REPORT

New International Airport of Cabinda (NAIC Project) - Angola

Environmental and Social Impact Assessment - Chapter 16 - Climate Change Risk Assessment - Transition Risks

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16.0 CLIMATE CHANGE RISK ASSESSMENT – TRANSITION RISKS

This is the Climate Change Risk Assessment (CCRA) chapter relevant to the Transitional Risk. Based on the EPIV Principle 2, if a Project when combined Scope 1 and 2 emissions are expected to be more than 100,000 tons/year of CO_2 equivalent during the operation phase, consideration relevant to climate transition risk are needed. From the GHGs calculation (refer to chapter 14) the Project is not expected to reach this threshold limit.

However, by adopting a conservative approach and the risks associated to the aviation sector, it was decided to adopt a precautionary approach and to include in the CCRA also aspects related to transitional risks.

16.1 INTRODUCTION

16.1.1 Policy Context: Global

The current global climate change situation remains a pressing and urgent issue. The Earth's climate is continuing to undergo significant changes primarily due to the accumulation of greenhouse gases in the atmosphere, primarily carbon dioxide (CO_2) emissions from human activities such as burning fossil fuels, deforestation, and industrial processes.

The consequences of climate change are increasingly evident across the globe. Rising temperatures have resulted in increased frequency and intensity of extreme weather events like hurricanes, floods, and droughts. These events pose significant risks to human lives, ecosystems, and economies.

In response to the global climate crisis, the international community has engaged in various efforts to address climate change and mitigate its impacts. One of the most significant international agreements since the Kyoto Protocol in 1997 is the Paris Agreement (COP21), adopted in December 2015 under the United Nations Framework Convention on Climate Change (UNFCCC).

The Paris Agreement aims to limit global warming well below 2°C above pre-industrial levels and pursue efforts to limit the temperature increase to 1.5°C. It emphasizes the need for all nations to work together to reduce greenhouse gas emissions, enhance climate resilience, and support developing countries in their adaptation and mitigation efforts.

Under the Paris Agreement, countries are required to submit Nationally Determined Contributions (NDCs), which outline their targets and actions to address climate change. These targets may include emissions reduction goals, renewable energy targets, and adaptation plans.

Since its adoption, the Paris Agreement has been ratified by 197 parties. However, while many countries have made progress in implementing climate policies and taking steps to reduce emissions, the overall global efforts have fallen short of what is necessary to achieve the agreement's temperature goals.

To strengthen and enhance the implementation of the Paris Agreement, the international community continues to hold annual UNFCCC conferences, known as the Conference of the Parties (COP). These conferences provide a platform for countries to negotiate and collaborate on climate action and enhance their commitments.

Several key outcomes emerged from COP26, including renewed commitments from countries to enhance their NDCs, with some aiming to reach net-zero emissions by mid-century. For instance, Angola in 2021 updated his first NDC.

16.1.2 Policy Context: National

As part of its commitment, Angola has submitted its NDC, outlining its efforts to reduce greenhouse gas emissions and adapt to the impacts of climate change.

Angola has set a target to unconditionally reduce its GHGs emissions by up to 15% by 2025, compared to the base year. The baseline is established using the most recent National GHG Inventory, which was conducted in 2015 and indicates emissions totaling 99.99 million tonnes of CO_2e, of which 18% is relative to the energy sector (transport included) (Figure 1). If no additional actions are taken, it is estimated that emissions under the business-as-usual (BAU) scenario will reach 103.9 million tonnes of CO_2e in 2020 and 108.5 million tonnes of CO_2e in 2025.

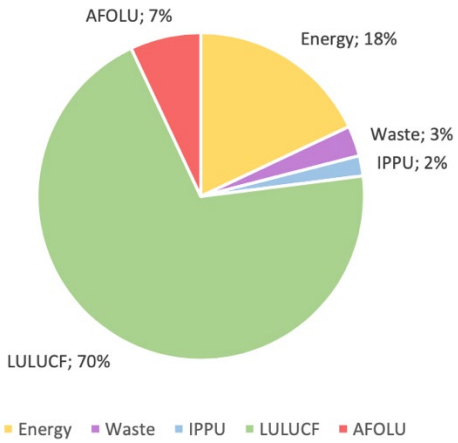

Figure 1: Emissions breakdown by sector. Source: https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20Angola.pdf[1]

The emission reduction target for the African Adaptation Acceleration Plan is set at 21% by 2030, without any conditions. This target corresponds to an estimated mitigation level of 23.3 million tonnes of CO_{2e} in that year. Additionally, if a conditional mitigation scenario is pursued, the plan aims to achieve an additional 15% reduction below the business-as-usual (BAU) emission levels by 2030. This would amount to an estimated mitigation level of 39.7 million tonnes of CO_{2e} in that year (Figure 2).

[1] AFOLU: Agriculture, Forestry and Other Land Use
LULUCF: Land use, land use change and forestry
IPPU: Industrial processes and product use

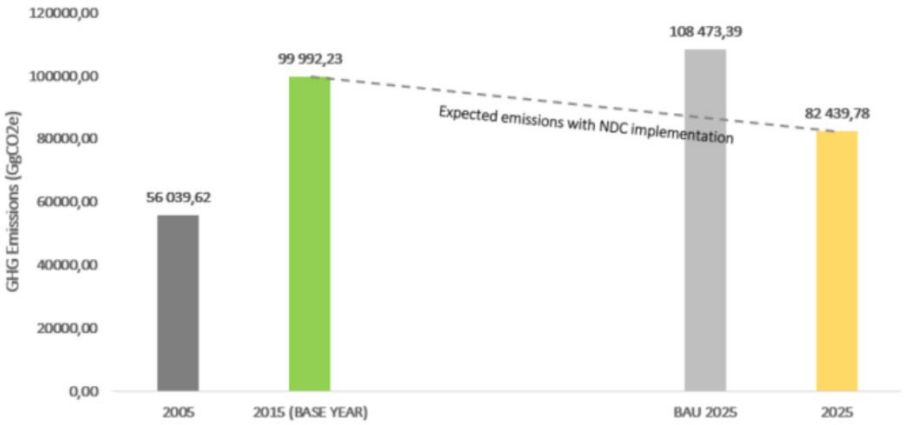

Figure 2: Ambition for the Angolan NDC. Source: https://unfccc.int/sites/default/files/NDC/2022-06/NDC%20Angola.pdf

In its NDCs, Angola has planned measures to combat climate change. These include promoting sustainable land use and reforestation efforts to enhance carbon sinks, promoting renewable energy sources, improving energy efficiency, and strengthening climate change education and awareness. The mitigation strategy primarily focuses on the energy and industry sectors as its main targets for emissions reduction. However, it is important to note that the country in question has not established a Net Zero target, indicating a lack of specific goals to achieve carbon neutrality. Additionally, the NDC does not provide a detailed roadmap for addressing emissions in the aviation sector.

Angola's NDCs emphasize the importance of international cooperation, technology transfer, and financial support to achieve its climate goals. The country recognizes that addressing climate change requires global collaboration and support from developed nations to assist developing countries in their mitigation and adaptation efforts.

It is worth noting that while Angola has shown commitment to addressing climate change, implementation and progress may vary. Like many countries, Angola faces challenges in terms of resource constraints, capacity building, and balancing environmental goals with economic development needs.

16.1.3 ICAO, IATA and the Net-Zero 2050 strategy

The aviation industry plays a significant role in global carbon emissions, contributing to climate change. However, recognizing the urgent need to address this issue, various organizations have set milestones and proposed decarbonization measures to achieve net-zero emissions. For instance, the International Air Transport Association (IATA) has formulated a detailed resolution to achieve net-zero carbon emissions by 2050 for its member airlines by setting the following milestones:

1) Use of Sustainable Aviation Fuel (SAF): IATA emphasizes the use of SAF sourced from feedstocks that do not degrade the environment or compete with food or water resources.

2) Investment in New Aircraft Technology: IATA promotes the adoption of radical aerodynamic advancements and alternative propulsion solutions like electric or hydrogen-powered aircraft.

3) Infrastructure and Operational Efficiency: IATA encourages continuous improvements in air traffic management and operational efficiency.

4) Utilizing endorsed offsets, such as carbon capture and storage technology.

This roadmap has a direct impact on airports, as it necessitates changes in operational efficiency to reduce carbon emissions. Airports will need to implement measures such as optimizing energy usage, improving building efficiency, and enhancing overall operational processes. Additionally, the roadmap has indirect effects on airports through the potential reduction of demand. As the aviation industry shifts towards using Sustainable Aviation Fuel (SAF), which is expected to come at a higher cost compared to conventional fuel, it may lead to increased prices for air travel. This, in turn, could potentially result in a decrease in demand for flights. Consequently, airports might experience changes in passenger volumes and associated revenue streams. Table 1 below shows a potential set of milestones and required action produced by IATA to reach the decarbonization by 2050.

Table 1: Milestone towards net zero. Source: IATA Net zero carbon 2050 resolution – Fact sheet.

DATE	AMOUNT OF CO_2 ABATEMENT	PATHWAY	ACTION
2025	**381 megatonnes (Mt)** (2021-2025)	97% offsets, 2% SAF, 1% improvements above business as usual (BAU)	ICAO agree long-term goal for international aviation (2022); energy sector commits to at least 6 million tonnes SAF production; agreement of full implementation of Article of Paris Agreement
2030	**979 Mt** (2026-2030)	93% offsets; 5% SAF, 2% Improvements above BAU	Use of 100% SAF on aircraft, ANSPs fully implement ICAO Aviation System Block upgrades to deliver fuel efficiency improvements of 0.3% by 2030
2035	**1,703 Mt** (2031–2035)	77.5% offsets, 17.5% SAF, 3% improvements above BAU, 2% Carbon Capture Utilization and Storage (CCUS)	Evolutionary technology achieving 30% reduction in fuel burn, electric/hydrogen aircraft for regional markets (50-100 seats, 30-90 min flights) become available
2040	**3,824 Mt** (2036-2040)	44.5% offsets, 40% SAF, 7.5% non drop-in fuel (new propulsion technologies), 5% CCUS, 3% improvements above BAU	Feasibility of new aircraft such as blended-wing bodies demonstrated with full-scale working prototypes, electric/hydrogen for short-haul markets (100-150 seats, 45-120 min flights) become available.
2045	**6,153 Mt** (2041-2045)	55% SAF, 24% offsets, 10% non drop-in fuel, 8% CCUS, 3% improvements above BAU	Necessary infrastructure for new energy requirements (low carbon electricity/hydrogen) becomes available
2050	**8,164 Mt** (2046-2050)	**65% SAF**, 13% non drop-in fuel, 11% CCUS, 8% offsets, 3% improvements above BAU	Commercially viable annual SAF production of 449 billion litres available

In this context, the *International Civil Aviation Organization (*ICAO) developed a new global carbon market for the aviation sector, Carbon Reduction and Offsetting Scheme for International Aviation (CORSIA), that aims at reducing the emissions by 85% by 2050[2]. The objective is to push airline companies to reduce their emissions by increasing the use of SAF and to push states to implement policies governing renewable jet

[2] https://www.iea.org/energy-system/transport/aviation

fuels, along with measures to encourage the introduction of new, more fuel-efficient aircraft. However, this mechanism, whose first voluntary phase will start in 2023, has not been introduced in Angola.

ICAO has formulated a Long-Term Aspirational Goal (LTAG) for the global aviation sector. This goal considers three integrated scenarios that represent different levels of readiness, attainability, and aspiration on a global scale. Among these scenarios, Integrated Scenario 3 (IS3) embodies "low readiness/attainability and high aspiration." In this scenario, emissions in 2050 are projected to decrease by 87% compared to the baseline scenario (IS0). This reduction would result from improvements in aircraft technologies (21%), operational practices (11%), and the implementation of sustainable fuels (55%). Achieving this ambitious vision will require substantial investments from governments, aircraft manufacturers, fuel suppliers, airlines, and airports. Under IS3, where hydrogen aircraft may come into service after 2035, airports might need to invest around $100 to 150 billion in infrastructure by 2050[3].

The International Council on Clean Transportation (ICCT) has produced four decarbonization scenarios: the Action, Transformation, Breakthrough, and Baseline scenarios. These scenarios are built around six critical parameters: (1) traffic; (2) aircraft technology; (3) operations; (4) zero-emission planes (ZEPs); (5) sustainable aviation fuels (SAFs); and (6) economic incentives. The "Breakthrough scenario" aligns with the 1.75°C target set by the Paris Agreement, representing a more ambitious path towards reducing aviation-related emissions[4].

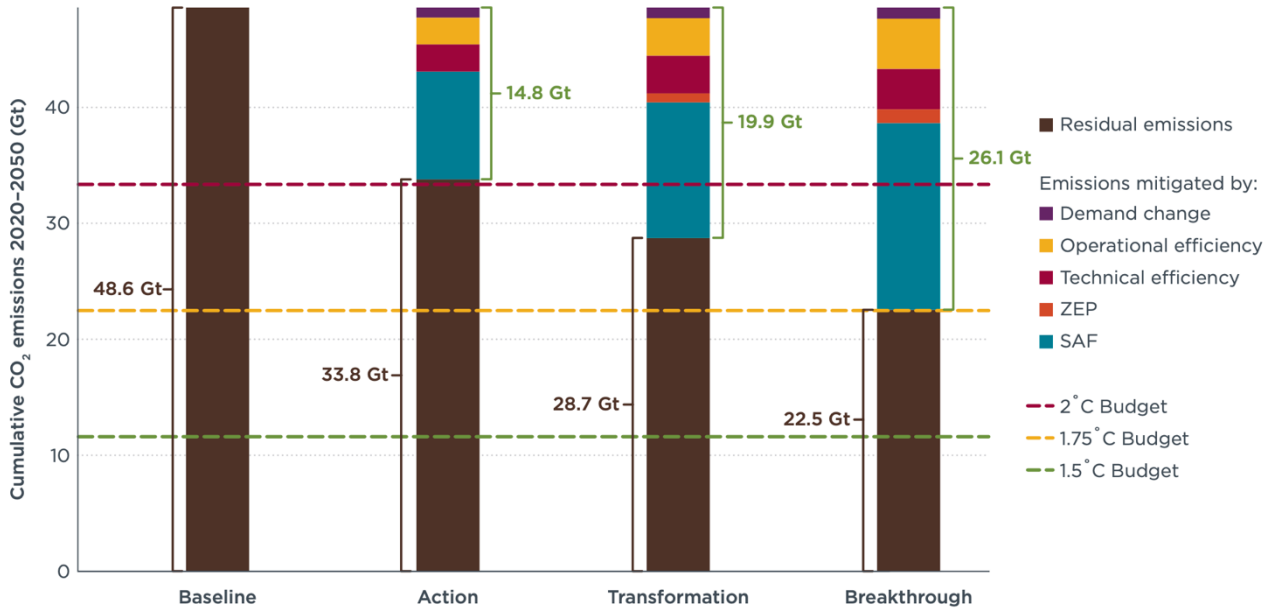

Figure 3 Cumulative global aviation CO_2 emissions by scenario and measure, 2020-2050. Source: Graver, B., Mukhopadhaya, J., Zheng, X. S., Rutherford, D., Mukhopadhaya, J., & Pronk, E. (2022). Aligning Aviation with the Paris Agreement.

As indicated by the “Breakthrough scenario”, achieving decarbonization will heavily rely on Sustainable Aviation Fuel (SAF). Nevertheless, we must not overlook the significance of airports and operational efficiency, such as the introduction of single-engine taxiing, electric tows to gates, continuous climb and

[3] ICAO (2022), Report on the feasibility of a long-term aspirational goal (LTAG) for international civil aviation co2 emission reductions.

[4] Graver, B., Mukhopadhaya, J., Zheng, X. S., Rutherford, D., Mukhopadhaya, J., & Pronk, E. (2022). Aligning Aviation with the Paris Agreement.

descent, smart air traffic management[5]. In this scenario, demand reduction directly contributes only 4% towards the mitigation goal, the introduction of SAF and other market-based measures might have an indirect impact with broader implications[6].

All these scenarios have been presented on a global scale and might not accurately depict the effort required for each individual country.

16.2 TRANSITION CCRA

16.2.1 Methodology

The Task Force on Climate-related Financial Disclosures (TCFD) defines climate transition risk as the risk associated with the transition to a low-carbon and resilient economy. It refers to the potential financial impacts and disruptions that businesses and financial institutions may face as a result of policy, legal, technological, and market changes aimed at addressing climate change.

Transition risks arise from efforts to mitigate greenhouse gas emissions and transition to a more sustainable and low-carbon economy. These risks can include regulatory changes, shifts in market preferences and demand, changes in technology and innovation, and evolving societal expectations. They can lead to significant financial implications, such as asset write-downs, stranded assets, reduced market share, increased operating costs, or disrupted supply chains.

This assessment follows the TCFD classification of transition risks as summarized in Table 2.

Table 2 Transition risk classification.

RISK	DESCRIPTION
POLICY RISK	Changes in regulations and policies related to carbon emissions, energy use, and environmental standards can impact airports. Stricter regulations or the introduction of carbon pricing mechanisms may require airports to invest in emission reduction measures or adopt cleaner technologies, potentially increasing operational costs.
TECHNOLOGY RISK	Rapid technological advancements aimed at decarbonization, such as the development of electric or hydrogen-powered aircraft, may require airports to adapt their infrastructure and services. Failure to keep up with evolving technologies could lead to stranded assets or a loss of competitiveness.
MARKET RISK	The transition to a low carbon economy could impact the demand. Ideally, for an airport, key transition risks are related with changes in demand (passenger driven or regulated) and increasing competition from lower carbon travel options.
REPUTATIONAL RISK	Airports are increasingly under scrutiny from stakeholders, including passengers, airlines, investors, and communities, to address climate change. Failure to demonstrate commitment and progress in reducing emissions and adapting to climate risks can harm an airport's reputation and relationships with stakeholders.

[5] EASA. (2022) EASA publishes new fuel/energy rules with positive environmental impact. Retrieved from the European Union Aviation Safety Agency https://www.easa.europa.eu/newsroom-and- events/press-releases/easa-publishes-new-fuelenergy-rules-positive-environmental.

[6] Graver, B., Mukhopadhaya, J., Zheng, X. S., Rutherford, D., Mukhopadhaya, J., & Pronk, E. (2022). Aligning Aviation with the Paris Agreement.

The TCFD encourages organizations to assess and disclose their exposure to climate transition risks, including the potential financial impacts on their business models, strategies, and operations. This assessment follows the TCFD taxonomy of transition risks and is in line with the Equator Principles 4. In particular, according to EP4 Annex A, the CCRA should provide:

- a comprehensive overview of the current and anticipated climate risks, both transition and physical, associated with the Project's operations.
- evaluate whether the Client has established plans, processes, policies, and systems to effectively manage and address these risks through mitigation, transfer, acceptance, or control measures.

Furthermore, the EP4 emphasizes the importance of considering the Project's compatibility with the host country's National Climate Commitments as an additional aspect to be evaluated.

The EP4 proposes a two-phased approach:

1) **review of the project alignment with the National Country Commitment** (NCC), considering the national determined contribution (NDC), long-term strategies (LTS) and Paris Agreements objectives. This stage is carries out by checking the inclusion of Project activity type in negative lists (first screening; Section 4.3.2 "Universally not-aligned list"[7]) or positive lists (second screening, Section 4.3.2 "Universally aligned list"[8]). A deeper assessment should be done on “conditional” project (Section 4.3.2 “Specific Assessment Criteria for Conditional Projects”[9]). This phase should classify the project as “*aligned*”, “*conditional*” or “*unaligned*”.

2) **Development of Project Resilience to Transition Climate Risks** (under categories in line with TCFD recommendations) through a staged CCRA process of:

   a) screening/scoping;

   b) risk assessment; and

   c) risk management.

The assessment will be qualitative and conducted to identify potential risks and their corresponding material financial impact drivers under each scenario. This assessment will utilize existing literature on the future of the aviation sector to assign a qualitative assessment, categorizing risks as low, medium, or high based on their level of significance. "Low risk" means that there is little or no evidence that the event will intersect with the project and have an impact on it, “Medium risk” means that there are some Evidence/indications suggesting a transition from business as usual will occur with some impacts; “High Risk” means that evidence/indications strongly suggest a transition from business as usual will occur with the impact anticipated to be substantial.

16.2.2 Scenarios and timeline

According to the TCFD (Task Force on Climate-related Financial Disclosures), it is recommended to consider a range of scenarios instead of relying on a single scenario. This range should encompass a

[7] EP (2023), GUIDANCE NOTE ON CLIMATE CHANGE RISK ASSESSMENT Guidance CCRA. In https://equator-principles.com/app/uploads/Guidance-CCRA_May-2023.pdf pg. 30

[8] EIB (2021), BB1 and BB2 Technical Note Joint MDB Assessment Framework for Paris Alignment for Direct Investment Operations. In https://www.eib.org/attachments/documents/cop26-mdb-paris-alignment-note-en.pdf

[9] EP (2023), GUIDANCE NOTE ON CLIMATE CHANGE RISK ASSESSMENT Guidance CCRA. In https://equator-principles.com/app/uploads/Guidance-CCRA_May-2023.pdf pg. 32

reasonable variety of potential future outcomes, including both favorable and unfavorable possibilities. Specifically, it is advised to include a scenario that aligns with a 2°C or lower temperature increase, along with two or three additional scenarios that are most relevant to the specific circumstances. The analysis will focus the alignment of the project to the net zero strategy by 2050 provided by IATA, considering three horizons: 2025, 2030 (medium term) and 2050 (long term). The evaluation will take into account globally recognized scenarios, such as those provided by ICAO, ICCT and IEA, which are publicly available.

16.2.3 Transition risk and opportunity assessment

16.2.3.1 Project alignment with National Climate Commitments (NCC)

The Guidance Note on CCRA published by the EP Secretariat in May 2023 suggests starting the assessment with a preliminary review of the compatibility of the Project with National Climate Commitments (NCC). From the first screening and second screening the Project activity is either part of the "Universally not-aligned list" or the “Universally aligned list". Hence, the Project is classified as “Conditional”.

Table 3: Specific Assessment Criteria for Conditional Projects.

Specific Criteria	Description	Assessment
SC1	Is the Project inconsistent with the NDCs[10] 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 Project sector is part of the NDC’s strategy to reduce GHG emissions (as part of the energy sector). However, the country has not provided decarbonization pathways for the aviation sector. **Consequently**, we **do not evaluate this project as inconsistent** with Angola climate strategy.
SC2	Is the Project, over its lifetime, inconsistent with the country’s LTSs[11] or other similar long-term national economy-wide, sectoral, or regional low-GHG strategies compatible with the mitigation goals of the Paris Agreement?	Currently, Angola does not have a Long-Term Strategy. We can only refer to the updated NDC strategy. Therefore, **we do not evaluate this project as inconsistent** with national low-GHG strategies **over its lifetime**.
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?	The International Air Transport Association (IATA) has reinforced its original objective and made a commitment to achieving net-zero carbon emissions from worldwide civil aviation operations by 2050. This ambitious goal takes into account advancements in air traffic management and other airport operations, which will present further prospects for reducing energy consumption.[12]. The success of the Project heavily relies on an oil refinery plant, and it lacks a decarbonization strategy throughout its lifespan to incorporate renewable energy or sustainable fuel infrastructure. Therefore, **we assume that the Project is inconsistent with global sector specific**

[10] https://unfccc.int/NDCREG

[11] https://unfccc.int/process/the-paris-agreement/long-term-strategies

[12] IATA, executive summary: Net Zero Roadmaps.
https://www.iata.org/contentassets/8d19e716636a47c184e7221c77563c93/executive-summary---net-zero-roadmaps.pdf

Specific Criteria	Description	Assessment
		decarbonization pathways, due to the lack of decarbonization plans in the long-term.
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?	The Project is not directly related to non-aligned activities (see universally non-aligned list[13]). However, it is highly reliant on fossil fuels for its generators.

16.2.3.2 Transition risk screening

The initial screening process revealed the presence of possible transition risks and defined the potential financial impact mechanism for the project. To ensure an assessment reliant as much as possible on quantitative data rather than personal assumptions, we exclusively analyzed risks for which a quantitative indicator was available.

Table 4: Transition risk screening.

Potential transition risk	Potential impact mechanism for the Project	Overview of management approach	References
1. Exposure to risk associated with decarbonization and net-zero policies that may impose constraints or mitigate activities that contribute to climate change.	*+ CapEx in equipment or new technologies to manage transition risk, adaptation, and conservation/efficiency efforts.*	*Based on the documentation provided, no risk mitigation strategy is outlined.*	*Not provided*
2. Exposure to phase out of fossils for energy production	*+ CapEx in equipment or new technologies to manage transition risk, adaptation, and conservation/efficiency efforts.*	*Based on the documentation provided, no risk mitigation strategy is outlined.*	*Not provided*
3. Exposure to decrease in passenger demand due to policy regulation and competition from lower-carbon travel solutions (Modal shift).	*+/- Revenue from changing sales of products/services*	*Based on the documentation provided, no risk mitigation strategy is outlined.*	*Not provided*
4. Exposure to the risk of development and deployment of new technologies, such as SAF infrastructure.	*+ CapEx in equipment or new technologies to manage transition risk, adaptation, and conservation/efficiency efforts*	*Based on the documentation provided, no risk mitigation strategy is outlined.*	*Not provided*
5. Exposure to the risk of development and deployment of new technologies, such as SAF renewables.	*+ CapEx in equipment or new technologies to manage transition risk, adaptation, and conservation/efficiency efforts*	*Based on the documentation provided, no risk mitigation strategy is outlined.*	*Not provided*

[13] EP (2023), GUIDANCE NOTE ON CLIMATE CHANGE RISK ASSESSMENT Guidance CCRA. In https://equator-principles.com/app/uploads/Guidance-CCRA_May-2023.pdf pg. 30

Potential transition risk	Potential impact mechanism for the Project	Overview of management approach	References
Risk Not Included			
⊗ *Exposure to increased stakeholder pressure and concern.*	*Absence of robust reputation risk data, at the sector and country level*		

16.2.3.3 Transition risk assessment

The Transition Risk Assessment is the last step of the analysis, where the resilience of the implemented transition management actions (such as transition strategy, business case, financial planning, and design/technological considerations) is stress-tested across various scenarios. The aim is to identify any remaining risks. However, in this case, there scarcity of official documents containing future strategy or emission reduction targets, leaving the Project exposed to transition risks, which is quite common in the early stage of a project. Additionally, it should be considered that the aviation sector in Angola is growing up and a number of new airports are currently under renew or development. It is therefore recommended that the Ministry of Transportation, the owner of the Project, consider developing a Climate Adaptation Plan based on a clear set of future climate and transition scenarios and considering the relevant adaptation actions being implemented by airports globally and to align to the official National Strategy for Climate Change (ENAC 2022-2035).

The plan would provide a pathway to strengthen the airport's approach to climate change risk management, including trigger points to embed climate resilience in decision-making and assist the airport in its climate-related financial decisions. Such plan should be combined with the physical risks (see Chapter 15).

The following Table is a high-level assessment that should be complemented by a more extensive and deeper analysis to obtain a comprehensive understanding of the financial materiality of transition risks. The information presented in this qualitative analysis are not exclusively sourced at the country level. To define the general trend, data from other countries within the same region may have been taken into account. Therefore, findings and conclusions should be interpreted with the understanding that regional data may influence the overall assessment.

Given the early stage of the Project, there are some recommended actions for implementation that should be more articulated and refined once the Project design and organization management is completed. Such actions should be part of the climate adaptation plan to be developed before starting operation as part of the ESMS.

Table 5: Transitional Risk assessment

Transition Trend	Potential risk factors	Potential financial impacts for the Project[14]	Management actions integrated into Project design and business planning	Residual Financial Impact			*Recommended management actions for Residual Financial Impact*
				Net Zero 2050			
				Baseline	2030s	2050s	
Policy and Legal							
Increasingly stringent efficiency mandates, emission limits and circularity requirements along with higher carbon prices	TR1 - The Project is potentially exposed to risk associated with decarbonization and net-zero policies that may impose constraints or mitigate activities that contribute to climate change. (e.g., operational efficiency requirements such as single-engine taxiing, electric tows to gates, continuous climb and descent, smart air traffic management).	Potential material impact on increased Operational Expenditure due to R&D for new technologies. Potential material impact on increased Capital Expenditure for new equipment and conversion to low-carbon technologies.	No management actions for this risk are available at the time of this report preparation.	LOW RISK	MEDIUM RISK	HIGH RISK	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). Engage with policy makers and decision makers to guide and influence change. Low-carbon investment plans to increase operational efficiency. Participation in expert working groups, industry sector initiatives and airport operator forums to capture best practice learning and drive change.
	TR2 – The Project is potentially exposed to the phase out of fossil fuels for energy production.	Potential material impact on increased Operational Expenditure due to R&D for new technologies.	No management actions for this risk are available at the time of this report preparation.	LOW RISK	MEDIUM RISK	HIGH RISK	

[14] Examples of potential financial impact can be found in TCFD (2021), “Implementing the Recommendations of the Task Force on Climate-related Financial Disclosures”. Appendix A.1

Transition Trend	Potential risk factors	Potential financial impacts for the Project[14]	Management actions integrated into Project design and business planning	Residual Financial Impact			*Recommended management actions for Residual Financial Impact*
				Net Zero 2050			
				Baseline	2030s	2050s	
	The Project produces part of its energy using its own diesel generator.	Potential material impact on increased Capital Expenditure for new equipment and conversion to low-carbon technologies.					
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)	TR3- The Project is potentially exposed to change in passenger demand due to policy regulation and competition from lower-carbon travel solutions. (e.g., introduction of SAF and modal shift)	Potential material impacts on revenues.	No management actions for this risk are available at the time of this report preparation.	LOW RISK	LOW RISK	MEDIUM RISK	Low-carbon investment plans to keep up with the introduction of SAF and operational efficiency. 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,

Transition Trend	Potential risk factors	Potential financial impacts for the Project[14]	Management actions integrated into Project design and business planning	Residual Financial Impact			*Recommended management actions for Residual Financial Impact*
				Net Zero 2050			
				Baseline	2030s	2050s	
							Participation in expert working groups, industry sector initiatives and airport operator forums to capture best practice learning and drive change.
Technology							
Competition from low-carbon technologies Asset impairment, competitive.	TR4 - The project is exposed to the need of adapting to new technologies to remain competitive such as introduction of SAF infrastructure.	Potential material impact on increased Capital Expenditure for new equipment.	No management actions for this risk are available at the time of this report preparation.	LOW RISK	MEDIUM RISK	HIGH RISK	Low-carbon investment plans to introduce new infrastructure. 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). Diversify the supply chain where possible to reduce risk exposure within the supply chain.
	TR5 - The project is exposed to the need of adapting to new fuels/technologies to remain competitive such as renewable technologies for electricity production	Potential material impact on increased Capital Expenditure for new equipment.	No management actions for this risk are available at the time of this report preparation.	MEDIUM RISK	MEDIUM RISK	HIGH RISK	

16.2.4 Conclusions and Recommendations

Based on the comprehensive analysis of projections from various scenarios, it is evident that the transport sector in Angola will gradually witness a reduction in direct CO_2 emissions, attributed to the ongoing efforts to decrease operational activities' emissions. This trend suggests a growing need for the Project to adapt its infrastructures to align with the changing energy landscape and reduce its reliance on fossil fuels over time. As the demand for air travel in the Sub-Saharan Africa region remains relatively inelastic until 2030, the risk associated with passenger demand is considered low during this period. However, beyond 2030, a medium risk is assumed due to potential shifts in transportation choices with the gradual reduction of conventional jet fuels.

The implementation of electric vehicles and hydrogen aircraft, along with the increasing utilization of Sustainable Aviation Fuels (SAF), will necessitate airports to prepare early to remain competitive. Renewable energy adoption is set to rise consistently, indicating a growing imperative for all sectors to incorporate more renewable energy sources to curtail emissions effectively.

Overall, embracing renewable energy, sustainable transportation options, and proactive infrastructure adjustments will be key to navigating the evolving energy landscape and reducing environmental impacts. As we progress towards a sustainable future, the Project's strategic decisions should align with these trends, ensuring long-term viability and contributing positively to global climate goals.

As explained the information available at the time of the study on the technical design of the Project does not allow to complete a full assessment and further considerations are needed in the course of the Project development once MoT will define the approach for the management of the new airport. The preparation of a Climate Adaptation Plan is strongly recommended to guide the project towards a medium-term low carbon strategy. The Adaptation Plan will be a living document that will have to be periodically reviewed, to ensure the actions for reducing and adapting to risks are organized according to short – medium- and longer-term timescales, covering the period up to 2050. The plan shall also include consideration on physical risks. The ICAO Climate Resilient Airport toolkit could be a valid guidance reference and may provide some good foods for thoughts.

This high-level assessment serves as a valuable tool to offer a broad perspective on the alignment of an entity or organization with the internationally defined net zero strategy. It provides an overview of the extent to which the entity's activities and initiatives are in line with the overarching goals of the net zero strategy.

However, it is important to note that this assessment is not exhaustive and comprehensive. Further in-depth analysis and evaluation are necessary to delve into the specific details and intricacies of the entity's operations, emissions profile, and strategies. This deeper analysis would enable a more accurate and detailed understanding of the entity's alignment with the net zero strategy.

APPENDIX A

Rational data

Table 6: Rationale behind the assessment.

TRANSITION RISK CODE	Rationale "Net Zero 2050" scenario
TR1	According to the International Energy Agency – Energy Technology Perspective (IEA ETP) scenario Beyond 2°C Scenario[15] (B2DS), the transport sector's direct CO2 emissions (Mt CO2) in South Africa are expected to experience a slight reduction by 2025 (63 Mt CO2) compared to the 2014 levels (64 Mt CO2)[16]. On the other hand, the ICCT projection in the same scenario[17] suggests that emissions from operational activities will begin to decrease from 2030[18], leading to progressive reductions in direct CO2 emissions (Mt CO2) from the transport sector. The IEA ETP reports that, by 2030, the emissions are projected to be at 58 Mt CO2 compared to the 2014 baseline of 64 Mt CO2 to align with the 2°C target, in line with the ICCT projection. This will result in a gradual reduction by one-third by 2050, bringing the emissions down to 26 Mt CO2 compared to the 2014 level of 64 Mt CO2. Based on these projections, we assume that the risk associated with emissions will gradually increase over time, given the ongoing reduction efforts and their impact on emissions trends.
TR2	According to the Net Zero 2050 scenario proposed by the NGFS (Network for Greening the Financial System), the consumption of fossil fuels for secondary energy is projected to experience a minor decrease by 2025, and this reduction is expected to be nearly halved by 2050. As we consider a sustainable scenario, we should take into account the possibility that this risk may start to materialize as early as 2030 and could become a full-fledged reality by 2050[19].
TR3	The IEA ETP B2DS projection for South Africa indicates a rise in air transport's passenger km (billion) from 33 in 2014 to 38 in 2025, with an expected further increase to 74 passenger km (billion) by 2050. This growth might be attributed to limited available alternatives that prevent customers from selecting other travel options. This positive trend is also corroborated by the NGFS scenario Net Zero 2050, which takes into account the Southern Africa region[20]. This trend can be attributed to the relatively inelastic demand of Sub-Saharan Africa region towards price changes, as travel is primarily concentrated among higher-income individuals, who are less price-sensitive[21]. Consequently, we anticipate no evidence supporting a significant change in passenger demand in this region until 2030. However, by 2050, a medium risk is assumed due to the gradual reduction of conventional jet fuels, possibly leading to a modal shift in transportation choices.

[15] The B2DS scenario aligns with the ambition range set by the Paris Agreement. However, it does not aim to establish a precise temperature target of "well below 2°C."

[16] IEA (2017), Energy Technology Perspectives 2017, *International Energy Agency*. Paris. www.iea.org/etp2017

[17] We are making reference to the "Breakthrough scenario" developed by the ICCT, outlining the aviation sector's trajectories aiming to achieve the 1.75°C target by the year 2050.

[18] Graver, B., Mukhopadhaya, J., Zheng, X. S., Rutherford, D., Mukhopadhaya, J., & Pronk, E. (2022). Aligning Aviation with the Paris Agreement.

[19] Richters, Oliver, Bertram, Christoph, Kriegler, Elmar, Al Khourdajie, Alaa, Cui, Ryna, Edmonds, Jae, Hackstock, Philip, Holland, Dawn, Hurst, Ian, Kikstra, Jarmo, Lewis, Jared, Liadze, Iana, Meinshausen, Malte, Min, Jihoon, Nicholls, Zebedee, Piontek, Franziska, Sauer, Inga, Sferra, Fabio, Sanchez Juanino, Patricia, … Zwerling, Matthew. (2022). NGFS Climate Scenarios Data Set (3.4) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7198430

[20] Ivi.

[21] Smyth, M., & Pearce, B. (2008). Air Travel Demand: IATA Economics Briefing No. 9. International Air Transport Association, April.

	Furthermore, evidence indicates that the African Union has outlined plans to enhance the African High-Speed Train Network under its Agenda 2063 initiative[22]. This development may have implications for the aviation sector in the long term.
TR4	According to the ICCT report, in a "Breakthrough scenario"[23], electric vehicles and hydrogen aircraft are expected to be introduced by 2030 and 2035, respectively. As a result, airports need to be prepared early to remain competitive. Specifically, electric commuter aircraft are projected to constitute 50% of new units by 2030 and 100% by 2050. Regarding Sustainable Aviation Fuels (SAF), the ICCT report indicates that by 2030, 46 million tonnes of biofuels and 5 million tonnes of e-fuels (accounting for 17% of fuel use) will be utilized. By 2050, these figures are projected to increase significantly to 100 million tonnes of biofuels and 215 million tonnes of e-fuels, amounting to 100% of fuel use. Furthermore, the IEA ETP scenario B2DS reveals that in South Africa, the consumption of biofuels will rise to 37 PJ in 2025, a substantial increase from 5 PJ in 2014. Therefore, we assume that the level of risk will gradually increase over time.
TR5	The NGFS scenario, Net Zero 2050, envisions a consistent rise in renewable electricity capacity from 2025 onwards in the southern Africa region. This trend indicates that all sectors will need to escalate their utilization of renewable energy to effectively curtail their Scope 2 emissions[24]. Consequently, our assessment reveals a moderate risk in the short and medium term, driven by the growing imperative to enhance energy efficiency and incorporate a greater proportion of renewable energy sources. According to the IEA report, in a sustainable scenario, electricity generation in Africa will witness a significant shift towards renewables. By 2030, solar photovoltaic (PV) will emerge as the most cost-effective energy source across the continent, surpassing all other options. The report highlights that over 80% of new power generation capacity by 2030 in the Sub-Saharan region will come from renewable sources such as solar, wind, hydropower, and geothermal. This indicates a promising trend towards a greener and more sustainable energy landscape in Africa. In addition, by reallocating the investment initially earmarked for discontinued coal plants to solar PV projects, it would be possible to cover approximately half of the total cost of all solar PV capacity additions in Africa until 2025, specifically in the Sub-Saharan region[25].

[22] https://au.int/agenda2063/flagship-projects

23 The Breakthrough scenario envisions swift, proactive, and continuous government intervention that catalyzes extensive investments in zero-carbon aircraft and fuels. This approach would lead to a peak in fossil fuel utilization by 2025, ultimately phasing it out entirely by 2050.

[24] Richters, Oliver, Bertram, Christoph, Kriegler, Elmar, Al Khourdajie, Alaa, Cui, Ryna, Edmonds, Jae, Hackstock, Philip, Holland, Dawn, Hurst, Ian, Kikstra, Jarmo, Lewis, Jared, Liadze, Iana, Meinshausen, Malte, Min, Jihoon, Nicholls, Zebedee, Piontek, Franziska, Sauer, Inga, Sferra, Fabio, Sanchez Juanino, Patricia, … Zwerling, Matthew. (2022). NGFS Climate Scenarios Data Set (3.4) [Data set]. Zenodo. https://doi.org/10.5281/zenodo.7198430.

[25] IEA (2022), Africa Energy Outlook 2022, International Energy Agency. Paris. https://www.iea.org/reports/africa-energy-outlook-2022/key-findings.

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