**Step 2.1**

Determine how climate risk might influence the cost estimates over the course of the years for each climate scenario (refer to Box 2.6)

**Step 2.2**

Determine how climate risk might influence the forecasted benefits over the course of the years for each scenario. (refer to Box 2.6)

**Step 2.3**

Based on updated estimates of costs and benefits determine the results per climate scenario.

**Step 2.4**

Draw overall conclusions on the economic feasibility of the projects, including the outcome of the scenarios.

# Box 2.6

## THINKING ABOUT HOW CLIMATE RISKS AFFECTS COSTS AND BENEFITS

**Method:** In a workshop with experts (climate scenarios, engineering + costing, environmental economic), discuss and determine how climate risk might affect each cost and benefit category.

**1 /** *Question: How do the following costs change in the selected climate scenarios?*

[Note: investigate this issue with an understanding of the outputs of the project-identification stage tools as well as tool 2.1 – 2.3 for nuanced understanding of the potential hazards]

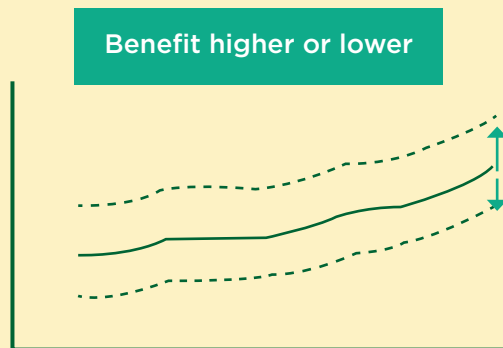
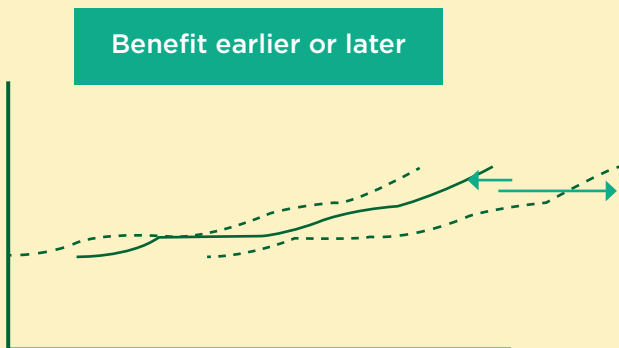
**Maintenance Costs:** this includes more repairs due to increased incidents of storms, higher temperatures, more flooding, etc

**Operational Costs:** this includes for example higher costs associated with HVAC systems, increased insurance premiums, etc

**Replacement Costs:** for example, is it likely that there will be more frequent replacements due to more severe weather events?

**2 /** *Question: How do the possible benefits change in the selected climate scenarios?*

- ▶ Are the benefits likely to increase/decrease in the future?
- ▶ Will climate scenarios affect timing of certain benefits – i.e. will they come earlier or later?



## Example 2.6 / of Climate Risk Considerations Included in a CBA

The City of Rotterdam carried out a cost benefit analysis to determine which adaptation measures to choose for its climate adaptation strategy. In determining the benefits of the various measures (from permeable pavements to coloring roofs in a light color), two climate scenarios were considered in the following way:

**Step 1/** Per measure (e.g. permeable pavements), the annual effect in the current climate was determined (e.g. prevented street flooding damage)

**Step 2/** Then, per measure, the effect was determined for the future for both

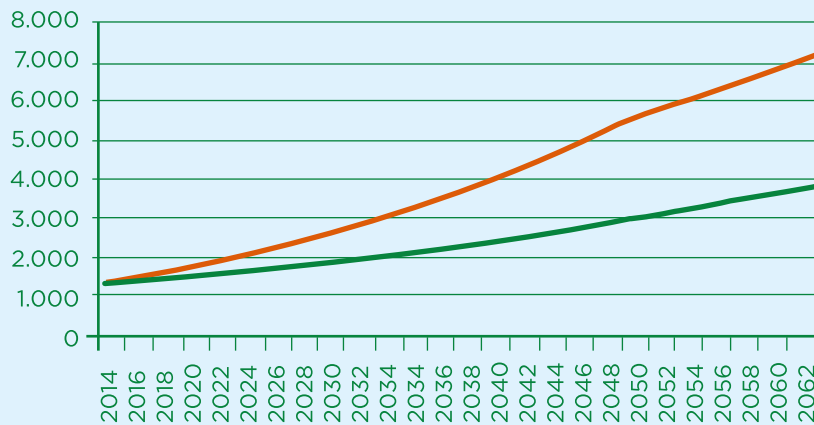
climate scenarios. The climate projections of the Dutch Royal Meteorological Institute (KNMI) provided the basic assumptions on temperature, rainfall patterns and sea level rise for the year 2050.

**Step 3/** The KNMI projections are for the year 2050, so interpolation was used to determine the effect for the years between the current date and 2050.

**Step 4/** The results were discussed and presented for each climate scenario.

Days/ year	Warm	Tropical
Today's climate	24	4
2050 - Climate scenario 1	30	7
2050 Climate scenario 2	50	15

**Development of draught damage in Bergpolder Zuid for 2 climate scenarios (in 1000 £)**



# TOOL 2.7

## INCLUDING CLIMATE RISK IN FINANCIAL FEASIBILITY ANALYSIS / BUSINESS CASE

For PPP projects, financial analysis is an important step in the due diligence process. Both the procuring authority and the private party will need to understand the expected financial performance. For the procuring authority, the financial analysis will determine if the project requires fiscal support or government guarantees.

The financial assessment developed, includes an evaluation of the pre-financing project cash flow—in other words, the expected cash revenues generated by the project minus the expected cash expenditures. The outcome of the Financial Assessment is the Net Present Value (NPV) and the Internal Rate of Return (IRR).<sup>14</sup>

Climate 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 risk as part of a Business Case Stage financial analysis.



### When in PPP process to use

When assessing the financial feasibility in a business case as part of the feasibility study.



### Length of time to implement

Depending on availability of data and expertise, from a couple of hours to a couple of days.



### Stakeholders involved

Project Team; Financial and Technical Advisors, Climate Team.



### Expertise Required

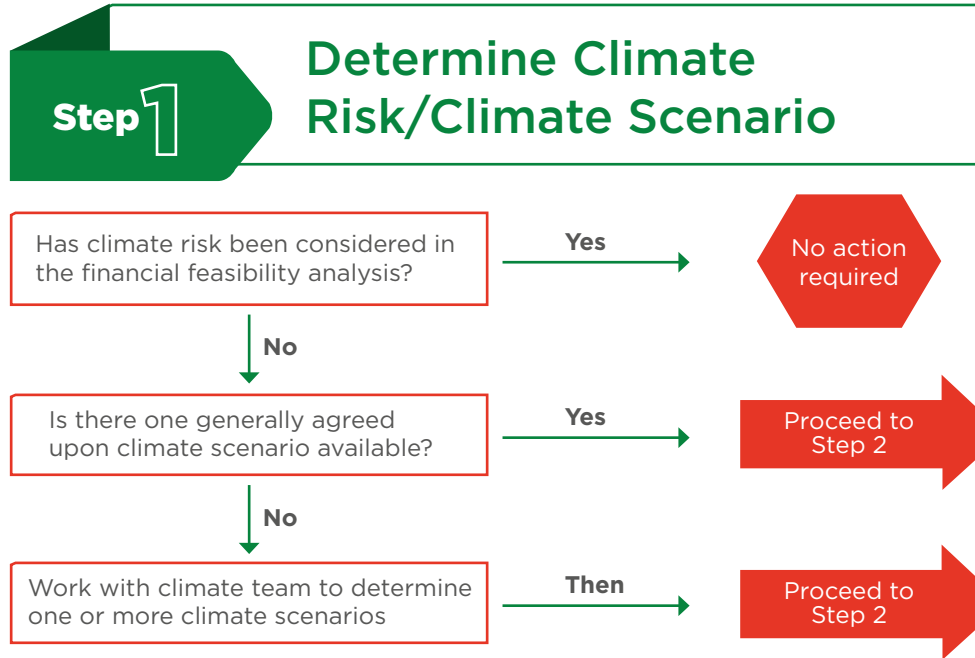
Financial/Commercial expertise; project knowledge; technical knowledge; understanding of the outputs of project specific climate risk analysis (tools 2.1 a-c).



### Reference Materials

Caribbean PPP Toolkit – Module 4, Chapter 7 ‘Financial Feasibility and Fiscal Affordability’.

<sup>14</sup>Caribbean PPP Toolkit, 2015



## Step 2 Include Climate Risk in Financial Analysis

Steps	Description	Methods
Step 0	Determine the business case based on regular commercial assumptions	Expert Assessment & Financial Modelling
Step 2.1	Go through each cost item and each revenue item and determine whether climate influences this assumption (see Box 2.6)	Workshop with Experts
Step 2.2A	For those assumptions, define alternative assumptions per climate scenario.	Workshop with Experts & Financial Modelling
Step 2.2B	If alternative assumptions are unavailable, determine risk mark-ups (or deductions) for overarching cost and revenues by sub-categories.	Workshop with Experts & Financial Modelling.
Step 2.3	Perform a check on double-counting (e.g. only take either insurance payments or material damage/business interruption)	Workshop with Experts & Financial Modelling
Step 2.4	Draw overall conclusions on financial feasibility of project, including outcome of scenarios	Expert Assessment

# Box 2.7

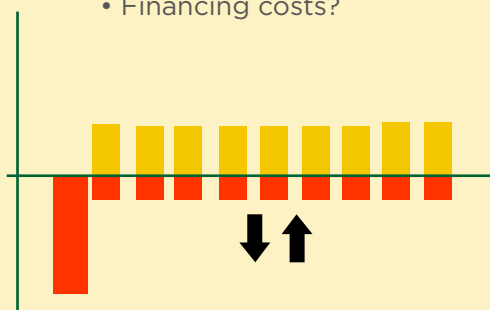
## DETERMINING IMPACT OF CLIMATE RISKS ON COST AND REVENUES ASSOCIATED WITH A PPP PROJECT

**1 / Question:** How do project costs change in the climate scenarios?

[Refer to tool 2.4 for overview of cost changes]

► How will various climate scenarios affect:

- Preparation and transaction phase costs?
- Construction phase costs?
- Operational phase costs?
- Financing costs?



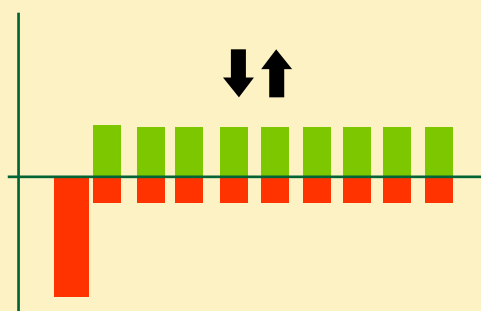
Movements in these costs will impact the cash expenditures associated with the project throughout the project's life.

**2 / Question:** How do project revenue projections change in the climate scenarios?

► Considering the effect of:

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

Climate risks, if they materialize, are likely to have an impact on the construction and operations of the project. There may be construction delays, reduced service quality, or total loss of service. These examples would negatively impact revenue projections. Depending on the project and climate scenarios, there could be instances where climatic changes are beneficial to the project and as a result, project revenues. The goal in conducting a financial analysis that considers climate risks is to make an educated assessment of how various climate risks are likely to impact the project's revenues and costs.





# TOOL 2.8

## INCLUDING CLIMATE RISK IN A VALUE FOR MONEY ASSESSMENT

Contracting authorities center their decision on whether to deliver a project as a PPP based on whether sufficient evidence exists to show that delivering a project as a PPP will generate added value for the public sector and society. A PPP's 'Value for Money' (VfM) can be realized in two ways: 1) when it provides greater value but at the same cost (as alternative), or 2) when it provides the same value but at a lower cost.<sup>15</sup>

The VfM assessment is a standard analysis conducted by PPP project teams to determine if the project under consideration delivers more value to society as a PPP or via some other procurement method. It can comprise a qualitative assessment, quantitative assessment or combination of

both. The quantitative assessment consists of a comparison of all expected costs and risks under PPP and non-PPP delivery methods. Similar to the other analyses, the VfM assessment ideally considers all risks and uncertainties, including those associated with climate. More specifically, the VfM needs to consider to what extent climate risks and uncertainties are expected to affect the differences between PPP and non-PPP delivery, also referred to as "value drivers", as that is ultimately what this assessment is about.

The following tool provides guidance on how to think about including climate-related considerations as part of VfM assessments.

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<sup>15</sup>Caribbean PPP Toolkit 2015



**When in PPP process to use**

when conducting the Value for Money (VfM) assessment and including climate risk (for projects with medium to high climate risks).



**Length of time to implement**

depending on availability of data and expertise, from a couple of hours to a couple of days.



**Stakeholders involved**

Project Team; Financial and Technical Advisors, Climate Team.



**Expertise Required**

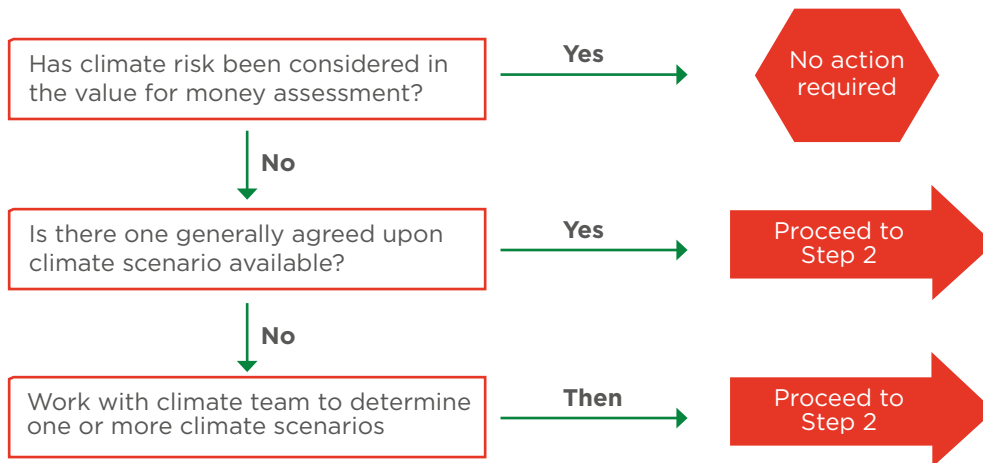
Financial/Commercial expertise; project knowledge; technical knowledge; Understanding outputs of project specific climate risk analysis (tools 2.1 a-c).



**Reference Materials**

- APMG PPP Certification Guide, Chapter 16: Value for Money Assessment.
- Caribbean PPP Toolkit - Module 4 Business Case

**Step 1 Determine Climate Risk/Climate Scenario**




**Step 2**

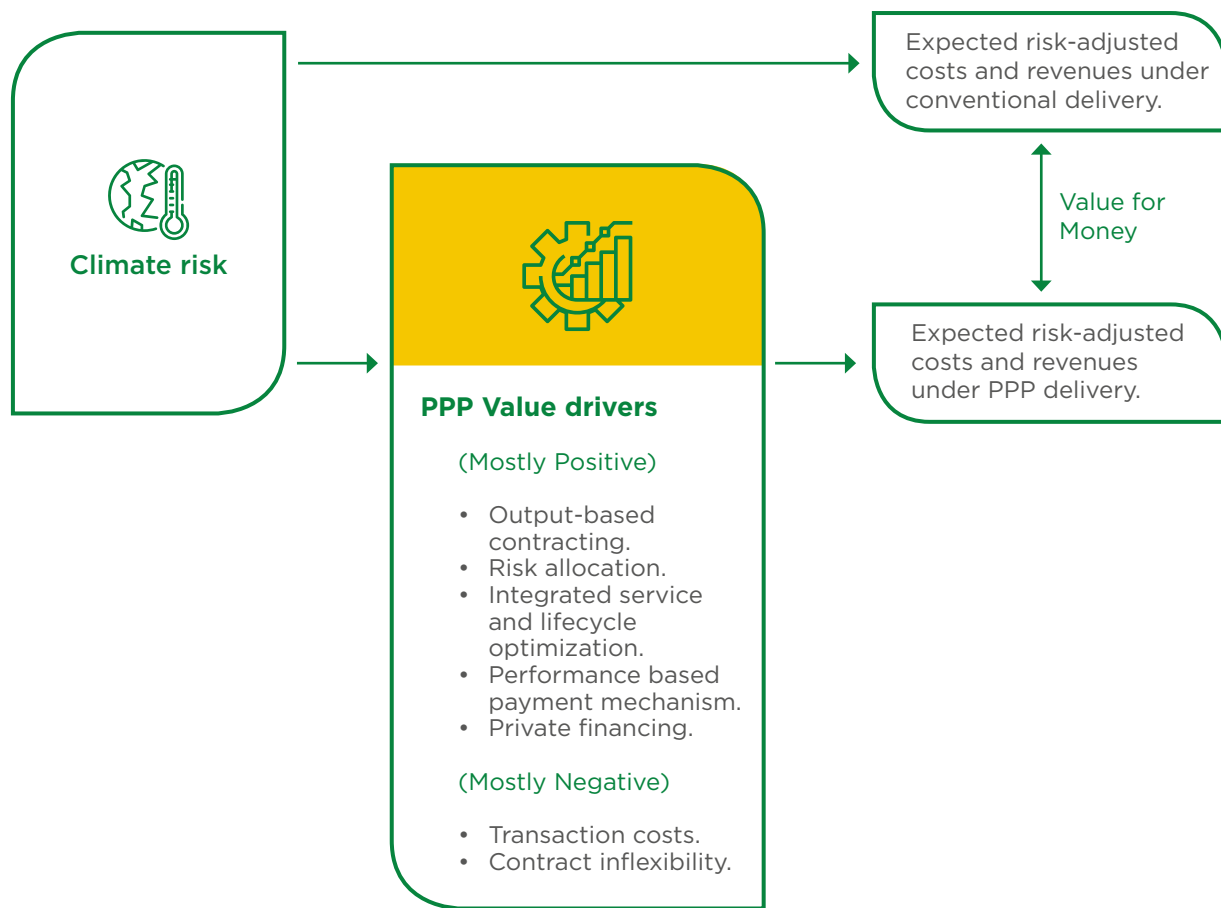
## Include Climate Risk in Financial Analysis

Steps	Description	Methods
<b>Step 0</b>	Determine the costs and risks (and potentially revenues) under both PPP and non-PPP delivery, not specifically considering climate risks and following general value for money methodologies.	Expert Assessment & Financial Modelling.
<b>Step 2.1</b>	Go through each cost, risk and potentially revenue item and determine whether climate influences this assumption (see Box 2.6) <sup>16</sup>	Workshop with Experts
<b>Step 2.2A</b>	For those cost, risk and potentially revenue items, define alternative assumptions per climate scenario.	Workshop with Experts & Financial Modelling
<b>Step 2.2B</b>	If alternative assumptions are unavailable, determine risk mark-ups (or deductions) for overarching cost and revenues by sub-categories.	Workshop with Experts & Financial Modelling.
<b>Step 2.3</b>	Perform a check on double-counting (e.g. only take either insurance payments or material damage/business interruption).	Workshop with Experts & Financial Modelling.
<b>Step 2.4</b>	Determine how climate risk can impact differences between PPP and non-PPP delivery (“value drivers”).	Workshop with Experts & Financial Modelling.
<b>Step 2.5</b>	Draw overall conclusions on value for money of PPP delivery, including outcome of scenarios.	Expert Assessment.

<sup>16</sup>Steps 2.1 through 2.3 are not critical for the value for money assessment, as the goal of this analysis ultimately is to decide on the optimal project delivery model and if climate risk does not impact the differences between the delivery model, these do not have to be considered. In other words, the completeness of the expected costs and risks is less relevant than the completeness over the expected differences between delivery models. Other analyses like the CBA or financial feasibility analysis do require a complete assessment of climate risks and uncertainties.

**Figure 2.8**

**Schematic of how PPP Value Drivers Affect VfM**



**Conducting a VfM Assessment that incorporates climate risk requires understanding:**

- i. Broadly, how does climate risk affect a project’s costs and revenues?
- ii. For PPP projects, how does this climate risk, when filtered through the ‘PPP Value Drivers’, affect a project’s risk adjusted cost and revenues? (see table 2.8.1)

**Table 2.8.1****How considering climate risk can impact value drivers in Value for Money Assessment**

Value driver	How considering climate risk can impact value driver: description	Result	Conditions
Output based contracting (OBC)	OBC leaves room to concessionaire to think about most efficient and effective way to deal with climate risk, e.g. for mitigation measures, disaster response, rebuilding.	Better quality/ lower cost	<ul style="list-style-type: none"> <li>• Transfer of climate risk mitigation responsibility</li> <li>• Sufficient flexibility in design standards to develop optimal climate resilient solutions</li> </ul>
Risk allocation.	Transferring climate risk to concessionaire can be beneficial if concessionaire is better able to manage the risk (e.g. more / more specific experience with that risk and the asset; optimal mix between mitigation and response measures).	Reduced Risk	<ul style="list-style-type: none"> <li>• Define SMART disaster response and climate risk mitigation performance indicators</li> </ul>
Integrated service and lifecycle optimization	Lower cost: Lower life cycle costs due to life cycle integration: e.g. stimulating climate proof design in order to reduce response and repair costs.	Lower Cost	<ul style="list-style-type: none"> <li>• Robust payment mechanism around climate risk performance indicators</li> </ul>
Performance based payment mechanism	Financial incentive can stimulate better climate risk mitigation and preparation as well as quicker and higher quality response and repairs.	Reduced risk/ better quality	<ul style="list-style-type: none"> <li>• Robust payment mechanism around climate risk performance indicators</li> </ul>
Private finance	Reduced risk / better quality: additional pressure from private financiers stimulates good climate risk management and high performance (see above) in order to ensure repayment/ returns.	Reduced risk/ better quality	<ul style="list-style-type: none"> <li>• Ensure continuous knowledge exchange with financial sector</li> <li>• Ensure same climate assumptions</li> </ul>
Transaction costs	Including climate risk potentially requires more data and expertise, additional studies and adjustments to standard documentation, increasing preparation time and budget.	Higher Costs	<ul style="list-style-type: none"> <li>• To reduce negative effect:</li> <li>• Standardization of methods, data and studies.</li> <li>• Build capacity and build learning and expertise network.</li> <li>• Adjust standard documentation with climate risk considerations.</li> </ul>

Value driver	How considering climate risk can impact value driver: description	Result	Conditions
Inflexibility	Long term contractual requirements might need to be changed in time consuming/ costly measure, as climate risk is not yet certain and standards might change.	Higher Costs	To reduce negative effect: <ul style="list-style-type: none"> <li>• Introduce quick contract change mechanisms.</li> <li>• Consider future changes to standards etc. in contractual requirements / output specs.</li> </ul>

## Including Climate Risks in VFM

### Exercise: Guidance

**Method:** Best to conduct in ‘workshop with experts’ – that is, have a discussion with PPP project team, Financial and Technical Advisors, and Climate Change Team to unpack whether climate-resilience related aspects of the proposed PPP structure(s) have any impact on VfM.

**Key Questions:** Were there any climate risk considerations included in the key PPP value drivers? If so, is it expected that these will lead to more value for money of a PPP delivery of the project or less?

## By Value Driver

Value driver	Design & construction	Operation & maintenance	Disaster response
<b>Output-based contracting</b>	<ul style="list-style-type: none"> <li>Do the technical specifications allow and incentivize the bidders to come up with design solutions that better mitigate climate risks?</li> </ul>	<ul style="list-style-type: none"> <li>Do the technical specifications require and incentivize the concessionaire to manage climate risks?</li> </ul>	<ul style="list-style-type: none"> <li>Do the technical specifications allow and incentivize the concessionaire to optimize disaster response?</li> </ul>
<b>Risk allocation</b>	<ul style="list-style-type: none"> <li>Does proposed PPP contract structure require concessionaire to manage all or part of the climate risk?</li> </ul>	<ul style="list-style-type: none"> <li>Does proposed PPP contract require concessionaire to regularly update a climate risk mitigation plan or a disaster response plan?</li> </ul>	<ul style="list-style-type: none"> <li>Does proposed PPP contract require concessionaire to develop and implement a disaster response plan?</li> </ul>
<b>Integrated service and lifecycle optimization</b>	<ul style="list-style-type: none"> <li>Will proposals be evaluated based on the all-inclusive life-cycle costs including the costs of climate risks and disaster response?</li> </ul>		
<b>If applicable: performance-based payment mechanism</b>	<ul style="list-style-type: none"> <li>Will the payment mechanism result in deductions for failure to implement the agreed climate risk mitigation plan?</li> </ul>	<ul style="list-style-type: none"> <li>Will the payment mechanism offer bonuses for achieving certain climate resilience targets or deductions for failure to achieve climate resilience targets?</li> </ul>	<ul style="list-style-type: none"> <li>Will the payment mechanism offer bonuses for achieving certain disaster response targets or deductions for failure to achieve disaster response targets?</li> </ul>
<b>If applicable: private financing</b>	<ul style="list-style-type: none"> <li>Will commercial lenders and insurance providers assess the climate resilience of the proposed design?</li> </ul>	<ul style="list-style-type: none"> <li>Will commercial lenders and insurance providers assess the robustness of climate risk mitigation plans?</li> </ul>	<ul style="list-style-type: none"> <li>Will commercial lenders and insurance providers assess the robustness of disaster response plans?</li> </ul>
<b>Transaction costs</b>	<ul style="list-style-type: none"> <li>Does the Project Team have access to climate risk expertise to help it evaluate climate-related aspects of proposals and projects?</li> <li>Does the Project Team have access to a robust climate data source and standard methodologies for climate risk mitigation and disaster response plans?</li> </ul>		
<b>Inflexibility</b>	<ul style="list-style-type: none"> <li>Does the proposed contract offer flexible mechanisms for instituting changes?</li> <li>Does the proposed contract offer to ensure fair market pricing for changes?</li> </ul>		

# TOOL 2.9

## INCLUDING CLIMATE RISK IN ENVIRONMENTAL IMPACT ASSESSMENT

A comprehensive assessment of environmental issues related to the project helps ensure that these issues are explicitly addressed and incorporated into the decision to proceed with the project as a PPP. They also help ensure that no unmanageable environmental or social obstacles will prevent the project from achieving its goals. This analysis enables project teams to anticipate any issues, avoid them where possible, minimize them or offset them so as to prevent any unnecessary delays in the project schedule.

Most people easily recognize the relevance of climate risk assessment for the environmental impact assessment. Many people however,

think about climate risk exclusively in the context of environmental impact assessment, whereas climate risk assessment is relevant for all analyses. Whereas the environmental impact assessment focuses on the impact that climate risks have on the project's surrounding environment, the financial feasibility analysis examines the impact of climate risks on the project itself and the cost benefit analysis considers both. Integrating climate risk considerations into the EIA process is an emerging practice. This tool provides some high-level guiding questions to help Project Teams go about embedding climate into their EIAs.





### When in PPP process to use

When conducting the Environment and Social Assessments (for projects with medium to high climate risks).



### Expertise Required

Environment and Social expertise; project knowledge; technical knowledge; understanding outputs of project specific climate risk analysis (tools 2.1 a-c).



### Length of time to implement

Depending on availability of data and expertise, from a couple of hours to a couple of days



### Reference Materials

- This Columbia University Law Website provides several resources on integrating climate change considerations into Environmental Impact Assessments.
- This 'Guide to the Integration of Climate Change into the EIA Process' is focused on Caribbean countries and has several good diagrams highlighting how climate assessments can be streamlined into EIA.



### Stakeholders involved

Project Team; Environment and Social Advisors, Climate Team.

## Checklist on Embedding Climate Risks in Environment Impact Assessment

- |   |   |
|---|---|
| <input type="checkbox"/> Does the environmental impact assessment consider the impact of the project on the environment under current climate conditions AND future climate conditions? | <input type="checkbox"/> Does the environmental impact assessment contain suggestions for mitigation measures including the respective change in impact, with and without climate change? |
| <input type="checkbox"/> Are the same climate scenarios applied to the environmental impact assessment as to the technical, financial and economic feasibility assessments?             | <input type="checkbox"/> Has the environmental impact assessment been reviewed by climate risk experts?   |

# 3



# TRANSACTION STAGE TOOLS

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**3.1** Including Climate Resilience in ‘Request for Qualifications’

**3.2** High-Level Decision Framework for Including Climate Resilience in PPP Contracts.

**3.3** Integrating Climate Resilience into PPP Output Specifications.

**3.4** Considerations for Requiring ‘Emergency Preparedness and Response Plan’

**3.5** Embedding Climate Resilience into PPP Evaluation.

**3.6** Sample Language on Requirement to Periodically Update Climate Risk Mitigation Plan.

**3.7** Enforcing Climate Risk Mitigation Plans through Payment Mechanism.

**3.8** Potential for blended financing options.

**3.9** Potential for innovative funding mechanisms.

**3.10** Potential for innovative financing mechanisms Money Assessment.

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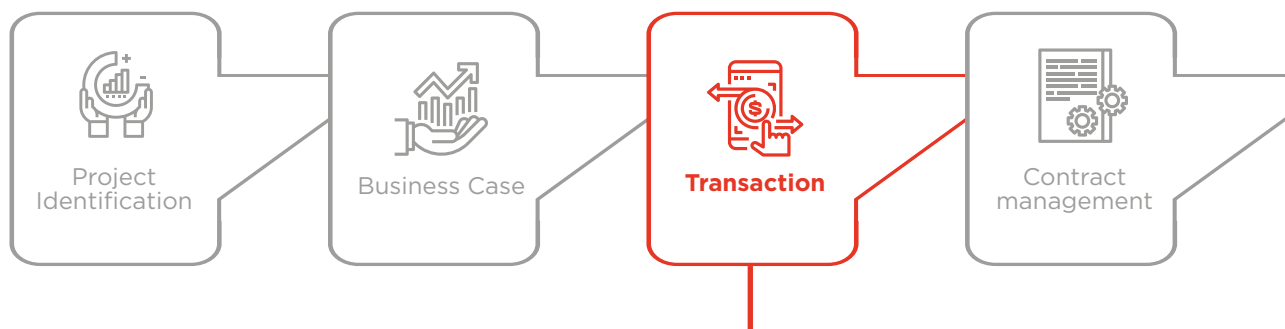
# SECTION 3

## CLIMATE RESILIENCE IN THE PPP TRANSACTION STAGE

During the transaction stage, the government selects the private party that will implement the PPP. This stage builds on the analysis of the ‘business-case stage’ to determine the effective terms of the contract and concludes when the PPP reaches financial close—that is, when the government has selected and signed a contract with a private party, and the private party has secured the necessary financing and can start deploying it in the project.

This stage offers many opportunities for the project team to embed climate resilience considerations. These exist when designing the contract, qualifying bidders, tendering the project, and evaluating 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 building climate resilience measures into the PPP contract and evaluation of bidders, project teams would be wise bear in mind the transaction costs involved—both on the public side (i.e. is there government capacity?) and on the private party side (i.e. is what the government is requesting in terms of climate resilience so burdensome so as to temper private interest?) The following section of this Toolkit provides several possible decision-making tools that PPP project planners and teams can use during the Transaction Stage to ensure that climate resilience is considered.



- |  |   |   |   |
|--|---|---|---|
| <ul style="list-style-type: none"> <li>▶ Climate</li> <li>▶ Resilience</li> <li>▶ Tools</li> </ul> | <p><b>3.1</b> Include climate resilience in ‘request for qualifications’</p> <p><b>3.2</b> high-level decision framework for including climate resilience in ppp contracts.</p> <p><b>3.3</b> integrating climate resilience into ppp output specifications decision framework.</p> | <p><b>3.4</b> Considerations for requiring ‘disaster response plans’.</p> <p><b>3.5</b> Embedding climate resilience into ppp evaluation.</p> <p><b>3.6</b> Sample language on requirement to periodically update climate risk mitigation plan.</p> | <p><b>3.7</b> Enforcing climate risk mitigation plans through payment mechanism.</p> <p><b>3.8</b> Potential for concessional financing options.</p> <p><b>3.9</b> Potential for innovative funding mechanisms.</p> <p><b>3.10</b> potential for innovative financing mechanisms.</p> |
|--|---|---|---|

# TOOL 3.1

## INCLUDING CLIMATE RESILIENCE IN 'REQUEST FOR QUALIFICATIONS'

Most bidding processes set out qualification criteria- this helps ensure that a competent firm, with the appropriate capacity, is selected to manage the project. Often, though not always, this check of the bidding teams' capacity is done in the pre-qualification phase or Request for Qualification (RFQ) Stage, prior to the Request for Proposal (RFP) Stage, also referred to as two-step procurement. This check is intended to avoid wasting the time and effort of bidding teams that are not sufficiently qualified and also helps ensure that the number of bidders is limited to a manageable number as not to overwhelm the government counterpart during the evaluation process.

Generally, pre-qualification requires evaluating bidding teams according to specified pass/fail

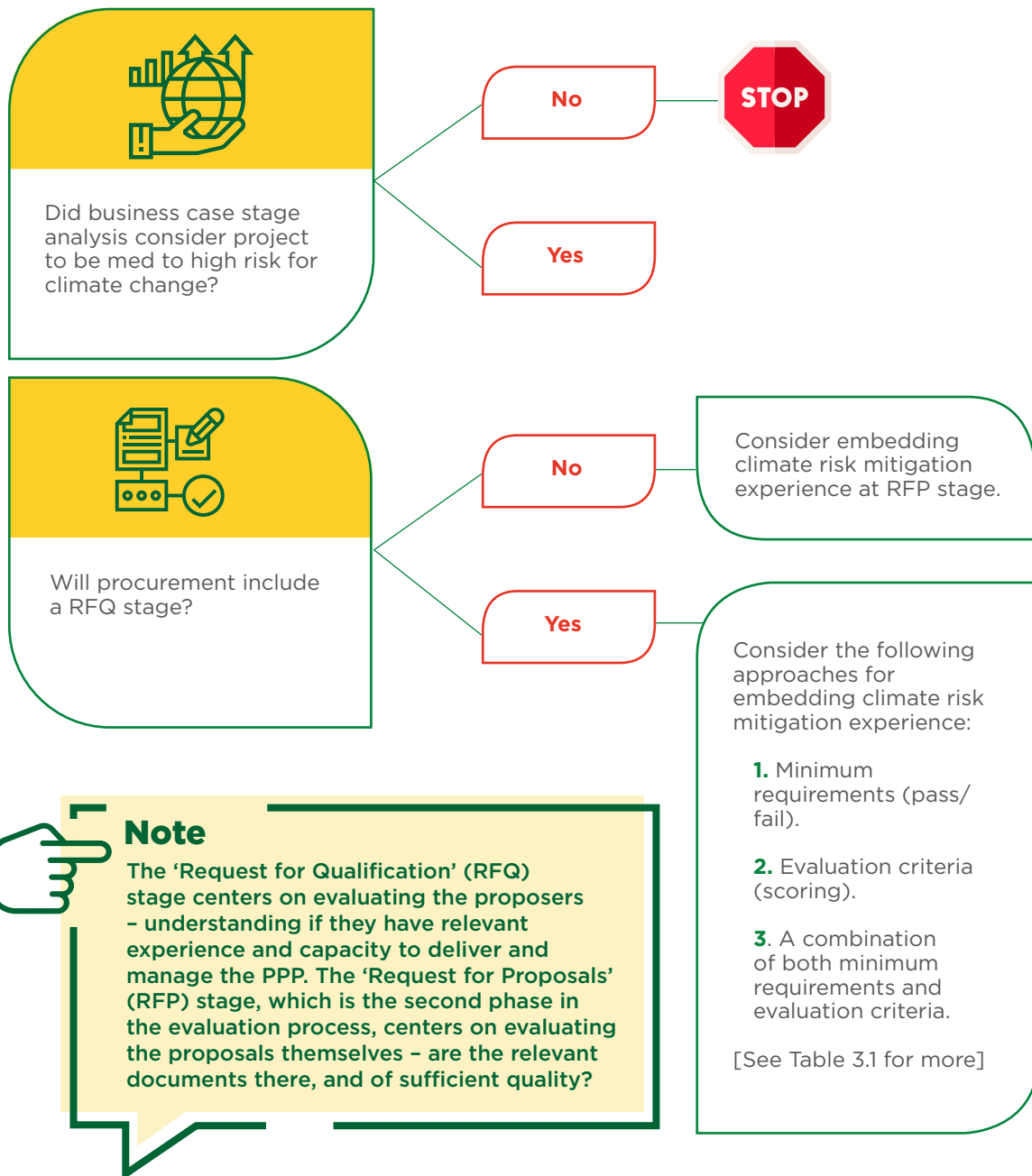
qualification requirements. Only bidding teams that meet the qualification requirements are allowed into the next phase of the PPP procurement. Alternatively, governments can specify qualification criteria, to allow for further shortlisting based on capacity.<sup>17</sup>

The following tool provides guidance on how to consider including climate resilience in the Request for Qualification Stage, in particular as part of the pre-qualification criteria. As during this stage, the goal is to determine whether the competencies of the potential bidding teams are adequate, this tool focuses on how to garner information to understand whether the prospective bidding teams have experience and qualifications with regards to managing climate and disaster risk.

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<sup>17</sup><https://pppknowledgelab.org/guide/sections/68-deciding-the-procurement-strategy>

## Framework: Deciding Whether and How to Embed Climate Resilience in the RFQ



**Table 3.1**

**Approaches for Evaluating Proponent’s Climate Resilience Experience in RfQ Stage**

**Approach 1 minimum requirement**

<b>Requirement</b>	Respondent teams shall demonstrate sufficient experience managing projects with a similar climate risk profile.
<b>Measurement</b>	The evaluation of the qualifications will be based on the submittals received as required by Section [__x__] of this RFQ. Respondent teams shall submit all information in accordance with Section [__x__] of this RFQ. The Government, at its sole discretion, shall have the right to seek clarifications from each of the Respondents.
<b>Submission requirement</b>	<p>Section [__x__]</p> <p>Provide completed submittal form [__y__] for reference projects. Each respondent team member shall identify a maximum of five Reference Projects as and to the extent required to furnish the reference project-related information.</p> <p>Based on the reference projects demonstrated to be most relevant to this subsection, describe the respondent team’s experience and capability with:</p> <ol style="list-style-type: none"> <li>1. ...</li> <li>2. ...</li> <li>3. ...</li> <li>4. Managing projects with a similar climate risk profile;</li> </ol>

**Approach 2 evaluation**

<b>Criterion</b>	<p>When evaluating responsive RFQ submittals, the following selection criteria will be considered with the accompanying weightings used to calculate an overall score:</p> <ol style="list-style-type: none"> <li>1. ...</li> <li>2. ...</li> <li>3. ...</li> <li>4. Extent of past experience with projects with a similar climate risk profile, as well as with the effective mitigation of climate risks in such projects (100 points)</li> <li>5. ...</li> </ol>
<b>Measurement</b>	The evaluation of the qualifications will be based on the submittals received as required by Section [__x__] of this RFQ. Respondent teams shall submit all information in accordance with Section [__x__] of this RFQ. The Government, at its sole discretion, shall have the right to seek clarifications from each of the Respondents.

<b>Submission requirement</b>	<p>Section [__x__] Provide completed submittal form [__y__] for reference projects. Each respondent team member shall identify a maximum of five Reference Projects as and to the extent required to furnish the reference project-related information.</p> <p>Based on the reference projects demonstrated to be most relevant to this subsection, describe the respondent team’s experience and capability with:</p> <ol style="list-style-type: none"> <li>1. ...</li> <li>2....</li> <li>3....</li> <li>4.Managing projects with a similar climate risk profile;</li> <li>5....</li> </ol>
-------------------------------	--

### Approach 3 evaluation and minimum pass grade:

<b>Criterion / minimum score</b>	<p>When evaluating responsive RFQ submittals, the following selection criteria will be considered with the accompanying weightings used to calculate an overall score:</p> <ol style="list-style-type: none"> <li>1. ...</li> <li>2....</li> <li>3....</li> <li>4.Extent of past experience with projects with a similar climate risk profile, as well as with the effective mitigation of climate risks in such projects (100 points)</li> <li>5....</li> </ol> <p>Each RFQ submittal must achieve a score of at least 70% for each individual part of the submittal and associated sub criterion.</p>
<b>Measurement</b>	<p>The evaluation of the qualifications will be based on the submittals received as required by Section [__x__] of this RFQ. Respondent teams shall submit all information in accordance with Section [__x__] of this RFQ. The Government, at its sole discretion, shall have the right to seek clarifications from each of the Respondents.</p>
<b>Submission requirement</b>	<p>Section [__x__] Provide completed submittal form [__y__] for reference projects. Each respondent team member shall identify a maximum of five Reference Projects as and to the extent required to furnish the reference project-related information.</p> <p>Based on the reference projects demonstrated to be most relevant to this subsection, describe the respondent team’s experience and capability with:</p> <ol style="list-style-type: none"> <li>1. ...</li> <li>2....</li> <li>3....</li> <li>4. Managing projects with a similar climate risk profile;</li> <li>5....</li> </ol>



# TOOL 3.2

## HIGH-LEVEL DECISION FRAMEWORK FOR INCLUDING CLIMATE RESILIENCE IN PPP CONTRACTS

For governments, PPPs offer a way to introduce private sector innovation into the provision of public services. This is possible, as PPPs are defined in terms of outputs – the government does not prescribe how the private parties to the PPP project must go about achieving this or that infrastructure asset or related service standard. This feature of the PPP can be useful to governments wishing to develop climate resilient infrastructure assets through PPP. In general, governments have two tools at their disposal: setting the PPP’s minimum requirements to achieve certain climate resilient aims or embedding climate resilient considerations into the evaluation of bidding teams’ proposals. The following framework provides guidance on how to think about the spectrum of how much discretion the Procuring Authority gives to the private sector in meeting climate resilience goals.



### When in PPP process to use

when structuring the PPP contract.



### Length of time to implement

As long as it would take to have a few discussions with key stakeholders.



### Stakeholders involved

Project Team; Enterprise Team; Advisors.



### Expertise Required

Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties



### Reference Materials

For this framework, refer to references under tools 3.2 and 3.3.

**Table 3.2** Approaches for Incorporating climate resilience in RFP stage

	Minimum requirements	Evaluation criteria
<b>When to use</b>	If the Procuring Agency knows what it wants with regards to requirements vis a vis climate resilience, then using some sort of minimum requirements - either used as pass/fail criteria during the procurement or as requirements during the contract management stage - can be a way to achieve this.	If the Procuring Agency would like 1) bidders to differentiate themselves on climate resilience during the procurement and/or 2) the agency wants to confirm that it is comfortable with the approach the bidders are looking to follow.
<b>Required for use</b>	Expertise on the Procuring Agency side to set the minimum requirements.	Capacity on the Procuring Agency side to evaluate the climate resilience proposals put forth by the bidders.
<b>Complementary tools</b>	3.3	3.4 3.5

# TOOL 3.3

## INTEGRATING CLIMATE RESILIENCE INTO PPP OUTPUT SPECIFICATIONS DECISION FRAMEWORK

The PPP contract should clearly specify the ‘outputs’ expected from the private party in terms of the quality and quantity of the assets and services to be provided. This could include defining required maintenance standards for a road, or defining the required service quality and connection expansion targets for utility services provided directly to users. Performance indicators and targets are typically specified in an annex to the main PPP agreement in terms of required outputs (such







as road service quality). The output-based – rather than input-based or prescriptive – nature of specifications enables the bidding teams to be innovative in responding to contract requirements.<sup>18</sup>

The following tool provides a framework and guidance for how to think about developing output specifications to ensure that climate resilience is considered.

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<sup>18</sup><https://pppknowledgelab.org/guide/sections/62-performance-requirements>

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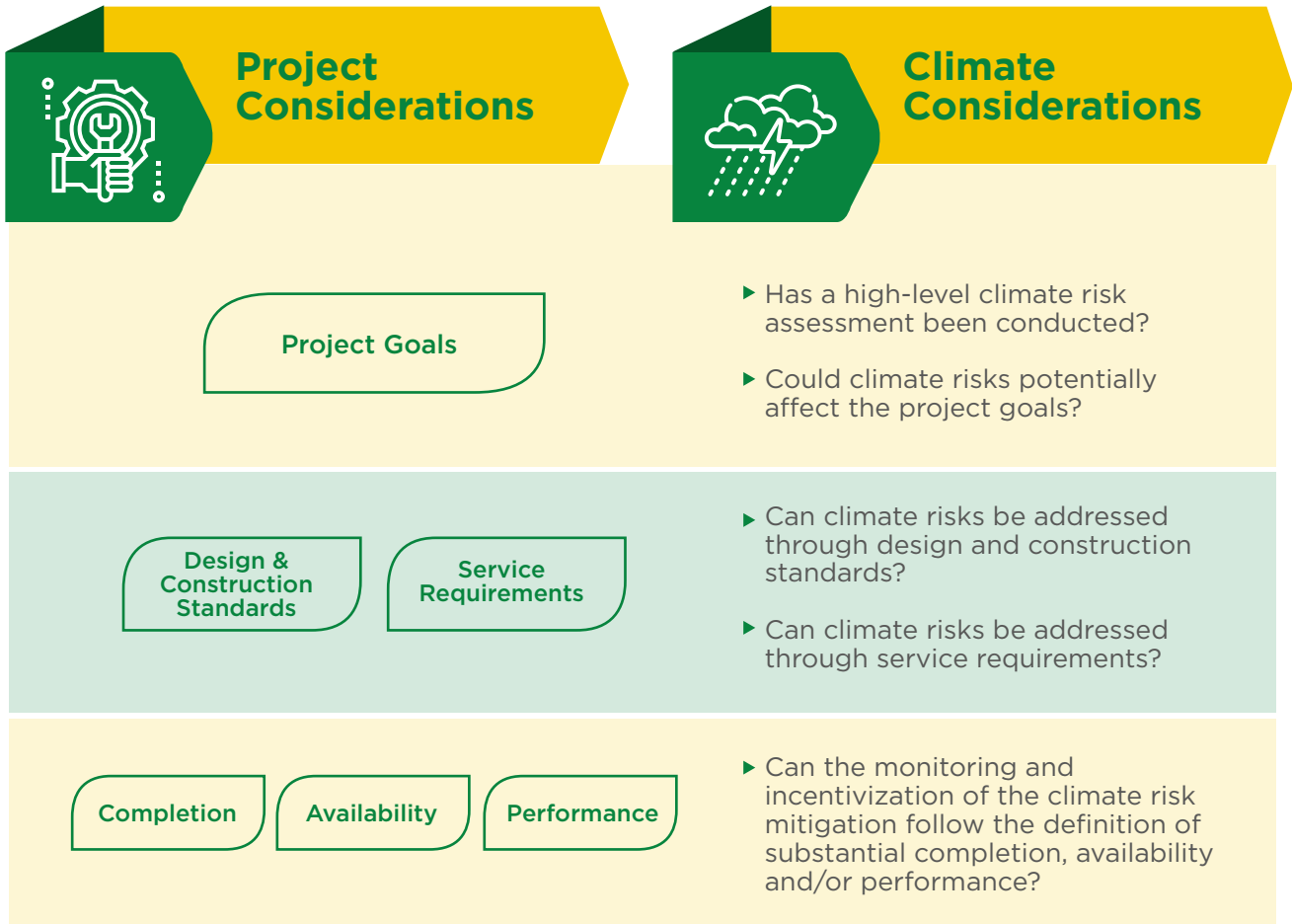
 <p><b>When in PPP process to use</b></p> <p>This high-level decision-making framework is helpful to use when structuring the PPP contract.</p>	 <p><b>Examples</b></p> <ul style="list-style-type: none"> <li>• Example 3.1: Specifications on Emergency Response and Business Continuity, Sendai Astronomical Observatory Project.</li> <li>• Example 3.2: Design Specifications on Seismic Resilience and Emergency Response, Sendai School Meal Supply Center Project (excerpts).</li> </ul>
 <p><b>Length of time to implement</b></p> <p>A few days to a few weeks. Would require conversation and expert judgement to implement.</p>	 <p><b>Reference Materials</b></p> <ul style="list-style-type: none"> <li>• GI Hub Guidance Note on Output Specifications [version for consultations found here: <a href="https://www.gihub.org/news/open-for-consultation-output-specifications-for-quality-infrastructure/">https://www.gihub.org/news/open-for-consultation-output-specifications-for-quality-infrastructure/</a>]</li> <li>• PPP Knowledge Lab “Performance Requirements”</li> <li>• Lam, P.T.I. et al. ‘A Best Practice Framework of Output Specifications for PPP Projects’ [<a href="http://hdl.handle.net/10397/37383">http://hdl.handle.net/10397/37383</a>]</li> </ul>
 <p><b>Stakeholders involved</b></p> <p>Project Team; Enterprise Team; Advisors.</p>	
 <p><b>Expertise Required</b></p> <p>Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement specialties.</p>	

**Table 3.3**

**Framework for Integrating Climate Resilience into PPP Output Specifications**

In a PPP procurement, when the Procuring Agency communicates its requirements to the private sector to invite bids, mechanisms like the negotiation process, the payment mechanism, performance evaluation and output specifications are used as opposed to a set of prescriptive specifications. Designing the output specifications is best done with an understanding of what the Procuring Agency wants, what is required for the infrastructure asset itself, how these requirements link to

the payment mechanism and performance evaluation procedures, and how any changes will be managed. The following framework lays out on the left side, the key aspects PPP project planners need to consider when designing output specifications, while the right side examines how climate resilience considerations could be embedded into this thought process. Table 3.3 on the following page provides further guiding questions.



**Table 3.3** Guiding Questions - Integrating Climate Resilience into Output Specifications

Project Related Questions	
<b>Getting Started</b>	<ul style="list-style-type: none"> <li>• Do climate risks determine the extent to which key project goals will be met? Would climate risks cause the project to potentially have a negative impact on the project surrounding?.</li> <li>• Is the project location particularly subject to climate risk? Can the project location be changed to reduce the climate risk?</li> </ul>
<b>Developing Design &amp; Construction Standards</b>	<ul style="list-style-type: none"> <li>• Are certain standards - use of certain materials or prescriptive design requirements - necessary to effectively mitigate climate risks?</li> <li>• Is there an evaluation process to ensure that these standards are met upon completion of the asset's construction?</li> </ul>
<b>Developing Availability Requirements</b>	<ul style="list-style-type: none"> <li>• Are certain performance requirements associated with climate risk mitigation important enough to be included in the definition of availability (meaning that not meeting these requirements would be qualified as critical and would need to have severe financial implications)?</li> </ul>
<b>Developing Performance Standards</b>	<ul style="list-style-type: none"> <li>• Is there a need for any less critical performance requirements?</li> <li>• Is there a way to make the performance dynamically follow changing climate risks over the life of the contract, for example by requiring the development and periodic update of 1) a disaster response plan and 2) a maintenance plan that addresses climate risks?</li> </ul>

**Checklist: Integrating Climate Resilience into Output Specifications**

Climate resilience checks	
<input type="checkbox"/>	Have output specifications integrated the findings of any project-related climate resilience assessments?
<input type="checkbox"/>	Have output specifications been reviewed by climate risk experts in addition to those with legal, procurement and engineering expertise?
Output specification checks	
<input type="checkbox"/>	Do output specifications state the requirement of the specification completely, clearly, concisely, logically, and unambiguously?
<input type="checkbox"/>	Do output specifications contain enough information for potential bidders to decide and cost how they will achieve the specifications?
<input type="checkbox"/>	Do output specifications contain only the essential features or characteristics of the requirements?

**Table 3.3****Developing 'SMART' Output Specifications<sup>19</sup>**

	SMART	Not-SMART
<b>Specific</b>	Refurbish or replace all dwellings on the estate to comply with the government's "decent homes" standard.	Refurbish dwellings to a good standard.
<b>Measurable</b>	Ensure that all dwellings are structurally sound, with adequate ventilation, lighting, and thermal comfort.	Ensure that all dwellings are fit for habitation.
<b>Achievable</b>	Maintain internal temperature at X degrees when outside temperature is between Y and Z degrees.	Ensure that internal temperature is always maintained at X degrees.
<b>Realistic</b>	Ensure that faults with the temperature control system are rectified within eight hours during business hours and 16 hours outside of business hours.	Ensure that faults with the temperature system are repaired within two hours.
<b>Timely</b>	Maintain a log of faults and report every month.	Provide an annual report on performance.

<sup>19</sup>Torres De Mastle, Clemencia; Encinas, Javier; Farquharson, Edward; Yescombe, Edward Raymond. 2011. How to engage with the private sector in public-private partnerships in emerging markets (English). Washington, D.C. : World Bank Group. <http://documents.worldbank.org/curated/en/995241468337913618/How-to-engage-with-the-private-sector-in-public-private-partnerships-in-emerging-markets>

### Example 3.1 / Specifications on Emergency Response and Business Continuity, Sendai, Japan<sup>20</sup>

#### Operation Level Requirements (extracted)

##### Security service level requirements

- In the event of an emergency such as an occurrence of an accident, crime, and disaster, the policy and the person in charge at the municipality will be notified.
- In the event of an earthquake or a disaster caused by wind and floods while security services are being provided by automated alert when the observatory is closed or at night, or in the event that such a situation is likely to occur, the staff in charge will

immediately hasten to the scene, verify the situation and take initial measures.

#### Development and Maintenance Level Requirements (extracted)

##### Information systems: display-type information service system

- A system should be established where information can be continuously displayed by installing equipment that can supply electricity for a certain period, even during emergencies such as disasters.

### Example 3.2 / Design Specifications on Seismic Resilience and Emergency Response, Sendai School Meal Supply Project<sup>21</sup>

#### Design Level Requirements

##### Basic requirements for safety

- Regarding resistance to flood, wind, snow, cold, and lightning, the necessary functions should be secured in compliance with the 'Standards for Basic Functions of Government Facilities'.

##### Basic requirements for structural planning

(B) Required Functions: Facilities with required functions shall have the following levels or higher. Levels of items that are not stated below shall be at the same level as the 'Standards for Basic Functions of Government Facilities'

1. Seismic and structural safety of facilities shall be classified as Class II in the

Standards for General Seismic Plans of Government Facilities

2. Seismic safety performance of nonstructural components at facilities shall be classified as Class A in the Standards for General Seismic Plans of Government Facilities.
3. Seismic measures for facilities shall be Class Otsu in the Standards for General Seismic Plans of Government Facilities. In considerations of their disaster prevention abilities, water tanks, heat source equipment, power source equipment and anti-disaster facilities are all characterized as important equipment

<sup>20</sup>Original Source: Contract documents, Sendai Astronomical Observatory Project; Example taken from: Resilient Infrastructure Public-Private Partnerships (PPPs): Contracts and Procurement. The Case of Japan. World Bank. 2017.

<sup>21</sup>Source: Resilient Infrastructure Public-Private Partnerships (PPPs): Contracts and Procurement. The Case of Japan. World Bank. 2017



# TOOL 3.4

## CONSIDERATIONS FOR REQUIRING 'EMERGENCY PREPAREDNESS AND RESPONSE PLAN'

A project-related emergency preparedness and response plan (EPR plan) can help manage the impacts of the occurrence risks, which were unable to be transferred or mitigated. This type of risk, for example the destruction inevitable in the wake of a Category 5 hurricane, is best managed through an EPR plan. When accepting bids for

an infrastructure PPP project, the government may want to request bidders to develop, or jointly-develop with the government, an EPR as a way to ensure that there is some forethought on how to manage the possible eventuality of such a risk. This tool provides sample language that decision makers can use in requesting bidders to provide such plans.



### When in PPP process to use

When structuring the PPP contract.



### Length of time to implement

as long as it would take to have a few discussions with key stakeholders.



### Stakeholders involved

Project Team; Enterprise Team; Advisors; Bidders; Climate Change Team.



### Expertise Required

Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties; outputs of Business Case Stage Analysis; 'Disaster-Response' and Climate Change expertise.



### Examples

- The following provides an example of an emergency response template for an airport: [http://www.airtap.umn.edu/publications/factsheets/documents/emergency\\_manual\\_template.pdf](http://www.airtap.umn.edu/publications/factsheets/documents/emergency_manual_template.pdf).

Option	Description	Pros	Cons	When to use	Draft RFP language	Draft ppp agreement language
<b>1. Before procurement</b>	Government develops ERP plan and prescribes it to bidders.	<ul style="list-style-type: none"> <li>• Simple approach.</li> <li>• Uniformity of disaster response plans.</li> <li>• Low transaction costs.</li> </ul>	<ul style="list-style-type: none"> <li>• No creative contributions from bidders.</li> </ul>	<ul style="list-style-type: none"> <li>• Government has strong ERP plan.</li> <li>• Government wants uniformity of ERP plans.</li> <li>• Government does not want / need bidders to differentiate themselves on the development of ERP plans.</li> </ul>	N/A	<p>The Developer shall implement the ERP Plan as per Appendix [__x__].</p> <p>Appendix [__x__] is developed by the Government.</p>
<b>2. During procurement</b>	Government invites bidders to develop ERP plans and evaluates them.	<ul style="list-style-type: none"> <li>• Leverage private sector expertise and creativity.</li> </ul>	<ul style="list-style-type: none"> <li>• High transaction costs, both for public and private sector.</li> </ul>	<ul style="list-style-type: none"> <li>• Government believes that private sector can offer significant creativity.</li> <li>• Government wants bidders to differentiate themselves on the development.</li> </ul>	As per below.	<p>The Developer shall implement the ERP Plan as per Appendix [__x__].</p>
<b>3. After procurement</b>	Government requires bidders to develop an ERP plan after the selection of the preferred bidder.	<ul style="list-style-type: none"> <li>• Leverage private sector expertise and creativity.</li> <li>• No additional transaction costs.</li> </ul>	<ul style="list-style-type: none"> <li>• No certainty about an ERP plan at the selection of the preferred bidder.</li> </ul>	<ul style="list-style-type: none"> <li>• Government has strong ERP plan.</li> <li>• Government does not need bidders to differentiate themselves on the development of disaster response plans.</li> </ul>	N/A	<p>Prior to the Effective Date the Grantor and the Developer will jointly develop an ERP plan as per Clause [__x__].</p> <p>OR</p> <p>Within calendar 45 days of the Effective Date, the Developer shall provide for the Grantor’s review and approval, which shall be neither unreasonably nor arbitrarily withheld, an ERP plan as per Clause [__x__].</p>

## Sample Language for the ‘Request for Proposals’ to include Disaster Response Plans

**Draft language for the main RFP document:** Each Bidder is required to provide a complete Business Plan / Technical Proposal / Project Management Plan, including, but not limited to, the requested contents detailed in Schedule [\_\_x\_\_].

Draft table for schedule [\_\_x\_\_] to the RFP document listing all components to be included Business Plan / Technical Proposal / Project Management Plan, including the disaster response plan:

Component	Description
...	...
...	...
...	...
<b>Disaster Response Plan</b>	Demonstrate an effective disaster response approach that: <ul style="list-style-type: none"> <li>• Builds on and is in accordance with the Office of Disaster Preparedness and Emergency Management plans, more specifically [__x__] and [__y__];</li> <li>• Distinguishes between the construction phase and the operational phase; and</li> <li>• Focuses on the climate risks that were identified as “high” and “medium” in [__] the climate risk assessment dated [__z__] carried out by the Government [__].</li> </ul>
...	...

## Sample Language for the PPP Agreement

Prior to the Effective Date the Grantor and the Developer will jointly develop a disaster response plan as per Clause [\_\_x\_\_].

OR

Within calendar 45 days of the Effective Date, the Developer shall provide for the Grantor’s review and approval, which shall be neither unreasonably nor arbitrarily withheld, a disaster response plan as per Clause [\_\_x\_\_].

# TOOL 3.5

## EMBEDDING CLIMATE RESILIENCE INTO PPP EVALUATION

PPP proposals are evaluated in accordance with the criteria set out in the Request for Proposals (RFP). As presented in Tool 3.2

encouraging climate resilience actions through evaluation lends more discretion to the private party to the PPP in designing the solution.



### When in PPP process to use

When structuring the PPP contract.



### Length of time to implement

As long as it would take to have a few discussions with key stakeholders.



### Stakeholders involved

Project Team; Enterprise Team; Advisors.



### Expertise Required

Understanding of government processes; Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties.



### Examples:

For this tool, please see the 'mock' examples provided for guidance on how this could be implemented in practice. Also, see the 'Sofia Airport Tender Documentation' - Bidders were required to submit an environmental and social program, which should include bidder's approach to the increase of the airport's use and production of renewable energy. Doing so can earn them extra points during evaluation.



### Reference Materials

Refer to references under tools 3.2 and 3.3.

## Key Questions




Is evaluation based on best value or lowest price?

- Lowest Price
- Best Value

**Note**

If government expects the private sector to be able to creatively contribute to meeting the project goals, then it is probably wise to evaluate proposals based on best value.




Is climate resilience important enough to be embedded in evaluation criteria?

- No
- Yes

**Note**

If climate risk is a serious issue for the project and government expects private sector to be able to creatively contribute to effective climate risk mitigation, then it is probably wise to incorporate climate resilience in the evaluation criteria.



Would climate resilience be a separate criteria or a sub-criteria?

- Separate Criteria
- Sub-Criteria

**Note**

If climate risk is extremely important, it may be justified to apply this as a separate evaluation criterion. In all other cases, the inclusion of climate resilience as one of the considerations in the sub-criteria will suffice.

## Example of Climate Resilience as a Separate Criterion

When requesting PPP project proposals in the 'Request for Proposals' (RFP), the Procuring Authority will list all necessary submission requirements (what documents are needed and in what format) as well as how the contents of the bid will be evaluated. Every criterion used to evaluate a bid will be explained in the RFP, providing bidders with an understanding of what parts of their

proposals will be evaluated and considered for scoring and what is needed to comply. In the evaluation process, it is possible for the government to evaluate project proposals based in part on the quality of their climate or disaster risk mitigation plans.<sup>22</sup> This table shows sample evaluation criteria, where climate resilience is listed as a **separate** criterion.

				Weighting
<b>Price</b>	<b>50%</b>	<b>e.g. payment amount</b>		<b>50</b>
<b>Technical</b>	20%	<b>Construction</b>	Quality and reliability of project design	8.5
			Flexibility of construction term	6.0
			Quality of assurance methods proposed	4.0
			Etc	15
	10%	<b>Operations</b>	Quality + reliability of operating procedures and manuals.	4.5
			Commitment of means	3.0
			Etc.	2.5
	10%		Quality of proposed maintenance methodology.	10
			Etc.	
	5%	<b>Environment, social</b>	Thoroughness of ESMP.	5
			Etc.	
	5%	<b>Climate resilience</b>	Quality and realism of climate risk mitigation plan.	5
Etc.				
				Σ100

All evaluation criteria are reflected in the submission requirements for the project. Here is sample language as to how climate change could be reflected.

<sup>22</sup>For more information on RFPs, please see: <https://ppp-certification.com/ppp-certification-guide/8-structuring-and-drafting-request-proposals-defining-proposal-requirements>



The proponent will provide a climate risk mitigation plan, which at a minimum, details a proposed mitigation response to all the 'critical' climate risks identified by the Government of [xx] during the project's screening phase. Proponent may wish to provide varying responses according to different climate scenarios.

All evaluation criteria are reflected in the submission requirements for the project. Here is sample language as to how climate change could be reflected.

## Example of Climate Resilience as a Sub-Criteria


Another way to evaluate proponents' proposals for their climate risk management consideration is by requiring proponents to discuss climate resilience in the various other technical reports required as part of the RFP package. This means that the parts of the submission that cover the construction, operations and maintenance plans would

include discussion of climate resilience and how the proponent aims to address it. Submission requirements will clearly state what is expected in each of these reports and how it will be scored. The following shows indicative evaluation criteria, where climate resilience is a **sub-criterion**.


			Weighting	
<b>Price</b>	<b>50%</b>	<b>e.g. payment amount</b>	<b>50</b>	
<b>Technical</b>	20%	<b>Construcción</b>	Quality and reliability of project design.	8.5
			Flexibility of construction term.	6.0
			Quality of assurance methods proposed.	4.0
			Etc	1.5
	15%	<b>Operations</b>	Quality and reliability of operating procedures and manuals; <i>evidence that procedures reflect consideration of climate related disruptions.</i>	4.5
			Commitment of means.	3.0
			Etc.	2.5
	10%	<b>Maintenance</b>	Quality and flexibility of proposed maintenance methodology; <i>responsiveness to occurrence of climate hazards.</i>	10
			Etc.	
5%	<b>Environment, social</b>	Thoroughness of ESMP, <i>evidence that climate change considerations are reflected in plan.</i>	5	
			Σ 100	

When included as a sub-criterion, RFP should clearly state that various technical reports – e.g, O&M, Design – require discussion of climate resilience and how that will be evaluated.


## Sample RFP language



e.g., “The proponent’s ‘design functionality report’ shall address flexibility of the project to adapt to increased hazards associated with climate change.”



e.g., “The proponent’s operations and maintenance plan shall include how ceases in operations due to climate change hazards (e.g. hurricanes) will be addressed. It shall also include a proposed maintenance methodology, which takes into consideration climate change.”



e.g., “The proponent’s ‘Environment and Social Management Plan’ shall include discussion of how the plan will respond in the event of a climate hazard that affects the project area.”



# TOOL 3.6

## SAMPLE LANGUAGE ON REQUIREMENT TO PERIODICALLY UPDATE CLIMATE RISK MITIGATION PLAN

If the procuring authority decides to require a Climate Risk Mitigation Plan as part of the bid submissions it may want to have the bidders update these plans periodically to take into account latest, most up to date climate data.

In drafting the PPP contract, the procuring authority could thus include a requirement that the private party submit a new 'Climate Risk Mitigation Plan' every 3-5 years.



### When in PPP process to use

Use when structuring the PPP contract.



### Stakeholders involved

Project Team; Enterprise Team; Advisors; Climate Change Team.



### Length of time to implement

As long as it would take to have a few discussions with key stakeholders.



### Reference Materials

Climate Risks and Resilience in Infrastructure PPPs: Issues to be Considered, PPIAF, March 2016 [file:///Users/home/Downloads/PPIAF\_ClimateResilience\_IssueBrief.pdf]

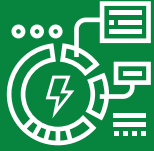


### Expertise Required

Understanding of government processes; Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties.

Model Terms of Reference for a Climate Risk Assessment, EU, 2017 [<https://europa.eu/capacity4dev/public-environment-climate/documents/model-terms-reference-climate-risk-assessment>]

## Sample language to include requirement for periodically updated climate risk mitigation plans as part of PPP agreement



### ***Include in the PPP Contract:***


*Every [insert #, or range of #s] years the private party is required to update its Climate Risk Mitigation Plan, such that it takes into account the most up to date climate data available for the project area.*

# TOOL 3.7

## ENFORCING CLIMATE RESILIENCE THROUGH THE PPP PAYMENT MECHANISM






The PPP's payment mechanism defines how the private party will be remunerated. Providing bonuses or penalties to the payment, serves as an important lever to incentivize certain actions like promoting climate resilience by the private party and efficient risk allocation in the contract. The basic elements of PPP payment mechanisms can include user charges, government payments, and/or bonuses, penalties or fines.<sup>23</sup>

A PPP payment mechanism could include some or all of these elements, which should be fully defined in the contract—including specifying the timing and mechanism for making the payments in practice. The following tool provides guidance on how the payment mechanism can help incentivize the private sector partner to manage the climate risk associated with the project.

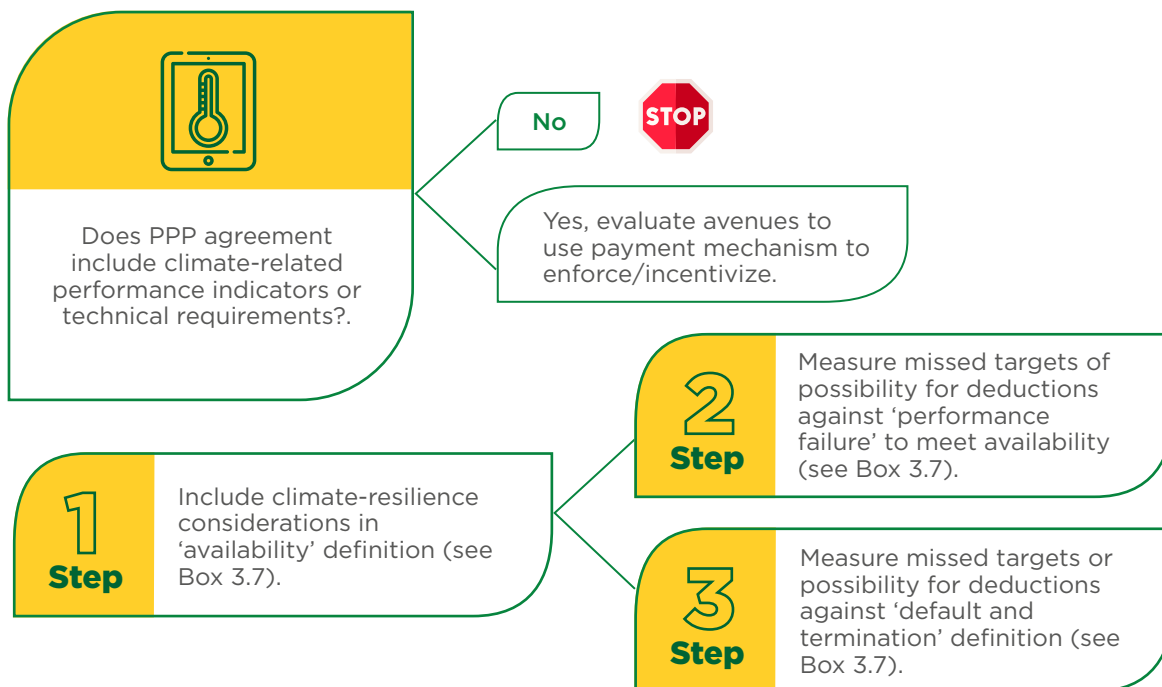


For PPPs to work, they require three things: clear output and performance specifications, strong incentive structures, and robust monitoring. Including climate change as part of the specifications is discussed in Tool 3.3, and this Tool 3.7, discusses payment, which is a key incentive lever. This tool highlights how it can be used to encourage the private party to build more climate resilience actions into project. However, clear specifications and incentive systems are not enough – there needs to be an effective monitoring system in place. To do this, governments often hire an 'Independent Engineer' to monitor the private party's actions. The government party to the PPP could consider including in the Independent Engineer's scope of work a requirement to monitor the private party's climate related objectives.

<sup>23</sup><https://pppknowledgelab.org/guide/sections/63-payment-mechanism>

 <p><b>When in PPP process to use</b></p> <p>Use when structuring the PPP contract.</p>	 <p><b>Stakeholders involved</b></p> <p>Project Team; Enterprise Team; Advisors.</p>
 <p><b>Length of time to implement</b></p> <p>As long as it would take to have a few discussions with key stakeholders.</p>	 <p><b>Reference Materials</b></p> <ul style="list-style-type: none"> <li>• ‘Revenue Regime and Payment Mechanism’: <a href="https://ppp-certification.com/ppp-certification-guide/51-revenue-regime-and-payment-mechanism">https://ppp-certification.com/ppp-certification-guide/51-revenue-regime-and-payment-mechanism</a></li> <li>• ‘Payment Mechanism’: <a href="https://pppknowledgelab.org/guide/sections/63-payment-mechanism">https://pppknowledgelab.org/guide/sections/63-payment-mechanism</a></li> </ul>
 <p><b>Expertise Required</b></p> <p>Understanding of government processes; Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties.</p>	

## Checklist: Questions to Ask when considering using payment mechanism to enforce/incentivize climate resilience



# Box 3.7

## AVENUES FOR USING PPP AGREEMENT'S 'PAYMENT-MECHANISM' TO ENFORCE OR INCENTIVIZE CLIMATE RESILIENCE AIMS

### 1 / *Including critical performance standards in the definition of 'availability'*

The PPP agreement should clearly specify what is expected from the developer 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 agreement.

Climate resilient related KPIs could pertain to resilient design and construction standards or facility management standards (something examined in Tool 3.2b) as well as requirements to update climate risk mitigation or disaster response plans.

When 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 arrangement, 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 generally based on two criteria: i) whether the asset is physically available for use and ii) the condition criteria. Climate resilience considerations could be included in the 'condition-criteria' aspect of the 'availability' definition.

### 2 / *Using Performance Failure Definition to Apply Payment Deductions*

The PPP agreement could include climate-resilience considerations in its definition of

what constitutes as a 'performance-failure', and these failures could be linked to specific payment penalties, executed through the payment mechanism. Sample 'performance failures' related to climate resilience could include:

*Failure to develop, submit, implement and update throughout the PPP agreement term, all management plans as per 'Section X' of the PPP agreement. These include the Start-up Plan, Life-Cycle Plan, Environmental Management Plan, Energy Management Plan, Crisis Management Plan, Climate Risk Mitigation Plan, and Disaster Response Plan.*

### 3 / *Using Default and Termination Procedures*

The definition of Developer Default typically includes persistent breach of any obligation in the PPP agreement, and therefore "automatically" includes reference to climate resilient minimum requirements and the climate risk mitigation plan included as an annex. The occurrence of such "persistent breach" triggers a procedure in which the Developer is allowed to cure the breach within an agreed upon time period or the PPP agreement will be terminated.

# TOOL 3.8

## POTENTIAL FOR BLENDED FINANCING OPTIONS

Concessional Finance refers to any financial instrument provided on terms, and/or conditions that are more favorable than those provided by the market. This could mean that the interest rates charged on the financing are lower or that the instrument carries performance-based incentives. More favorable terms on concessional financing often include subordination, longer tenors, or back-weighted repayment profiles, not often acceptable to commercial financial institutions. Concessional financing can also help improve liquidity in markets— concessional finance tools like guarantees can help reduce a project's risk to a level acceptable to commercial lenders, thereby increasing the project's access to finance.

'Blended-finance' refers to the targeted use of concessional financing for high-impact

projects where actual or perceived risks are too high for commercial lenders to enter on their own. This type of finance is increasingly used to help spur investment in projects with climate resilience impacts. The landscape of this type of financing is evolving and what is available depends on the project's characteristics, such as its geography, sector, etc. While the search and preparation costs associated with accessing some of this concessional financing may not always make sense, especially for small projects, as a rule, for larger projects it is worth exploring options.

The following tool provides a brief overview of the concept of concessional finance, factors providers of such financing will consider, as well as a list of possible concessional finance sources for climate resilient projects.



### When in PPP process to use

Use when structuring the PPP contract.



### Length of time to implement

As long as it would take to have a few discussions with key stakeholders.



### Stakeholders involved

Project Team; Enterprise Team; Advisors.



### Expertise Required

Understanding of government processes; Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties.



### Examples

See Example 3.8: 'IDB Invest's' Blended Finance Support to a Hydroelectrical Power Plant in Equador'.



### Reference Materials

- The 'Blended Finance Task Force' has several working papers on the topic of blended finance: <https://www.blendedfinance.earth/working-papers>.
- The IFC's Environmental and Social Performance Standards apply to most if not all concessional financing options.
- See IDB Invest's Page on Blended Finance for information and resources: <https://idbinvest.org/en/solutions/blended-finance>
- See the Green Climate Fund's 101 Guide

## Figure 3.8

## Principles for Applying Blended Finance

When institutions that provide concessional financing—Multilateral Development Banks (MDBs) or Development Finance Institutions (DFIs)—evaluate whether a project is worthy of concessional finance or not, they rely on five key principles (found below). Chief among these is to determine whether the presence of concessional finance enables the project to proceed. There are several modalities for

determining this 'additionality' and the various providers of concessional finance have their own methods.<sup>24</sup> There are several examples of 'blended-finance' being used for climate change aims – either as a way to promote the use of a new and innovative technology or to promote innovative adaptive measures (as highlighted in Example 3.8 below).

<sup>24</sup>See 'DFI Blended Finance Report 2018: Annex 3 – Measurement of Concessionality': [file:///Users/home/Downloads/DFI%20Blended%20Finance%20Report%20OCT%202018%20\(External\)%20%20%20%20\(FINAL\).pdf](file:///Users/home/Downloads/DFI%20Blended%20Finance%20Report%20OCT%202018%20(External)%20%20%20%20(FINAL).pdf)

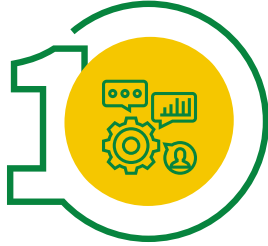
1	Additionality	Meaning: the project would not proceed without the presence of concessional finance.
2	Minimum concessionality	Meaning: concessional finance provided is not more than is needed to induce commercial finance.
3	Crowding-in	Meaning: project using concessional finance seeks to 'crowd-in' commercial finance.
4	Commercial sustainability	Meaning: structure project such that in the future concessional finance not needed.
5	Governance	Meaning: ensure there is adequate capacity for oversight of concessional finance within project teams.

## Modes for Applying Blended Finance to Climate Resilient PPPs

There are three main ways that concessional financing can be used towards climate resilient

PPPs. These possible modalities are discussed below.



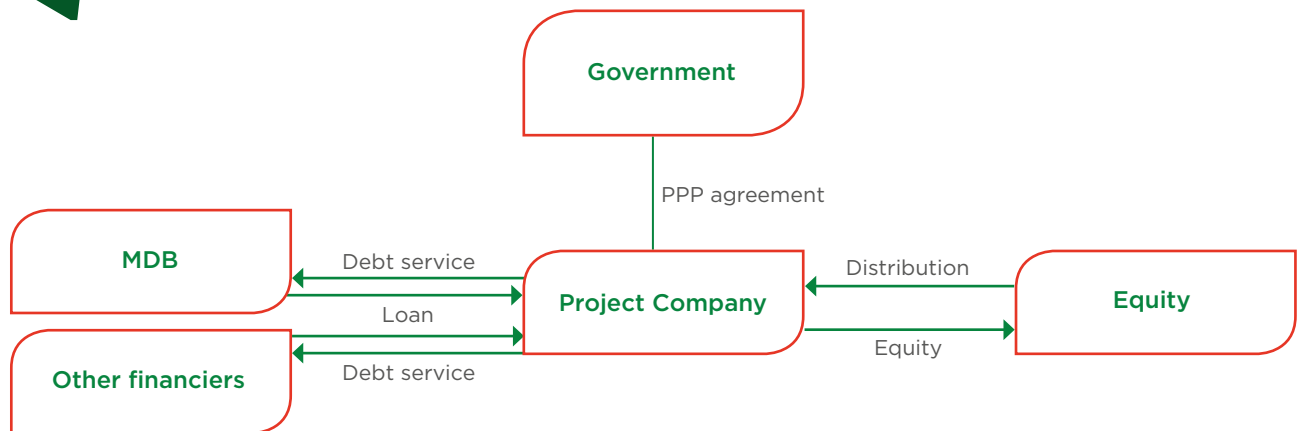


## Multilateral development bank provides concessional lending to PPP project company

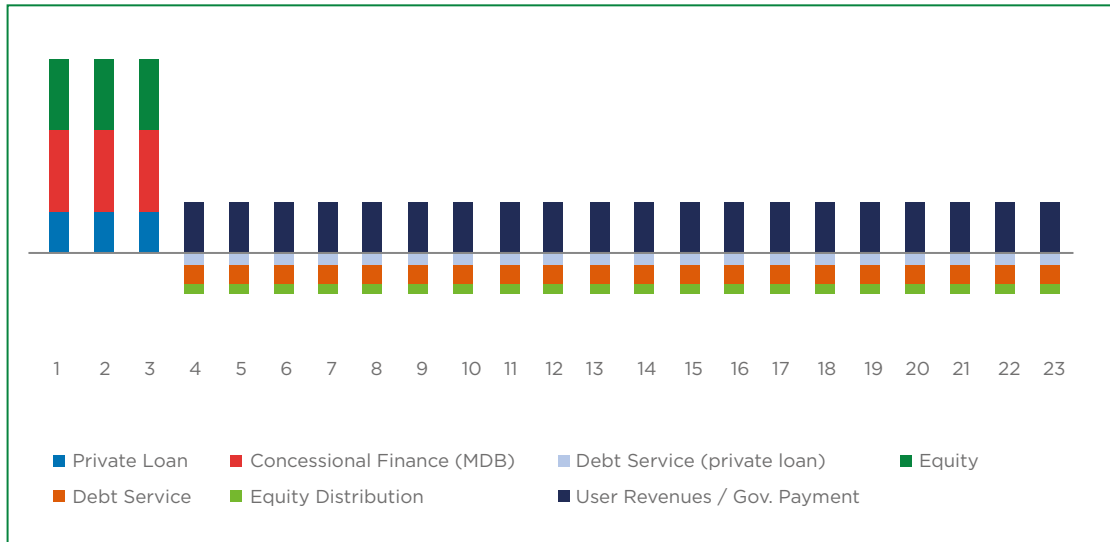
In this structure the investment arm of a Multilateral Development Bank – like ‘IDB Invest’ or IFC or of a bilateral development financial institution like the Netherland’s FMO or France’s Proparco, with the mandate to lend to private firms, will provide some form

of concessional finance to the PPP project company. To protect the level playing field and keep the PPP transaction transparent it is recommended to communicate a standard term sheet with all bidders.

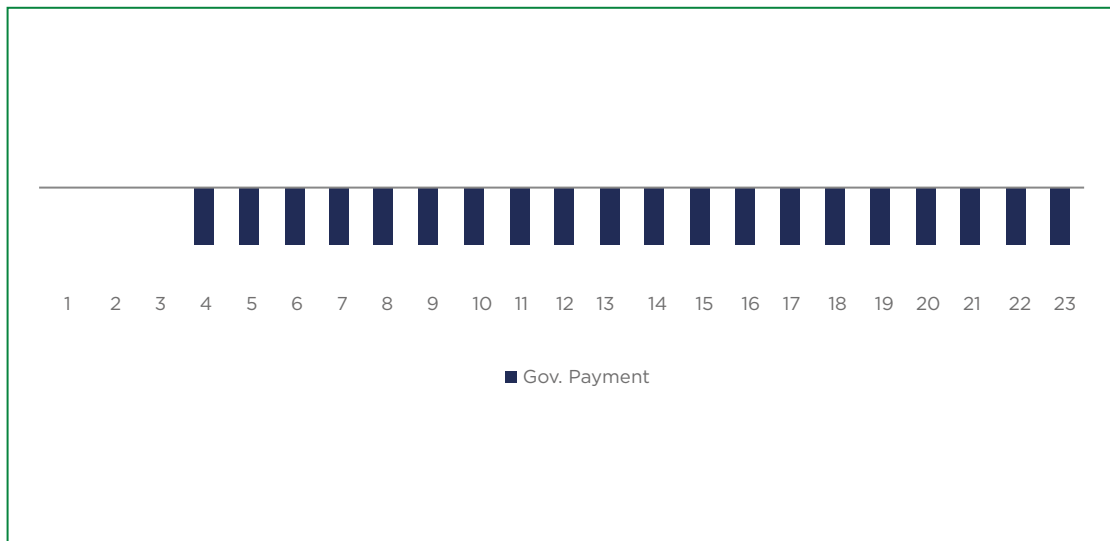
### Schematic of the PPP Structure



## Schematic of Concessionaire Cash Flows



## Schematic of Government Cash Flows



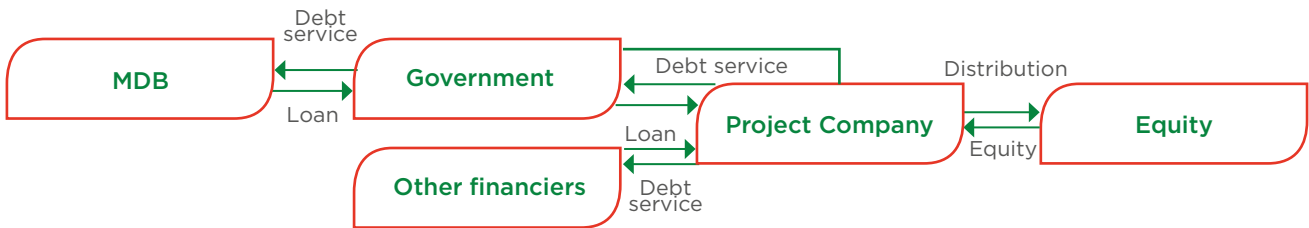


## Government ‘On-Lends’ to PPP project company

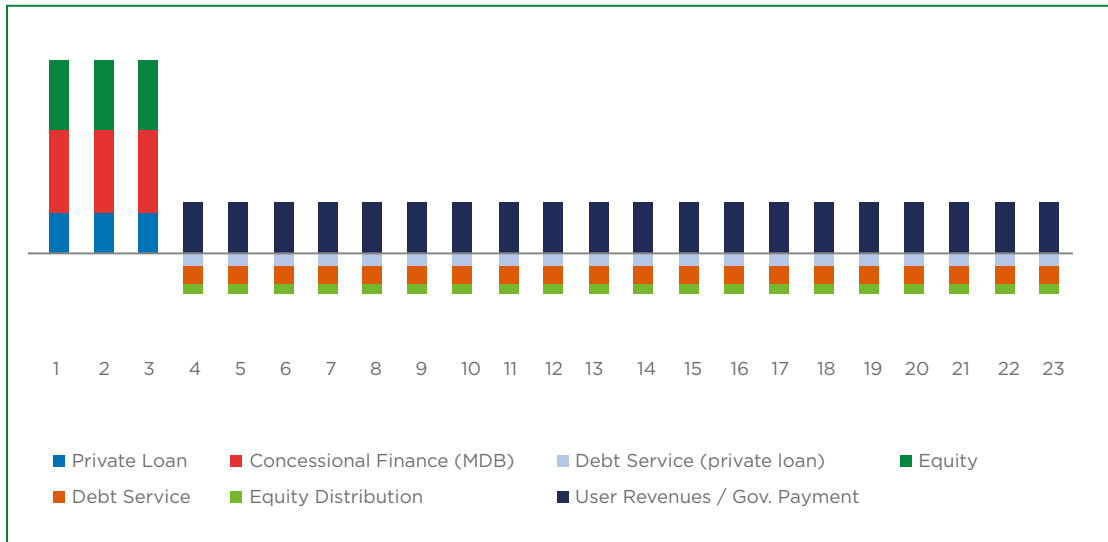
In this structure the host government will provide a concessional loan to the PPP project company - the loan can be used to help pay for capital investment costs or operational

costs. To protect the level playing field and keep the PPP transaction transparent it is recommended to communicate a standard term sheet with all bidders.

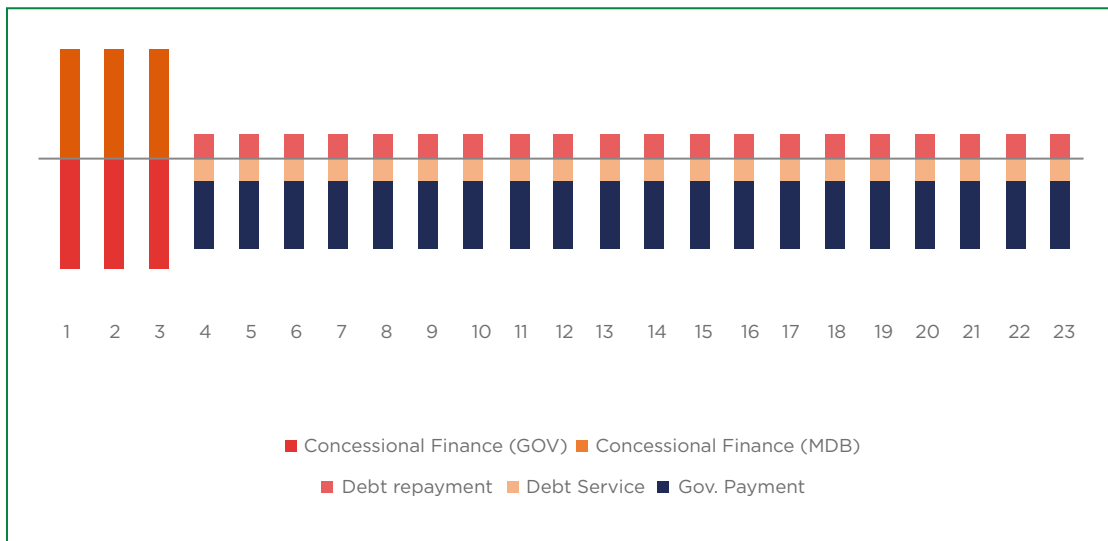
### Schematic of the PPP Structure



## Schematic of Concessionaire Cash Flows



## Schematic of Government Cash Flows



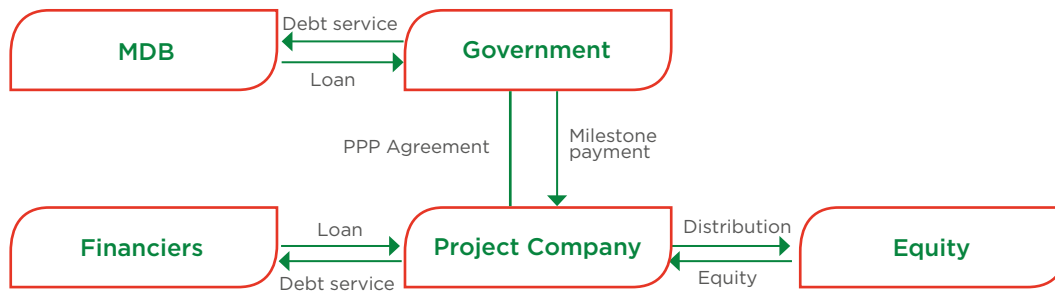


## Government attracts sovereign loans for milestone payments

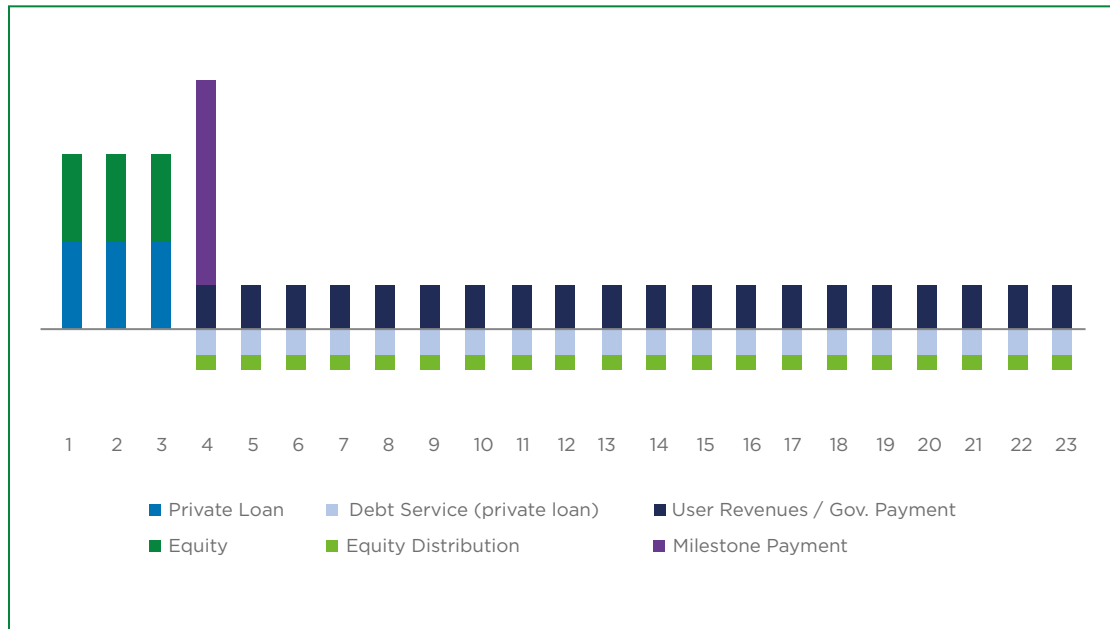
In this structure the host government will provide an up-front payment at ‘substantial completion’ of a certain project milestone – e.g. construction completion. When the government has committed to making a milestone payment, though is unable to fund this from its capital budget, the government

will take out public financing to pay for this milestone payment. The combination of a publicly financed milestone payment, with the remainder of the project privately financed (secured by user revenues or spread out government payments) is a form of blending.

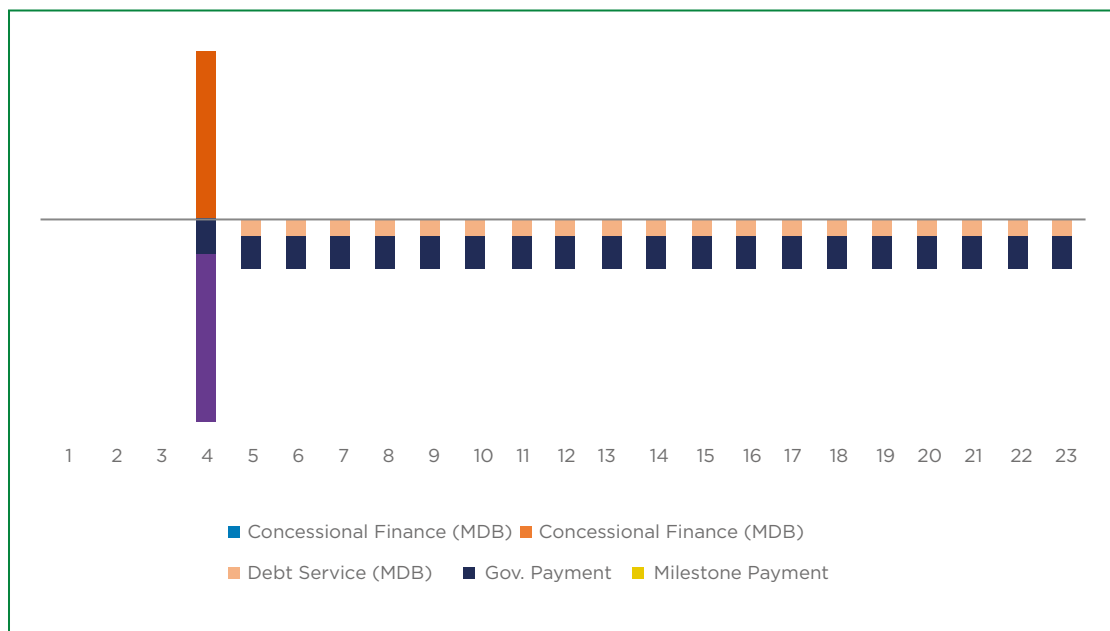
### Schematic of the PPP Structure



## Schematic of Concessionaire Cash Flows



## Schematic of Government Cash Flows



## Example 3.8 / Example of a Blended Finance Used in an Infrastructure Project

### **IDB Invest Supports an Adaptive Ecological Flow Management Plan for a Hydroelectric Plant in Ecuador**

**Project Description:** IDB Invest supported Hidrowarm S.A. (now called Hidronormandia S.A. for the financing of the construction, operation and maintenance of a 48.15 MW run-of-river hydroelectric plant in the Upano River Basin in Ecuador, together with an 85-kilometer transmission line to evacuate the power. The project is financed by a \$10 million senior loan from IDB Invest, \$34 million in B loans by IDB Invest, a \$24 million from co-senior lender FMO, the Dutch development bank, and a \$10 million subordinated blended finance loan funded by the Canadian Climate Fund for the Private Sector in the Americas (C2F) channeled through IDB Invest.

#### **Use and Rationale of Blended Finance:**

The contract for the financing of the plant includes the obligation to adhere to a first in kind adaptive ecological flow management plan, which aims to mitigate the plant's potential negative

environmental impact by requiring an increase in the ecological flow to the diverted reach of the river if certain biological thresholds (such as target fish populations) are violated. While the ecological flow management plan makes the plant more sustainable from an environmental impact perspective, it also creates less operational risk due to lower energy output that would result from the reduction in water flow for power generation. The subordinated blended finance loan from the C2F is structured to offset that risk.

**Expected Impact:** the plan will help diversify Ecuador's energy matrix by adding 49.6MW of renewable energy capacity and generating 349.9 GW/h or clean energy every year. It will reduce dependency on fossil fuels and imports from neighboring countries, while displacing approximately 126,781 tons of carbon dioxide equivalent each year.

Source:

file:///Users/home/Downloads/DFI%20Blended%20Finance%20Report%20OCT%202018%20(External)%20%20%20%20(FINAL).pdf

# TOOL 3.9

## POTENTIAL FOR INNOVATIVE FUNDING MECHANISMS

More important than any financing solution for an infrastructure project is the funding. A financially robust project has funding in place, i.e. has identified who is willing to pay for it. For many projects, this may be the government, or (ultimately) the taxpayer. Government resources are constrained however, which makes it often necessary to seek alternative funding solutions.


This tool provides resources and information related to funding mechanisms, which can be deployed to fund resilience measures for infrastructure. It is mostly focused on the policy and financial tools at governments' disposal which enable them to earmark money

for particular purposes. For example, value capture mechanisms—financial instruments and initiatives that enable communities to recover and reinvest land value increases resulting from public investments and other government actions<sup>25</sup>—could offer a useful model for climate resilience funding. These mechanisms, which include business improvement districts and tax increment financing (see table 3.9) have been frequently used in transportation related developments. These concepts can be applied for resilience improvements as well. In addition to a list of innovative funding mechanisms, this tool provides an approach for the identification of funding options.

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<sup>25</sup>Definition from: <https://www.lincolinst.edu/sites/default/files/pubfiles/land-value-capture-policy-brief.pdf>






### When in PPP process to use

Use when developing the project’s business case and structuring the PPP contract.




### Stakeholders involved

Project Team; Enterprise Team; Financial Advisors




### Length of time to implement

as long as it would take to have a few discussions with key stakeholders.



### Reference Materials

- For a concise brief on Land Value Capture, see here: <https://www.lincolinst.edu/sites/default/files/pubfiles/land-value-capture-policy-brief.pdf>
- For more information on policy control levers including taxes and land use policies that local governments can use to finance resilience, see: <https://www.lincolinst.edu/sites/default/files/pubfiles/land-value-capture-policy-brief.pdf>



### Expertise Required

Understanding of government processes; Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties.

**Figure 3.9**

## Innovative Funding Mechanisms for Climate Resilient Projects

	Name	Definition	Ease of combination with ppp	Example in practice	Reference
1	Resilience Grant	A grant given by a multilateral or fund – such as Green Climate Fund, Global Environment Facility, Climate Investment Funds, Inter-American Development Bank (IDB), The Rockefeller Foundation – for the purpose of improving resilience.	High	In March 2019, the U.S. Economic Development Agency announced it would provide South Carolina with \$3.7M in grants to help the state make critical infrastructure upgrades to respond to natural disasters. The grants will support planned upgrades to a Wastewater Treatment Facility to better respond to high-water events; and Winthrop University will receive \$1.2 million to fund electrical upgrades to support disaster resilience efforts.	<b>example source:</b> <a href="https://www.eda.gov/news/press-releases/2019/03/27/sc.htm">https://www.eda.gov/news/press-releases/2019/03/27/sc.htm</a>

	Name	Definition	Ease of combination with ppp	Example in practice	Reference
2	Real estate transfer tax	A tax that may be imposed on the privilege of transferring real property within the jurisdiction.	Medium	The Governor of Massachusetts, Charlie Baker, proposed to increase the ‘deeds excise rate’, which is paid when a property is sold, from \$2 per \$500 of value to \$3. This would be expected to raise an additional \$137 million a year, which would be deposited into a fund called the Global Warming Solutions Trust Fund. The money would be used to help cities and towns invest in “climate-smart infrastructure” and for other initiatives that help communities prepare for climate change.	<b>example source:</b> <a href="https://www.masslive.com/news/2019/01/gov-charlie-baker-proposes-raising-real-estate-transfer-tax-to-pay-for-effects-of-climate-change-in-massachusetts.html">https://www.masslive.com/news/2019/01/gov-charlie-baker-proposes-raising-real-estate-transfer-tax-to-pay-for-effects-of-climate-change-in-massachusetts.html</a>
3	Sales tax	A consumption tax imposed by the government on the sale of goods and services. Can be earmarked and to fund resilience projects.	Medium	Sales tax could be increased with a specific infrastructure/ climate resilience related purpose in mind. One example is Los Angeles County’s ‘Measure R’, which is a half-cent sales tax to finance new transportation projects and programs, and accelerate those already in the pipeline. The tax took effect July 2009. Measure R alone does not fully fund all projects. The Measure contains an Expenditure Plan that identifies the projects to be funded and additional fund sources that will be used to complete the projects.	<b>example source:</b> <a href="https://www.metro.net/projects/measurer/">https://www.metro.net/projects/measurer/</a>
4	Property tax	Property taxes reflect the value of the underlying asset. Investment in climate resilience will increase the asset value and therefore property tax.	Medium	In practice ‘payment in lieu’ of property tax could be used as a way to incentivize climate resilience improvements in a property. Instead of agreeing to a property tax payment the asset owner agrees to provide a payment (foreseen as less than the property tax) instead. This arrangement could be structured such that a property owner can only access this favorable tax treatment if it achieves a certain level of climate resilience standard.	<b>concept explained further:</b> <a href="https://memphischamber.com/2018/06/11/pilot-economic-development-terms-explained/">https://memphischamber.com/2018/06/11/pilot-economic-development-terms-explained/</a>

	Name	Definition	Ease of combination with PPP	Example in practice	Reference
4	Stormwater (utility) fee (and discount programs)	A dedicated funding source for existing stormwater management services and projects to reduce sediment and nutrient (nitrogen and phosphorous) pollution into waterways.	Low/ Medium	The City of Alexandria, Virginia has instituted a Stormwater Utility Fee to provide a dedicated funding source for existing stormwater management services and new capital projects to reduce sediment and nutrient (nitrogen and phosphorous) pollution into local waterways, the Potomac River, and the Chesapeake Bay. Funds raised by the fee go toward operation and maintenance of public stormwater quality and public drainage infrastructure in the separate storm sewer system, stormwater quality initiatives, compliance with the MS4 stormwater permit, plan review, and our flood management program.	<b>Series of blogs from UNC Chapel Hill on the topic:</b> <a href="http://efc.web.unc.edu/2017/11/29/staying-up-to-date-with-north-carolina-stormwater-utility-fees/">http://efc.web.unc.edu/2017/11/29/staying-up-to-date-with-north-carolina-stormwater-utility-fees/</a> <a href="http://efc.web.unc.edu/2019/02/25/stormwater-utility-fees-in-north-carolina-now-and-then/">http://efc.web.unc.edu/2019/02/25/stormwater-utility-fees-in-north-carolina-now-and-then/</a> <b>example source:</b> <a href="https://www.alexandriava.gov/tes/stormwater/info/default.aspx?id=93591">https://www.alexandriava.gov/tes/stormwater/info/default.aspx?id=93591</a>
5	New Development Charge/'Impact Fee'	Fee imposed by a local government within the United States on a new or proposed development project to pay for all or a portion of the costs of providing public services to the new development.	Low/ Medium	The Village of Menomonee Falls in Waukesha County, Wisconsin, requires impact fees for sewers, water facilities, parks and other public facilities outlined in its capital improvement plan. The village also maintains a program that provides developers and landowners with credits for the voluntary dedication of land, physical improvements, or construction of public facilities necessitated by the development. The credits directly offset the cost of impact fees normally charged to the landowner. (See Sec. 42-159 of the Village Code)	general definition: <a href="https://www.investopedia.com/terms/i/impact_fees.asp">https://www.investopedia.com/terms/i/impact_fees.asp</a> case source: <a href="https://www.uwsp.edu/cnr-ap/clue/Documents/PlanImplementation/Impact_Fees.pdf">https://www.uwsp.edu/cnr-ap/clue/Documents/PlanImplementation/Impact_Fees.pdf</a>
6	Insurance premium (saving) (discount)	Insurance premiums reflect the risk profile. Investment in climate resilience will reduce the risk profile and therefore allows for reduction of insurance premiums.	Low/ Medium	In the U.S., many federal and state insurance offices and private insurers offer reduced premiums for taking steps to reduce climate risks. For instance, Chubb offers reduced premiums to policy holders using resilience strategies. Similarly, in the U.S. National Flood Insurance Program, communities that are rated well for their floodplain management and disaster preparedness can qualify for discounted flood insurance rates.	<a href="https://www.c2es.org/content/financing-resilience/">https://www.c2es.org/content/financing-resilience/</a>

	Name	Definition	Ease of combination with PPP	Example in practice	Reference
7	Parcel tax.	A form of property tax assessed at a rate based on the characteristics of a parcel—or unit of property—rather than a rate based on the assessed value of the property, which is the standard method of levying property taxes.	Low/ Medium	Los Angeles county in the U.S. approved a ‘parcel-tax’ of 2.5 cents a square foot of “impermeable space,” in November 2018. The tax will help cities across Los Angeles County meet their obligations under the federal Clean Water Act and associated permits given out by the state. Revenue generated will be used to pay for regional and municipal projects that improve water quality and may also increase water supply and provide community benefits such as parks or wetlands.	<b>example sources:</b> <a href="https://laist.com/2018/07/18/everything_la_county_voters_need_to_know_about_the_stormwater_tax_now_on_their_november_ballot_1.php">https://laist.com/2018/07/18/everything_la_county_voters_need_to_know_about_the_stormwater_tax_now_on_their_november_ballot_1.php</a> ; <a href="https://www.latimes.com/local/lanow/la-me-ln-measure-w-20181130-story.html">https://www.latimes.com/local/lanow/la-me-ln-measure-w-20181130-story.html</a>
8	Business’/‘Resilience’ Improvement District or ‘District Improvement Financing’	A Business Improvement District enables property owners in a particular district to raise funds for investments that provide a collective benefit. The concept has been used extensively for transit investments.	Low	Several of London’s Business Improvement Districts - where businesses have voted to invest together to improve their environments - received support from the Greater London Authority to identify and deliver opportunities for increasing green cover. The goal is to increase green cover to reduce the Urban Heat Island effect and tackle local surface water flooding, while enhancing the beauty of London.	<b>example source:</b> <a href="https://www.c40.org/case_studies/greening-the-bids-private-public-collaboration-to-deliver-green-infrastructure-opportunities">https://www.c40.org/case_studies/greening-the-bids-private-public-collaboration-to-deliver-green-infrastructure-opportunities</a>
9	Insurance premium (saving) (discount)	Insurance premiums reflect the risk profile. Investment in climate resilience will reduce the risk profile and therefore allows for reduction of insurance premiums.	Low/ Medium	In the U.S., many federal and state insurance offices and private insurers offer reduced premiums for taking steps to reduce climate risks. For instance, Chubb offers reduced premiums to policy holders using resilience strategies. Similarly, in the U.S. National Flood Insurance Program, communities that are rated well for their floodplain management and disaster preparedness can qualify for discounted flood insurance rates.	<a href="https://www.c2es.org/content/financing-resilience/">https://www.c2es.org/content/financing-resilience/</a>

## Approach 3.9 Four Steps to Identifying Funding Opportunities

Steps	Description	Key questions
<b>1. Benefits</b>	The identification of funding options starts with the assessment of the benefits or avoided costs of a climate resilience intervention. All benefits and costs of a project would typically also be identified in a cost-benefit analysis.	<ul style="list-style-type: none"> <li>• What are the main benefits of the climate resilience investments?</li> <li>• Does climate resilience increase the value of existing properties and / or create opportunities for new property development?</li> <li>• What climate risk related damage can be avoided with climate resilience investments?</li> </ul>
<b>2. Value</b>	The monetization of these benefits can be challenging. Sometimes only some indicative quantification of the impacts is possible, A full-fledged cost-benefit analysis typically includes the valuation of benefits.	<ul style="list-style-type: none"> <li>• How much value do these benefits and avoided costs approximately represent?</li> </ul>
<b>3. Distribution</b>	The next step is to identify who the beneficiaries of the climate resilience improvements are and to what extent they share in the benefits, which should be an indication of their willingness to pay.	<ul style="list-style-type: none"> <li>• What is the distribution of value?</li> <li>• Who are the main beneficiaries?</li> </ul>
<b>4. Capture</b>	After evaluating who is gaining how much from the climate resilience investment considered, the focus shifts to the mechanisms to make the beneficiaries contribute financially.	<ul style="list-style-type: none"> <li>• How can the value be made available for the climate resilience investment?</li> <li>• Are there any existing mechanisms that can be used?</li> <li>• Are any of the capture mechanisms in table 3.9 fair and practicable?</li> </ul>

# TOOL 3.10

## POTENTIAL FOR INNOVATIVE FINANCING OPTIONS

Economic losses to infrastructure systems associated with natural disasters – some related to climate change – are on the rise. One effective tool in the effort to building resilience against these disasters are financial and insurance instruments. Contracting Authorities and governments can use financial instruments like ‘resilience bonds’ to raise financing for resilience building projects; they

can also make use of various types of risk pooling and insurances to manage the risks associated with extreme weather events. The following provides a high-level resource, inclusive of examples, that can help in identifying a financial or insurance instrument relevant for an infrastructure-PPP related resilience project.



### When in PPP process to use

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



### Length of time to implement

As long as it would take to have a few discussions with key stakeholders.



### Stakeholders involved

Project Team; Enterprise Team; Climate Change Team; Advisors.



### Expertise Required

Understanding of government processes; Technical expertise related to the project (e.g. power engineer, transport planner, etc); procurement and legal specialties.



### Examples

Embedded in Table 3.10



### Reference Materials

Embedded in Table 3.10

**Table 3.10****Innovative Financing Mechanisms for Climate Resilient Projects**

Name	Definition	Ease of combination with PPP	Example in practice	Reference
<b>Resilience bond</b>	Resilience Bonds are a form of Catastrophe Bond that links insurance premiums to resilience projects in order to monetize avoided losses through a rebate structure.	Low	[still in concept phase, no recorded real-world applications]	<a href="https://journals.openedition.org/factsreports/4910#-tocto1n3">https://journals.openedition.org/factsreports/4910#-tocto1n3</a> ; file:///Users/home/Downloads/InnovativeFinance_FINAL_web.pdf
<b>Resilience / development / environmental impact bond</b>	A bond with outcome-based repayments that are focused on resilience and social goals.	Low	The Washington D.C. Water and Sewerage Authority (DC Water) instituted an 'Environmental Impact Bond' (EIB) to fund the construction of green infrastructure to manage storm water runoff and improve the District's water quality. The EIB uses a structure inspired by the 'Pay for Success' model and investors will only recoup their investment if positive environmental benefits are realized.	<a href="https://govlab.hks.harvard.edu/files/govlabs/files/dc_water_environmental_impact_bond.pdf">https://govlab.hks.harvard.edu/files/govlabs/files/dc_water_environmental_impact_bond.pdf</a> ; <a href="https://www.goldmansachs.com/media-relations/press-releases/current/dc-water-environmental-impact-bond-fact-sheet.pdf">https://www.goldmansachs.com/media-relations/press-releases/current/dc-water-environmental-impact-bond-fact-sheet.pdf</a>
<b>Cat bond / catastrophe (RE) insurance</b>	A risk-linked security that transfer a specified set of risks from a sponsor to investors.	Low/ Med	Mexico, one of the most experienced emerging market countries with disaster risk management pioneered the transfer of risk to international capital markets with its 2006 disaster cat bond. The bond required a US\$ 26 million premium and provided cover of US\$ 450 million over the duration of the contract period. The bond was parametric with two basic criteria as triggers: i) Occurrence of an earthquake in excess of a specified magnitude and depth with its epicenter location within the boundary of a zone specified in the bond documentation. ii) Official declaration of the disaster by the Ministry of the Interior of Mexico.	<a href="https://www.preparecenter.org/fr/node/66">https://www.preparecenter.org/fr/node/66</a> ; <a href="https://www.chicagofed.org/publications/chicago-fed-letter/2018/405">https://www.chicagofed.org/publications/chicago-fed-letter/2018/405</a>

Name	Definition	Ease of combination with PPP	Example in practice	Reference
<b>(Regional) (catastrophe) risk pool</b>	A cooperative group of governmental entities joining together through written agreement to fund an exposure, liability or risk.	Low	In 2007, the Caribbean Catastrophe Risk Insurance Facility was formed as the first multi-country risk pool in the world, and was the first insurance instrument to successfully develop parametric policies backed by both traditional and capital markets. It was designed as a regional catastrophe fund for Caribbean governments to limit the financial impact of devastating hurricanes and earthquakes by quickly providing financial liquidity when a policy is triggered.	<a href="https://www.ccrif.org/">https://www.ccrif.org/</a>
<b>Weather index insurance</b>	A type of protection against a financial loss that may be incurred because adverse, measurable weather conditions.	Low/Medium	Uruguay generates a substantial amount of energy through hydroelectric plants that largely rely on rainfall. The risk of lower-than-usual rainfall has become an increasing burden to the Uruguayan government: For instance, in 2012 hydropower production slumped because of a prolonged drought, making it necessary for the government to buy costly electricity produced from fossil fuels as a substitute. In 2014, Swiss Re assumed a portion of risk in a USD 450 million weather coverage bought by the Uruguayan government with the assistance of the World Bank Treasury, to reduce this financial risk. In future, if the government needs to import electricity because of drought and a subsequent fall in energy generation, it will automatically receive compensation. The payout amount will be determined by rainfall data and oil prices, thus covering the double risk of drought conditions and an increase in energy prices.	<a href="https://reports.swissre.com/corporate-responsibility-report/2014/cr-report/solutions/strengthening-risk-resilience-highlights-of-2014/hydropower-insurance-for-uruguay.html">https://reports.swissre.com/corporate-responsibility-report/2014/cr-report/solutions/strengthening-risk-resilience-highlights-of-2014/hydropower-insurance-for-uruguay.html</a>
<b>insurance linked loan package</b>	Concessional loans with integrated resilience conditions.	Low/Medium	[still in concept phase, no recorded real-world applications]	file:///Users/home/Downloads/InnovativeFinance_FINAL_web.pdf
<b>Resilience service company</b>	An agent who pays for and implements resilience measures upfront in return for a share of future insurance premium savings	Low/Medium	[still in concept phase, no recorded real- world applications]	file:///Users/home/Downloads/InnovativeFinance_FINAL_web.pdf



# 4

# CONTRACT MANAGEMENT STAGE TOOLS

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**4.1** Climate Resilience in the Change Regime.

**4.2** Checklist for Force Majeure Definition.

**4.3** Sample Language for Uninsurability Definition and Procedure.

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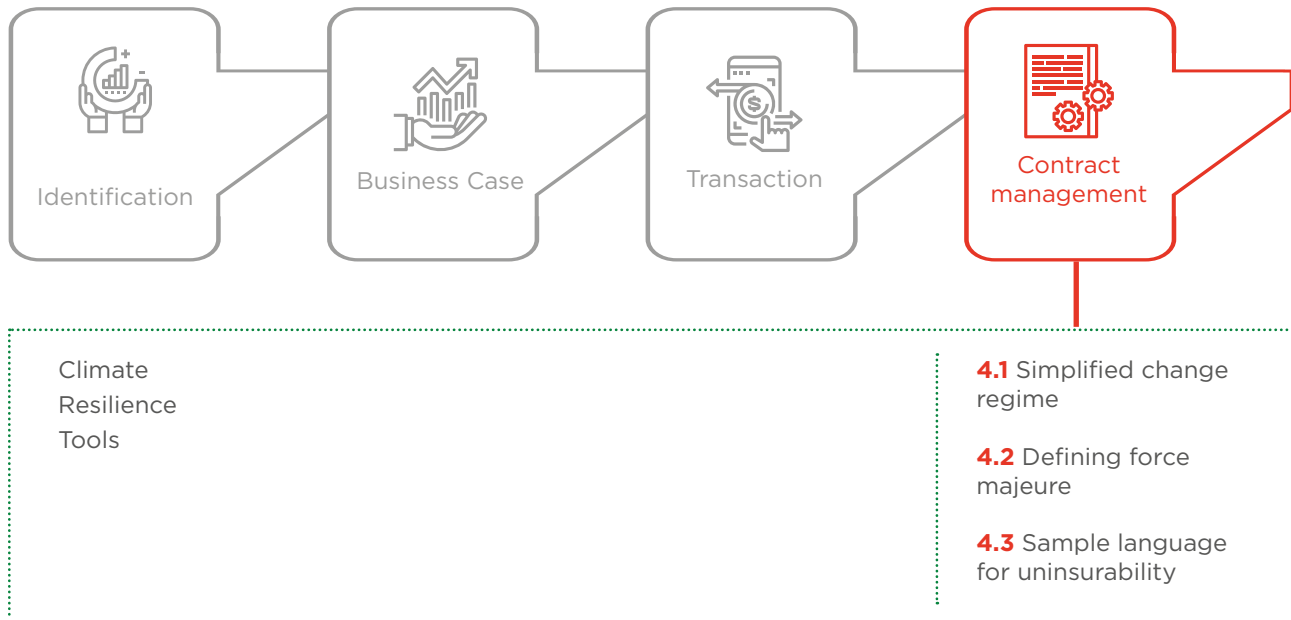
# **SECTION 4**

## **CLIMATE RESILIENCE IN THE PPP CONTRACT MANAGEMENT STAGE**

Once the Transaction Stage is complete, the project implementation begins as does the Contract Management Stage. During this stage, the government must ensure that promises agreed in the contract are delivered and that new events or changes in general – and also specifically changes to the climate risk profile – are responded to efficiently and adequately; without disrupting the project. As regards climate resilience considerations, this stage will require tracking any climate-related agreements set during the Transaction

Stage and managing any unforeseen climate-related risks that occur. For those projects deemed to have medium to high-climate related risks it is wise to include climate change expertise as part of the contract management team.

The following section of this Toolkit provides three decision-making tools that PPP project planners and teams can use during the Contract Management Stage to ensure that climate resilience continues to be considered.



# TOOL 4.1

## CLIMATE RESILIENCE IN THE CHANGE REGIME

As infrastructure PPP contracts run over many years, often up to 25-30, changes to the contract, specifically as pertains to works, services or service delivery, are inevitable. Such changes may be necessary as a result of new climate circumstances- like higher precipitation levels or more extreme droughts - which could not be fully anticipated or quantified when the PPP agreement was signed. Further, some climate events may be sudden and extreme, for example, storm surges that inundate coastal areas in the event of a hurricane. In these circumstances, being able to quickly adapt services or service delivery, and as a result, the contract itself is likely needed.

Generally, to manage any type of change to a PPP contract, it is helpful when drafting the contract to incorporate a bit of flexibility and to delineate clear roles and procedures for executing the changes. The contract management team put in place to manage the contract should have an understanding of this process, be able to assess any proposed changes and have the capacity to keep careful records. For changes being executed in the name of making a PPP more climate resilient, all of these best practices hold, and project planners should seek to make the process as streamlined as possible - perhaps even simpler than other types of changes while ensuring that proposed climate resilience changes are reviewed and approved by climate change experts.

The following provides guiding questions for how to think about instituting mechanisms to allow changes to the PPP contract for climate resilience reasons.



### When in PPP process to use

When drafting the PPP contract and during the contract management stage.



### Length of time to implement

1-2 hours



### Stakeholders involved

Project Team; Contract Management Team; Private Party to the PPP



### Expertise Required

Understanding of the PPP contract; Climate Change Expertise.



### Reference Materials

- APMG's 'PPP Certification Guide', Chapter 8, section 7 Variation Management [<https://ppp-certification.com/ppp-certification-guide/7-variation-management>]



### Drafting ppp contract

'Change Regime' Goals: as much as possible, anticipate possible changes to the project (services or infrastructure) related to climate change. If these changes can be identified ahead of time, price and include them in the PPP contract. Ensure that change management procedures are clearly identified.

#### Guiding Questions

- In the identification and business case stages was a climate risk analysis conducted? Are there likely to be any climate related phenomena that will impact the project?
- Are there any possible climate-related changes or variations to the infrastructure asset (e.g. a higher sea wall that does not make sense under current climate conditions but could if sea levels rise) that can be foreseen? Can these be pre-identified and priced as part of the PPP contract?
- Is the process for executing a change to the PPP process clear and easy to follow? Is it possible to have a separate process for climate related changes, which is more streamlined (in terms of numbers of approvals or documents required)?
- For any type of change to PPP contract, does change process require explanation of how proposed change, impacts project's resilience?



### Managing ppp contract

'Change Regime' Goals: ensure contract management team understands contract; that variation requests are clear and comprehensive; that clear roles and responsibilities for managing changes exists; and that any changes have a clear audit trail.

#### Guiding Questions

- Does the contract management team have someone with climate change expertise to help in reviewing changes to the contract and how they will impact a project's resilience to climate change? If not, is it easy to gain access to climate change expertise?

# TOOL 4.2

## CHECKLIST FOR FORCE MAJEURE DEFINITION

Typically, in PPP contracts, the Developer takes the risk of any non-performance, even if the cause of non-performance falls outside the Developer’s control. Accordingly, much time is spent analyzing the risks that could arise during the term of the PPP contract and the extent to which the Developer should be relieved from poor or non-performance caused by ‘supervening events’, i.e. events that are beyond the control of the parties. Over time, this has resulted in most jurisdictions adopting a three-tiered approach to risk events, as follows:

- **Compensation Events:** events for which the Grantor takes the risk. The Grantor pays compensation to the Developer and gives any other form of contractual relief required to leave the Developer in the position that it was in before the relevant Compensation Event occurred (“no better, no worse”).

- **Relief Events** (often called Delay Events where they occur during the construction phase): events for which the Developer is expected to take financial risk but is given relief from other consequences of non-performance that such events cause. These are, by nature, events that are either insurable or not expected to continue for many days.

- **Force Majeure Events:** events beyond the control of the parties; and that render the performance of all, or a material part, of one party’s obligations impossible. The definition often focuses on events that are uninsurable, outside of the control of either party, and are catastrophic in nature. Each party will typically bear its own consequences of a Force Majeure Event.

	<b>Schedule relief:</b> Private party may take extra time to meet certain milestones.	<b>Performance / Breach Relief:</b> Private party not penalized for not meeting performance requirements.	<b>Cost compensation:</b> Private party is compensated for extra costs.	<b>Delay / Financing cost compensation:</b> private party compensated for extra financing costs.	<b>Termination right:</b> private party has right to terminate contract.
Compensation event	•	•	•	•	
Relief event	•	•			
Force Majeure event	•	•		•	•

Climate (and natural disaster) risks are generally treated as Force Majeure events and both parties share in the risk of their occurrence. Yet, often it can make sense to apply a more nuanced approach to specific climate/natural disaster risks in order to allocate increased levels of risks to the private party. This has been done, for example in Japan, where experience from previous natural disasters has enabled them to qualify earthquakes in their PPP contracts' Force Majeure clauses based on their seismic intensity. If an earthquake is lower in seismic intensity, then it does not qualify as Force Majeure. Chile, another earthquake prone country, has similarly excluded earthquakes

from its definition of 'Force Majeure'.<sup>26</sup> In these cases more responsibility for managing the aftermath of climate risks falls to the private party, and based on experience in Japan, such transfer of responsibility can result in faster and more efficient response times than if the public sector were solely responsible.<sup>27</sup> This is likely because the private party has considered the risk in the design and planning stages.

The following tool provides guiding questions to project teams seeking to ensure that climate change events are properly treated within the PPP contract's 'Force Majeure' definition.



### When in PPP process to use

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



### Length of time to implement

2-4 hours; a few conversations with experts.



### Stakeholders involved

PPP project team; Climate Team; Legal Advisors.



### Expertise Required

Project, Climate and Legal Expertise.



### Reference Materials

- Resilient Infrastructure Public Private Partnerships (PPPs): The Case of Japan, World Bank 2018 [[https://www.globalinfrastructure.org/sites/gif/files/Resilient%20Infrastructure%20PPP%20Japan%20Case%20Study%20FINAL\\_web.pdf](https://www.globalinfrastructure.org/sites/gif/files/Resilient%20Infrastructure%20PPP%20Japan%20Case%20Study%20FINAL_web.pdf)]
- Termination and Force Majeure Provisions in PPP Contracts, EPEC 2013 [[https://www.eib.org/attachments/epec/epec\\_terminaison\\_and\\_force\\_majeure\\_en.pdf](https://www.eib.org/attachments/epec/epec_terminaison_and_force_majeure_en.pdf)]
- Guidance on PPP Contractual Provisions (2019), World Bank [consultation version: <https://ppp.worldbank.org/public-private-partnership/library/guidance-ppp-contractual-provisions>].

<sup>26</sup>Concession Law of Public Works. Ley y Reglamento de Concesiones de Obras Publicas. Available at: [http://www.concesiones.cl/quienes\\_somos/funcionamientodelsistema/Documents/Nueva%20Ley%20y%20Reglamento%202010.pdf](http://www.concesiones.cl/quienes_somos/funcionamientodelsistema/Documents/Nueva%20Ley%20y%20Reglamento%202010.pdf)

<sup>27</sup>See [https://www.globalinfrastructure.org/sites/gif/files/Resilient%20Infrastructure%20PPP%20Japan%20Case%20Study%20FINAL\\_web.pdf](https://www.globalinfrastructure.org/sites/gif/files/Resilient%20Infrastructure%20PPP%20Japan%20Case%20Study%20FINAL_web.pdf)

## Defining Force Majeure: Key Principles for Including Climate Risks

### What to include in definition?

- ▶ Climate Risk Events that cannot be foreseen and managed by the developer.
- ▶ Qualified Climate Risk Events: Where certain natural or climate change related events regularly occur (such as seasonal rains resulting in floods) and should have formed part of the Developer's due diligence, the degree of such events should be specified so

that only "exceptional" occurrences qualify as Force Majeure (e.g. floods of a scale that occur not more frequently than once in every [100] years or earthquakes over a specified seismic intensity).

### What to exclude from definition?

- ▶ Non-compliance with Risk Mitigation plan as prescribed by the agency or developed by the Developer and included in the PPP agreement.

## Defining Force Majeure: Guiding Questions for Including Climate Risks<sup>28</sup>

**1/** Does the Procuring Authority have contractual freedom under the PPP governing law to: i) define the concept of Force Majeure; ii) specify its consequences?

**a/** Yes: go to question 2.

**b/** No: seek to ensure that measures to mitigate against climate risks are incentivized through evaluation procedures, performance requirements, payment mechanisms, and required insurances.

**2/** Does Procuring Authority follow an open-ended catch all approach to defining Force Majeure? This means that 'Force Majeure'

includes all events beyond the reasonable control of the affected party, which satisfy certain criteria like 'foreseeability' and 'avoidability' and prevent the affected party from performing. Even with such a broad approach, it is common to list certain events under this definition, those these are meant for illustrative purposes and not seen as exhaustive.

**a/** Yes: project team, legal advisors and climate team should discuss whether there are any climate risks associated with the project that could perhaps be mitigated against and passed onto the private party as opposed to being included as a part of the Force Majeure definition. With an open-ended catch all approach, the government

<sup>28</sup>See: <https://ppp.worldbank.org/public-private-partnership/library/guidance-ppp-contractual-provisions>



may be in a position where it takes on more of the climate risks than necessary.

**b/** No: go to question 3.

**3/** Does Procuring Authority follow an approach to defining Force Majeure that includes an exhaustive list of specific events or circumstances?

**a/** Yes: when drafting this list ensure that the events listed are beyond the control of the affected party and would prevent it from performing. Generally, countries that choose to define Force Majeure in this way, set out a very limited list of events. Usually events listed here are those that are uninsurable.

**b/** No: see question 2.

**4/** Did the results of the climate risk assessment performed during the Business Case Stage identify any climate risks that have a high likelihood of occurrence?

**a/** Yes: work together with climate change experts and legal team to determine if:

Any of these events can be excluded from the definition of Force Majeure;

Any of these events can only be included if they are qualified, that is included if they occur to a certain degree (for example, rainfall of a certain level);

Bidders can be requested 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, and non-compliance of which is excluded from the definition of Force Majeure.

**b/** No: discuss with climate change experts to determine if all climate risks which could affect the project should be included in the Force Majeure Definition

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<sup>29</sup>For example: The Netherlands and UK PF2 guidance.

# TOOL 4.3

## SAMPLE LANGUAGE FOR UNINSURABILITY DEFINITION AND PROCEDURE

Contracting Authorities typically require the private party to insure material project risks, such as accidental damage or third-party liabilities. The availability, cost of, and obligation to take out relevant insurances, will depend in part on how certain events are allocated. For example, if when defining Force Majeure (tool 4.2), a particular climate risk, like flooding, is excluded, and instead transferred to the private party, then the private party may need to take out insurance to cover any expected losses resulting from this risk.

Extreme events, like natural disasters related to climate change, pose a set of challenging problems to insurers – they are uncertain but involve potentially high-losses. The insurance industry is actively trying to stay ahead of the curve with regards to responding to climate change related disasters, though there is a chance given the long length of a PPP contract that a particular climate related event becomes ‘uninsurable’ at some point over the contract’s life.

‘Uninsurability’ does not mean that the market has no insurance, but that a) insurance is unavailable on the international insurance market by insurers of an adequate credit rating/reputable insurers of good standing; and b) insurance premiums are prohibitively high (not merely more expensive)—for example, at such a level that the risk is not generally being insured against in the worldwide insurance market with reputable insurers of good standing by contractors in the same country.<sup>30</sup>

While risks beyond just climate-related could possibly become ‘un-insurable’, building an ‘uninsurability’ clause into the PPP contract helps make the PPP inherently more climate resilient. Doing so acknowledges the uncertainty around climate changes and the difficulty in insuring them. The following tool provides some sample language that project teams and their legal advisers can use as a starting point when defining ‘uninsurability’ and its treatment.

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<sup>30</sup>Guidance on PPP Contractual Provisions (2019), World Bank



### When in PPP process to use

when drafting the PPP contract: refer to if/ when an event is by definition 'un-insurable'.



### Length of time to implement

2-4 hours; a few conversations with experts.



### Stakeholders involved

PPP project team; Climate Team; Legal Advisors.



### Expertise Required

Project, Climate and Legal Expertise.



### Reference Materials

- Guidance on PPP Contractual Provisions (2019), World Bank [consultation version: <https://ppp.worldbank.org/public-private-partnership/library/guidance-ppp-contractual-provisions>]

## Sample Language: Meaning of Uninsurable Risk

### An 'uninsurable risk' occurs where:

**a/** insurance is not available in the recognized international insurance market with reputable insurers of good standing (including the minimum credit rating specified in the project agreement) in respect of that risk at the time that the insurance is sought to be obtained.; or

**b/** the insurance premium payable for insuring that risk is prohibitively high, such

*that the risk is not generally being insured against in the international insurance market with reputable insurers of good standing.*

[\_\_\_The effect of this provision should not be to give protection against changes in terms of insurance or levels of deductibles. Rather, it is intended to offer protection if the cost of insurance is such that the market is not generally insuring against that risk (on any terms).\_\_\_]

## Sample Language: Procedures for Uninsurable Risk<sup>31</sup>

**a/** If either party considers that a risk, which is covered by the required insurances, is or will be uninsurable, then that party must immediately notify the other in writing, providing detail of how the risk qualifies as 'uninsurable'.

**b/** If the parties agree, or it is determined through the dispute resolution procedure, that the relevant risk is uninsurable, and the fact that the risk is uninsurable is not attributable to the actions of the private party or a sub-contractor, the private party is not required to procure insurance against that risk for so long as that risk is and remains uninsurable.

**c/** The [\_\_\_insert 'Government' or name of 'Contracting Authority'\_\_\_] will then deduct from the service fee an amount equal to the premium that was payable immediately prior to the insurance becoming uninsurable. [\_\_\_insert 'Government' or name of 'Contracting Authority'\_\_\_] may also consider any other changes to the private party's rights and obligations arising from the unavailability of the relevant required insurance.

**d/** If the uninsurable risk materializes, the [\_\_\_insert 'Government' or name of 'Contracting Authority'\_\_\_] will:

**a.** pay to the private party an amount equivalent to the insurance proceeds

that would have been payable if the relevant insurance was available;

**b.** [\_\_\_optional\_\_\_] if the facility is wholly or substantially damaged or destroyed, terminate the project agreement, in which case:

**i.** [\_\_\_optional\_\_\_] compensation will be payable on a Termination for Convenience basis;

**ii.** [\_\_\_optional\_\_\_] compensation will be payable on a Force Majeure Termination Event basis;

**c.** [\_\_\_optional\_\_\_] implement a government-initiated Modification to remove the affected part of the site from the project provided that following the implementation of the Modification, the private party will be no worse off had the Uninsurable Event not occurred.

**e/** Where a risk is uninsurable, the private party must approach the insurance market on a regular basis to establish whether that risk remains uninsurable and advise government accordingly. If the insurance becomes available again, the private party must effect that insurance.

<sup>31</sup>National Public Private Partnership Guidelines, Volume 3: Commercial Principles for Social Infrastructure, Australian Government, Department

## Appendix A / Screening-level Hazard Exposure Assessment Template

\*Corresponds with Tool 1.1

Project Name: \_\_\_\_\_

N°	Hazards	Rating: High (3pts); Medium (2pts); Low (1pt)
	<b>Geophysical</b>	
1	Seismic	
2	Volcanic	
3	Landslide	
4	Hurricane-wind	
5	Hurricane-storm surge	
6	Tsunami	
7	Drought	
8	Heatwave	
9	Riverine flooding	
10	Wildfire	
	<b>Hydrometeorological</b>	
11	Drought	
12	Heatwave hazard under RCP 4.5	
13	Heatwave hazard under RCP <sup>32</sup> 8.5	
14	Riverine flooding	
15	Sea level rise	
16	Water scarcity	
17	Precipitation changes under GCM 1 <sup>33</sup>	
18	Precipitation changes under GCM 2	
19	Precipitation changes under GCM 3	
20	Precipitation changes under GCM 4	
21	Precipitation changes under GCM 5	

<sup>32</sup>RCP refers to Representative Concentration Pathways' (RCPs) - climate change model developed by the Intergovernmental Panel on Climate Change. The RCPs measures Green House Gases in watts per square meter pathway and level by 2100. For more information, visit: [https://sedac.ciesin.columbia.edu/ddc/ar5\\_scenario\\_process/RCPs.html](https://sedac.ciesin.columbia.edu/ddc/ar5_scenario_process/RCPs.html)

<sup>33</sup>General Circulation Models (GCMs) are models that represent physical processes in the atmosphere, ocean, cryosphere and land surface, are the most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations. For more information on GCM and GCM criteria, visit: [http://ipcc-data.org/guidelines/pages/gcm\\_guide.html](http://ipcc-data.org/guidelines/pages/gcm_guide.html)

**Scoring methodology**<sup>34</sup> Use the following legend to score the exposure to the hazard at low, medium or high level.

Exposure Level	Definition	Score
<i>Low</i>	If natural hazards are not likely to occur during construction and/or operational life of the project.	<b>1</b>
<i>Medium</i>	If the hazard is likely to occur at least once during the execution (construction) period and/or the operational life of the project.	<b>2</b>
<i>High</i>	If hazards may occur several times during the execution (construction) period and/or the operational life of the project.	<b>3</b>

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<sup>34</sup>Methodology adapted from: Adapted from: IDB Disaster Risk Policy Guidelines, 2008. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=360026>

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# Appendix B / Screening-level Lifecycle Based Vulnerability Assessment Template

*\*This is an optional step included in Tool 1.2. When filling out use a simple 'Low, Medium, High' scoring technique.*

Project Name: \_\_\_\_\_

Project System	Seismic	Volcanic	Landslide	Hurricane-Wind	Hurricane-Storm Surge	Tsunami	Drought	Heatwave	Riverine Flooding	Wildfire	Drought	Heatwave, RCP 4.5	Heatwave, RCP 8.5	Riverine Flooding	Sea-level rise	Water Scarcity	Precipitation, GCM 1	Precipitation GCM 2
A. Project assets and processes																		
B. Inputs (water, energy, others)																		
C. Outputs (e.g, power supply; services)																		
D. Linkages (to/from other systems)																		

Vulnerability Level	Definition	Score
Low	Project aspect not affected by a particular hazard, e.g., water scarcity is not expected to affect airport passenger services.	Low
Medium	Project aspect somewhat vulnerable to particular hazard, e.g., wildfires that come near airport could affect functioning of airport.	Medium
High	Project aspect very vulnerable to a particular hazard, e.g., airport located near sea would be very sensitive to a hurricane storm surge.	High

## Appendix C / Screening-level Hazard Vulnerability Assessment Template

*\*Corresponds with Tool 1.2*

Project Name: \_\_\_\_\_

N°	Hazards	Rating: High (3pts); Medium (2pts); Low (1pt)
	<b>Geophysical</b>	
1	Seismic	
2	Volcanic	
3	Landslide	
4	Hurricane-wind	
5	Hurricane-storm surge	
6	Tsunami	
7	Drought	
8	Heatwave	
9	Riverine flooding	
10	Wildfire	
	<b>Hydrometeorological</b>	
11	Drought	
12	Heatwave hazard under RCP 4.5	
13	Heatwave hazard under RCP <sup>35</sup> 8.5	
14	Riverine flooding	
15	Sea level rise	
16	Water scarcity	
17	Precipitation changes under GCM 1 <sup>36</sup>	
18	Precipitation changes under GCM 2	
19	Precipitation changes under GCM 3	
20	Precipitation changes under GCM 4	
21	Precipitation changes under GCM 5	

<sup>35</sup>RCP refers to Representative Concentration Pathways' (RCPs) - climate change model developed by the Intergovernmental Panel on Climate Change. The RCPs measures Green House Gases in watts per square meter pathway and level by 2100. For more information, visit: [https://sedac.ciesin.columbia.edu/ddc/ar5\\_scenario\\_process/RCPs.html](https://sedac.ciesin.columbia.edu/ddc/ar5_scenario_process/RCPs.html)

<sup>36</sup>General Circulation Models (GCMs) are models that represent physical processes in the atmosphere, ocean, cryosphere and land surface, are the most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations. For more information on GCM and GCM criteria, visit: [http://ipcc-data.org/guidelines/pages/gcm\\_guide.html](http://ipcc-data.org/guidelines/pages/gcm_guide.html)



# Appendix D / Screening-level Climate Risk Matrix Template

\*Corresponds with Tool 1.3

Project Name: \_\_\_\_\_

		Exposure		
		Low	Medium	High
Vulnerability	Low			
	Medium			
	High			

**Scoring methodology<sup>37</sup>** Use the following legend to score the project’s overall climate risk profile at low, medium or high level.

Risk Level
Low (low-low)
Medium (low-medium; medium-low; medium-medium; high-low; low-high)
High (high-medium; medium-high; high-high)

<sup>37</sup>Methodology adapted from: Adapted from: IDB Disaster Risk Policy Guidelines, 2008. Available at: <http://idbdocs.iadb.org/wsdocs/getdocument.aspx?docnum=360026>

## Appendix E / Comprehensive Hazard Exposure Assessment Template

Project Name: \_\_\_\_\_

N°	Hazards	Description	Key Considerations	Likelihood
	<b>Geophysical</b>			
1	Seismic			
2	Volcanic			
3	Landslide			
4	Hurricane-wind			
5	Hurricane-storm surge			
6	Tsunami			
7	Drought			
8	Heatwave			
9	Riverine flooding			
10	Wildfire			
	<b>Hydrometeorological</b>			
11	Drought			
12	Heatwave hazard under RCP 4.5			
13	Heatwave hazard under RCP <sup>38</sup> 8.5			
14	Riverine flooding			
15	Sea level rise			
16	Water scarcity			
17	Precipitation changes under GCM 1 <sup>39</sup>			
18	Precipitation changes under GCM 2			
19	Precipitation changes under GCM 3			
20	Precipitation changes under GCM 4			
21	Precipitation changes under GCM 5			

<sup>38</sup>RCP refers to Representative Concentration Pathways' (RCPs) - climate change model developed by the Intergovernmental Panel on Climate Change. The RCPs measures Green House Gases in watts per square meter pathway and level by 2100. For more information, visit: [https://sedac.ciesin.columbia.edu/ddc/ar5\\_scenario\\_process/RCPs.html](https://sedac.ciesin.columbia.edu/ddc/ar5_scenario_process/RCPs.html)

<sup>39</sup>General Circulation Models (GCMs) are models that represent physical processes in the atmosphere, ocean, cryosphere and land surface, are the most advanced tools currently available for simulating the response of the global climate system to increasing greenhouse gas concentrations. For more information on GCM and GCM criteria, visit: [http://ipcc-data.org/guidelines/pages/gcm\\_guide.html](http://ipcc-data.org/guidelines/pages/gcm_guide.html)

## Appendix F / Comprehensive Climate Risk Assessment Template

N°	A. Climate hazard	B. Likelihood	C. Vulnerability	D. Impact	E. Valuation	F. Mitigation	G. Allocation
1							
2							
3							
4							
5							

