GUIDANCE NOTE

ON CLIMATE CHANGE RISK ASSESSMENT

EQUATOR PRINCIPLES

GUIDANCE NOTE ON CLIMATE CHANGE RISK ASSESSMENT

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PREAMBLE

The adoption of the Equator Principles (EPs) ensures that the financing of Projects is developed in a manner that is socially responsible and reflects sound environmental management practices, while negative impacts on Project-affected ecosystems, communities, and the climate are avoided where possible. This document provides guidance to support the development of Climate Change Risk Assessments (CCRA) as required under Principle 2 of the fourth version of the EPs dated July 2020 (EP4[1]).

In line with EP4, Equator Principles Finance Institutions (EPFIs) support the objectives of the 2015 Paris Agreement on climate change and recognise that they have a role to play in improving the availability of climate-related information, such as the Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD), when assessing the potential transition and physical risks of Projects financed under EP4.

This note provides guidance to support the understanding and implementation of the CCRA requirements under EP4 and replaces the earlier EP Association (EPA) Guidance Note on Climate Change Risk Assessment dated September 2020.

The guidance and templates provided in this document are intended to be read in conjunction with other available guidance and resources available on the EPA website.

[1] The Equator Principles_EP4_July2020 (equator-principles.com)

1. INTRODUCTION

1.1 Purpose of the Guidance Note on CCRA

The purpose of this Guidance Note on CCRA is to support the implementation of the requirements contained in EP4 in relation to CCRA as defined under "Principle 2: Environmental and Social Assessment" and "Annex A: Climate Change: Alternatives Analysis, Quantification and Reporting of Greenhouse Gas Emissions" of EP4. This guidance note is not intended to establish new principles or requirements beyond EP4 but rather provides good practice guidance on the development of CCRA under EP4.

This Guidance Note replaces the earlier EPA Guidance Note on Climate Change Risk Assessment (September 2020) and has been developed to reflect:

I. Recent developments in the global understanding of, and approach to, managing climate change risks, with consideration of a 'double materiality' approach (i.e. addressing the climate change-related risks/impacts both from, and to, the Project);
II. New regulatory standards and/or other relevant initiatives that may be relevant, including but not limited to prudential regulations; and
III. Experience gained from the practical implementation of CCRA in the context of EP4 compliance.

The Guidance Note is intended for use by EPFIs, Borrowers/Clients/Project Sponsors (hereafter referred to as 'Clients'), their consultants and individuals seeking further information on what good practice is regarding CCRA (see Box 1-1).

Box 1-1: Who is this Guidance Note on CCRA intended for?

- EPFIs during their internal assessment of climate change risks as part of the financing of Projects, including review of Project CCRAs developed by Clients.
- Clients and their consultants undertaking Project CCRAs for Projects seeking financing.
- Lender consultants supporting EPFIs in the review of Project CCRAs.
- Other stakeholders seeking further information on good practice on CCRA in Project financing.

1.2 Definitions of Climate-related Risks and Opportunities

Whilst there are a number of definitions of climate change, for clarity this Guidance Note uses and assumes the definition adopted by the IPCC.

The definitions of climate-related risks and climate-related opportunities have been adopted from the Recommendations of Task Force on Climate-Related Financial Disclosures [2] (TCFD) published on 15 June 2017 (see Box 1-2 below). The TCFD was created in 2015 by the Financial Stability Board to develop consistent climate-related financial risk disclosures for use by companies, banks and investors in providing information to stakeholders.

Box 1-2: Key definitions

Climate-related risk refers to the potential negative impacts of climate change on a Project.

Physical risks emanating from climate change can be event-driven (acute), such as increased severity of extreme weather events (e.g., *cyclones, droughts, floods, heat waves and fires*). They can also relate to longer-term shifts (chronic) in precipitation and temperature and increased variability in weather patterns (e.g., *sea level rise*) (these are discussed in more detail in Section 5.1).

Climate-related risks can also be associated with the transition to a lower-carbon global economy (transition risks), the most common of which relate to policy and legal actions, technology changes, market responses and reputational considerations. Examples include, inter alia, *shifts in market demand or customers segments, competition from low-carbon technologies, more stringent regulatory mandates* (refer to Section 6.2 for more details).

Climate-related opportunity refers to the potential positive impacts related to climate change on an organization. Efforts to mitigate and adapt to climate change can produce opportunities for organizations, such as through *resource efficiency and cost savings, the adoption and utilization of low-emission energy sources, the development of new products and services, and building resilience along the supply chain*. Climate-related opportunities will vary depending on the region, market, and industry in which an organization operates. Refer to Section 2.2.2 below.

The nature of risks and the approach to defining materiality are discussed in Section 2.1.3, as part of the Requirements and Applicability section (Section 2).

1.3 Guidance Note Structure

This Guidance Note is structured in six sections as showed in Figure 1.1. The annexes attached to this document comprise good practice guidance.

[2] https://www.fsb-tcfd.org/recommendations/

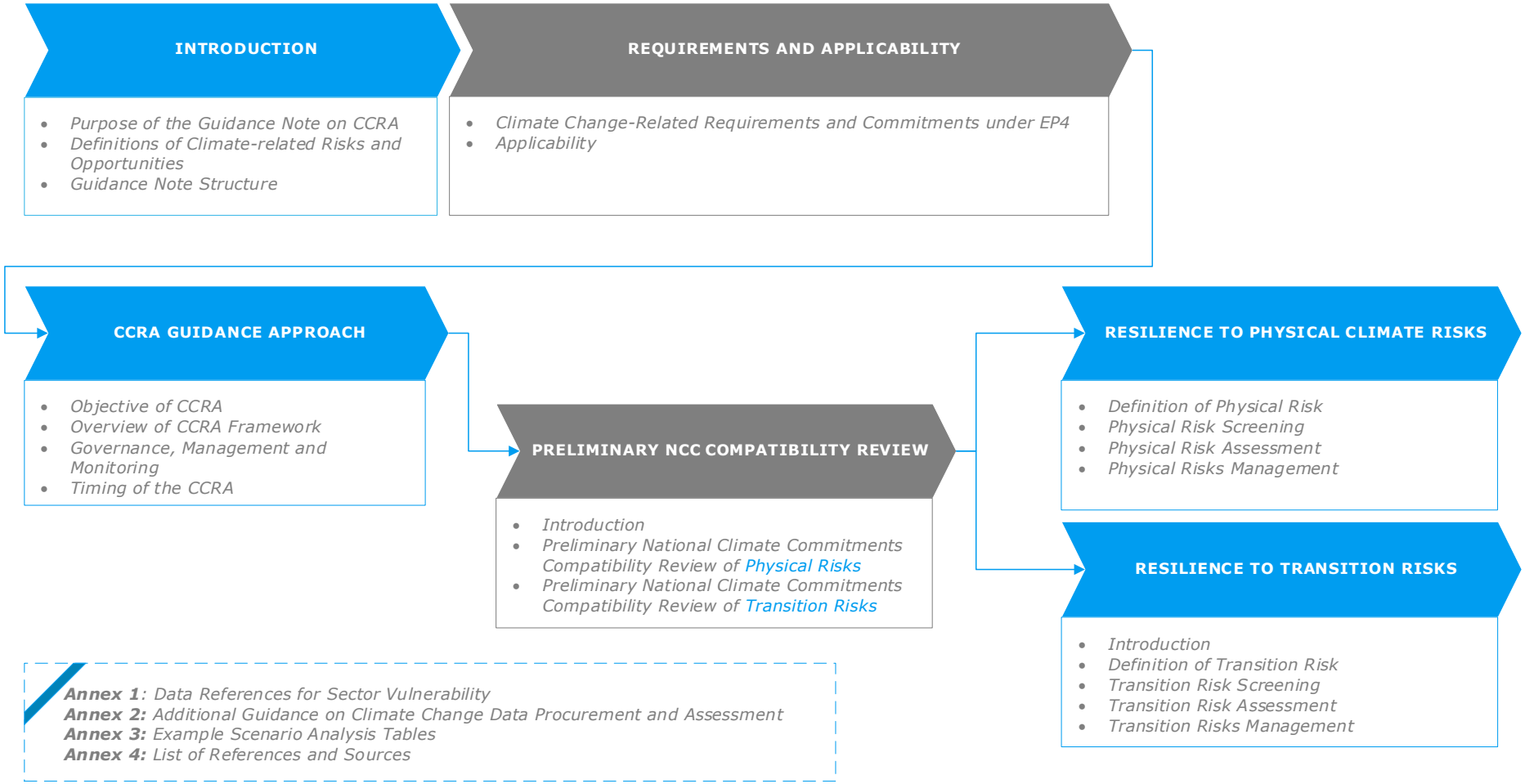

Figure 1.1: Structure of the Guidance Note on CCRA

2. REQUIREMENTS AND APPLICABILITY

2.1 Climate Change-Related Requirements and Commitments under EP4

2.1.1. General Requirements

The primary specific climate change-related requirements and commitments defined in EP4 are as follows:

EP4 Preamble	EPFIs: • "*believe that negative impacts on … the climate should be avoided if at all possible*" • "*support the objectives of the 2015 Paris Agreement*" • "*recognise that EPFIs have a role to play in improving the availability of climate-related information, such as the Recommendations of the Task Force on Climate-related Financial Disclosures (TCFD) when assessing the potential transition and physical risks of Projects financed under the Equator Principles*"
Principle 1	Categorisation of in-scope Projects should be "*based on the magnitude of potential environmental and social risks and impacts, including those related to … climate change …*"
Principle 2	Requirement for CCRA: • Clients are expected "*to include assessments of potential adverse …. climate change risks as part of the ESIA or other Assessment*". • The Climate Change Risk Assessment should be aligned with Climate Physical Risk and Climate Transition Risk categories of the TCFD. • Project Categories subject to a CCRA of physical risks (as defined by TCFD) are set; and thresholds (i.e. combined Scope 1 and Scope 2 emissions) are also defined for the inclusion in the CCRA of: 1) climate transition risks (as defined by TCFD); and 2) an alternatives analysis evaluating lower Greenhouse Gas (GHG) intensive alternatives. Requirements under the International Finance Corporation (IFC) Performance Standards (PS), which underpin Principle 2 for Non-Designated Countries and may be used as benchmarks for Designated Countries, include: • PS1 Guidance Note states that the Clients' "*risks and impacts identification process will consider the emissions of greenhouse gases, the relevant risks associated with*

	a changing climate and the adaptation opportunities, and potential transboundary effects." • PS3 states that Clients should "*consider alternatives and implement technically and financially feasible and cost-effective options to reduce Project-related GHG emissions during the design and operation of the Project*" and for Projects that are expected to produce more than 25,000 tonnes of CO_2-equivalent annually, the Client to quantify "*direct emissions from the facilities … as well as indirect emissions associated with the off-site production of energy used by the project*".
Principle 10	For all Category A and, as appropriate, Category B Projects, the Client will: • "*ensure that, at a minimum, a summary of the ESIA is accessible and available online and that it includes a summary of …. climate change risks and impacts when relevant*" • "*report publicly, on an annual basis, GHG emission levels (combined Scope 1 and Scope 2 Emissions, and, if appropriate, the GHG efficiency ratio) during the operational phase for Projects emitting over 100,000 tonnes of CO_2 equivalent annually*"
EP4 Annex A	Provides detailed requirements underpinning support Principles 2 and 10 in relation to: • GHG alternatives analysis • GHG Quantification • CCRA

Further elaboration on key elements of these requirements/commitments is provided in the following sub-sections.

2.1.2. CCRA-Specific Requirements

Overview

EP4 Principle 2 sets out the expectation that the Client includes an assessment of climate change risks as part of the ESIA[3] or other Assessment, with these included in the Assessment Documentation. The Client should align the CCRA with Climate Physical Risk and Climate Transition Risk categories of the TCFD (see Box 1-2).

[3] See also EPA Guidance Note: On ESIA Scope of Work, July 2022 [Annex 4 - Ref 22]

Under EP4 Principle 2 a CCRA is required as follows:

- **Physical CCRA** – For all Category A and, as appropriate, Category B Projects, and will include consideration of relevant physical risks.
- **Transition CCRA** and **alternatives analysis** - For all Projects, in all locations, when combined Scope 1 and Scope 2 emissions are expected to be more than 100,000 tonnes of CO_2 equivalent annually (100ktpa $CO_{2\text{-eq}}$). Consideration must be given to relevant Climate Transition Risks (as defined by the TCFD) and an alternatives analysis completed which evaluates lower GHG intensive alternatives.

Applicability of these requirements is further discussed in Section 2.2.

The depth and nature of the CCRA will depend on the type of Project, as well as the nature and severity of the risks (see Section 2.1.3 for further guidance on materiality of risks). EP4 Annex A requires that the CCRA should address the following questions at a high level:

- What are the current and anticipated climate risks (transition and/or physical) of the Project's operations?
- Does the Client have plans, processes, policies and systems in place to manage (i.e., to mitigate, transfer, accept or control) these risks?

EP4 Annex A further requires that the CCRA should also consider the Project's compatibility with the host country's National Climate Commitments (NCC) as appropriate, and this is further discussed in section 2.1.4.

When evaluating a CCRA the EPFI should ensure that the risks identified in the CCRA are aligned with the physical and transition risk categories identified by the TCFD Recommendations (see also Box 1-2).

Physical CCRA

Determination of whether a Physical CCRA is required under EP4 is based the categorisation of the Project as defined under Principle 1; these categorisation criteria are as shown in Box 2-1.

Box 2-1: Project Categorisation

EPFI's environmental and social due diligence should be proportionate to the categorised level of environmental and social risks and impacts, including those related to climate change of the Project in review. Such categorisation is based on the IFC environmental and social categorisation process, which divides Projects into the following three categories:

Category A: Projects with potential significant adverse environmental and social risks and/or impacts that are diverse, irreversible or unprecedented

Category B: Projects with potential limited adverse environmental and social risks and/or impacts that are few in number, generally site-specific, largely reversible and readily addressed through mitigation measures

Category C: Projects with minimal or no adverse environmental and social risks and/or impacts.

It is highly recommended that the susceptibility of projects to physical climate change risks is considered as part of the categorisation process.

Applicability of the requirements for provision of Physical and Transition CCRA in respect to the project categorisation is further discussed in Section 2.2.1.

Transition CCRA and GHG Assessment

Determination of whether a Transition CCRA and GHG Alternatives Analysis is required under EP4 is based on whether the project's combined Scope 1 and 2 GHG emissions exceed 100ktpa $CO_{2\text{-eq}}$.

In order to make this determination, GHG emissions should be calculated in line with the GHG Protocol[4] to allow for aggregation and comparability across Projects, organisations and jurisdictions. Where appropriate and possible, it is good practice to assess Scope 3 GHG emissions to understand better the Project settings in regard to the overall value chain (i.e. upstream and downstream), and therefore select one of the best alternatives from the GHG emissions perspective.

Box 2-2 provides more information on GHG quantification and reporting according to the GHG Protocol.

4 GHG Protocol. Available from https://ghgprotocol.org/

Box 2-2: Greenhouse Gas Quantification and Reporting

The **GHG Protocol** provides guidance for accounting and reporting of seven greenhouse gases (carbon dioxide (CO_2), methane (CH_4), nitrous oxide (N_2O), hydrofluorocarbons (HFCs), perfluorocarbons (PFCs), sulphur hexafluoride (SF_6) and nitrogen trifluoride (NF3)). The emissions of each GHG type are calculated separately and then converted into **CO_2 equivalents** ($CO_{2\text{-eq}}$) based on their global warming potential.

The GHG Protocol categorises GHG emissions into the following three broad scopes:

Scope 1: Direct GHG emissions from owned or controlled sources, i.e. fuel combustion and fugitive emissions;

Scope 2: Indirect GHG emissions from the use of purchased electricity, heat or steam; and

Scope 3: Other indirect emissions, such as the extraction and production of purchased materials and fuels, transport-related activities in vehicles not owned or controlled by the reporting entity, electricity-related activities not covered in Scope 2, outsourced activities, waste disposal, etc.

It should be noted that GHG emissions estimates may not be sufficiently certain at the feasibility or even the Front-End Engineering & Design (FEED) stages of a Project to fully confirm whether or not the GHG emission threshold may be exceeded. In such cases it is prudent that a precautionary determination is taken at these early Project stages; this may then be revised as the Project detailed design evolves. The Lenders' Independent E&S Consultant (IESC) should be requested to review the scope and methodology used by the Client to confirm the validity of the predicted GHG emissions during these phases of the Project development.

Once in operation, for Projects with predicted GHG emissions above 100ktpa $CO_{2\text{-eq}}$ the Client is required to report their annual GHG emissions (see also Section 2.1.4). In such cases it is preferable that the GHG emissions are subject to formal third-party verification and, where this is not undertaken, it is recommended that as a minimum the IESC's scope of work includes not only monitoring of compliance with the disclosure reporting requirements but also detailed review of the reported annual GHG emissions, especially during the initial years of operation.

In determining the depth and scope of the Transition CCRA, the nature and severity of the potentially material transition risks should be considered. This should take into account both impact materiality and financial materiality perspectives (see Section 2.1.3 below).

GHG Alternative Analysis

As defined in EP4 Annex A, the GHG alternatives analysis should cover:

- Evaluation of technically and financially feasible and cost-effective options available to reduce Project-related GHG emissions during the design, construction and operation of the Project (e.g., product changes to use of low-carbon fuels, reduce material use, sustainable agricultural practices, material recycling, use of cement additives[5] or changes of business operations) (also a requirement under IFC PS3).
- For Scope 1 emissions, determination of the best practicable environmental option (this may be supported by reference to relevant IFC Environmental Health and Safety (EHS) sectoral guidelines and other Good International Industry practice (GIIP)) and will include consideration of alternative fuel or energy sources if applicable.
- For Projects in high carbon intensity sectors[6], the GHG alternatives analysis will include comparisons of the selected technology to other viable technologies used in the same industry sector and in the country or region, including energy efficiency and GHG intensity ratios, as appropriate.

The selected alternative needs to balance optimising GHG-intensity, with economically viability and avoiding/minimising impacts to other environmental and social (E&S) aspects.

In some cases, the GHG alternatives analysis may need to be re-visited to ensure that it remains valid as the design moves through the lifecycle from feasibility through to FEED and then final detailed design. Where detailed design is to be completed after signing the loan agreement, it is recommended that a commitment to follow key design options and parameters selected on base of available GHG alternatives analysis output is included into the loan documentation, and its realisation is monitored through the project implementation.

The Equator Principles Action Plan (EPAP) should include actions to:

- Verify that the final detailed design, once completed, aligns with the agreed design requirements and the GHG alternative analysis outcome.
- Ensure that the operational management plan includes commitments to ongoing compliance with the agreed design parameters (e.g. emissions standards, GHG efficiency ratios etc.).

5 See also IFC Guidance Note 3: Resource Efficiency and Pollution Prevention, 2012. https://www.ifc.org/wps/wcm/connect/9fc3aaef-14c3-4489-acf1-a1c43d7f86ec/GN_English_2012_Full-Document_updated_June-14-2021.pdf?MOD=AJPERES&CVID=nXqnsJp

6 As per EP4 Annex A, high carbon intensity sectors indicatively include but are not limited to the following: oil and gas, thermal power, cement and lime manufacturing, integrated steel mills, base metal smelting and refining, and foundries, pulp mills and potentially agriculture.

- Confirm that relevant agreed design parameters are achieved in the as-built Project as part of lenders reliability testing where applicable.

2.1.3. Defining Materiality

Materiality of risks and opportunities should form an essential part of the CCRA process, and should drive decisions on if and how a risk or opportunity should be addressed as part of the Project design, strategy, business and financial planning, as well as in the corresponding management plans as relevant. The consideration of materiality for climate-related risks by Clients should be consistent with the consideration of materiality in financial filings and business planning.

For the purposes of this guidance, a climate-related risk or opportunity is material for the Project, and required to be considered within the CCRA, if there are associated significant financial risks or if it poses impacts in terms of either:

- The risk that climate change may have on the financial performance of the Project through physical and/or transition impacts on financial position and cash flows (i.e. **Financial Materiality**).
- The climate-related impacts to society and the environment posed by the Project in terms of GHG emissions and any incompatibilities with the NCC (i.e. **Impact Materiality**). In addition, the Client also needs to consider the potential for the Project to exacerbate direct climate change impacts to infrastructure, environment, economy and society within the project's direct Area of Influence; such wider impacts may be addressed either specifically as part of the CCRA or elsewhere in the ESIA.

Information is considered material for lenders if, as part of the set of information used for decision-making, it can be reasonably expected to have the ability to influence decisions they make on the basis of the anticipated climate/ESG performance, reputational risk and credit risk of the Project.

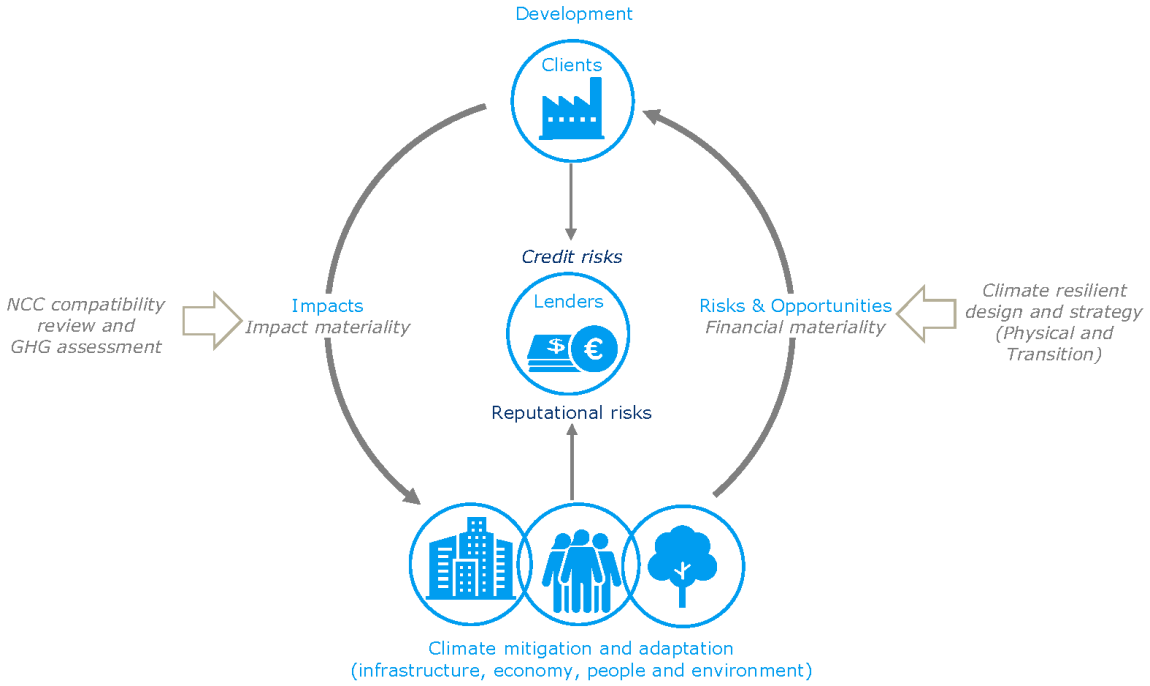

Figure 2.1: Double materiality

This 'double materiality' principle is incorporated into this guidance through the preliminary NCC compatibility review and GHG assessment (refer to Sections 2.1.2, 2.1.4. and 4) and the climate resilient Project design and strategy (TCFD) review (refer to sections 5 & 6; see also Figure 3.1) as follows:

- The preliminary NCC compatibility and GHG assessment review enable the consideration of impact materiality (i.e. Project impacts on climate mitigation and adaptation for the host country and on global decarbonisation efforts, with direct and indirect effects on infrastructure, economy, people and the environment), in that:
    - The Project compatibility and contribution to: 1) decarbonisation goals; and 2) national, regional or local adaptation plans or resilience of the wider system in question, are assessed. This enables the reduction of carbon lock-in[7] and climate vulnerability risks for the Client and host country at national and local levels, and general alignment with the Nationally Determined Contribution (NDC) and Long Term Strategies (LTS).

[7] Carbon lock-in occurs when the systemic transformations required to achieve a rapid reduction of regional and global CO_2 emissions in line with climate targets are prevented or delayed due to committed greenhouse gas emissions. The long-life of physical infrastructure can lock societies into carbon-intensive pathways, adding difficulty and costs to the transition to low-carbon alternatives. These assets can also result in substantial sunk costs given their long lead times. See e.g. Seto et al., (2016) and Stoddard et al., (2021).

- In turn, this process reduces reputational risks for the EPFIs (potentially beyond the loan tenure, over the Project lifecycle), thus mitigating potential financial impacts associated to their brand (see financial materiality below for consideration of reputational impacts on the financial performance of the Project and their associated credit risk).

- The climate resilient Project design and strategy (TCFD alignment) process has a focus on financial materiality (i.e. financial risk for the Project driven by its exposure to, and management of, climate related risks), in that:
  - This approach enables Clients to identify and manage known and potential impacts that pose a financial material risk or opportunity to the Project over the short-, medium- and long-term (e.g. can impact cash flows, development or performance), and which arise either from the transition to a low carbon economy or from climate-related hazards. Key to this process is the identification of financial drivers – will the risk or opportunity pose an impact on Project revenues, costs, value of assets/liabilities, cost of/access to finance – and associated transmission channels (e.g. operational disruption, supplier disruption, price volatility of critical materials, energy and carbon costs, policy mandates, technological disruption, introduction of new business models, shift in consumer preferences, or reputational considerations).
  - In turn, this process enables EPFIs to assess and manage credit risks based on the anticipated impacts of climate-related risks and opportunities on the financial performance of the Project over the term of the loan.

The materiality of a Project is context specific and, as such, a materiality assessment should be conducted and documented as part of the climate risk assessment process in order to identify those climate related risks and opportunities that are known to (or can potentially) be material (individually or in aggregate over the CCRA time horizon, or in a cumulative way in conjunction with other Project risks).

The assessment of the materiality of climate-related risks (and opportunities) for a Project (i.e. materiality assessment) is used to identify the need for management actions to reduce the severity and likelihood of risks, as well as to 'filter in' the information that is relevant to stakeholders. Crucially, whilst health and safety considerations – risks on assets, infrastructure and people – are included within the scope of the physical CCRA, these risks are not necessarily assessed in quantitative or monetary terms. Therefore, in assessing the Project materiality, consideration should be given to the financial thresholds above which the Project operation could be significantly impacted and the potential significance of the impact, along with other broader qualitative or quantitative thresholds, including but not limited to reputational, social, health and safety, legal/regulatory and operational considerations.

2.1.4. Compatibility with National Climate Commitments

In line with EP4 Annex A, the CCRA should *take "into consideration"* the Project's "*compatibility"* with the NCC of the host country[8]. For countries that are party to the 2015 Paris Agreement, the NCC therefore link to commitments made under the agreement including NDC and, if submitted, LTS, as well as any other nationally developed commitments. In addition, the Preamble to EP4 states that EPFIs "*support the objectives"* of the 2015 Paris Agreement. Where Projects are located in one of the (small number of) countries that are not party to the Paris Agreement, and where other NCCs are not available, EPFIs may nonetheless wish to assess the Project for compatibility with the general sectoral objectives set in line with the Paris Agreement. Further details on the NCC and the 2015 Paris Agreement are provided in Box 2-3 and Box 2-4

Box 2-3: Paris Agreement

The **Paris Agreement** is a binding international treaty on climate change adopted in 2015 at the twenty-first Conference of the Parties (COP 21) in Paris. 196 Parties adopted the treaty with the goal to limit global warming to well below 2°C, preferably to 1.5 °C, compared to pre-industrial levels, as well as building climate resilience to adapt to the increased impacts of climate change.

Implementation of the Paris Agreement requires economic and social transformation. In a five-year cycle, each Party is required to submit their increasingly ambitious **national climate commitments.**

Paris Alignment refers, amongst other aspects, to the alignment of public and private financial flows with the goals of the Paris Agreement to strengthen the global response to the threat of climate change. Article 2.1c of the Paris Agreement establishes that financial flows must be consistent with a pathway to low GHG emissions and climate resilient development.

[8] The requirement to assess the significance of climate change risks in the context of national commitments and policy goals is also consist with other available good practice, such as IEMA's Guide: Assessing Greenhouse Gas Emissions and Evaluating their Significance.

Box 2-4: National Climate Commitments

Since 2015, countries that are parties to the Paris Agreement are required to submit a national climate action plan known as **Nationally Determined Contribution** (NDC). Countries are also invited to submit **Long-term Strategies** (LTS) towards a low-carbon economy, although these are not mandatory.

NDCs submitted under the Paris Agreement, are the main channel for countries to publicly state their self-defined ambitions in setting long-term decarbonisation targets to keep global temperature rise below 1.5 degrees and to set goals on enhancing climate resilience.

Each country that has ratified the Agreement must submit their NDCs to the United Nations Framework Convention on Climate Change (UNFCCC) secretariat every five years. These must represent a progression compared to the previous NDC and reflect its highest possible ambition.

LTS set long-term deadlines, or concrete timeframes and is a central component of national climate planning.

NDCs and LTSs include targets, measures and policies and are the basis for national climate action plans, programmes and policies.

Within this guidance, compatibility against the NCC is assessed by categorising Projects as 'Aligned', 'Not Aligned' or 'Conditional'. Definitions for these terms and the Preliminary NCC Compatibility Review approach are outlined in Section 4[9].

2.1.5. Responsibilities for NCC Compatibility Review and CCRA Development

Ultimate responsibility for the development of the Project CCRA (NCC compatibility review, physical and transition risk screening and full risk assessment) rests with the Client. In the event that the EPFI is engaged prior to the development of the ESIA documentation for the Project, the EPFI may wish to recommend the CCRA be included in the scope of work for the Project Sponsor's consultant undertaking the ESIA (see also EP4 Exhibit II[10] and EPA guidance on ESIA Scope of Work [Annex 4 - Ref 22]), and that engagement takes place at the Project inception stage to inform the NCC compatibility review and physical and transition risk screening, for an early and cost-effective management of risks and opportunities.

The Client may seek support from its designers, ESIA consultant, other specialist consultancies support to develop the Project CCRA, although it is important such consultants engage with all relevant

[9] In assessing 'compatibility with NCC' EPFIs may wish to adopt a broader test of the project 'not being inconstant with NCC' to recognise that NCC climate adaptation resilience policies and strategies are not always included, comprehensive or exhaustive and cannot be expected to cover all potentially valid climate adaptation priorities.

[10] Please also refer to Equator Principles 4 Exhibit II (Illustrative list of potential environmental and social issues to be addressed in the ESIA documentation), which includes consideration of climate risks and adaptation opportunities.

disciplines with the Client team (including, for example, operational management and engineering design teams).

In selecting consultancy support, the Client needs to consider whether the Project-specific requirements of the CCRA are wholly within the capabilities of an individual consultancy and the Client may seek to secure certain specific skills and experience on the consultant team to assist in ensuring an appropriate quality CCRA, such as:

- Deep understanding of climate change science, associated risks and impacts;
- Knowledge of factors impacting climate change vulnerability and resilience;
- Understanding of the potential risk that the transition to a low-carbon economy can pose to the project technology and business model, beyond carbon considerations;
- Experience of applying forward looking scenario analysis for physical and transition risk;
- Experience in carrying out localized climate risk assessments for high-risk infrastructure;
- Experience developing climate change-related mitigation and adaptation strategies; and
- Experience in catastrophe modelling tools, as well as exposure and vulnerability assessments.

The CCRA should also be reviewed by the IESC on behalf of the EPFI (see also EPA Guidance Note: On Section and Scope of Work (SoW) for the Lender's IESC, July 2022 [Annex 4 - Ref 23][11]). In some situations, review of the CCRA and GHG alternatives analysis by the IESC may be strengthened by liaison with the Lenders' Market Advisor (LMA – in relation to transition risks), the Lenders' Technical Consultant (LTA – in relation to physical risks and GHG alternatives) and/or insurance adviser (in relation to physical risks). Review of the CCRA should take due account of this guidance note. Consideration during the review will also need to be given to alignment with any lender-specific climate-related policies.

Where a Project meets the criteria to produce a CCRA, but the Client lacks the technical capability to produce such an assessment, it may be pragmatic for the IESC to undertake a CCRA screening to determine whether there are any likely significant risks. Where significant risks are identified, then a requirement should be placed on the Client to engage the necessary expertise to develop a detailed CCRA; where the Client cannot identify suitable external expertise then as a last resort the IESC, with support from the other lender advisors, may be requested to undertake the CCRA. However, in such case it is imperative that the Client fully collaborates with the process and commits to the implementation of any recommendations that the CCRA may provide.

2.1.6. Client Disclosure Requirements

EP4 Principle 10 requires the Client to ensure that, at a minimum, a summary of the ESIA is accessible and available online and that it includes a summary of the Project's climate-related risks and the

[11] https://equator-principles.com/app/uploads/PUBLIC-Guidance_Selection-and-SoW-for-IESCs.pdf

potential impacts of the identified risks[12]. The timing of this disclosure should be such that it supports meaningful engagement with stakeholders and should also occur prior to loan signing.

Principle 10 also requires the Client to report publicly, on an annual basis, GHG emission levels (combined Scope 1 and Scope 2 Emissions, and, if appropriate, the GHG efficiency ratio) during the operational phase for Projects emitting over 100ktpa $CO_{2\text{-eq}}$. It is also good practice to disclose Scope 3 GHG emissions under available upstream and downstream categories as defined by GHG Protocol.

Where applicable, the public reporting requirement should be embedded within the loan documentation and/or EPAP, with appropriate agreed methods of quantification (see Section 2.1.2. and Box 2-2 for details) and disclosure.

Furthermore, in order to improve strategy and efficiency of managing climate-related risks, enhance transparency and reduce reputational risks for the project, development and disclosure of TCFD reports are also recommended as good practice, if applicable.

2.2 Applicability

2.2.1. Applicability of Requirements on Physical and Transition CCRA

A summary of when physical and transition CCRA (and GHG alternatives analysis) respectively are required under EP4 for in-scope transactions is provided in Table 2-1.

Table 2-1: Summary of CCRA Implementation Requirements Under EP4

OVERALL CCRA IMPLEMENTATION REQUIREMENT		Transition Climate Change Risk Assessment Thresholds Requirements	
		Project's Scope 1 and Scope 2 GHG emissions are expected to exceed 100kpta $CO_{2\text{-eq}}$	Project's Scope 1 and Scope 2 GHG emissions are expected to be **less than** 100kpta $CO_{2\text{-eq}}$
Project Categorisation	Category **A**	GHG Emissions Assessment Physical CCRA Transition CCRA GHG Alternative Analysis	GHG Emissions Assessment Physical CCRA
	Category **B**	GHG Emissions Assessment Physical CCRA Transition CCRA GHG Alternative Analysis	GHG Emissions Assessment Physical CCRA

EP4 recognises that the level of potential E&S and financial risks and impacts within Projects classified as Category B may vary. Therefore, higher risk Category B Projects will be treated similarly to Category

[12] Except in Project-Related Refinance and Project-Related Acquisition Finance.

A Projects, and lower risk Category B Projects could be treated in a lighter manner. In determining whether a Physical CCRA is "appropriate" for a Category B Project consideration should be given whether it is of generally higher or lower E&S risk and, more specifically, whether by its nature and/or location may be susceptible to climate-related physical risks, and therefore poses a financial risk to the client and EPFI. EPFIs may also wish to consider susceptibility to physical climate change risks as part of the categorisation process.

While Transition CCRAs are required for all Projects where combined Scope 1 & 2 $CO_{2\text{-eq}}$ emissions exceed 100ktpa regardless of categorisation, EPFIs may wish to use this threshold as an indication that the Project should be considered as Category A or, as a minimum, Category B higher risk and cannot be considered under Category C.

Furthermore, it should be noted that some projects may have limited (less than 100tkpa) Scope 1 and 2 Project emissions but be inextricably linked to broader sectoral or associated facilities' transition risks (examples may include gas pipelines, support facilities to the O&G sector, etc.). In such cases, the EPFI may decide it prudent for a transition CCRA to be developed.

High-level screening at an early stage is required to support such determination of the CCRA scope under discussion (see also Sections 3.3 and 3.4 for appropriate timing). In addition, a preliminary review of the level of compatibility of a Project with the host country's NCC (and by extension alignment with the Paris Agreement as appropriate), may also be used by EPFIs when determining whether a CCRA would be beneficial from a risk management perspective. Such preliminary review may also be used to inform the scope and nature of the CCRA – see also Section 4 for discussion.

2.2.2. Applicability for sovereign loans

The recommendations on the CCRA approach and methodology given in this Guidance Note are primarily developed on project finance and project development cycle (see Figure 3.2). However, the same approach can and should be employed for sovereign and corporate project-related loans as appropriate under the requirements of EP4. In the case of sovereign loans, it should be noted that many national and regional level investments have high sensitivity to climate change with potentially very significant socio-economic and environmental consequences.

For sovereign loans, the assessment of financial risks for the Project (i.e., financial materiality/credit risks), including those associated with climate change risks as defined under the TCFD, may be of less relevance to EPFIs. However, risks to the environment, economy and society (i.e., impact materiality/reputational) can still be relevant and material (refer to Section 2.1.3). In such cases, EPFIs may determine that the full CCRA requirements may not be applicable from a financial risk management perspective. However, even in such cases: (i) physical climate risks should still be considered as appropriate in line with broader ESIA / IFC PS1 requirements; and (ii) consideration of transition risks may still be relevant in terms of, for example, reputational risk management

commitments and/or project(s) alignment and compatibility with the host country's national climate commitments.

In addition, it is often the case on sovereign loans that an Independent Technical Consultant has not been appointed. Where this is the case and potential physical risks are identified, EPFIs should ensure that the IESC has sufficient capability and mandate in their scope of work to adequately review the project(s) design and, if appropriate, operational manuals and corporate processes to ensure that climate change risks and their management have appropriately been addressed.

3. CCRA GUIDANCE APPROACH

3.1 Objective of CCRA

The overall aim of the CCRA is to ensure the availability of climate-related information to help individuals and organisations making climate-resilient decisions and to do so in line with the requirements set out in EP4 Principle 2 and Annex A.

The objectives of a CCRA are to identify and assess material[13] climate-related risks to a Project (and hence to the EPFIs) from the early stages of its development in order to most effectively minimise and manage the potential impacts, risks and opportunities over its lifecycle (considering the Project implementation stages from feasibility to decommissioning). Assessments adapted to the specific local context as well as the Projects' own design and operation plans are vital to effective management. Early identification and continuous management of climate-related impacts, risks and opportunities for incorporation into Project design and business strategies are central to effective, timely and cost-efficient management of climate change risks (see also Section 3.3). Further guidance on the assessment of materially of Project resilience risks within the CCRA is provided in 2.1.3.

3.2 Overview of CCRA Framework

A two-phased approach to the CCRA is proposed comprising the following components (refer to Section 2.1.5 for an overview of responsibilities):

1. A preliminary review of the Project's compatibility with host country NCCs, including as appropriate NDCs, LTS and Paris Agreement objectives, with compatibility framed in the context of 'Aligned', 'Conditional' or 'Unaligned' (see Section 2.1.4). This preliminary review may be used by EPFIs in conjunction with applicability criteria described in Section 2.2 to determine whether they consider a Physical and/or Transition CCRA is/are required, and, if so, to inform the scope and nature of the required CCRA.
2. Development of Project Resilience to Physical and/or Transition Climate Risks (under categories in line with TCFD recommendations), as relevant, through a staged CCRA process of screening/scoping; risk assessment; and risk management. The assessment of the Project's compatibility with the NCC will be further elaborated and confirmed through the CCRA process based on the outcome of the risk assessment.

Each of these phases is undertaken for both Physical and Transition risks, and this framework is summarised in Figure 3.1. The right-hand side of the figure shows the adaptation to climate change

[13] refer to Section 2.1.3 for defining materiality

by assessing physical risks and is further described in Section 5, while the left hand side shows climate change mitigation by assessing transition risks and is further described in Section 6.

See additional references in Annex 4 for further information and guidance.

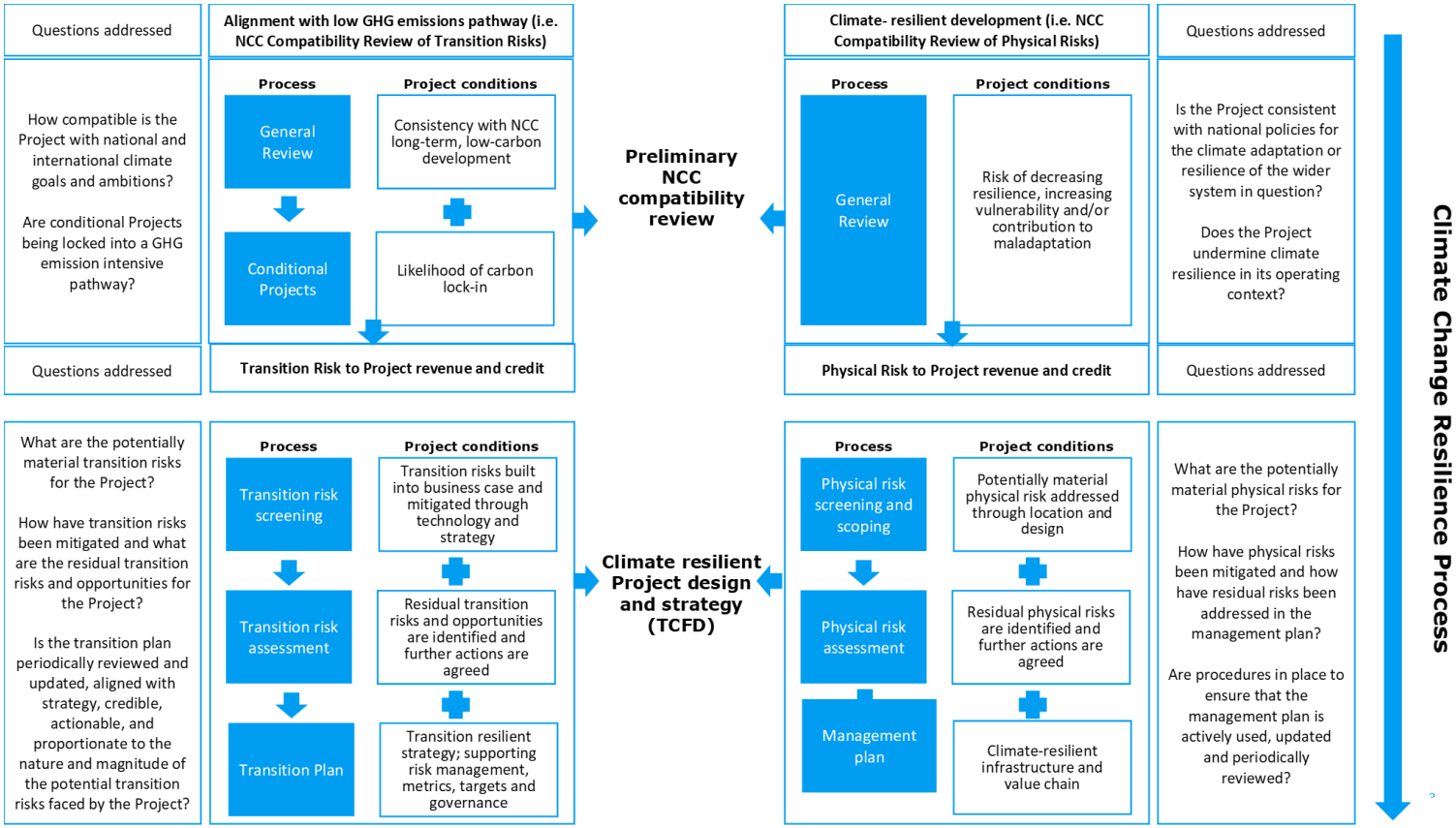

Figure 3.1: Climate Change Resilience Process

3.3 Governance, Management and Monitoring

Governance and climate change risk management

The vulnerability of a Client to climate change risks over a period of time (e.g. 10+ year investment period) can become highly significant (such as infrastructure severally affected by floods, high operational costs for energy-intensive industries and conventional technologies due to energy costs and carbon tax/adjustment mechanism, or loss of market share due to shifts in customer preferences, stakeholder pressure, or competition from new business models and low-carbon technologies). The successful and cost-effective management of climate-related risks requires strategic goals setting (short-, medium- and long-term), oversight and leadership at the highest possible level in the organisation or its parenting entity.

Upscaling the climate change risk management approach at the Project level (i.e. Project level governance) to the top management or corporate level (i.e. corporate governance) will enhance implementation of risk management and strategic decisions and overall financial stability for the Client. This is achieved via assigned responsibilities, resources, support, and proper consideration of climate change constrains in any development plans or strategic, business and financial planning.

Management and Monitoring

Material risks identified in the framework of CCRA should be managed, mitigated and monitored via Project-specific management plans. Depending on the sensitivity of the Project, its type, scale and complexity, it can be stand-alone documents, separate for transition and physical risks or a set of the management and monitoring measures integrated into the ESMP and/or other Project documentation such as design or construction documentation, emergency response plans, subject-specific management plans, GHG Emission Management Plan. The Climate Change Risk Management Plan should include the following components: project context, defined roles and responsibilities, GHG strategy and policies, management approach and procedures, Project-specific set of mitigation measures, monitoring metrics and approach to support implementation, and public reporting commitments. For reference, general guidelines, including but not limited to IFC Guidelines on Environmental and Social Management Systems[14] can be used. More information on climate change risk management plans and further reference can be found in Sections 5.4 and 6.6.

[14] IFC (2015) Environmental and Social Management System Implementation Handbook, https://www.ifc.org/wps/wcm/connect/4c41260d-1ba8-4d10-a77d-f762d60a1380/ESMS+Handbook+General+v2.1.pdf?MOD=AJPERES&CVID=lllFYII

Opportunities

Climate change and the transition to a low-carbon economy can pose both opportunities and risks. The subsequent sections of this Guidance document focus on risks. However, the climate change resilience process can also reveal various opportunities such as potential savings in resource costs, the adoption and utilization of low-carbon technology, development of new products and services, and enhancing resilience for the Project and along the supply chain. Climate-related opportunities are also specific to the region, market and Project. The opportunities should be realised and enhanced, where possible, and supporting management actions should be included into the CCRA management plans.

3.4 Timing of the CCRA

For climate-related Project risks to be identified and managed in an effective, timely and cost-efficient manner they should be considered from the initial stages of the Project and developed through its lifecycle. The Figure 3.2 below illustrates the temporal correlation of financing and Project lifecycle and the climate change resilience process.

To optimise the interaction between Project design and strategy decisions and the outcome of the CCRAs, the CCRA process should be aligned with the Project development and financing lifecycle. The preliminary NCC compatibility review and the physical and transition risk screenings (see Figure 3.1) should be undertaken as early as possible, ideally at the Project feasibility stage when Project concepts will be defined. The hazards and sector vulnerability baseline should be undertaken during Project planning once sufficient Project information is available to confirm its location and physical / spatial extent. The risk assessment should be conducted in full during the design phase but preferably started earlier. Exchanges between the CCRA developer and design team should take place to consider design alternatives to reduce Project related GHG emissions and to improve climate change adaptation and resilience of the Project.

It is further recommended that:

i. **Prior to loan signing:** the CCRA be completed by the Client following review/agreement by EPFIs and their IESC as part of the pre-signing due diligence, as this process will inform the credit risk evaluation.
ii. **Prior to Financial Close:** the corresponding climate change management plan should be in place that addresses all relevant identified mitigation measures related to both the construction and detailed design of the Project.
iii. **Prior to Operation:** The EPAP should include an action for the climate change management plans to be reviewed and adapted for the operational phase ahead of the commencement of the operational phase.
iv. **During Operations:** Requirements should be put in place (e.g., directly in the Loan Documentation or as part of covenanted management plans) for the Client to periodically

review and adapt the operational climate change management plan throughout the operational phase (and decommissioning if relevant) until the end of the loan in order to respond to evolving physical and transition risks.

In addition to the timing discussed above, some EPFIs might have additional requirements on the CCRA-related documentation required prior to a signing stage or a financial close.

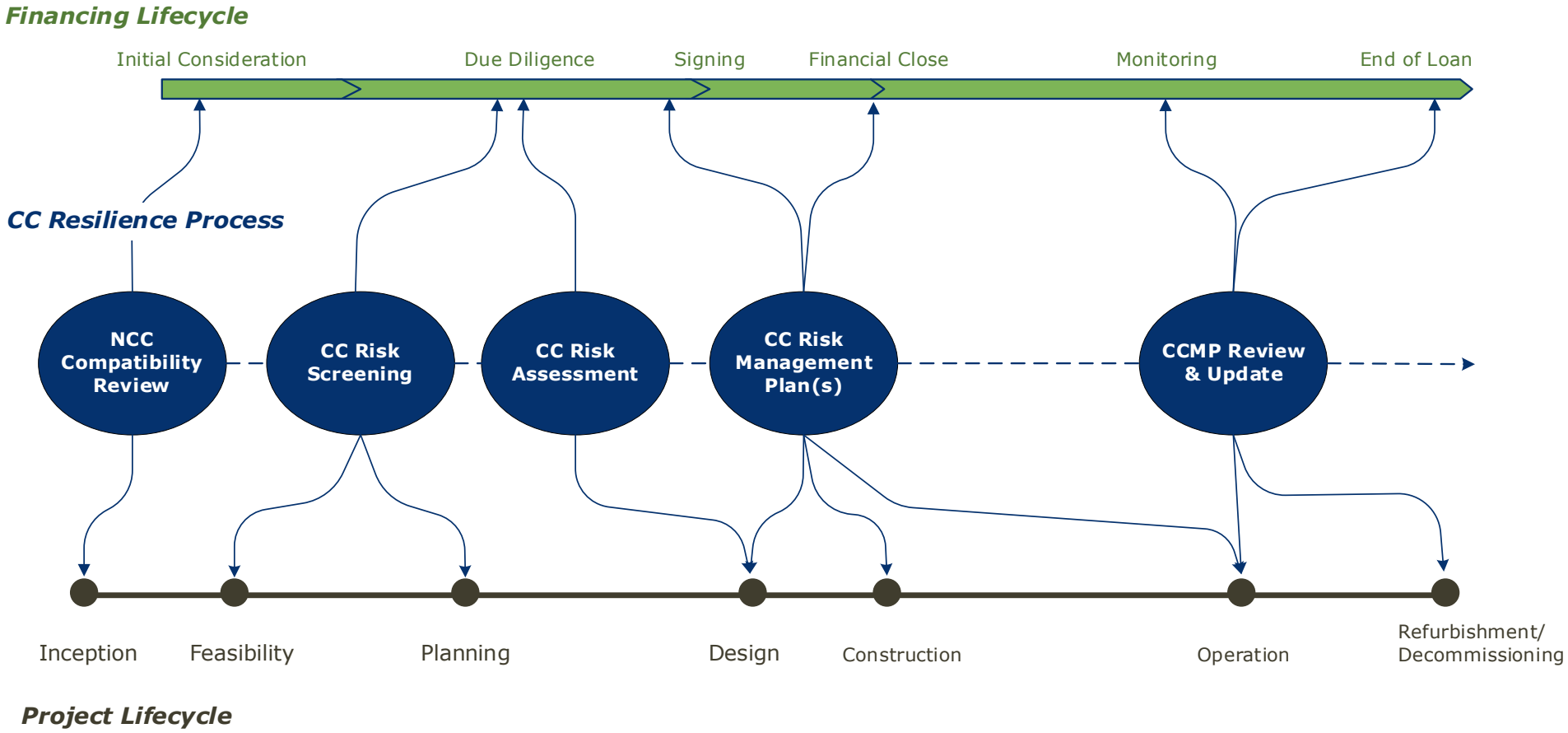

Figure 3.2: Financing Lifecycle, Project Lifecycle and Climate Change Resilience Process Requirements

4. PRELIMINARY NCC COMPATIBILITY REVIEW

4.1 Introduction

The assessment of climate-related risks follows a phased approach whereby the overall Project compatibility with the host country's NCC is preliminarily assessed, in line with EP4 Annex A, preferably during the inception phase.[15] The assessment of impacts can be qualitative if no quantitative data is available, and it will be informed by quantitative data such as GHG emissions associated to the project as well as qualitative information (e.g. alignment of the project technology and GHG emission with the NCC for the host country). The aim is to integrate climate change alongside other Project considerations from the earliest stages in a Project's life cycle, and to inform the scope and nature of the remaining CCRA stages (refer to Figure 3.1 and Sections 5 and 6 below).

In order to be considered compatible with the host country NCC, Projects need to be compatible with both the adaptation/resilience (i.e. physical risks) and mitigation (i.e. transition risks) NCC approaches described below.

Preliminary compatibility **does not exclude the Project from going through the remaining CCRA stages** (see Sections 5 and 6 below). The following should be noted in relation to transition risks:

1. Projects deemed to be compatible with the host country's NCC and/or aligned with the Paris Agreement (where applicable, see Section 4.3.2) can still present material transition risks and will need to go through the 'Resilient Project Design and Strategy' steps in order to determine their resilience to transition risks (refer to Section 6).
2. Projects that are determined to be incompatible with the host country's NCC and/or not aligned with the Paris Agreement (where applicable), will present higher transition risks due to the nature of their operations. The purpose of this preliminary compatibility review is to ensure that those risks are clearly identified so that they can be used to inform the scope and nature of the Transition CCRA (refer to Section 6) and also be considered by EPFIs' in their commercial decisions.

[15] Additional requirements for alignment of the financed project with the Paris Agreement and NCC are elaborated by IFIs. Good example of such best practice can be found in Environmental and Social Standards of European Investment Bank (2022). - https://www.eib.org/en/publications/eib-environmental-and-social-standards

4.2 Preliminary NCC Compatibility Review of Physical Risks

4.2.1. Objectives

The purpose of the preliminary NCC compatibility review of physical risks is to assess the level of alignment with the host country's NCCs and relevant associated global adaptation objectives under the Paris Agreement, including (under Article 8):

- Enhancing adaptive capacity.
- Strengthening resilience and reducing vulnerability to climate change with a view to contributing to sustainable development.

4.2.2. Approach

Reflecting the area-related nature of physical climate change impacts and, unlike for transition risks (see Section 4.3), there is no positive list of sectors or activities that are automatically aligned. Therefore, compatibility with NCC is assessed through the CCRA process by addressing the two (2) questions in Box 4-1.

Box 4-1: Project's NCC Alignment (Physical Risks)

Question 1: Is the Project consistent[13] with national policies and commitments for the climate adaptation or resilience of the wider system in question and the context it operates?

Question 2: Have Project-related physical climate risks been identified and addressed?

By addressing Question 1, this preliminary review provides an initial consideration of the Project's compatibility[16] with adaptation and resilience requirements defined in the NCC of the host country, including NDCs, LTS (where set by the host country), National Communications, National Adaptation Plans and any other relevant national climate resilience policy plans (and regional/local plans, as appropriate) within the CCRA process as required under EP4 Annex A.

An assessment of a Project's resilience against physical climate risks is provided by addressing Question 2.

[16] both consistent and compatibility are recommended to allow for the varying degrees to which adaptation is addressed within NCCs/NDCs

If a Project includes investment contradictory to the declared adaptation strategy, it is determined to be "Not Aligned". In all other cases it requires further evaluation to determine alignment. This evaluation should include consideration of:

- The host country's NCC/NDC, as well as adaptation plans, commitments, strategies, actions and/or targets.
- Related climate government permits / decision outcomes granted to the Project, including relevant regional and local plans.
- Forward-looking assessments of the host country's compliance with objectives of the Paris Agreement[17] and high-level analysis of potential / likely future policy commitments (e.g., legislation under review or consideration, political commitments, etc.).

4.3 Preliminary NCC Compatibility Review of Transition Risks

4.3.1. Objectives

The aim of the preliminary NCC compatibility review of transition risks is to ascertain whether the Project is compatible with achieving national and international climate goals set out in the NCC (and as applicable NDCs, LST and global Paris Agreement objectives). In particular, the following aspects are assessed:

- Technologies and inputs used in the operation are consistent with a plausible low GHG pathway.
- Outputs (goods or services) and revenue generated by the Project operation are consistent with a plausible GHG pathway.
- The viability of the operation depends on or promotes policies or regulations consistent with the low GHG pathway.

4.3.2. Approach

The steps involved in undertaking a preliminary NCC compatibility review are summarised in Table 4-1 and further detailed below.

[17] Note that the first phase of NDCs is not anticipated to be sufficient for limiting global climate change to "well below 2°C", as articulated in the Paris Agreement. There is an expectation that, over time, government climate actions will evolve to more closely align with Paris Agreement aims.

Table 4-1: Overview of Preliminary NCC Compatibility Review of transition risks

Assessment type	Lifecycle stage	Objective	Approach	Information requirements
Preliminary NCC compatibility review – general screening	Inception	Determine the compatibility of the Project with national and international climate goals and ambitions.	Check inclusion of Project activity type in negative lists (first screening; Section 4.3.2 "Universally not-aligned list") or positive lists (second screening, Section 4.3.2 "Universally aligned list").	Project activity
Preliminary NCC compatibility review – conditional Projects	Inception	Determine whether conditional Projects may be locked into a GHG emission intensive pathway.	Assess carbon lock-in (i.e. sector and geography screening) through a review of alignment with: 1) a low-GHG development pathway for that country (i.e. NDC). 2) transition trajectory for the sector Screening criteria SC1 to SC4 (Table 4-2).	Project performance (if known at this stage e.g. energy intensity, energy sources, Scope 1 and 2 GHG emissions, technological choices) Host country climate goals, strategies and decarbonisation pathways.

Through the preliminary NCC compatibility review, Projects are categorised as 'Aligned', 'Not Aligned' or 'Conditional' (refer to Figure 4.1 below, adapted from Cochran et al., 2021[18]) based on their inclusion in the 'universally aligned' or 'universally not aligned' lists[19]. These lists are developed and periodically reviewed by multilateral development banks (MDBs) as part of the Joint MDB Assessment Framework for Paris Alignment for Direct Investment Operations.

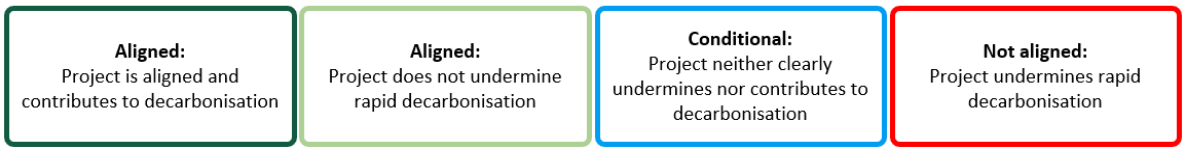

Figure 4.1: Levels of alignment with national and international climate goals.

[18] Cochran, I., Pauthier, A., Kachi, A. and Lutkehermoller, K., 2021. Operationalization Framework on Aligning with the Paris Agreement. Available at: https://www.idfc.org/wp-content/uploads/2021/06/report_idfc_frameworkforaligninwiththeparisagreement_final-1.pdf

[19] Available through individual MDB websites. e.g. https://www.eib.org/attachments/documents/cop26-mdb-paris-alignment-note-en.pdf. See also African Development Bank Group, the Asian Development Bank, the Asian Infrastructure Investment Bank, the European Bank for Reconstruction and Development, the European Investment Bank, the Inter-American Development Bank Group, the Islamic Development Bank, the New Development Bank, and the World Bank Group (International Finance Corporation, Multilateral Investment Guarantee Agency, World Bank.

If the preliminary compatibility review is inconclusive (i.e. conditional Projects), a more detailed analysis is required (see Figure 4.2 below, adapted from EBRD, 2021[20], and the sub-sections below).

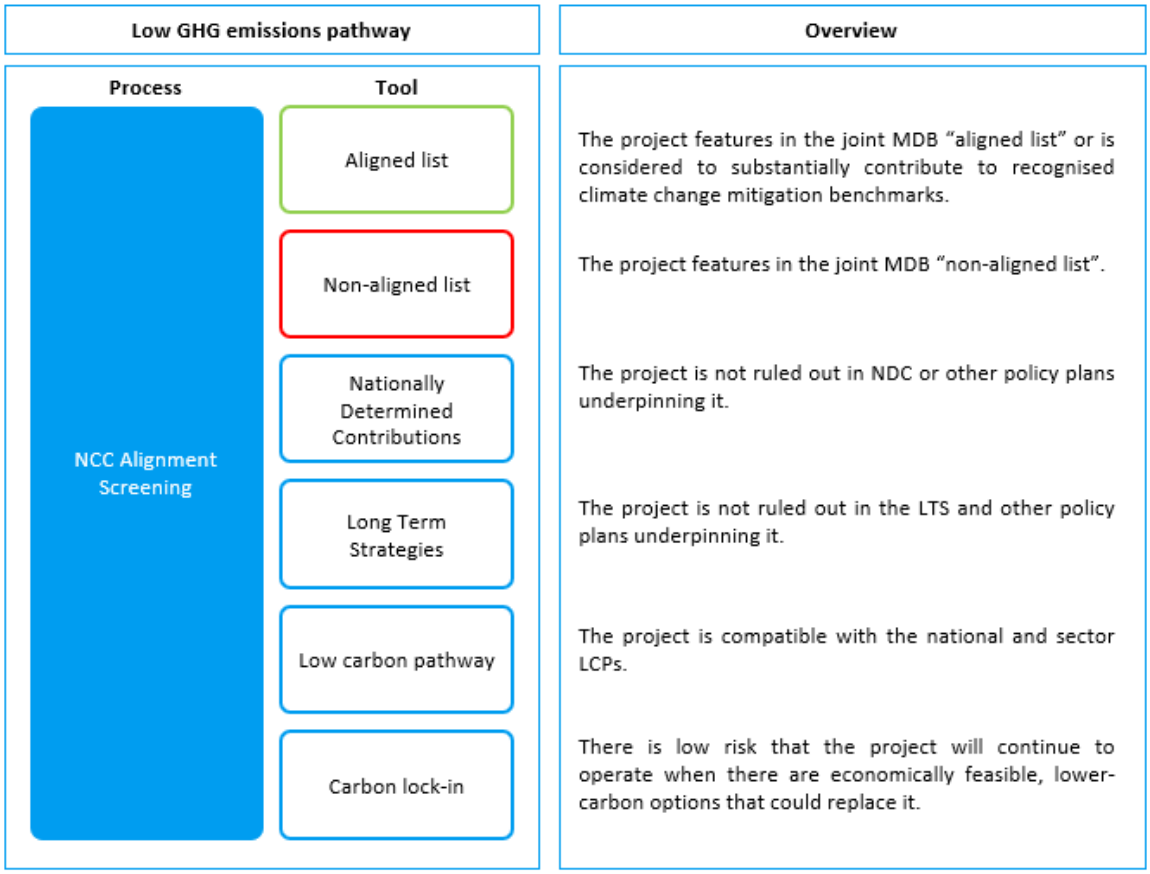

Figure 4.2: Preliminary NCC compatibility review.

The NCC alignment screening steps outlined above are further described in the following sections.

Universally not-aligned list

As of November 2021, four activity types were considered to be universally not aligned with the Paris goals as follows:

- Mining of thermal coal
- Electricity generation from coal
- Extraction of peat
- Electricity generation from peat

[20] EBRD Guidance Note, Methodology to determine the Paris Agreement alignment of directly financed ERD investments, June 2021. Available at: https://www.ebrd.com/paris-agreement-methodology.pdf

However, this list will be periodically reviewed and updated (see 4.3.2 above).

Universally aligned list

The universally aligned list comprises Projects that either contribute to decarbonisation through the reduction of GHG emissions, or they have negligible impact on GHG emissions but do not undermine rapid decarbonisation - refer to the latest version of Annex 1 of BB1 and BB2 Technical Note, Joint MDB Assessment Framework for Paris Alignment for Direct Investment Operations (note that the list will be updated over time, see 4.3.2 above).

Operation types included in this draft list will have to go through the specific criteria assessment (see sub-section on conditional Projects below) to determine their alignment if they fall under any of the following:

- Operations whose economic feasibility depends on external fossil fuel exploitation, processing, and transport activities (e.g., a railway line that will have a significant income from the transport of coal from a coal mine).
- Operations whose economic feasibility depends on existing fossil fuel subsidies (e.g., a fishing fleet that would be unfeasible in the absence of subsidies to diesel fuel).
- Operations that rely significantly on the direct utilization of fossil fuels (e.g., a pharmaceutical production plant that makes use of diesel pumps).

Conditional Projects

Operations that cannot be characterized through preliminary review will require more detailed analysis in order to determine their level of compatibility with NCC. The review may be conducted against criteria SC1 to SC4 below, however the number of assessment criteria and the granularity of the assessment will be dependent on the available information (e.g. some countries have not defined NDC or may not be party to the Paris Agreement), and there is no hierarchy among the criteria.

Table 4-2: Specific Assessment Criteria for Conditional Projects

Specific Criteria	Description	Guidance
SC1	Is the Project inconsistent with the NDCs[21] of the country in which it takes place?	Is the sector or activity covered by the host country NDC, and if so, is the operation in line with the pathways laid out for that particular sector or activity? The more aligned an NDC is with the long-term goals of the Paris Agreement, and the more sector it covers, the more robust the SC1 assessment will be.
SC2	Is the Project, over its lifetime, inconsistent with the country's LTSs[22] or other similar long-term national economy-wide, sectoral, or regional low-GHG strategies compatible with the mitigation goals of the Paris Agreement?	As above, but in relation to LTSs and other relevant low-GHG strategies. The more ambitious and realistic an LTS is, the more robust the assessment under SC2 will be.
SC3	Is the Project inconsistent with global sector-specific decarbonization pathways in line with the Paris Agreement mitigation goals, considering countries' common but differentiated responsibilities and respective capabilities?	Sector-specific decarbonization pathways may include sector roadmaps developed by international organizations (e.g., the International Energy Agency), academia, or industry associations[23]. Sector scenarios provide estimates in terms of emission thresholds that could also inform the assessment, as applicable.

[21] Nationally Determined Contributions Registry. Available at: https://unfccc.int/NDCREG

[22] Long-term strategies portal. Available at: https://unfccc.int/process/the-paris-agreement/long-term-strategies

[23] Examples include, but are not limited to:

- Transition pathway initiative. Available at:https://www.transitionpathwayinitiative.org/publications/100.pdf?type=Publication
- IEA decarbonisation pathways e.g. IEA Net Zero pathways. Available at: https://www.iea.org/reports/net-zero-by-2050
- Deep decarbonisation pathways. Available at: https://ddpinitiative.org/about/
- Sectoral Decarbonisation Approach (SDA), Science Based Targets Initiative (SBTi). Available at: https://sciencebasedtargets.org/resources/files/Sectoral-Decarbonization-Approach-Report.pdf
- Meinshausen, M., Dooley, K. (2019). Mitigation Scenarios for Non-energy GHG. In: Teske, S. (eds) Achieving the Paris Climate Agreement Goals. Springer, Cham. https://doi.org/10.1007/978-3-030-05843-2_4
- Teske, S., Niklas, S., Talwar, S. *et al.* 1.5 °C pathways for the Global Industry Classification (GICS) sectors chemicals, aluminium, and steel. *SN Appl. Sci.* 4, 125 (2022). https://doi.org/10.1007/s42452-022-05004-0
- Teske, S. and Guerrero, J., 2022. One earth climate model—integrated energy assessment model to develop industry-specific 1.5 C pathways with high technical resolution for the finance sector. Energies, 15(9), p.3289.
- Teske, S., Nagrath, K. Global sector-specific *Scope 1*, *2*, and *3* analyses for setting net-zero targets: agriculture, forestry, and processing harvested products. *SN Appl. Sci.* 4, 221 (2022). https://doi.org/10.1007/s42452-022-05111-y
- Teske, S., Niklas, S., Nagrath, K., Talwar S., Atherton, A., Guerrero Orbe, J., (2020), Sectoral pathways and Key Performance Indicators: aluminium, chemical, cement, steel, textile & leather industry, power utilities, gas utilities, agriculture, forestry, the aviation and shipping industry, road transport, and the real estate & building industry. Report prepared by the University of Technology Sydney for the UN-convened Net Zero Asset Owners Alliance. Available at: https://www.uts.edu.au/sites/default/files/2022-05/2622%20UTS%20Limit%20Global%20Warming%20report%20mr%2005b_UPLOAD.pdf

Specific Criteria	Description	Guidance
		Global studies should be applied to the country context. Countries are at different stages of development and have different resources and capacities that may affect their ability to decarbonize their economies in line with global pathways. As a result, an operation that would be deemed inconsistent in one country context might be deemed consistent in another context.
SC4	Does the Project prevent opportunities to transition to Paris-aligned activities, OR primarily support or directly depend on non-aligned activities in a specific country/sectoral context?	Through comparison with low-carbon alternatives, asses the risk of creating lock-in or preventing future deployment of Paris-aligned activities and impacting the likelihood of achieving the low-GHG transition. Can be informed by relevant low-GHG development pathways or other studies.

Timing

The preliminary NCC compatibility review should be undertaken as early as possible, ideally at the Project inception stage, and the process and outcomes should be documented. Alternatively, justification should be provided of how and at what point in the project lifecycle has the NCC compatibility review taken place, and what management actions have been introduced in the Project design, strategy and business and financial planning.

5. RESILIENCE TO PHYSICAL CLIMATE RISKS

5.1 Definition of Physical Risk

The term "physical risk" is used in this guidance note to refer to risks to the Project arising from the hazard-exposure-vulnerability concept, as set out by IPCC[24]. Physical risk to the Project is defined as:

Physical Risk = hazard[25] * exposure * vulnerability.

For additional details on the definition of physical risks resulting from climate change refer to Annex 2.

Physical risks change over time through the dynamic relationship of the three core components of risk (i.e., hazard, exposure and vulnerability). The use of the term "physical risk" in risk studies requires consideration of not just hazard changes but also exposure and vulnerability to the hazard. However, according to an IPCC report released in late 2020[26], there is currently limited understanding of how physical *risks* change, and therefore the focus in risk studies is often exclusively on *hazard* changes without consideration of exposure or vulnerability.

Physical risks can impact Project facilities and infrastructure, affect Project operations, availability of water and raw materials for the Project, and cause disruptions to the Project supply chain, among others, (see Box A2-1 in Annex 2 for further examples). These may result in direct financial consequences for Clients and associated EPFIs, as well as additional costs related to upfront insurance and investments.

Climate change may affect the magnitude and or significance of Project E&S impacts and potentially exacerbate adverse effects. For example, the loss of prime agricultural land to a Project may increase the significance of E&S impacts if climate change is projected to reduce the availability of such land.

For a consistent approach to the assessment of physical risk, it essential that the definition of risk within the CCRA methodology is clear. The definitions of risk components (i.e., hazard, exposure, vulnerability), as defined by IPCC, are provided in Table 5-1.

[24] IPCC, The concept of risk in the IPCC Sixth Assessment Report: a summary of cross-Working Group discussions. Guidance for IPCC authors. September 2020.

[25] Hazard = Weather and Climate events

[26] IPCC, The concept of risk in the IPCC Sixth Assessment Report: a summary of cross-Working Group discussions. Guidance for IPCC authors, September 2020.

Table 5-1: Definition of risk components as per IPCC AR6[27]

		IPCC AR6 definition
TERM	Hazard	The potential occurrence of a natural or human-induced physical event or trend, that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision and environmental resources.
	Exposure	The presence of people, livelihoods, species or ecosystems, environmental functions, services and resources, infrastructure, or economic, social, or cultural assets in places and settings that could be adversely affected.
	Vulnerability	The propensity or predisposition to be adversely affected. Vulnerability encompasses a variety of concepts and elements including sensitivity or susceptibility to harm and lack of capacity to cope and adapt. For example , a community exposed to a drought hazard would have increased vulnerability if it lacked the capacity to bring in water resources from elsewhere or to adapt to reduced water availability.

The recommended approach to the Physical CCRA in this guidance note is built around the systematic application of the risk model to in-scope EP Projects with the aim of identifying risks (as per the IPCC definition) as early as possible so that decisions of Project development can be informed.

5.2 Physical Risk Screening

At the initial stage of the CCRA process, the focus is on climate hazards and vulnerability components of the risk.

The key physical climate hazards at the country or regional level and their relationship to the typical vulnerabilities that the sector exhibits should be considered. Commensurate with the need for this assessment to come as early as possible at this stage the detailed characteristics of the Project or the specific of its location are not required.

5.2.1. Climate Hazard

Climate data shall be reviewed for a set of climate hazards relevant to the Project's general geography. The set of climate hazards typically includes chronic and acute changes which may be temperature-related, water-related, wind-related and solid mass-related hazards on the national or regional level. For information on sources of climate hazard data see Annex 2.

[27] IPCC, 2022: Climate Change 2022: Impacts, Adaptation and Vulnerability. Contribution of Working Group II to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [H.-O. Pörtner, D.C. Roberts, M. Tignor, E.S. Poloczanska, K. Mintenbeck, A. Alegría, M. Craig, S. Langsdorf, S. Löschke, V. Möller, A. Okem, B. Rama (eds.)]. Cambridge University Press. Cambridge University Press, Cambridge, UK and New York, NY, USA, 3056 pp., doi:10.1017/9781009325844.

5.2.2. Sector Vulnerability

Vulnerabilities to climate hazards vary by sector although there is a degree of commonality. Around the world, environmental regulators, industry and trade bodies have begun to publish information on sector vulnerabilities against a range of potential climate hazards. For information on sector vulnerability screening sources, see Annex 1.

As an example, the table below from the EU Taxonomy[28] illustrates the typical sensitivities of the transmission and distribution of electricity to climate related hazards.

Table 5-2: Example of typical sector sensitivities for Electricity Transmission and Distribution

Temperature-related		Wind-related		Water-related		Solid mass - related	
Chronic	Acute	Chronic	Acute	Chronic	Acute	Chronic	Acute
• Changing temperature • Heat stress • Temperature variability • Permafrost thawing	• Heat wave • Cold wave/frost • Wildfire	• Changing wind patterns	• Cyclone, hurricane, typhoon • Storm • Tornado	• Changing precipitation patterns and types • Sea level rise	• Drought • Extreme precipitation • Flood • Glacial lake outburst	• Coastal erosion • Soil erosion • Solifluction	• Avalanche • Landslide • Subsidence

Source: EU Technical Expert Group on sustainable Finance (2020) Taxonomy Report: Technical Annex. Updated methodology & Updated Technical Screening Criteria.

Timing

Sector vulnerability screening should be undertaken as early as possible, ideally at the Project concept stage.

[28] EU Technical Expert Group on sustainable Finance (2020) Taxonomy Report: Technical Annex. Updated methodology & Updated Technical Screening Criteria.

5.3 Physical Risk Assessment

As far as data allow, the risk assessment should consider the key physical climate **hazards** at the local level of the Project. Knowledge of the Project's detailed location is used to determine the **exposure** of the Project to those hazards. **Vulnerability** can then be assessed in more detail, drawing on Project design information and standards together with any other factors which may provide resilience, e.g. pre-existing flood prevention measures.

To direct the downscaling climate modelling, Project coordinates will be required. Where the Project has a large extent, e.g. a linear Project such as a highway or railway, then care should be taken to ensure that the downscaled data have sufficient coverage.

Annex 2 provides further information on climate hazards and additional guidance on climate change data procurement and evaluation.

The risk assessment shall be provided based on understanding of the potential resulted impact considering vulnerability, hazard and exposure. Climate hazard trends in combination with Project-specific exposure and vulnerability are assessed to identify climate risks and their materiality to the Project. Risks to be considered include risk to personnel, facilities and infrastructure, impacts on operation, water and raw material availability and supply chain disruption.

The method to combine these three components of risk shall be determined as part of the CCRA. It is not the purpose of this guidance to prescribe specific methods, but the selected risk assessment method needs to:

- Consider all three components of risk in its assessment.
- Uncertainty or lack of information in each of the components should be considered in the assessment.
- Be transparent and clearly documented.
- Be based on quantitative data as far as possible - where qualitative scales are applied their rationale should be stated.

The methodology cannot be precise, so it is recommended that the outputs are subject to professional review and/or benchmarking to ensure reliable and transparent outcomes.

Scenario analysis consideration

The climate risk assessment should be based on a robust analysis of climate data and projections across a range of future GHG emission scenarios. The TCFD recommends selecting a range of scenarios (not just one) that covers a reasonable variety of future outcomes, both favourable and unfavourable; more specifically the use of a 2°C or lower scenario in addition to two or three other scenarios most relevant to their circumstances, such as scenarios related to NDCs, physical climate-related scenarios, or other challenging scenarios. The selection of the scenarios should be fully justified within the CCRA. Further details on the selection of suitable scenario are provided in Annex 2.

Consideration of financial risks

Consideration of potential financial risks associated with the Project's exposure to physical climate risks is required in order to inform management actions (refer to Section 5.4). Potential financial risks should therefore be identified, and their anticipated evolution over time under the physical scenarios considered should be assessed. Examples of potential financial risks (non-exhaustive list) are presented Table 5-3 below.

Table 5-3: Physical climate change risk factors and financial risks

Potential physical risk factor	Potential financial risks
Exposure to physical climate change impacts that exceed design or performance criteria impacting on the integrity of Project assets or the ability of the Project to provide the intended service (e.g. drainage capacity for peak rainfall, material expansion/performance due to temperature, impaired performance of Project component due to ambient environment).	Potential material impacts on revenue from decreased production capacity and lower sales as result of physical damage to the asset or negative impacts on the workforce. Potential material impacts on operational cost due to negative impacts on the workforce (e.g. heath, safety, absenteeism). Increased capital costs (e.g. damage to Project assets). Potential write-offs/write-downs and early retirement of assets.
Exposure to supply chain disruption because of physical climate change impacts and a failure of supply chains to prepare and adapt, led to non-availability of critical materials during construction or critical supply services during operation.	Potential material impacts on revenue from decreased production capacity. Potential material impact on cost of critical supplies.
Competition from other projects in the sector that are better adapted/able to adapt to climate change.	Potential asset impairment. Competitive disadvantage due to higher operational costs and/or lower productivity and reduced demand, with potential material impacts on revenues.

Litigation risks if the Project is perceived to lack transparency in preparedness for climate change impacts, or damage to 3rd party is caused due to the Project operation failure or if the Project is seen to increase climate vulnerability to third parties.	Increased insurance premiums and potential reduced availability of insurance on assets in 'high-risk' locations.

Timing

The risk assessment should be undertaken as soon as sufficient Project information is available to confirm the Project's location, extent and key design decisions including the technology, assets and structures type and layout. This should be essentially between the FEED and detailed design stage, providing the physical risk screening as early at the design stage as possible. Physical risks may have financial implications for the Project via operational risks realisation, such as direct damage to assets (due to e.g. floods, mudslides, tornados), disruptions on supply or transportation (caused by droughts and water shortage or bad quality, heavy precipitation events or other reasons), health & safety issues (due to heat waves or extreme temperature) and indirect impacts from supply chain disruption. Therefore, early understanding of the physical risks can prevent financial losses at the design, construction and operation stages.

The risk assessment should be completed prior to loan signing. Where detailed design is to be completed after loan signing or financial close, the risk assessment should be based on a suitably developed FEED design and then be re-confirmed once detailed design is complete – see Section 3.3 for further details.

5.4 Physical Risks Management

All material risks identified in the construction or operational phases of the Project must be addressed in the management plan to build up climate resilience.

The plan should set out clearly how each identified risk will be addressed through a mechanism of either mitigate, transfer, accept or control, all as defined below.

Mitigation. This represents management measures to be implemented in order to reduce or eliminate the risk to the Project.

Transfer. This is a risk reduction method that shifts risk from the Project to another party; i.e. paying someone else to accept the risk (e.g. to purchase of an insurance coverage for climate-related damage).

Acceptance. This involves accepting the risk and collaborating with others sharing responsibility for absorbing negative impacts of risks (Government, other Projects and local community).

Control. This involves developing an alternative strategy to reduce the probability of occurrence or the severity of the consequences of climate-related risk (e.g. crop failure), but is usually linked to a higher cost. An example is the use of drought-resistant crop varieties to reduce irrigation water needs.

Typical management measures include design/specification changes to avoid/mitigate risk and the specification of operational management processes in operation and maintenance manuals. Residual risks should be evaluated for their materiality and may need to be addressed themselves through further management measures. Some examples of climate change risk factors and consideration for management options are given in Table 5-4.

Table 5-4: Physical climate change risk factors and management considerations

Potential physical risk factor	Potential management considerations
Exposure to physical climate change impacts that exceed design or performance criteria impacting on the integrity of Project assets or the ability of the Project to provide the intended service (e.g. drainage capacity for peak rainfall, material expansion/performance due to temperature, impaired performance of Project component due to ambient environment).	Elevated design criteria or specifications for critical components of the Project. Operational management plans to provide for quick recovery of disrupted services and appropriate performance review and maintenance regime/schedule. Specific project defences, e.g the provision of additional flood walls beyond specifications required for the projects function
Exposure to supply chain disruption because of physical climate change impacts and a failure of supply chains to prepare and adapt, led to non-availability of critical materials during construction or critical supply services during operation.	Risks include non-availability of critical materials in a timely fashion impacting on Project construction programme, and non-availability of critical services from supply chain to support the operation of the Project e.g. power /water. Mitigation via diversity of, or special requirements for supply within supply chain management. This may include consideration of suppliers' own climate change strategies and management plans and ensuring diversity of supply.
Competition from other projects in the sector that are better adapted/able to adapt to climate change.	Adaption to physical climate risks considered over the lifetime of the Project, covering planning, design, construction, operation, and maintenance.
Litigation risks if the Project is perceived to lack transparency in preparedness for climate change impacts or damage to 3rd party is caused due to the Project operation failure or if the Project is seen to increase climate vulnerability to third parties.	Project adaptation in design and management, eliminating and minimising the potential impact to third parties.

Timing

A Project Adaptation Management Plan or specific adaptation measures embedded to the ESMP should be developed before start of construction and start of operation, and before financial close. During the operations phase management plans should be reviewed and adapted if deemed necessary until the end of the loan period. See Section 3.3 for details on the time of Climate Change risk management through the Project and financing lifecycle.

6. RESILIENCE TO TRANSITION RISKS

6.1 Introduction

Regardless of the outcome of the preliminary NCC compatibility review (refer to Section 4), all Projects meeting the applicability criteria set out in Section 2.2 should undergo the transition risk screening and the transition risk assessment components of the Transition CCRA as part of the feasibility and design stages.

The purpose of the Transition CCRA is to:

- Evaluate the resilience of the Project design and strategy to the transition to a low carbon economy.
- Assess the associated financial exposure to both the Client and the EPFIs.
- Enhance Project resilience and overall performance at the design and operational stages.

Residual material transition risks (i.e. those not addressed through project design and business plan) will require management throughout the Project lifetime through a Transition Management Plan (refer to Section 6.6).

6.2 Definition of Transition Risk

The TCFD Recommendations state that *"transitioning to a lower-carbon economy may entail extensive policy, legal, technology, reputation and market changes to address mitigation and adaptation requirements related to climate change".*

The TCFD Recommendations identify the following categories of transition risks:

- **Policy and legal risks** – impact of policy and regulatory actions that seek to constrain the adverse effects of climate change or promote adaptation or transition (e.g. carbon pricing, emissions caps, differential capital treatment by regulators, land use changes, water restrictions).
- **Technology risks** – technological improvements that support the transition to a lower emissions economy and lead to demand shifts and market advantage for operators who adapt faster (e.g. battery storage, electric vehicles, carbon capture and storage and technologies that enable improved operating efficiency, reduce GHG emissions and optimise water and land use).
- **Market risks** - shifts in supply and demand for certain commodities, products and services as climate-related risks and opportunities are acted on (e.g. rise in electric vehicle demand, increased production costs due to changing input prices of energy, water, etc.).

- **Reputation risks** - changing stakeholder's perceptions of an organisation's positive or negative impact on the transition to a lower emissions economy (e.g. public perception of coal-fired power).

6.3 Approach

The transition risk screening, transition risk assessment and Transition Risk Management Plan approaches, along with their steps and associated objectives, are outlined in Table 6-1 below.

Table 6-1: Overview of CCRA transition approach

Assessment type	Lifecycle stage	Objective	Approach	Information requirements
Resilient Project Design and Strategy - Transition risk screening	Feasibility	Identify potentially material transition risks for the Project to inform business case and strategy, prevent lock-in and reduce risk management costs.	Identify typologies of potentially material risks for the Project based publicly available transition trajectories and sectoral risks analyses: 1) transition risk heatmaps and third-party transition risk analyses 2) a low-GHG development pathway for that country (i.e. NDC). 3) transition trajectory for the sector	Project operations, energy sources, technological choices, products, customer, markets
Resilient Project Design and Strategy - Transition risk assessment	Design	Assess residual exposure to transition risks (revenue generation, Client; credit risk, lender) based on design and business case.	Full CCRA using scenario analysis to stress-test the resilience of the strategy, and the adequacy of the transition action plan (governance, strategy, risk management, metrics and targets).	Business base case, transition risk mitigation and opportunity enhancement measures, transition scenarios.
Resilient Project Operation and Strategy – Transition plan	Design	Anticipate and manage transition risks over the Project operation.	Develop a plan for the management of residual material risks to the Project associated to the transition to a low-carbon economy (i.e. Climate Change Transition Management Plan).	Residual risk and associated management, metrics, monitoring and reporting, governance structure, frequency of revisions.

6.4 Transition Risk Screening

A transition risk screening should be conducted at the feasibility stage to identify the typology and nature of potentially material transition risks, with a view to inform the Project's business case, design and strategy.

Screening criteria can largely be grouped around sectoral and geographic considerations. Guidance on relevant criteria and their associated information sources are outlined below:

6.4.1. Sectoral considerations

Certain Projects may have increased exposure to transition risks, such as Projects that are in:

- Industry sectors that have high GHG intensity, high water usage in locations prone to drought or high usage of land that requires native vegetation clearance.
- Industries that are adapting faster to alternative lower GHG technologies or climate efficient technologies, leading to a more rapid shift in the competitive landscape.

Transition risks identified for the first time as part of the full Transition Risk Assessment will be more costly to address, as typically the full assessment takes place when design, business and commercial decisions have already been locked in.

Screening involves the identification and consideration of risk factor pathways for the sector at a high level, in order to identify suitable and cost-effective mitigations measures to be incorporated into the Project at the feasibility stage. The purpose of the screening phase is to raise awareness about the Project's potential transition risks and opportunities. In doing so, the transition screening seeks to ensure that those risks and opportunities inform the Project design and business case, thus embedding transition resilience into the Project strategy from the early planning stages of the process and reducing the cost of the transition.

Transition screening may be conducted and documented through a short questionnaire or table, in which a structured process is followed to ensure that consideration is given to all the potentially material risks and opportunities for the Project, with indication of the potential impact mechanisms and the selected management approach. A credible transition management approach will embed transition resilience decision gates or transition tests as part of the decision-making process during design and business/financial planning, and will document how transition risk have been assessed and managed.

A robust transition screening sets the basis for the full transition risk assessment, and will provide evidence of the awareness of transition risks to which the Project is exposed and the management actions implemented and embedded into its design and business plan.

The transition risk assessment that will follow during the design stage (Section 6.5) will analyse in more detail the Project exposure to the various categories of potentially material risks identified. The full assessment will test the resilience of the transition management actions (i.e. transition strategy, business case, financial planning and design/technological considerations) under a range of scenarios to assess their adequacy, and to identify residual risks and develop proportionate management actions during the operational phase.

Potential transition risk factors include, but are not limited to, those outlined in Table 6-2 below. The purpose of this table is to present a broad range of potentially material risks for consideration by the Project and EPFIs' in their commercial decisions.

Table 6-2: Transition risk factors and screening considerations.

Potential risk factor	Potential financial impacts	Potential considerations
Exposure to energy efficiency mandates, emission limits and carbon prices associated with direct Project operations (scopes 1 and 2) based on the energy and carbon intensity. Influence over scope 3 emissions based on location and availability of low-carbon transport modes.	Potential material impacts on e.g. unplanned capital expenditures, operational costs and ultimately, revenue impacts associated to reputational considerations.	Sector benchmarks, best available technology, technical developments.
Exposure to supply chain disruption or cost increases from increasing carbon prices.	Potential material impacts on e.g. operational costs, as well as revenues (if production is disrupted or impaired).	Critical raw materials, supplier risk management processes/ diversification, alternative low carbon inputs.
Potential changes in demand (e.g. due to shifts in consumer preference, competition from low-carbon products, market disruptors) across its customer segments and markets.	Potential material impacts on revenues.	Market diversification, demand drivers, alternative low-carbon technologies, flexibility in design to enable cost-effective adaptation to low carbon materials and technologies.
Competition from low-carbon technologies that could lead to e.g. asset impairment, competitive disadvantage due to higher operational costs and/or lower productivity, and reduced demand.	Potential material impacts on costs and revenues, sunk costs of premature closure/stranded asset risk (with associated reputational risks).	Alternative low-carbon technologies that compete at present or which pose a competition or disrupt production processes in the future.
Litigation risks if the Project is perceived to lack transparency, make unsubstantiated claims and/or	Potential material impacts on costs and revenues (if climate related litigation	Stakeholder pressure and expectations; Project performance relative to sectoral considerations and

Potential risk factor	Potential financial impacts	Potential considerations
negatively contribute to climate mitigation.	leads to reputational impacts).	decarbonisation pathways (e.g. GHG emission intensity, emission reduction targets); marketing and disclosure approaches; availability and cost of litigation insurance
Attraction and retention of human resources and technical specialists if the Project is perceived to negatively contribute to climate mitigation.	Potential material impacts on costs and revenues.	As above.
Shift on investor's perception of risk, impacts on security valuation, access to debt and equity capital and risk premiums.	Access to/cost of finance	As above

Other potential information sources and tools include:

- Transition risk heatmaps for oil and gas, agriculture, real estate, power generation, metals & mining, industrials, transportation and services and technology sectors have been published by UNEP Finance Initiative: Beyond the Horizon, 2020. Available at: https://www.unepfi.org/industries/banking/beyond-the-horizon/
- Gambhir, A., George, M., McJeon, H., Arnell, N.W., Bernie, D., Mittal, S., Köberle, A.C., Lowe, J., Rogelj, J. And Monteith, S., 2022. Near-term transition and longer-term physical climate risks of greenhouse gas emissions pathways. *Nature Climate Change*, *12*(1), pp.88-96.

6.4.2. Jurisdictional considerations

The significance of the risks outlined in Table 6-2 above may be increased by the Project location, and location specific considerations should be taken into account when assessing and identifying management actions in the early project stages. Certain jurisdictions may pose increased exposure to transition risks, such as:

- Jurisdictions with comprehensive climate action policies and associated regulatory controls at the Project level.
- Markets or jurisdictions that are adapting faster to alternative lower GHG technologies or climate efficient technologies, leading to a more rapid shift in the competitive landscape.
- Jurisdictions with higher stakeholder expectations, in sectors with higher global activist focus or locations where communities are well aligned in objectives and have greater capacity to engage on climate risks.

Potential information sources and tools include:

- Climate action tracker. Available at: https://climateactiontracker.org/countries/rating-system/
- Country environmental analysis. Available at: https://openknowledge.worldbank.org/handle/10986/2163
- HSBC Global Research, 2019. Fragile Planet. The politics and economics of the low-carbon transition. Available at: h92rQqt (hsbc.com)

Timing

Transition risk screening should be undertaken as early as possible and prior to loan signing, ideally at the Project feasibility stage (refer to Section 3.3 above), and the process and outcomes should be documented. Alternatively, justification should be provided of how, and at what point in the project lifecycle, transition risks have been preliminarily assessed and what management actions have been introduced in the Project design, strategy and business and financial planning.

6.5 Transition Risk Assessment

As previously noted, the aim of the Transition Risk Assessment is to stress-test, under a range of scenarios, the resilience of the transition management actions (i.e. transition strategy, business case, financial planning and design/technological considerations) implemented in the early project stages, with a view to:

- Assess their adequacy and overall project resilience.
- Identify residual risks.
- Develop proportionate management actions during the operational phase.

In assessing the Project resilience to transition risks, the following questions should be answered:

Table 6-3: Transition Risk Assessment checklist.

Category	Questions
Strategy	• What material transition risks and opportunities is the Project exposed to over the short, medium and long term? • How does the nature and magnitude of those risks vary under a range of scenarios, including under a 2° Celsius or lower scenario? • Have material transition risks and opportunities been considered in the design, business case and financial planning in the early project stages? • What management actions have been defined and implemented? • What is the overall Project resilience (business case, strategy and financial planning) under a range of uncertain futures?

This section presents recommendations in relation to the following:

- Transition risk assessment scope and approach (Section 6.5.1).
- Scenario analysis considerations (Section 6.5.2).
- Transition risk assessment report (Section 6.5.3).

6.5.1. Transition risk assessment approach

The transition risk assessment should follow the steps outlined below:

1. Identification of the assessment scope and timeframe, taking into account the Project life cycle.
2. Selection of transition scenarios representative of a range of uncertain futures (see Scenario analysis considerations below). At a minimum, 2 transition scenarios including a 2° Celsius or lower scenario should be selected.
3. Definition of materiality thresholds for the project (refer to Section 2.1.3).
4. Scenario analysis (see also Section 6.5.2 below):
    a. Identification of transition indicators (e.g. carbon prices, energy mandates, technological development, cost/availability of fossil fuels, commodity demand or price shifts either at global level or across key geographies, consumer preferences/ESG performance, and other drivers that that could pose a risk or present and opportunity for the Project).
    b. Definition of transition pathways for the transition indicators selected under each transition scenario (i.e. scenario narratives and supporting quantitative metrics). The scenario narratives should outline transition trends across all the transition categories (broader legal and regulatory, market, technology and reputational risks) over the assessment timeframe for the selected transition indicators (see scenario analysis considerations below).
    c. For each transition indicator, comparison between the anticipated pathways based on the project strategy, design and base case, and the pathways defined under each scenario.
    d. Identification of the risk drivers under each scenario (e.g. demand reduction, unplanned capital expenditures to meet more stringent regulatory requirements, cost volatility for critical raw materials, competitions from new technologies) and their associated material financial impact drivers (e.g. revenues, capital costs, operational costs, cost of/access to capital, premature closure/stranded asset).
    e. Assessment of the material financial impacts (i.e. qualitatively, quantitatively or in monetary terms) based on their potential magnitude, taking into account management actions embedded into the project strategy, design and business case (i.e. residual risks). A quantitative assessment of the most significant transition risks categories should be considered. This can be developed over time, as more information becomes available, and can be incorporated in subsequent iterations (see Transition Management Plan, Section 6.6). When qualitative assessments are

conducted, the selected significance categories (e.g. low, medium, high) should be defined.

5. Identification of additional management actions required to reduce each risk, for incorporation into the transition management plan.

6.5.2. Scenario analysis considerations

Scenario analysis should be used to identify and assess material risks to the Project (refer to 2.1.3), through the identification of the transition drivers likely to have the most significant impacts.

Projects will be affected by the transition to a low carbon economy across multiple dimensions (strategic, operational, reputational, and financial), along the entire value chain (direct operations, suppliers, distribution, customer) and over a long-time horizon. Given the high level of uncertainty about e.g. policy and regulatory development, socioeconomic context, technological evolution and consumer preferences, the assessments of the potential Project exposure to transition risks and opportunities can be challenging.

Scenario analysis is a tool to overcome those challenges, allowing users to explore how those risks and opportunities may evolve under different hypothetical futures, and how those conditions may affect the Project performance. By identifying options and preparing for alternative futures, Projects can develop greater resilience and flexibility.

Scenario analysis informs strategic management in a structured, systematic, and analytical way, informing risk management. By stress-testing Project performance, the Project's strategic position is assessed, and key drivers of risk are identified. Through the monitoring of those impact drivers over time, Projects can understand which futures are emerging and revise their strategy and risk management.

The TCFD recommends organisations to assess their resilience taking into consideration different climate-related scenarios that cover a reasonable variety of future outcomes, both favourable and unfavourable, including a 2° Celsius or lower scenario. A 2°C scenario provides a common reference point that is generally aligned with the objectives of the Paris Agreement and will support Clients and EPFIs' evaluation of the potential magnitude and timing of transition-related implications for the Project; across different Projects within a sector; and across different sectors.

The Client can use existing external scenarios and models (e.g., those provided by third-party vendors) or develop their own, in-house modelling capabilities, depending on their needs, resources, and capabilities. Publicly available transition scenarios (e.g., International Energy Agency (IEA), Network for Greening the Financial System (NGFS)) are useful starting points and can serve to provide context, and as anchors for in-house-developed scenarios in subsequent iterations (see Transition

Management Plan in Section 6.6 below). They also enable comparability across Projects and transparency over the models and input assumptions.

In setting climate-related scenario time horizons, the Client should challenge their thinking about traditional planning horizons, which are often too short. Short-, medium- and long-term periods of time need to be selected considering trends, foreseen changes in legal requirements and development plans on transition to low carbon economy. In addition, compatibility with the Project's capital planning and investment horizons as well as with the lifecycle of major Project assets should be considered.

Box 6-1: Scenario Analysis Requirements

Scenarios are descriptions of alternative plausible futures. Scenario analysis is a tool which allows users to explore how Project-related risks and opportunities may evolve under different hypothetical futures, and how those conditions may affect the Project's performance.

Transition scenario analysis should meet the following requirements:

- The scenario analysis should consider a minimum of 2 transition scenarios, including a 2°C or lower scenario.
- The number and choice of scenarios should be sufficiently diverse to create challenging "what-if" analyses of favourable as well as unfavourable outcomes, and capture a wide range of insights about uncertain future.
- Scenarios should be of high quality, periodically updated, and transparent to be an effective decision tool and to have credibility.
- The choice of scenario should be justified.
- Time frames – short, medium and long term to be defined taking into account the Project's capital planning and investment horizons as well as the useful life of major Project assets.

6.5.3. Documentation of the Transition Risk Assessment

The CCRA transition report shall contain the following information:

- The scope of the assessment.
- Justification of the scenario selection and assessment period, taking into account the Project life cycle.
- Overview of Project operations and business case (anticipated revenue streams, cost streams, customer and market segments, and with their respective Projections over the assessment timeframe). The assumptions underpinning the business case and any forecasts should also be indicated.
- Scenario overview, with justification on the selection of transition drivers specific to the project and identification of transition trajectories for the selected transition drivers.

- Definition of materiality for the project.
- Scenario analysis with identification of potentially material risks and opportunities.
- Overview of management actions that have been incorporated into the project design, business plan and strategy.
- Assessment of potentially material, residual risks and opportunities (at least qualitative, moving onto quantitative or financial analysis in subsequent iterations).

Box 6-2: Documenting the transition risk assessment and outputs - suggested report structure

Introduction

- Project overview
- Policy context
- Background and objectives of the CCRA

Transition CCRA

- Methodology
- Project base case
    - Project overview and timeline
    - Justification of assessment timeframe
    - Transition strategy
    - Projected revenue and costs streams over the assessment timeframe (along with key assumptions and dependencies underlying the Project's business, operational and financial plans)
- Scenarios and timeline
    - Justification of scenario selection
    - Scenario narratives and transition indicators over the assessment timeframe
- Transition risk and opportunity assessment
    - Identification of material risks
    - Risk management actions (high level summary of risk management actions embedded into project design, financial and business planning, and overall strategy)
    - Residual risk categorisation

Conclusions and recommendations

- Summary of findings and overall risk
- Proposed transition risk management actions (for incorporation into the Transition Management Plan)

Appendices

Timing

Provided that a Transition Risk Screening has been conducted, the full Transition Risk Assessment can be conducted during the design stage as soon as sufficient Project information is available, and prior to loan signing (refer to Section 3.3 above).

Should a Transition Risk Screening not have been conducted, the full Transition Risk Assessment should be done as early as possible in order to meaningfully influence design, strategy and business planning.

Where detailed design is to be completed after loan signing or financial close, the risk assessment should be based on a suitably developed FEED design and then be re-confirmed once detailed design is complete – see Section 3.3 for further details.

6.6 Transition Risks Management

A climate change transition management plan is required for the management of material risks to the Project associated to the transition to a low-carbon economy. The transition plan should be integral to the overall Project strategy, and should be credible and proportionate to the nature and magnitude of the potential transition risks faced by the Project.

The aim of the Transition Management Plan is to set up the Project planning to prepare for a rapid global transition towards a low carbon economy, reducing costs and enhancing resilience. The Plan should be grounded in the following principles (Transition Plan Taskforce, 2023[29]):

- Ambition: the Plan should outline ambitious objectives and priorities for the Project to contribute to and prepare for a rapid and orderly economy-wide net zero transition. The Plan should cover any transition relevant actions material to the Project and its financial planning.
- Action: the Plan should translate ambitious Project objectives into concrete steps over the short and medium term, and should be connected to the Project business, operations and financial planning and underpinned by clearly articulated resourcing plans. The sensitivity of the plan to changes in assumptions should be assessed to mitigate delivery risks when possible.
- Accountability: delivery of the Plan should be enabled through clear governance mechanisms with relevant and appropriate incentivisation, reporting and accountability structures from the Client's side. Plan steps should be underpinned by quantifiable and timebound metrics and targets that are reported annually.

As with the ESMP, the effectiveness and implementation of the Transition Management Plan should be subject to thorough review and monitoring on behalf of EPFIs by the IESC.

In managing the Project transition risks, the following questions should be answered in the Transition Management Plan:

[29] https://transitiontaskforce.net/wp-content/uploads/2022/11/TPT-Disclosure-Framework.pdf

Table 6-4: Transition Management Plan checklist.

Category	Questions
Governance (see also Section 3.3)	Is there a robust governance structure in place to ensure the implementation of the transition risk management actions? What is management's role in assessing and managing climate related risks and opportunities? What is the role of the management in monitoring progress against climate related goals and targets? How are climate-related risks and opportunities taken into account when reviewing and guiding strategy, major plans of action, risk management policies, annual budgets and business plans, and when overseeing major capital expenditures?
Risk management	Are climate-related risk identification, assessment and management processes integrated into the Project risk management processes? What management actions have been defined to monitor the evolution of transition risks over time and ensure their timely management? Are there mechanisms in place to periodically reassesses the Project exposure to transition risks and adapt its overall strategy?
Metrics and targets	Have targets have been defined in order to mitigate material transition risks? What metrics and monitoring arrangements have been defined to monitor progress against those targets?

Examples of risk management actions

Some examples of potential management options for potential risk factors outlined in Table 6-2 are given in Table 6-5 below for consideration, however the list is non-exhaustive and the table is presented for information only. See also Appendix 3.

Table 6-5: Transition risk factors and management considerations.

Potential risk factor	Potential management considerations
Exposure to energy efficiency mandates, emission limits and carbon prices associated with direct Project operations (scopes 1 and 2) based on the energy and carbon intensity. Influence over scope 3 emissions based on location and availability of low-carbon transport modes.	Periodic monitoring of transition indicators, including policy/legal and technical development, with a potential impact on energy and GHG intensity. Identify opportunities to maximise renewable energy generation and flexibility. Develop procedures to minimise carbon emissions though improved operating practices. Setting a well design internal carbon price.
Exposure to supply chain disruption or cost increases from increasing carbon prices.	Supply chain diversification and risk management, use of alternative and low-carbon materials.

Potential risk factor	Potential management considerations
Potential changes in demand (e.g. due to shifts in consumer preference, competition from low-carbon products, market disruptors) across its customer segments and markets.	Procedure to ensure a diversified and balanced portfolio of goods an services. Procedure to review and assess sales of goods and services against forecasts and mechanisms to address gaps/respond to changes in demand and adjust capacity and operational costs in the short and medium term. Diversification of customer base (segment and geography). Enhanced ESG/low carbon credentials (e.g. certification) of products and services to differentiate and capture a greater market share. Build flexibility into the design and strategy to adapt to the delivery of new products and services.
Competition from low-carbon technologies, which could lead to e.g. asset impairment, competitive disadvantage due to higher operational costs and/or lower productivity, and reduced demand.	Monitor technical developments with the potential to impact Project competitiveness. Monitoring the evolution of market and technology drivers (such as commodity demand and prices, fuel prices, electrification) with the potential to pose direct or indirect financial impacts, for an early identification of direct and indirect impact on demand, markets, costs, and revenues to inform the strategy. Consider partnerships for the development of technological solutions and R&D. Low-carbon investment plans to replace carbon intensive equipment.
Litigation risks, if the Project is perceived to lack transparency, make unsubstantiated claims and/or negatively contribute to climate mitigation.	Periodic disclosure of climate-related ambition and broader strategy, targets and monitoring results to track compliance. Robust transition management plan including a credible and ambitious decarbonisation strategy, externally verified and disclosed. Disclosure of climate-performance metrics incorporated into remuneration policies.
Attraction and retention of human resources and technical specialists, if the Project is perceived to negatively contribute to climate mitigation.	
Shift on investor's perception of risk, impacts on security valuation, access to debt and equity capital and risk premiums.	

Documentation of the Transition Management Plan

The climate change transition management plan should include, but not be limited, to the following:

1. Project's high-level ambitions to mitigate, manage and respond to the risks and to leverage opportunities posed by the transition to a low-carbon and climate resilient economy.
2. Short, medium and long-term actions that the Project will take to achieve its strategic ambition.
3. Governance and accountability mechanisms that support delivery of the plan, with allocation of climate-related responsibilities across management levels and an overview of incentives and remuneration linked to climate-related performance. Communication (information flow) and frequency in relation to climate-related risks and opportunities should be clearly defined.
4. Periodic review mechanism, to reassess the evolution of transition risks (i.e. updated scenario analysis), high level ambitions and response actions over time. Reviews should be conducted at least annually, and earlier if change in the governance structure, management measures or metrics/targets occur.
5. Risk identification and management procedures to monitor and address transition risks as they evolve over time, and to identify and assess new risks.
6. Transition targets tailored to the nature and magnitude of the risks, with supporting metrics and monitoring plan to track progress.
7. Transition metrics and monitoring mechanisms in place.

   Note: Metrics and targets should not be limited to GHG emissions. Financial, governance, business and operational metrics and targets should be considered as relevant.

The climate change transition management plan can be a stand-alone document or integrated into the ESMP and other Project documentation for the Project, and should follow general guidelines, including but not limited to IFC Guidelines on Environmental and Social Management Systems[30].

Timing

Transition Management Plans should be developed during the design stage (before start of construction and start of operation, and before financial close). During operations phase management plans should be reviewed and adapted if deemed necessary until the end of the loan period. See Section 3.3 for details on the time of the management through the Project and financing lifecycle.

Additional information sources for transition risk assessment and management

[30] IFC (2015) Environmental and Social Management System Implementation Handbook, https://www.ifc.org/wps/wcm/connect/4c41260d-1ba8-4d10-a77d-f762d60a1380/ESMS+Handbook+General+v2.1.pdf?MOD=AJPERES&CVID=lllFYII

- Assessing Low Carbon Transition (ACT) - Publications – actiniative.org (actinitiative.org)
- Bank of England CBES – Climate Biennial Exploratory Scenarios
- CDP - Climate Transition Plans - CDP
- Climate Action Bonds – Transition finance for transforming companies
- EFRAG Draft European Sustainability Reporting Standards – ESRS E1 Climate Change
- GFANZ - Glasgow Financial Alliance for Net Zero (gfanzero.com)
- IEA – World Energy Outlook
- IGCC - IGCC-corporate-transition-plan-investor-expectations.pdf
- IFRS - IFRS - Climate-related Disclosures and IFRS - General Sustainability-related Disclosures
- NGFS – Network for Greening the Financial System
- OECD – Guidance on Transtion Risk Finance
- Say on Climate - https://sayonclimate.org/climate-action-plans/
- SBTi - Net-Zero-Standard.pdf (sciencebasedtargets.org)
- TCFD – Guidance and - TCFD Knowledge Hub
- TPT - Transition Plan Taskforce
- TPI - Transition Pathway Initiative
- ULI – Transition Risk Assessment

LIST OF ABBREVIATIONS

CCRA	Climate Change Risk assessment
EHS	Environmental, Health and Safety
EP	Equator Principles
EPA	Equator Principles Association
EPAP	Equator Principles Action Plan
EPFI	Equator Principles Finance Institution
E&S	Environmental and Social
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EU	European Union
FEED	Front End Engineering and Design
GHG	Greenhouse Gas
GIIP	Good International Industry Practice
HRA	Human Rights Assessment
IESC	Independent Environmental and Social Consultant
IFC PS	International Finance Corporation Performance Standards
LMA	Lenders' Market Adviser
LTA	Lenders' Technical Adviser
LTS	Long-term Strategies
NCC	National Climate Commitments
NDC	Nationally Determined Contribution
RfP	Request for Proposal
SoW	Scope of Work
TCFD	Taskforce on Climate-related Financial Disclosure
UNFCCC	United Nations Framework Convention on Climate Change

ANNEX 1 DATA REFERENCES FOR SECTOR VULNERABILITY

For sector vulnerability data some references are given below:

- Adapting to climate change: industry sector examples for your risk assessment: UK Environment Agency - Adapting to climate change: industry sector examples for your risk assessment - GOV.UK (www.gov.uk)
- EU Taxonomy Sectoral guidance - EU Taxonomy Compass (europa.eu)
- Safeguarding chemical businesses in a changing climate : Chemical Industries Association - Safeguarding chemical businesses in a changing climate - How to prepare a Climate Change Adaptation Plan.pdf (cia.org.uk)
- Guide on Climate Change Adaptation for the Mining Sector: The Mining Association of Canada - Guide on Climate Change Adaptation for the Mining Sector - The Mining Association of Canada
- Hydropower Sector Climate Resilience Guide: IHA International Hydropower Association - Hydropower Sector Climate Resilience Guide
- Climate Change Adaptation Planning for Ports and Inland Waterways (2020): PIANC The World Association of Waterborne Transport Infrastructure - Pianc

ANNEX 2 ADDITIONAL GUIDANCE ON CLIMATE CHANGE DATA PROCUREMENT AND ASSESSMENT

General good practices

The TCFD Recommendations state that '**Physical risks resulting from climate change can be event driven (acute) or longer-term shifts (chronic) in climate patterns.**'

- **Acute** physical climate risks can include increased severity and frequency of droughts, storms, floods, heat waves and wildfires.

- **Chronic** physical climate risks can include sea level rise, longer-term temperature/precipitation/wind increase/decrease.

According to the TCFD, the physical climate related scenarios are relevant for organizations exposed to acute or chronic climate change, such as those with:

- long-lived, fixed assets;
- locations or operations in climate-sensitive regions (e.g., coastal and flood zones);
- reliance on availability of water; and
- value chains exposed to the above.

Box A2-1: Examples of Physical Risk

Potential impacts for Projects from Physical Risks could include:

- Direct damage to assets, as a result of extreme weather events (e.g. droughts, storms) or rising sea levels.
- Changes in water availability, supply and quality, often with consequent social impacts.
- Disruption to operations, ability to transport goods and products
- Impacts on employee or community safety.
- Supply chain disruption.

Certain Projects may have increased exposure to Physical Risks, which are:

- Reliant on climate vulnerable resources, such as water.
- More susceptible to climate/weather variation, including extreme weather events.
- Located in geographically at high-risk areas, such as coastal zones or flood plains.

Some examples of Projects that could have increased exposure to Physical Risks include:

- Industrial operations, infrastructure or real estate situated in low lying areas close to coastlines, rivers or floodplains, may experience disruption to operations, physical damage and community impacts in flooding incidents.
- Infrastructure with high structures such as wind turbines and electricity transmission infrastructure are vulnerable to storm damage. This can reduce power capacity and/or cause power disruptions.
- Electricity transmission infrastructure in hot, dry climates can exacerbate or cause wildfires.
- Workforces on Projects located in hot climates and who are working in sectors which typically require outside working (e.g. in agribusiness, construction or mining sectors) are more susceptible to occupational heat stress from extreme hot weather.
- Both renewable and fossil energy industries can be impacted by changes to long term climatic conditions (wind, temperature, solar radiation).
- Hydroelectricity and other water dependent industries, such as farming, food processing, textiles and garments impacted by a decrease in precipitation levels compounded by competing water needs (social and ecological).
- Capacity to ship/transport resources and manufactured goods can be limited by changes in precipitation levels and extreme variability in weather patterns.
- Agriculture/forestry product sectors are vulnerable to limitations imposed across their supply chains from **changes to habitats** resulting from climate change as well as drought, flooding, wildfires and storms.

The climate Projections and assessment of physical risks should take into account the state-of-the-art science for risk analysis and related methodologies in line with the most recent Intergovernmental Panel on Climate Change reports, scientific peer-reviewed publications, free open source or paying tool/models.[31]

Climate data procurement

The Intergovernmental Panel on Climate Change (IPCC) identified a number of extreme climate events that are expected to worsen significantly over the 21st century, such as increasing mean temperatures, changing precipitation pattern, extreme heat, extreme precipitation, drought, changing winds, sea level rise, wildfires (6th assessment IPCC report, 2021[32]). These climate-related hazards should be taken as a minimum list of hazards to consider in the Climate Change Risk Assessment (CCRA) when considered relevant for Project/sector.

The datasets should be sourced from the latest state of the art climate models in the Coupled Model Intercomparison Projects (CMIP6, CMIP5). The Global Circulation Models (GCMs) do not provide the resolution required to assess climatic impacts at the asset level, the recommendation when conducting physical climate risk assessments is to use wherever possible the highest available resolution, downscaled data at regional and local scales from high-resolution regional models or statistical methods (which require long-term observational datasets).

Climate hazards, indicators and data sources

Climate change will manifest differently at geographical locations, a standard set of variables can provide a broad indication of the climate conditions (screening stage) from which a physical risk assessment can be undertaken.

The following table summarizes the key categories of climate information (climate modelling and hazards, variables, data sources, spatial coverage, resolutions). The acute and chronic climate-related hazards are classified following major hazard groups as defined in EU Taxonomy[33]. The list of climate-related hazards is non-exhaustive and constitutes an indicative list of most widespread hazards that

[31] One of the good practice example of such documents under development is the publication of German Environmental Agency "How to perform a robust climate risk and vulnerability assessment for EU taxonomy reporting? Recommendations for companies - final draft" (https://www.umweltbundesamt.de/sites/default/files/medien/479/publikationen/climate-risk-assessments-for-taxonomy-reporting.pdf)

[32] IPCC, 2021: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, 2391 pp. doi:10.1017/9781009157896.

[33] https://finance.ec.europa.eu/system/files/2020-03/200309-sustainable-finance-teg-final-report-taxonomy-annexes_en.pdf

are to be taken into account as a minimum in the climate risk and vulnerability assessment. Example of indicators are listed to characterize the changes in frequency and intensity of these hazards.

	Category of climate hazard	Hazards	Indicators	Data sources
Acute	Temperature related	Extreme heat event	Heatwave index, heat stress, tropical days/nights, days above thresholds (25°, 30°C,…)	Copernicus[34],[35]
				IPCC Atlas[36],[37]
				Climate Change Knowledge portal[38],[39]
	Water related	Extreme precipitation events	Heavy precipitation days (threshold above 10 mm, 20 mm, 50 mm), changes in precipitation intensity and frequency (return period)	Copernicus[34, 40]
				IPCC Atlas[36,37]
				Climate Change Knowledge portal[38,39]
		Drought	Drought index, consecutive dry days	Copernicus[34,40]
				Climate Change Knowledge portal[38,39]

[34] Copernicus Climate Data Store (CDS) and services, managed by European Commission, https://cds.climate.copernicus.eu/#!/home

[35] Spatial coverage and resolution : Global (CMIP5:0.5°x0.5°; CMIP6: from 0.5°x 0.5° to 2.8125°x2.8125°), CORDEX regional climate (Europe, 0.11°*0.11°), European cities

[36] IPCC Interactive Atlas, https://interactive-atlas.ipcc.ch/

[37] Spatial coverage and resolution : Global (CMIP5, CMIP6, CORDEX: 0.1° to 1°)

[38] Climate Change Knowledge Portal (CCKP), https://climateknowledgeportal.worldbank.org/

[39] Spatial coverage and resolution : Global (CMIP5, CMIP6: 1°x1°)

[40] Spatial coverage and resolution : Global (CMIP5:0.5°x0.5°; CMIP6: from 0.5°x 0.5° to 2.8125°x2.8125°), CORDEX regional climate (Europe, 0.11°*0.11°)

		Flood	River discharge, mean runoff, flood recurrence 2 to 50 years period	Copernicus[34, 41]
				Aqueduct WRI[42]
				Climate Change knowledge portal[38,39]
	Wind related	Extreme wind events	Storms, hurricanes, cyclones	Copernicus[34]
				World Meteorological Organisation[43]
	Solid mass related	Extreme mass movement	Landslide, avalanche, subsidence	NASA EarthData[44]
	Wildfires	Change in fire condition	Fire Weather index (FWI), number of high/medium/low fire danger days	Copernicus[34,41]
Chronic	Temperature related	Mean temperature change	Annual, monthly mean temperature	Copernicus[34, 45]
	Water related	Mean precipitation change	Annual/seasonal/monthly mean precipitation flux	Copernicus[34,45]
		Sea level rise	Sea level rise, coastal flooding	IPCC Atlas[36,37]

[41] Spatial coverage and resolution : CORDEX regional climate (Europe, 5km*5 km)

[42] Aqueduct Water Risk Atlas (WRI), https://www.wri.org/aqueduct, global coverage (catchment)

[43] World Meteorological Organization, https://public.wmo.int/en/our-mandate/focus-areas/natural-hazards-and-disaster-risk-reduction/tropical-cyclones/Notable-tcs, records of past cyclones

[44] Landslides toolkit, Earth data (NASA), https://www.earthdata.nasa.gov/learn/toolkits/disasters-toolkit/landslides-toolkit

[45] Spatial coverage and resolution : Global (CMIP5, CMIP6), CORDEX regional climate (Europe, Africa, Asia, America,…), Europe, Northern Brazil and Central Africa (1km*1km)

				Coastal risk screening tool[46]
	Wind related	Mean wind change	Wind speed, wind direction	Copernicus[34,45]
	Solid mass related	Erosion	Coastal/soil erosion indicators, soil degradation/loss	Copernicus[34, 47]

[46] Coastal Risk Screening Tool, https://toolkit.climate.gov/tool/coastal-risk-screening-tool, global coverage (30m*30m spatial resolution)

[47] Spatial coverage and resolution : CORDEX regional climate (Europe/Italy, 500mx500m)

The following sources can be used as complementary data and tools in order to identify and evaluate climate related risks and develop mitigation and adaptation requirements.

Content type	Source/link	Description
Tool	Climate and Disaster Risk Screening Tools (worldbank.org)	Disaster and climate risk screening tools for emerging market businesses
	Think Hazard	Identify natural hazards to reduce their impacts
	GFDRR	Understand and reduce vulnerabilities to natural hazards and climate change of low and middle income countries
	NatCatSERVICE | Munich Re	Comprehensive databases for analysing and evaluating natural catastrophes
	Natural Hazards Edition | Munich Re	Assess the risks of natural hazards around the world, from the location-based individual risk through to entire risk portfolios
	CatNet® (swissre.com)	Natural hazard for risk assessment.
Data	Global Assessment Report on Disaster Risk Reduction (GAR) | GAR (undrr.org)	Flagship report of the United Nations on worldwide efforts to reduce disaster risk
	Country Index // Notre Dame Global Adaptation Initiative // University of Notre Dame	Risk index that summarizes a country's vulnerability to climate change and other global challenges in combination with its readiness to improve resilience.
	Global Climate Risk Index | Germanwatch e.V.	Risk Index that analyses to what extent countries have been affected by the impacts of weather-related loss events
	EM-DAT | The international disasters database (emdat.be)	Database on the occurrence and effects of over 22,000 mass disasters in the world from 1900 to the present day.
	World Health Organization (WHO)	Information and examples of how diverse environmental changes affect the occurrence of various infectious diseases in humans
Data/Tool	TCFD Knowledge Hub - TCFD Knowledge Hub (tcfdhub.org)	Platform designed to help organizations implement the TCFD recommendations by providing over 400 relevant insights, tools and resources
	Transition Plan Taskforce	The Transition Plan Taskforce (TPT) was launched by UK HM Treasury in April 2022 to

		develop the gold standard for private sector climate transition plans applicable to the UK, but globally transferable..
	About Climate-ADAPT — English (europa.eu)	Platform designed to support organisations in the development, implementation and evaluation of climate change adaptation strategies, plans and actions at EU, transnational, national and sub-national levels
Adaptation	Resilience - OECD	Knowledge Hub on Organisation for Economic Co-operation and Development (OECD)'s climate adaptation work latest research and analysis
	Ministry of the Environment, Government of Japan	Practical guide for Scenario Analysis in line with the TCFD Recommendations

The climate assessment should represent and interpret **uncertainty**, inherent in the climate modeling Projections (internal variability, model bias, emissions scenarios), the spatial scale limitations. An important consideration should be to use the largest number of climate simulations available: large multi-models ensemble provides better confidence and robust estimations. The agreement between models can be evaluated using for example the 10^{th,} 50th and 90th centile values.

Emission scenarios

The climate risk assessment should be based on a robust analysis of climate data and Projections across a range of future GHG emission scenarios, published in the most recent AR5/AR6 Intergovernmental Panel on Climate Change (IPCC) reports[48,32]: the **Representative Concentration Pathways** (RCP2.6, RCP4.5, RCP6.0 and RCP8.5) and the **Socioeconomic Pathways** (SSP1-1.9, SSP1-2.6, SSP2-4.5, SSP3-7.0, SSP5-8.5). These scenarios describe 21st century pathways of GHG emissions related to possible societal development and policy paths, from sweeping cuts to unchecked pollution emissions. The TCFD recommends selecting a range of scenarios (not just one) that covers a reasonable variety of future outcomes, both favourable and unfavourable; more specifically the use of a 2°C or lower scenario in addition to two or three other scenarios most relevant to their circumstances, such as scenarios related to Nationally Determined Contributions (NDCs), physical climate-related scenarios, or other challenging scenarios.

[48] IPCC, 2014: Climate Change 2014: Synthesis Report. Contribution of Working Groups I, II and III to the Fifth Assessment Report of the Intergovernmental Panel on Climate Change [Core Writing Team, R.K. Pachauri and L.A. Meyer (eds.)]. IPCC, Geneva, Switzerland, 151 pp., https://www.ipcc.ch/site/assets/uploads/2018/02/SYR_AR5_FINAL_full.pdf

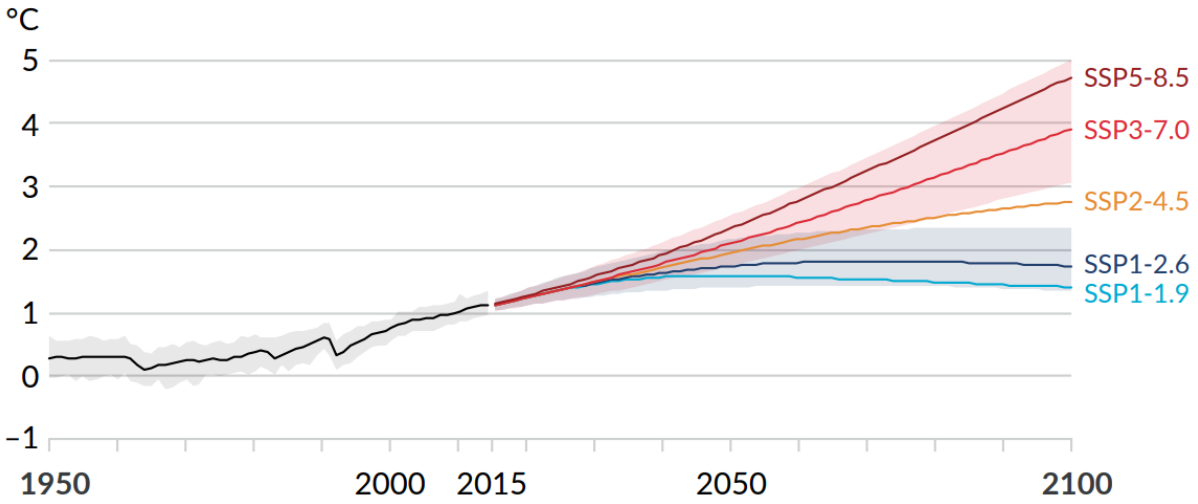

Figure A2.1: Global surface temperature change relative to 1850-1900. Source: AR6 IPCC report49.

Temporal horizon and climate periods

The horizons to consider climate-related impacts on Projects will vary across sectors and geographies. The suitable time frame for assessing climate-related risks is Project-specific. The selection of time horizons (short-term for near future; medium-term; long-term oriented between mid-century and end century) should be relevant to the lifetimes of the assets or liabilities.

The classical **climate period** for averaging the variables is 30 years, as defined by the World Meteorological Organization (WMO)[32]. A 30-year period is used, as it is long enough to filter out any inter-annual variation or anomalies, but show climatic trends.

Climate data assessment

The climate data assessment aims at understanding the extent and magnitude of climatic changes for the asset and hence the potential sensitivity to these changes.

49 IPCC, 2021: Summary for Policymakers. In: Climate Change 2021: The Physical Science Basis. Contribution of Working Group I to the Sixth Assessment Report of the Intergovernmental Panel on Climate Change [Masson-Delmotte, V., P. Zhai, A. Pirani, S.L. Connors, C. Péan, S. Berger, N. Caud, Y. Chen, L. Goldfarb, M.I. Gomis, M. Huang, K. Leitzell, E. Lonnoy, J.B.R. Matthews, T.K. Maycock, T. Waterfield, O. Yelekçi, R. Yu, and B. Zhou (eds.)]. Cambridge University Press, Cambridge, United Kingdom and New York, NY, USA, pp. 3–32, doi:10.1017/9781009157896.001.

A baseline/reference period (historical) should be identified, and the use of climate change projections from the baseline estimated for each climate-related hazards at the asset locations is highly recommended.

Charts (data tables, graphics) can be used to reflect climatic trends and the increase/decrease of main climate-related hazards.

Glossary of terms[32]

Baseline/reference period: A time period against which climate changes are calculated (e.g., expressed as anomalies relative to a baseline). *Current baseline* refers to present-day conditions while *future baseline* refers to future Projections.

Climate change: 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.

Climate indicator: Measures of the climate system, including large-scale variables and climate proxies.

Hazard: The potential occurrence of a natural or human-induced physical event or trend that may cause loss of life, injury, or other health impacts, as well as damage and loss to property, infrastructure, livelihoods, service provision, ecosystems and environmental resources.

ANNEX 3 EXAMPLE SCENARIO ANALYSIS TABLES

Table A3-1: Example transition screening checklist

Potential transition risk	Potential impact mechanism for the Project	Overview of management approach	*References*
Overview of potential transition risks to which the Project may be exposed over time. *E.g. Exposure to energy efficiency mandates, emission limits and carbon prices associated with direct Project operations (scopes 1 and 2) based on the energy and carbon intensity.*	*Describe the links between the transition risks and potential financial risks to the Project* *E.g. Potential material impacts on unplanned capital expenditures, operational costs and ultimately, revenue impacts associated to reputational considerations.*	*Describe how the risks have been addressed.* *E.g. Summarise low carbon design and energy efficiency considerations and justify choice of technology, with indication of the potential to build flexibility into design to adapt to new technologies or low carbon materials/energy sources in the future.*	*List references/links to key documents (e.g. procedures, decision gates, design specifications, etc) which evidence management actions and decisions taken.*

Table A3-2: Example of qualitative transition scenario analysis[50].

Transition trend examples	Potential risk factors (selected examples)	Potential financial impacts for the Project (selected examples)	Management actions integrated into Project design and business planning (selected examples)	Residual Financial Impact[51]						Examples of management actions for Residual Financial Impact[52] (selected examples)
				Favourable case scenario			Reasonable worst-case scenario			
				Short-term	Medium-term	Long-term	Short-term	Medium-term	Long-term	
Policy and legal										
Increasingly stringent efficiency mandates, emission limits and circularity requirements along with higher carbon prices	Exposure to increasingly stringent regulations impacting direct Project operations based on the energy and carbon intensity built into the Project design and operations.	Potential material impacts on e.g. capital expenditures, operational costs and ultimately, revenue impacts (driven by reputational risks associated to the Project).	Low carbon design and operations, with incorporation of energy efficiency and best available technologies and building flexibility into design (e.g. ability to switch to new fuels, or to adjust capacity, with limited cost and without the need for a total refurbishment). Use of up to 100% renewable energy (on-site generation and/or power purchase agreements).							Periodic monitoring of transition indicators, including policy/legal and technical development, with the potential to impact energy sources and prices, GHG intensity targets, carbon price instruments (e.g. carbon taxes. development of carbon markets), downstream uses and demand for projects and services, amongst other. Setting a well-designed internal carbon price. Identify further opportunities to maximise renewable energy generation and flexibility. Additional energy, water and material efficiency/ decarbonisation measures (e.g. develop procedures to minimise carbon emissions through improved operating practices).
	Exposure to supply chain disruption or cost increases driven by higher carbon, fuel and resource prices and lower availability.	Potential material impacts on e.g. operational costs, as well as revenues (if production is disrupted or impaired).	Short and diversified supply chains, resource efficiency and use of low-carbon materials integrated into design and operations.							Identify opportunities for further supply chain diversification and risk management (including logistics risk management), price hedging.
Market										
Shifts in consumer preference, competition from low-carbon products, market disruptors (e.g. innovation in design, materials, services) and new business models (e.g. marketplace or subscription, renting or leasing models)	Competitive disadvantage, leading to potential changes in demand across customer segments and markets.	Potential material impacts on revenues	Build flexibility in design to enable cost-effective adaptation to alternative or recycled materials and new technologies, selection of low carbon products and services, diversification of portfolio of goods and services, customers and markets.							Procedure to ensure a diversified and balanced portfolio of goods and services. Procedure to review and assess sales of goods and services against forecasts, and mechanisms to address gaps/respond to changes in demand and adjust capacity and operational costs in the short and medium term. Diversification of customer base (segment and geography). Enhanced ESG/low carbon credentials (e.g. certification) of products and services to differentiate and capture a greater market share.
Technology										

[50] Selected examples are presented, and the list of transition trends, risk factors, financial risk drivers and management actions should not be considered exhaustive. The structure and content of this table shall be adapted to the Project and context.

[51] Transition risks (and opportunities) for each Project in the short, medium and long term can be qualitatively assessed under the two scenarios, taking into account their anticipated evolution over time under each scenario and the current management actions. This can be done using a qualitative scale (e.g. non-material low, medium, high) and colour coded. Key to this analysis is the definition of materiality, and a clear definition of thresholds between categories in the qualitative scale**.** Short-, medium- and long-term time horizons to be defined taking into account the Project's capital planning and investment horizons as well as the useful life of major Project assets.

[52] Management actions for residual financial impacts should be integrated into the Transition Management Plan.

Transition trend examples	Potential risk factors (selected examples)	Potential financial impacts for the Project (selected examples)	Management actions integrated into Project design and business planning (selected examples)	Residual Financial Impact[51]						Examples of management actions for Residual Financial Impact[52] (selected examples)
				Favourable case scenario			Reasonable worst-case scenario			
				Short-term	Medium-term	Long-term	Short-term	Medium-term	Long-term	
Competition from low-carbon technologies	Asset impairment, competitive disadvantage due to higher operational costs and/or lower productivity, and reduced demand. OR Need to adapt to new fuels/technologies to remain competitive, leading to unplanned CAPEX and operational disruption.	Potential material impacts on costs and revenues, sunk costs of premature closure/stranded asset risk (with associated reputational risks).	Build low carbon, fuel efficiency and flexibility built into design to reduce the cost of adaptation to new technologies.							Monitor technical developments with the potential to impact Project competitiveness (i.e. that compete at present or pose a risk of competition or disruption of production processes in the future). Monitoring the evolution of market and technology drivers (such as commodity demand and prices, fuel prices, electrification) with the potential to pose direct or indirect financial impacts, for an early identification of potential direct and indirect changes on demand, costs, and revenues to inform the strategy. Consider partnerships for the development of technological solutions and R&D, supporting technological change to capitalise on efficiencies and improvements achieved. Low-carbon investment plans to replace carbon intensive equipment.
Reputation										
Increased litigation risk	Litigation risks, if the Project is perceived to lack transparency, make unsubstantiated claims and/or negatively contribute to climate mitigation.	Potential material impacts on costs, as well as revenues (if climate-related litigation leads to reputational impacts).	Stakeholder engagement and management; alignment of Project performance with sectoral benchmarks and decarbonisation pathways (e.g. GHG emission intensity, emission reduction targets); enhanced disclosures; ensure adequate litigation insurance							Robust transition management plan including a credible and ambitious decarbonisation strategy. Periodic disclosure of climate-related ambition and broader strategy, targets and monitoring results to track compliance. Disclosure of climate-performance metrics incorporated into remuneration policies. Promote decarbonization of industry through collaborative work with customers and suppliers and through partnerships.
Growing expectations for responsible conduct from stakeholders, including investors, lenders, consumers and workers	Attraction and retention of human resources and technical specialists, if the Project is perceived to negatively contribute to climate mitigation. Pressure on market share and ability to raise capital.	Potential material impacts on costs and revenues. Potential impacts on revenues (from lower demand) and access to/cost of capital. Opportunity to enhance reputation and brand value through enhanced transparency.	As above.							As above.

ANNEX 4 LIST OF REFERENCES AND SOURCES

1. About Climate-ADAPT — English (europa.eu). Available at: https://climate-adapt.eea.europa.eu/en/about
2. Aqueduct Water Risk Atlas (WRI). Available at: https://www.wri.org/aqueduct
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4. Bank of England CBES – Climate Biennial Exploratory Scenarios. Available at: https://www.bankofengland.co.uk/stress-testing/2021/key-elements-2021-biennial-exploratory-scenario-financial-risks-climate-change
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