



THE
GOVERNMENT OF THE
TURKS & CAICOS ISLANDS



TURKS AND CAICOS ISLANDS
AIRPORTS AUTHORITY

INTERMEDIATE INFRASTRUCTURE BUSINESS CASE FOR THE REDEVELOPMENT OF THE HOWARD HAMILTON INTERNATIONAL AIRPORT

ANNEX 1. DUE DILIGENCE REPORT

Annex 1.3 ENVIRONMENTAL & SOCIAL ASSESSMENT

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EXECUTIVE SUMMARY

ALG Global Ltd (ALG) and Ensphere Group Limited (Ensphere) were commissioned by the Government of Turks and Caicos Islands (TCIG) to complete an Environmental and Social (E&S) Assessment of Providenciales International Airport (Provo Airport) in Turks and Caicos, prior to its modernisation and expansion. The benefit of this report is to the TCIG, and Turks and Caicos Islands Airports Authority (TCIAA).

The objective of this E&S Assessment was to assess any latent, direct and indirect environmental and social liabilities, which may be of material consideration to any proposed bidder; identify any gaps in information; and ways to close such gaps in order to support the Project development in line with IFC Performance Standards (PS) and international good practice.

For the purposes of this assessment a materiality threshold of US\$100,000 per item has been applied. Any findings below this threshold have been reported as a 'minor cost' or 'management issue'.

All works have been undertaken in accordance with the scope of works and limitations outlined in ALG's agreement and the terms and conditions contained therein.

Providenciales International Airport is the primary gateway to the Turks and Caicos Islands (TCI), besides the Grand Turk Cruise Terminal. It serves the Providenciales Island, the most inhabited Island in TCI. It is located in the centre of this island, at 5 metres elevation above sea level. The Airport's property boundary encompasses 278.85 hectares (689.06 acres), including the airfield, terminal, landside and support facilities. Security fencing is provided around the perimeter of the property. In 2021, the airport handled over 400,000 stayover arrivals, of which 92% were US citizens. International airlines serving the airport include American Airlines, Air Canada, British Airways, Delta, United, WestJet, and JetBlue. It operates from 6am to 8pm, local time.

There are residential settlements to the northeast and southeast of the airport, industrial developments to the south, a forested area to the northwest, and, to the west/south-west of the airport, the Chalk Sound National Park is located with close proximity.

Based on our assessment, some potentially material environmental and social aspects have been identified. It is highlighted that, at the time of writing, there are still information gaps for which documentation is still awaited. Notwithstanding this, many of the issues identified have been considered as part of the proposed Project, with a view to mitigating them. These issues include:

- Surface and wastewater management
- Waste management
- Climate change (transitional and physical risks)
- Contaminated land
- Biodiversity

Costs for addressing and mitigating some of these aspects have been included within the business plan, while other mitigating factors have been included in the proposed PPP agreement.

The materiality of other E&S issues could not be established on the basis of existing information. These include:

- H&S matters
- HR (legal information pending)
- Emergency preparedness

It is expected that these will be suitably considered as part of the next iteration of this report.

Acronyms and Definitions

Acronym	Definitions
ARFF	Aircraft Rescue and Fire Fighting
AST	Aboveground Storage Tank
ATMs	Air Traffic Movements
Authority	Ministry of Transport
BOD	Biological Oxygen Demand
CA	Concession Agreement
CBA	Collective Bargaining Agreement
COD	Chemical Oxygen Demand
DBFOM	Design, Build, Finance, Operate and Maintain
ESAP	Environmental and Social Action Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FC	Financial Close
FTE	Full Time Employee
H&S	Health and Safety
HGV	Heavy Goods Vehicle
HSE	Health, Safety and Environment
IBC	Intermediate Bulk Container
ILO	International Labour Organisation
KPI	Key Performance Indicator
LNG	Liquified Natural Gas
M&E	Mechanical and Electrical
ODS	Ozone Depleting Substance
OHS	Occupational Health & Safety
O&M	Operation and routine Maintenance
PCB	Polychlorinated Biphenyls
PPE	Personal Protective Equipment
PPP	Public Private Partnership
PSA	Public Safety Area
RCP	Representative Concentration Pathway
RWY	Runway
SMS	Safety Management System
SS	Suspended Solids
TBC	To be confirmed
TCI	Turks and Caicos Islands
TCIAA	Turks and Caicos Islands Airports Authority
Project	The modernisation and expansion of Providenciales International Airport
UST	Underground Storage Tank

UXO	Unexploded Ordnance
WHO	World Health Organisation
WWTP	Wastewater Treatment Plant

1. Introduction

General

ALG Global Ltd (ALG) and Ensphere Group Limited (Ensphere) were commissioned by the Government of Turks and Caicos Islands (TCIG) to complete a Environmental and Social (E&S) Assessment of Providenciales International Airport (Provo Airport) in Turks and Caicos, prior to its modernisation and expansion. The benefit of this report is to the TCIG, and Turks and Caicos Islands Airports Authority (TCIAA).

The objective of this E&S Assessment was to assess any latent, direct and indirect environmental and social liabilities, which may be of material consideration to any proposed bidder; identify any gaps in information; and ways to close such gaps in order to support the Project development in line with IFC Performance Standards (PS) and international good practice.

For the purposes of this assessment a materiality threshold of US\$100,000 per item has been applied. Any findings below this threshold have been reported as a 'minor cost' or 'management issue'.

Methodology

All works have been undertaken in accordance with the scope of works and limitations outlined in ALG's agreement and the terms and conditions contained therein.

Scope of Works

The E&S Assessment comprised an independent evaluation of E&S aspects of the Project with consideration of the applicable regulatory and IFC applicable standards. The Assessment takes into consideration the existing operations at Provo Airport and elements relevant to future operations as defined by the Project.

The E&S Assessment comprised a site visit which was conducted between the 23rd May and the 26th May 2022 by Penelope Latorre (E&S Lead). The site visit comprised:

- A walkover of the terminal and landside areas (including car parks).
- A cursory visual inspection of the airside areas of the airport, which comprise:
 - The three fuel farms (two of them only externally)
 - The fire station
 - The ATC
 - The wastewater treatment facility
 - The FBO facilities
 - Waste storage areas (only selected areas)
 - An overview of landscaped areas across the airport (in particular, along the runway and taxiways).

In addition, during the period above, meetings were held with the following relevant entities:

External Stakeholders	Internal Stakeholders
Rubis Regional Manager, responsible for the operation of one Fuel Farm	TCIAA CEO and deputy CEOs
Ports Authority	Board Infrastructure Committee
Environmental Health	Project Team
Representatives of FBOs	Director of Contracts & Procurement
Ministry of Immigration and Border Services	Director of HR
Ministry of Infrastructure, Physical Planning, and Public Works	Director of Meteorology
Ministry of Finance, Trade and Investment	Executive Terminal Manager
Airline representatives	Safety Director
Airport concessions representatives	Director of Operations

Ministry of Tourism and Tourist Association representatives	Maintenance Manager
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Ministry of Environmental and Coastal Resources	Director of Security
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The Assessment further comprised a review of information and documentation facilitated by the Airport, although it is noted that information received in relation to E&S matters is scarce. A brief review of publicly available information in relation to EHS matters was also conducted.

This ESDD Report provides a summary of the findings from the visit, stakeholder engagement and documentation review. Where necessary, recommendations have been made to address any issues and close any gaps identified. Where possible, actions have been quantified and included as capital expenditure (CAPEX) and operational expenditure (OPEX) in the financial model. Where actions could not be identified, cost estimates have been provided for any additional technical studies which may be required in order to facilitate such quantification.

Risk analysis

For the purposes of this assessment a materiality threshold of €100,000 per item has been applied. Any findings below this threshold have been reported as a 'minor cost' or 'management issue'.

Materiality has been rated in the relevant sections below utilising a traffic light system as follows:

-  A material risk has been identified, which remains unmitigated.
-  A risk has been identified, which has the potential to be material, but requires additional information to confirm this or is only likely to be material for the Project.
-  A risk has been identified, which is unlikely to be material but this requires further substantiation for this to be confirmed. Also covers a scenario where a risk has been identified, but financial allowances have been included in the Project's business plan.
-  No material issues have been identified.

Limitations

The scope of this assessment is subject to the scope and limitations set out in the proposal referenced above (in particular in relation to information, scope and schedule limitations). It is highlighted that this assessment does not constitute a full compliance audit or an Environmental and Social Impact Assessment (ESIA). The Assessment comprised a non intrusive evaluation of performance, and it is noted that no intrusive investigations, monitoring or technical assessments were conducted as part of the assignment. Where relevant, these have been recommended within this report. The scope of this investigation does not include an assessment for the presence of Asbestos Containing Materials (ACMs). Where the presence of such materials is known or suspected, recommendations for management in accordance with legal requirements are provided in the main body of this report.

Where a review of third-party reports or other data sources has been undertaken, ALG/Ensphere has assessed the appropriateness of the scope of work in relation to the identification of risks and provided comment on the findings in relation to overall environmental and social liabilities. However, these reports may not necessarily be suitable to identify all relevant environmental risks attached to the asset, or to evaluate these risks in the context of due diligence. ALG/Ensphere is not able to warrant the accuracy of these reports, or the competence with which such studies were undertaken.

Where reference is made to contractual arrangements within the report, the content and interpretation of these arrangements has been provided by either site management or the legal advisor to this transaction.

It is noted that some gaps in information have been identified as part of this assessment. Where this is the case, this has been highlighted in the body of the report. Therefore, certain conclusions and recommendations

have been based on the Consultant's experience with this type of assets and benchmarks. However, it is noted that specific, more detailed studies would be required to fully assess the viability of the recommendations. Where this is the case, the need for these assessments has also been highlighted in the relevant sections below.

2. The Site and Project

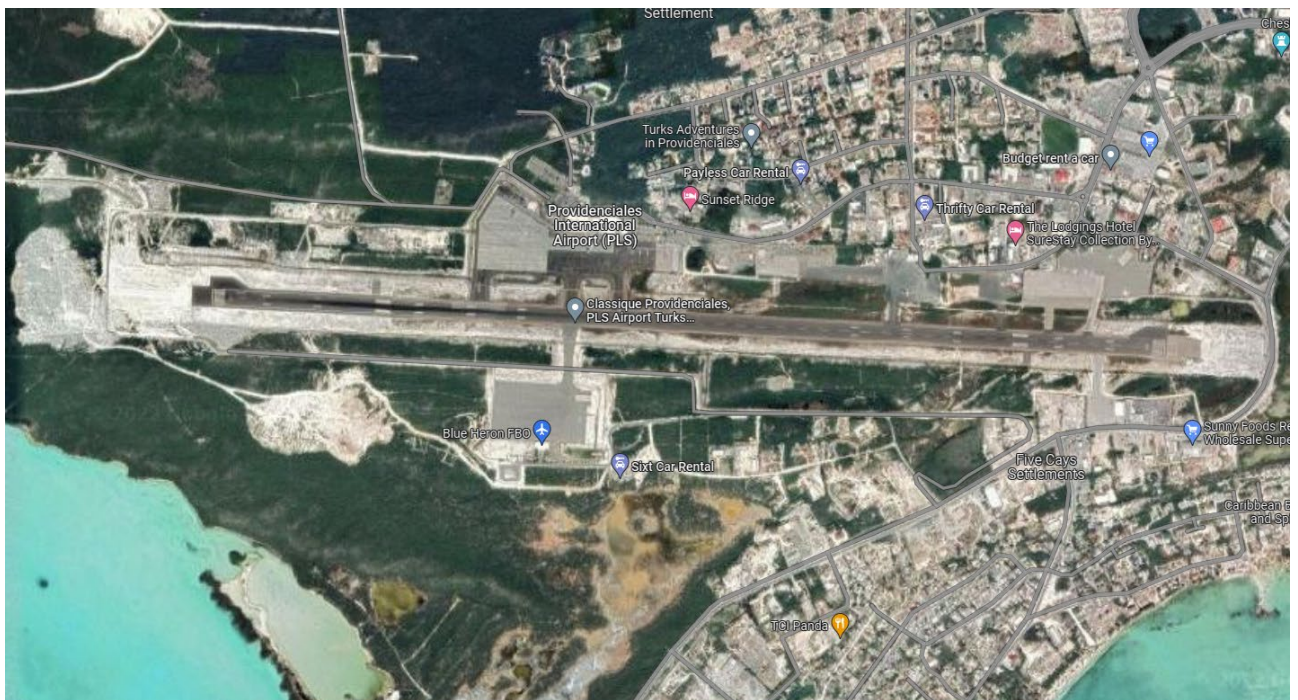
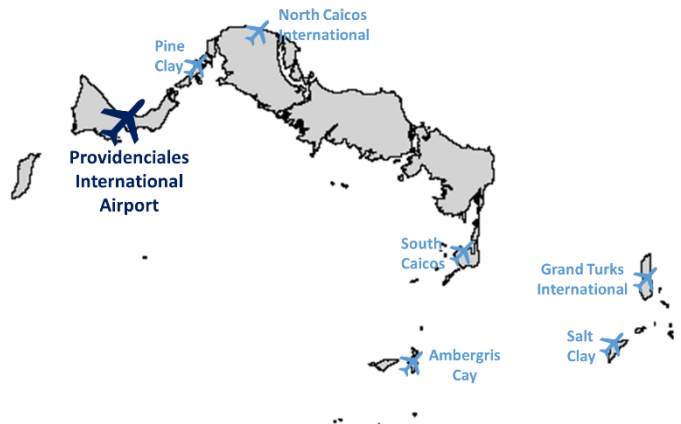
Site Description

Providenciales International Airport is the primary gateway to the Turks and Caicos Islands (TCI), besides the Grand Turk Cruise Terminal. It serves the Providenciales Island, the most inhabited Island in TCI. It is located in the centre of this island, at 5 metres elevation above sea level. There are residential settlements to the northeast and southeast of the airport, industrial developments to the south, a forested area to the northwest, and, to the west/south-west of the airport, the Chalk Sound National Park is located with close proximity.

In 2021, the airport handled over 400,000 stayover arrivals, of which 92% were US citizens. International airlines serving the airport include American Airlines, Air Canada, British Airways, Delta, United, WestJet, and JetBlue. It operates from 6am to 8pm, local time.

The Airport's property boundary encompasses 278.85 hectares (689.06 acres), including the airfield, terminal, landside and support facilities. Security fencing is provided around the perimeter of the property.

The airport has a single road access: Airport Road, located to the north of the airport.



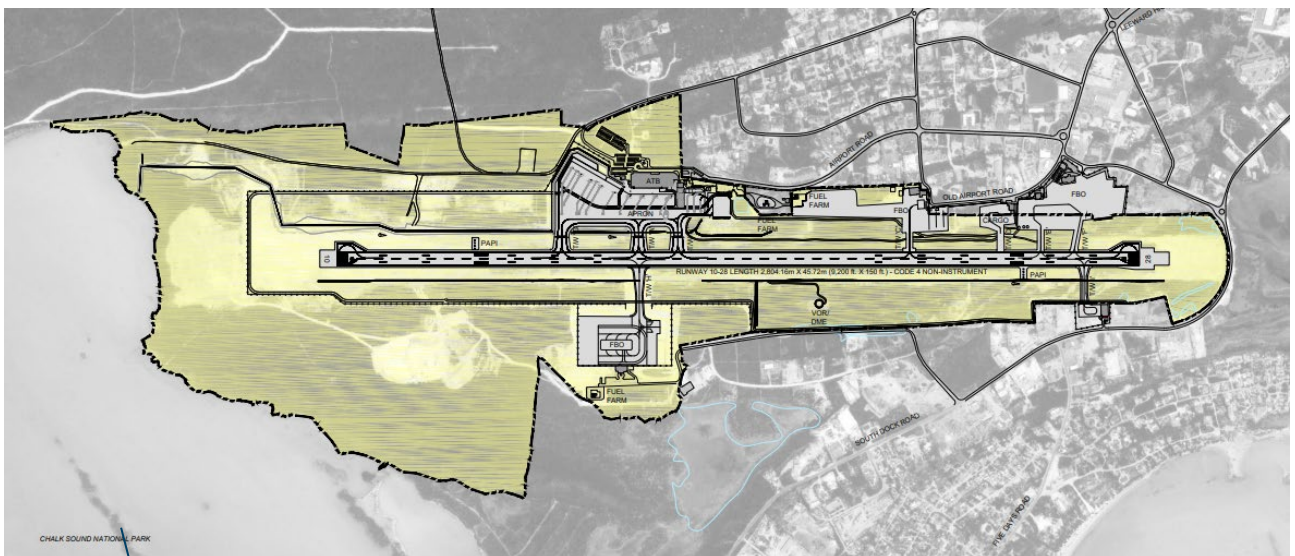
Source: Google Maps

The airport is government owned and managed by the Turks and Caicos Islands Airport Authority (TCIAA), a public company that was established in 2006 to control and manage state owned airports within the Turks and Caicos Islands. TCIAA also manages Gran Turks International, North Caicos International, South Caicos International, Salt Cay, Pine Cay, and Ambergis Cay airports.

The airport has the following infrastructure, mostly to the north of the runway:

1. **One main Terminal:** a two-storey steel structure of approximately 8,400m². The terminal handles both domestic and international air traffic. Check-in areas are located in a semi-open areas of the terminal.

- The terminal was last expanded in 2014 to include enlarged international hold-room on two levels, and expanded international arrivals facilities, including passport control and international baggage claim.
2. **Two FBO terminals:** operated by Blue Heron (to the south of the runway) and Provoair Centre (to the north of the runway and to the east of the fuel farms).
 3. One **runway:** runway 10-28, which length is 2,804m and width approximately 46m, with 7.5mtrs paved runway shoulders.
 4. **Taxiways:** a total of 9 taxiways provide support to the runway, seven located north of it and the remaining two south.
 5. **Aprons:** There are three main aprons at the airport: two serve the FBOs and one is dedicated to commercial aviation. This last apron has 9 marked aircraft stands (7 primary and 2 secondary).
 6. Three **fuel farms:** the primary fuel farm is located 200m east of the main terminal and is operated by Rubis (although it is understood this was formerly ran by Provo Air Charter). During the site visit, it was reported that this facility is located outside the airport's property boundary, on private land. This land is surrounded by a security fence and gated access, with paved access to the facility from Airport Road. A second fuel farm is located next to the primary one, which is owned and operated by Provo Air Center and exclusively serves general aviation at this FBO facilities. The third fuel farm is located south of the Runway and is owned and operated by Blue Heron Aviation and exclusively serves their operations.
 7. The **airport maintenance building** consists of equipment storage space and office space. The garage consists of equipment storage, maintenance repair shop, vehicle bays, and office space.
 8. The **rescue and fire-fighting services facilities** consists of three single-loaded vehicle bays that house three aircraft rescue and firefighting vehicles., personnel accommodation, and staff training facilities.
 9. **Two car parking areas:** the main area is north of the terminal and is used for rental cars and vehicles. A second car parking area is located adjacent to the east of the terminal and is used exclusively for taxis.
 10. Support facilities: air traffic control tower, wastewater treatment facility, wildlife services tower, etc.



Source: *Providenciales Masterplan 2018*

A detailed description of the Site's environmental and climatological setting is presented in Annex 1 below.

Site history

According to publicly available information, in the 1960s, a private airstrip was developed at this location to support the development of the island, which had been created by clearing way bushes. This was extended in

1970s and by 1977 the entire runway was surfaced with a sealcoat. In 1981 a major upgrade was conducted, with a further expansion and improvement of the runway and the construction of the terminal in the present location. The airport has been expanded on a few occasions, most recently in 2011 (phase 1) and 2014 (phase 2).

Phase 1 included the extension of the runway, the reconstruction of an apron, new connecting taxiways, perimeter security fencing, asphalt overlay of all existing pavement surfaces, and replacement of airfield electrical systems.

Phase 2 included the expansion of terminal building and construction of a parking lot, installation of a new flight display system, and expansion of the check-in counter areas, departure lounge and roadways for an improved passenger experience.

The Project

Overview

The Project (the modernization and expansion of Providenciales Airport) has been structured around two phases:

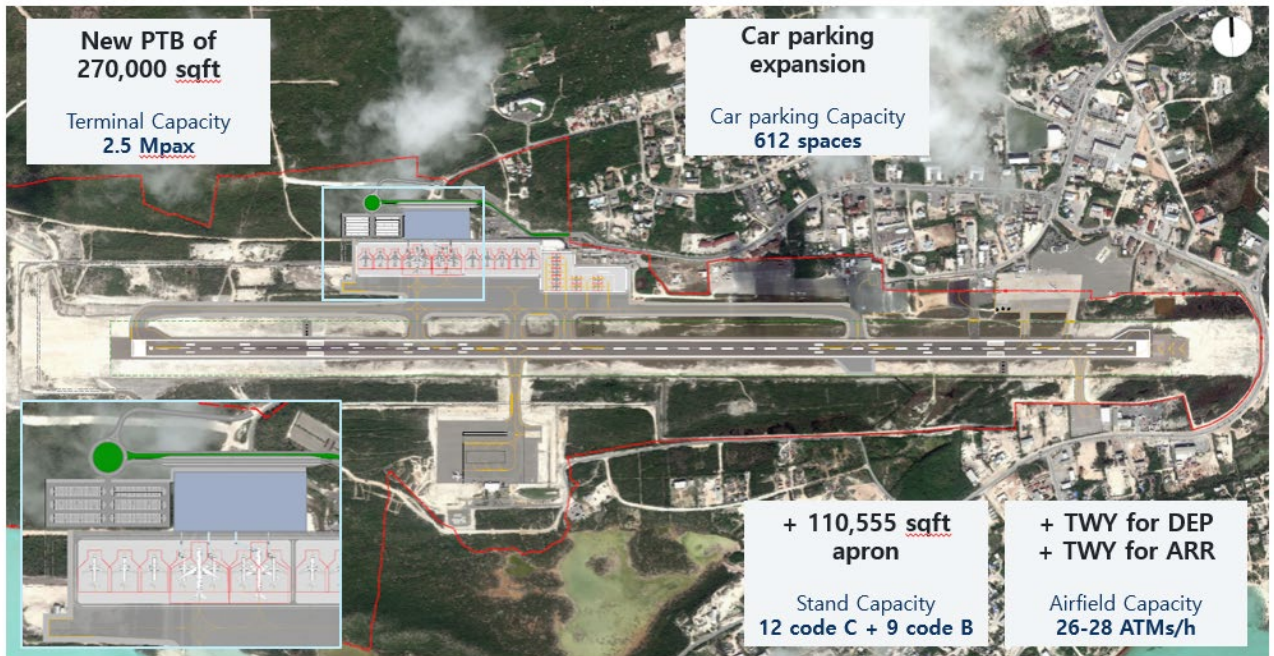
- Quick wins: projects as outlined in the figure below



The following changes would be proposed to the existing terminal to increase capacity in the immediate term:



- Short to medium term developments:







A new terminal would be proposed during this phase, as shown below:



Project timeline

The timeline for the two phases of the project has been preliminarily projected as outlined in the diagram below:

	2022	2023-2024	2025-2028
	Status Quo	Quick wins	Short/Mid Term developments
Airfield 	RWY 9,186 ft Airfield Capacity ~14 ATMs/h	+ Turn Pad + FBO restrictions Airfield Capacity ~17 ATMs/h	+ TWY for DEP + TWY for ARR Airfield Capacity 26-28 ATMs/h
Apron 	~750,000 sqft Stand Capacity 9 code C + 3 code A/B	+ 282,000 sqft Stand Capacity 12 code C + 7 code B	+ 110,555 sqft Stand Capacity 12 code C + 9 code B
Passenger Terminal 	92,322 sqft Terminal Capacity 0.8-1.2 Mpax	PTB expansion + 26,700 sqft Terminal Capacity 1.0-1.6 Mpax	New PTB of 270,000 sqft Terminal Capacity 2.5 Mpax
Surface access 	92,322 sqft Car parking Capacity 409 spaces	-	Expansion with new PTB Car parking Capacity 612 spaces



Associated Facilities

Based on our discussions with management and other stakeholders during the site visit, the only likely Associated Facility of the project, may be related to waste disposal. The Island is currently reviewing its landfill capacity. Whilst additional landfill capacity might be needed for the project, this is only likely to be on a cumulative basis with other developments in the tourism and hospitality industry which will be taking place in the island in parallel to this project.

3. Environmental and Social Assessment


Environmental Considerations


Category	Description of Findings	Implications	Risk	Proposed Action
Environmental considerations of planning and development	To date, no full Environmental and Social Impact Assessments (ESIAs) are known to have been completed as part of Phase 1 and 2 expansion processes as described above. In addition, no specific environmentally related technical studies have been provided for the airport.	Under the 1989 Physical Planning Ordinance, potential impacts of development on the environment must be assessed. In addition, the 2014 revision of the Turks and Caicos Development Manual, sets out the requirements for Environmental Impact Assessments (EIAs). The Manual states that an EIA is required for infrastructure projects. Although airports are not specifically listed under infrastructure, the Minister for Environmental and Coastal Resources confirmed that one would be required. However, it is currently unclear as to whether this is only for new airports or significant expansion projects or this includes any alteration of existing assets. Based on the above, the successful bidder will need complete an ESIA for the airport modernisation and expansion in line IFC and international best practice requirements and most likely as part of the planning process in TCI. The ESIA should be undertaken by competent and experienced professionals. In general, as required under IFC PS1 and the Development Manual, the ESIA will have to identify the environmental and social risks and impacts (direct, indirect and cumulative) of the Project within the project area of influence. Although at present no associated facilities have been identified, where these are identified at a later date, these should also be subject to assessment. The ESIA will need to identify any required mitigation or compensation measures in accordance with the mitigation hierarchy to reduce the significance of impacts.		Development of ESIA (estimated US\$200K- US\$300K) Potentially material mitigation measures (see where relevant below). Development of ESMP as part of the ESIA See below on land acquisition.



Category	Description of Findings	Implications	Risk	Proposed Action
		<p>Any mitigation and compensation measures identified through the ESIA will have to be implemented. Depending on the nature of the mitigation measures, these could require material CAPEX. Where relevant, an outline of potential mitigation measures which may be required have been outlined in the relevant sections below.</p> <p>Any actions and mitigations will need to be suitably collated in an ESMP.</p>		
Environmental permits	<p>The airport is not known to operate under any Environmental Permits as none are required under TCI legislation.</p>	<p>No material issues identified. It is recommended that environmental compliance is managed through the ESMP, ESMS and contractual arrangements.</p>		<p>See respective sections below</p>
Noise	<p>The airport operates 6am to 8pm with no night ATMs currently operated.</p> <p>Based on available information, it is understood that the airport is not subject to operational restrictions as a result of noise and has not assessed noise impacts to date. There are no currently implemented noise mitigation measures and there are no reported complaints by neighbouring communities in relation to noise disturbance, according to the representative of the Environmental Health Department and the airport's planning representative.</p> <p>A preliminary Noise Impact Assessment was conducted by ALG (see Annex 2), which concluded that footprints calculated for both periods considered (2022 and 2053) show that, considering FAA established acoustic limits (65 dB during daytime for residential areas), PLS has minor impact on the households of the airport' surroundings as the number of operations during the day is approximately 70-120 ATMs with code B and code C aircraft.</p> <p>Despite the current minor noise impact, it is important to consider that currently all the operations take place during the day period (7 AM – 10 PM) and none occur during night-time wherein operations would have a penalization of 10 dB and therefore it can be expected to have a higher noise impact in case of operations during night-time.</p> <p>In 2053, the level of impact is expected to increase compared to 2022 due to the increase in operations. However, despite the increase in the area affected, the population found under the contour is not significantly higher than in 2022.</p>	<p>In accordance with the findings of the Noise Impact Assessment, the operation of the airport does not show a significant noise impact on the population, and therefore no urgent mitigation measures are required to reduce noise levels. However, it is necessary to consider good practices for airport noise management, which are based on five pillars: technology, industry engagement, operations, mitigations, and community engagement.</p> <p>These recommendations are outlined in Annex 2 of this report. The new operator will be required to implement these recommendations. However, it is highlighted that none of the recommendations made for the period of the PPP are considered to be material in nature.</p>		<p>Recommendations included in Annex 2 unlikely to be material.</p>



Category	Description of Findings	Implications	Risk	Proposed Action
<p>Contamination of land and groundwater</p>	<p>Based on available information, observations made during the site visit and our experience with the aviation sector, a number of potential sources of contamination have been identified on site. These are mostly associated with:</p> <ul style="list-style-type: none"> The storage/use of aviation fuel (JetA1 and avgas) in three fuel farms; The storage and use of other fuels (e.g. in emergency generators) and maintenance oils and chemicals; Potential maintenance of aircraft (only minor reported at the airport); Operation and maintenance of ground vehicles; Storage and use of firefighting foams (including during training exercises at an unspecified location south of the runway, understood to be unpaved). <p>Although these could have resulted in contamination of the underlying soils and groundwater, it should be highlighted that the most significant sources of contamination (the fuel farms) are reportedly located in third party owned land and operated by third parties (who lease the land from the landowner with no airport intervention). Therefore, these areas fall outside the Project perimeter.</p> <p>The site has been operating as an airport since the late 1970s / early 1980s. Therefore, there is further the potential for contaminative build up over decades of site use as an airport. However, no site investigations are understood to have been conducted at the site to date and consequently the degree of any such impacts could not be quantified.</p> <p>The airport is located in an area of high environmental sensitivity. A geotechnical assessment is understood to be underway for the new ATC and fire station / training ground which will provide additional information on soils and groundwater characteristics at the airport. However, published information suggests that the site is underlain by sands over limestones of high permeability. Although there is no information on groundwater in the area, the island in general is only 5m above sea level, and shallow groundwater is expected which is likely to be saline and tidal. This water body is not abstracted locally and discharges to land (and groundwater) are known to take place at the airport and more widely at the airport. This has reportedly impacted the general quality of groundwater in the island. There are other sensitive environmental receptors in very close proximity to the airport, including the Chalk Sound National Park and areas that have been designated as critical habitats.</p> <p>Given the high permeability nature of the deposits underlying the island and their tidal nature, the potential for contaminants to laterally migrate from onsite sources towards sensitive receptors cannot be discounted. Impacts on the groundwater itself may also take place through vertical migration of contaminants and effluent discharges to land. However, groundwater quality in the island is noted to be of low quality due to the large number of untreated discharges made to this receptor and therefore all impact is unlikely to be solely attributable to the site itself.</p>	<p>Based on available information, the potential for current and historical contamination to have impacted sensitive receptors cannot be entirely discounted.</p> <p>Under the Contract, the grantor will remain responsible for any existing contamination, with the new operator retaining responsibility for any contamination they cause during the course of their operations. In order to facilitate adequate apportionment of liabilities, it is recommended that a site investigation be completed between contract award and financial close.</p> <p>It is understood that there are current proposals to relocate the fire station south of the runway, which will include the development of a formal fire training ground. It should be ensured that this facility is provided with impervious hardstanding and dedicated drainage which is either directed to a holding tank (for removal of effluent to be treated offsite) or connected to the proposed wastewater treatment plant. Given the proposed location of the new facilities (opposite side of the runway), the former may be an easier solution.</p> <p>Going forward, the new operator will have to ensure that all the necessary pollution prevention measures are adopted across the airport to prevent any additional pollution being caused (see hazardous substances and wastewater sections below). The operator should also be required to hold the corresponding insurance policy against accidental pollution to cover any release caused during their operations.</p>	<p>●</p>	<p>Full site-wide investigation will have to be performed. (allow US\$80K-\$150K for site investigation).</p> <p>See relevant sections below for upgrades required and associated costs.</p> <p>Consider inclusion of contaminated land clauses within third party contracts where not already included (legal issue).</p> <p>Consideration of Environmental Liability Insurance Policy.</p>

Category	Description of Findings	Implications	Risk	Proposed Action
	<p>There is also potential for lateral migration of contaminants from the offsite fuel farms onto the airport territory.</p> <p>Most operational areas are paved or covered by building footprint which is likely to reduce the risk of site users from becoming in contact with any contaminants beneath.</p>			
Unexploded Ordnance	<p>The site has not reportedly been used for any military uses nor does it store ammunition of any type which could present a risk of unexploded ordnance.</p>	<p>No current material issues identified.</p>		<p>No current material issues identified</p>
Bulk hazardous material storage	<p>The airport operates three fuel farms. It is highlighted that these three fuel farms are all located on third party owned land and are operated by third parties. Therefore, the airport does not have any responsibilities in relation to the operation and maintenance of these facilities.</p> <p>Only one of these facilities (Blue Heron fuel farm) was available for full inspection during the site visit. This fuel farm comprised:</p> <ul style="list-style-type: none"> • Three 30,000l Jet A1 ASTs of metal construction • One 10,000l Avgas AST, also of metal construction <p>All four tanks are located within a concrete bund of unconfirmed capacity. Fuel is delivered to this facility through road tankers, from which it is loaded onto the tanks via aboveground pipelines. Fuel onboard onto private jets is through mobile bowser. The condition of tanks and associated facilities, as well as concrete hardstanding in the area, was noted to be good and no evidence of staining was observed during the inspection.</p> <p>The two other fuel farms were not available for detailed inspection, but were externally viewed. The Provoair Centre fuel farm was observed to have four ASTs within a bund, with the Rubis farm comprising six ASTs also within a bund. At a distance, no obvious sign of rusting or poor conditions were observed.</p> <p>During the interview with Rubis representatives, it was indicated that the company is looking to centralise fuel servicing facilities at one location at the airport and conversations with the FBOs will take place in this respect. It was not possible to ascertain whether the new expanded Rubis facility would be located over private land as well. This was also recommended by the WSP Master Plan.</p>	<p>Although only one of the fuel farms was available for detailed inspection, it is highlighted that the airport does not retain any responsibilities over the maintenance and upgrades of these facilities.</p> <p>In the event that a new facility is built, it is understood that this will be owned and managed by Rubis, who will be responsible for its development (or expansion of their existing facility).</p> <p>Notwithstanding the above, it is recommended that the airport regularly audits third party operators to ensure that no pollution is being caused by these facilities, as these may have the potential to laterally migrate towards other parts of the airport through groundwater flow.</p>		<p>Conduct regular audits of third-party fuel farm operators (non material issue).</p> <p>Include environmental requirements and conditions within supply agreements (legal issue)</p>
	<p>We have not been provided with a tank register for the airport. However, the airport was not observed to store large quantities of hazardous substances in bulk. The following was identified during the site:</p>	<p>Upon replacement of the generators (projected in the Project program in 2028), consideration should be given to the</p>		<p>Replacement of generators with integrated tanks (US\$1.8M included)</p>

Category	Description of Findings	Implications	Risk	Proposed Action
	<ul style="list-style-type: none"> There are two diesel operated emergency generators, which are located at either side of the terminal. Only one of the generators was available for inspection at the time of the site visit (serving the ATC). This is located in a locked room within the ATC tower over concrete hardstanding. Diesel was noted to be stored in two 200l drums and fed onto the generator via aboveground rubber pipework. Staining was viewed around the drums during the inspection. Fire fighting foams (FFFs) are kept in 25l-50l containers within a locked portacabin located near the fire station. At the time of the inspection, a large number of containers were observed at this location. Fire brigade staff confirmed that this is kept in a concentrated form in the portacabin and diluted with water when incorporated into the fire truck. Together with the FFFs, three to four 30l containers of kerosene were also noted stored within the portacabin. This is reportedly used for small fire fighting exercises conducted on site (at a location south of the runway). No evidence of staining was observed externally or internally around the portacabin, but it is highlighted that an open drain is located just in front of the portacabin's door. <p>Although not viewed during the site visit, it is expected that other oils and chemicals (e.g. for maintenance and cleaning) will be kept on site.</p>	<p>Installation of plant with integrated and self bounded tanks.</p> <p>It should be ensured that all oils and chemicals on site are kept within secondary containment. This can include inexpensive solutions such as drip trays, where storage of smaller quantities allow. Storage should also take place away from drainage in order to prevent any accidental spillages from entering the drains. In addition, spill kits should be kept in the vicinity of all storage of hazardous substances to contain any spillages or accidental releases.</p> <p>The new airport operator should implement a pollution prevention plan as part of the ESMS which includes the below and outlines procedures on how to act in the event of accidental release.</p>		<p>within business plan)</p>
Ecology	<p>There are no ecologically designated protected areas within airport territory. However, Chalk Sound National Park is located adjacent to the west of the airport. In addition, Cheshire Hill Habitat Reserve is present immediately to the east of the airport.</p>	<p>The proposed Project does not involve expansion beyond the existing airport perimeter and therefore this will not result in any direct loss of or overlap with identified critical habitat or legally protected areas. However, given the proximity of these areas, the potential for impacts cannot be completely discounted. In line with the requirements of the Development Manual and the feedback received from the Ministry of Environmental and Coastal Resources, further assessment of potential impacts on these areas will have to be incorporated into the ESIA. This will have to include baseline assessments into the current conditions of the areas and a detailed analysis on the potential impacts from the airport and the proposed Project. In addition, given the proximity of some of the protected areas, consideration should be given to conducting a critical habitats assessment to ensure</p>		<p>Detailed biodiversity and critical habitats studies to be included within the ESIA (see cost of ESIA above).</p> <p>Potential for material CAPEX depending on the nature of mitigation and/or compensation measures required.</p>

Category	Description of Findings	Implications	Risk	Proposed Action
		<p>there are no such areas encroaching within airport territory (see also below).</p> <p>Where required, mitigation measures may need to be incorporated. These may include pollution prevention measures, although where impacts cannot be fully mitigated, compensation measures could also be imposed in the form of regeneration of other areas across the island, particularly if net gain needs to be achieved as part of impacts to critical habitats. Depending on the nature of the mitigation and the extent of any compensation, this could require material expenditure.</p>		
	<p><i>Source: Draft National Physical Sustainable Development Plan</i></p> <p>According to available information, there are various areas with potential for critical habitats in very close proximity to the airport.</p>			

Category	Description of Findings	Implications	Risk	Proposed Action
	 <p>The Ministry of Environment and Coastal Resources is understood to monitor the quality of these areas. During our interview with the Minister, no significant impacts on these areas were flagged. However, it was stated that for any project expanding the airport, consideration will have to be given to impact onto these areas, particularly as a result of any wastewater and surface water run off discharges into these areas.</p>			
	<p>During the site visit, site management confirmed that there are no known habitats to Critically Endangered or Endangered species within the airport. However, it was also confirmed that there have been no recent biodiversity studies conducted at the airport to confirm this.</p> <p>Based on a point search within the IUCN Red List, there are 9 Critically Endangered (CR) species in the proximity to the site, all of which are marine species. There are also 23 Endangered (EN) species many of which are also marine species, but also includes the Turks and Caicos Rock Iguana and some birds such as the Back-capped Petrel. Given the proximity that published information locates these species at, the possibility for these to encroach upon the site sporadically or on a more habitual basis cannot be discounted. Therefore, the potential for some critical habitats to exist can also not be discounted.</p>	<p>Protected species surveys for the airport (of both flora and fauna) will have to be included within the studies recommended above, which will also form part of the critical habitats assessment. In conducting such surveys, the promoter will have to give due consideration to the seasonality of some of these surveys (which may need to align to nesting or spawning seasons).</p> <p>Also as explained above, depending on the findings of these studies, mitigation measures may be required (e.g. translocation of specimens to other areas, development / construction works in certain</p>		<p>Protected species surveys to be included in ESIA. Potential expenditure if mitigation is required (see above)</p> <p>Implementation of a Biodiversity Management Plan will be required (minor OPEX Costs)</p>



Category	Description of Findings	Implications	Risk	Proposed Action
	<p>In relation to wildlife management and potential impacts from bird populations near the airport, a Wildlife Management Plan has been implemented. A copy of this Plan was provided for review and was observed that patrols are regularly conducted by the Apron Control Officers (APC).</p> <p>Aerodrome wildlife activity is monitored with assistance from the Agriculture Department animal control unit, who has a dedicated facility adjacent to the Terminal. All observations are reported to the APC for immediate dispersal.</p> <p>All wildlife hazard reports are monitored and reviewed by Principal Apron Controller in consultation with the TCIAA Safety Manager to identify trends and implement mitigating measures.</p> <p>Although the above is considered to be in line with standard practices at airports, wildlife incident statistics (including bird strike) were not available for review and therefore, it is unknown if these measures are being effectively implemented.</p>	<p>areas being restricted during certain times of the year, etc).</p> <p>In addition, to identifying any risks or impacts to these species, conservation opportunities may also be identified which could be exploited and promoted through the development of a Biodiversity Management Plan which seeks to foster ecological projects within and near the airport.</p> <p>It is recommended that wildlife management is linked to the findings of the biodiversity studies recommended above, and in particular whether any of the species identified require management due to safety or threatened status.</p> <p>It is recommended that fluid coordination is maintained with the Agriculture Department animal control unit, so that Wildlife Management is fully integrated into the day to day operations of the airport.</p> <p>The Wildlife Management Plan should be regularly reviewed based on ongoing biodiversity surveys. Input should be provided from all relevant parties on these revisions.</p>		<p>Periodic review of Wildlife management plan.</p>
Water Supply	<p>All water at the airport is mains supplied, with no abstraction reportedly taking place. No information on annual water consumption has been provided for review.</p> <p>The only water efficiency measure reportedly implemented at the airport is in the form of rainwater harvesting tank, which are not available for inspection during the site visit. The airport attempts to re-use water collected in this tank (e.g. for irrigation) but management confirmed this is not always the case. No further water efficiency measures (such as water saving taps, toilets and fittings, and reuse of treated effluent) are in place at present.</p>	<p>No current material issues identified. However, it is recommended that a better understanding is obtained in due course on water consumption at the airport.</p> <p>Although not a legal requirement, consideration should be given to the implementation of water efficiency measures as part of the terminal redevelopment. As well as being a matter of best practice, this will become a requirement, should green building</p>		<p>No current material issues identified.</p> <p>Implementation of water efficiency measures (part of the redevelopment cost).</p>

Category	Description of Findings	Implications	Risk	Proposed Action
		<p>certification (e.g. LEED, EDGE, BREEM) be sought for the new terminal.</p> <p>As part of improved water treatment facilities on site (see below), and depending on the nature and degree of treatment, consideration could be given to the re-use of treated water for irrigation of landscaped areas or even as grey water at the airport.</p>		
Wastewater management	<p>Sanitary wastewater from the terminal is collected through the airport's dedicated wastewater drainage network and directed towards a basic wastewater treatment plant located to the west of the terminal. Effluent is directed to a sump where filtration takes place, following which it is stored in a second sump prior to infiltration to land. There was a stark odour of sewage in the area at the time of the visit and the facility was noted to be in poor condition, only protected from rain and weather by a plastic tarpaulin. Sludge generated by the process is collected by a third party, but the ultimate process and/or place of disposal of this sludge could not be confirmed.</p> <p>Aircraft wastewater (blue water) is collected in a septic tank from where it is collected by a third party for treatment and disposal. The treatment afforded to this effluent could not be confirmed by site management.</p> <p>Finally, wastewater from restaurants passes through grease traps prior to being directed to a cesspit from which it is also infiltrated to land.</p>	<p>In line with Chapter 4 of the Development Manual, any effluent that is discharged to land from non-residential properties is likely to require pre-treatment prior to infiltration. Therefore, as part of the project a new wastewater treatment facility will have to be installed at the airport. It is recommended that all wastewater from the airport (including from cleaning) is directed to this point for adequate treatment. As part of the Project, a full assessment of the capacity and specification of such plant will have to be conducted and consulted with the Chief Environmental Health Officer. It should be ensured that discharged treated water from this facility is in line with requirements set out in the WB EHS Guidelines on Wastewater and Ambient Water Quality, TCI's Sewage and Water Ordinance and is to the Chief Environmental Health Officer's satisfaction.</p> <p>Aircraft waste should be subject to disinfection prior to any treatment, in line with international best practice.</p>		<p>Installation of new WWTP required as part of the project. (US\$1M in business plan)</p>
	<p>The quality of treated effluent is not monitored prior to infiltration. During our discussions with the Environmental Health Department, it was stated that the Department does not currently conduct any independent sampling of effluent but monitors odour sporadically. The Ministry of Environmental and Coastal Resources further confirmed that the island's laboratory facilities have recently reopened to bolster testing capability going forward.</p>	<p>Although no permitting regime is in place for wastewater discharges in TCI, the Development Manual establishes that any discharged effluent should not cause deterioration of groundwater quality and should meet the requirements set out by the Environmental Health Department. In order to meet these requirements, it should be ensured that regular sampling and</p>		<p>See above on CAPEX costs for new facility.</p> <p>Ongoing effluent monitoring and sludge disposal is expected (minor OPEX costs)</p>

Category	Description of Findings	Implications	Risk	Proposed Action
<p>Rainwater management</p>	<p>Based on information provided by the airport's Masterplan, it is understood that the airport was historically subject to flooding. Consequently, as part of the airside redevelopment project completed in 2011, an airside drainage system was installed with the ability to collect and convey stormwater from the airside areas. According to management, the system was structured around two basin areas (east and west) which directed the runoff to the Chalk Sound pond (west) and a creek (east), respectively. However, the masterplan appears to suggest that additional basin areas may be in place as outlined below.</p> <p>For the western basin, a large reinforced concrete open ditch was built from the main apron and extending west to Chalk Sound. A sedimentation basin, combined with natural filtration through vegetation, exists prior to final discharge into the Chalk Sound that permits suspended materials to settle and collect through overland flow prior to entering Chalk Sound. It is highlighted that the basin was not available for inspection during the site visit. In addition, management was not aware of any maintenance afforded to the basin. This west system was designed for a 1.5-year storm and management confirmed that it is providing adequate drainage to the western basin area.</p> <p>According to the masterplan, a stormwater pond located east of the general aviation apron provides storage for water drained from between the general aviation apron and Taxiway "C". This stormwater pond was not available for inspection either but is reportedly overgrown and its storage capacity and ability to adequately collect water is unknown. The masterplan suggests that in the event of a large storm event, these areas drain into the west drainage ditch system, mitigating flooding of airside movement areas between Taxiway "B" and "C".</p> <p>A third stormwater pond is believed to exist north of the Runway 28 threshold (again, not available for inspection), which accommodates runoff for the northeastern portion of the Airport. This pond was constructed in 2011 during the construction of the east RESA and was designed such that post-construction conditions (on-site stormwater storage) would not exceed pre-construction conditions. This pond holds water on-site during minor storm events before flowing into a creek off-site when capacity is exceeded. The Minister of Environmental and Coastal Resources confirmed that the creek is tidal and therefore in the event of a storm or during high tide, run off water reverts back to the airport causing flooding.</p>	<p>monitoring of discharged effluent is conducted by the operator to ensure effluent meets WB requirements. This will further ensure compliance during any future independent monitoring which may be conducted by the Environmental Health Department.</p> <p>A full review of the surface water drainage system (including any required technical studies, such as hydraulic modelling) will have to be conducted by the new operator in order to identify the exact upgrades required to the surface water drainage network to address the issues that have been identified. This will also need to be assessed as part of the ESIA recommended above, both from a climate change and pollution prevention points of view.</p> <p>Based on available information, upgrades may include the development of additional channels and retention basins (or enlargement and maintenance of the existing ones, with consideration of climate change projections), installation of oil/water separators and monitoring equipment.</p> <p>Given the expected extent and nature of some of the improvements that will be required, we consider that these may require material expenditure. Therefore, an preliminary budget for these works have been included within the business model.</p>	<p></p>	<p>Upgrades to surface water network, with treatment facilities required is (CAPEX allowance of US\$3.7M included in business plan).</p>



Category	Description of Findings	Implications	Risk	Proposed Action
	<p>South Dock Rd. (east of the RESA) also reportedly floods during heavy rainfall in part because the road has no drainage outlets and the cross-fall of the roadway slopes from east to west (towards the airport fence line). The road essentially needs to flood before water spills over to an existing lagoon to the east.</p> <p>Drainage south of the runway is achieved through a shallow ditch which runs parallel to the runway, outside of the runway strip. Water is then intercepted and conveyed to off-site the south.</p>			
	<p>As stated in the permitting section above, surface water discharges are not regulated under a dedicated environmental permit. The airport does not monitor the quality of discharges from the basins or drainage system from the airport to receptors. However, based on our discussions with the Ministry of Environmental and Coastal Resources, it is understood that the Ministry does conduct a degree of monitoring of the quality of receptors (including the Chalk Sounds National Park) and no visual or olfactive impact from the airport has been observed. In addition, we understand there has been no evidence of fauna deaths or wildlife loss which may be indicative of contaminative impacts.</p>	<p>Following the installation of the drainage system airside, regular run-off monitoring should be conducted to ascertain that no pollution is being caused. Results should be compared to WB EHS Guidelines on Wastewater and Ambient Water Quality and any requirements which may be eventually set out by the Environmental Health Department.</p> <p>Whilst this monitoring is unlikely to be material in nature, it is important to conduct this in order to ensure that no pollution is being caused.</p>	●	<p>Run off monitoring to be regularly conducted (minor OPEX costs).</p>
<p>Natural hazards and climate change</p>	<p>A full climate change impact assessment has not been undertaken for the airport. However, airport management is aware of climatological vulnerabilities the country is subject to. During our engagement with the different governmental departments and regulators, it was highlighted that (like in many islands of the Caribbean) the airport is the main gateway for aid in the event of a disaster. This has been specifically identified by the TCI Department of Disaster Management and Emergencies, which has established that climate adaptation is required to ensure that adequate emergency preparedness. Consequently, climate resilience has been included as one of the objectives of Goal 2 (strengthen resilience) of the Draft National Physical Sustainable Development Plan.</p> <p>Through preliminary publicly available data on climatological projections for the country, we have identified the following risks that could impact the airport:</p> <ul style="list-style-type: none"> ● Risk of increased frequency and severity of extreme weather events: In this respect, the country has experienced a number of hurricanes in the last years. The building code was recently updated after the last major hurricane to ensure construction standards withstand Category 4 and 5 hurricanes. This would have to be met by any new terminal or expanded terminal. The proposed drainage upgrades (see below) would have to allow 	<p>Based on our preliminary assessment, the airport may be exposed to a number of climate change physical risks. As part of the ESIA for the Project a full climate change assessment should be included.</p> <p>In terms of adaptation, the following should be considered at a minimum:</p> <ul style="list-style-type: none"> ● As part of the surface water design work, hydraulic modelling will need to be undertaken to assess the predicted rainfall and allow adequate sizing of the surface water drainage network. Where necessary, additional flood storage provisions should be allowed for. This could be part of an increased size of balancing ponds which could also act as flood storage should it be required. 	●	<p>See above in relation to surface water drainage. Drainage capacity to consider climatological changes projections, based on assessment in ESIA.</p> <p>Other assessments also to be required with proposed adaptation measures to be considered as part of the project as</p>




Category	Description of Findings	Implications	Risk	Proposed Action
	<p>sufficient drainage and storage capacity to reduce the risk of flooding at the airport.</p> <ul style="list-style-type: none"> Risk of increased temperatures: comfort cooling may have to be provided to the new terminal to prevent overheating. In providing this, consideration will have to be given to carbon emissions associated with the operation of any mechanical cooling (where required). Consideration will also need to be given to adequate paving to withstand increased temperatures Water stress: we understand that the island is subject to droughts during the dry season, this may impact water supply to the airport (for building supply and fire fighting), particularly as stress on water supply is placed by cumulative impacts from the hospitality sector. Rising sea levels and storm surge: although this is a concern for island countries, the airport is located at a relative distance from the sea and therefore it is unlikely this will present significant risks. 	<ul style="list-style-type: none"> An assessment of groundwater levels is recommended to assess any potential impacts from water stress. Engagement with regulators and the wider tourism industry may be required to ensure that water stress is tackled overall. As part of building design, an overheating assessment will have to be completed. This will inform the type of cooling that will be required to an expanded or new terminal. This will also be impacted by requirements dictated by any green building certification. Building design will also need to take into account the new Building Code in relation to hurricane protection. 		<p>required. (cost of assessments included in ESIA costs above).</p>
<p>Air quality and emissions to air</p>	<p>The airport has not formally assessed or identified its sources of air emissions, although some were identified during the site visit, including emergency generators, air handling units, etc. Some of this equipment (including one of the generators) were inspected during the site visit and were considered to be in acceptable condition. Although the exact age of this equipment could not be confirmed by site management, they were reported to be fairly old.</p> <p>Emissions from these sources are not currently regulated under the permit or monitored, as this is not a legal requirement in TCI.</p>	<p>Although not a legal requirement, a full review of point sources emissions at the airport is strongly recommended as soon as practicable to ensure no abnormal emissions are taking place.</p> <p>It is highlighted that most HVAC systems will be replaced as part of the projects. Any new systems in place will have to comply with requirements set out in the World Bank EHS Guidelines on Air Emissions and Ambient Air Quality</p>		<p>Replacement of HVAC systems to Terminal during initial works (included in redevelopment cost).</p> <p>Ongoing point source air monitoring to be conducted (minor OPEX costs).</p>
	<p>In addition, the airport does not conduct any ambient air quality monitoring within or in the proximity of the airport. Based on our discussions with the Environmental Health Department for the island and the Ministry of Environmental and Coastal Resources, ambient air monitoring is not conducted in the island either and therefore no information is available in relation to air quality in the area.</p>	<p>Although not required by TCI laws and regulations, in line with World Bank EHS Guidelines for airports, an Air Quality Management Plan should be developed, including air quality monitoring that will have to be performed on a regular basis. For this purpose, it is recommended that an air quality baseline be incorporated into the ESIA, including air quality modelling. The assessment and any subsequent monitoring</p>		<p>Air quality assessment to be conducted as part of ESIA (see costs above).</p> <p>Ongoing ambient air monitoring to be conducted (minor OPEX costs).</p>

Category	Description of Findings	Implications	Risk	Proposed Action
		<p>will have to give due regard to World Bank EHS Guidelines on Air Emissions and Ambient Air Quality, as well as the WHO Ambient Air Quality Guidelines. For subsequent monitoring it is possible that adequate monitoring equipment will have to be brought to the island as no equipment is understood to be currently available.</p>		<p>Development of Air Quality Management Plan. Ambient air monitoring stations may have to be installed (likely minor costs, depending on number of stations and specification).</p>
<p>Energy and carbon</p>	<p>The airport's electricity is supplied from the mains grid. There is an electricity substation adjacent to the main car park, although this is reportedly managed by the utility company and the airport has no access to this facility.</p> <p>No information is currently available in relation to electricity consumption at the airport. In addition, no energy efficiency plan is known to have been implemented to date.</p> <p>There is no heating or hot water at the airport.</p>	<p>Although energy efficiency is not a legal requirement, it is considered best practice and contributes towards energy cost reductions. This is also likely that energy efficiency will be a requirement of any green building accreditation (LEED, EDGE, BREEAM) for the new terminal.</p> <p>An energy efficiency plan should be put in place. Such a plan will also have implications in carbon emissions reductions and can include some of the measures included below.</p>		<p>Electrical equipment replacement will be required (~US\$6K)</p>
	<p>The airport has not calculated its carbon footprint nor developed a plan to reduce carbon emissions. In addition, the airport does not currently participate or has immediate plans to participate in the Airport Carbon Accreditation (ACA) Scheme. No consideration of renewables installation is understood to have been made at present. However, these are not legal requirements under TCI legislation.</p> <p>A preliminary assessment of emissions from aircraft and vehicles has been performed by ALG and this is included in Annex 3. Although these are scope 3 emissions, we note that these are the most significant sources of emissions for the airport. Scope 1 and 2 emissions could not be estimated based on available information.</p> <p>There is no current consideration of participation within the CORSIA scheme, although this would have a more direct impact on the airlines.</p>	<p>Consideration should be given to participation of the airport in the ACA Scheme, in line with best practice in the industry. This will require an initial calculation of the carbon footprint of the airport, followed by the implementation of carbon emissions reduction measures, and demonstrable progressive reductions, with an ultimate objective to achieve carbon neutrality. In our experience with this type of assets, measures can include:</p> <ul style="list-style-type: none"> • Implementation of LED lighting at the terminal, airfield and other buildings; 		<p>Carbon Footprint and LCA assessments (minor costs)</p> <p>Lighting (including for ~US\$900K for airside lighting), 400hz and PCA (part of US\$6.9M budget for the installation of air bridges), etc have been included in business plan.</p>


Category	Description of Findings	Implications	Risk	Proposed Action
		<ul style="list-style-type: none"> Installation of renewables such as solar in car park canopies and buildings' roofs. Replacement of the ground vehicle fleet (as and when electrical vehicle charging facilities become more widely available in the island). Installation of 400hz power supply and Pre-Conditioned Air (PCA) at all air bridges to prevent the use of APUs. <p>It is understood that financial incentives (as more beneficial airport fees) are being considered for airlines who operate less polluting aircraft.</p> <p>Consideration should also be given to calculating the Life Cycle Carbon Emissions associated with the Project, in line with best practice. This should include the consideration of embodied carbon for the materials to be used as part of any construction projects.</p>		Other projects would be subject to a business plan, justified by reasonable pay back periods.
Waste management	<p>As it would be expected from an asset of this type, the airport generates a wide range of waste streams as part of its operations. However, management could not provide a full list of waste streams generated. Based on observations made during the site visit and discussions with airport representatives, the following could be identified:</p> <ul style="list-style-type: none"> General waste from the terminal (this is reportedly collected directly from the terminal and disposed of at landfill). Solid international waste (this is also understood to be disposed of at landfill, with no incineration of this waste stream conducted on or off site). Waste from catering facilities at the terminal (these are stored in wheeled bins at a compound between the terminal and the ATC. The area was viewed during the site visit and was noted to sustain poor housekeeping). Sludge from wastewater filtering is collected by third parties, but the ultimate treatment and disposal provisions for this waste stream could not be confirmed. Although not reported, it is expected that other wastes will be generated on site including (but not limited to): <ul style="list-style-type: none"> Waste oils from maintenance activities Contaminated materials from maintenance 	<p>At present, waste storage is not centralised and most of the waste on site is directed to landfill.</p> <p>In line with the Development Manual, safe and efficient waste storage facilities should be provided. Therefore, it is recommended that a centralised waste storage facility be developed as part of the Project.</p> <p>The Ministry of Environmental and Coastal Resources confirmed that increased traffic at the airport and the higher volumes of tourism that this will bring will put pressure on the landfill capacity in the island. The Ministry is currently conducting a review of this capacity and the specification of the existing and any new landfills so as to prevent impactful leachate. In addition, a waste management strategy is currently</p>		<p>Installation of a centralised waste storage compound (US\$57K included in the business plan)</p> <p>Installation of a cogeneration facility to handle international aircraft waste (US\$2.4M included in the business plan).</p>

Category	Description of Findings	Implications	Risk	Proposed Action
	<ul style="list-style-type: none"> ○ Fluorescent tubes <p>Airport management believes that certain level of recycling takes place, although could not confirm which waste streams o volumes are recycled.</p>	<p>being developed for the island which will promote increased recycling.</p> <p>In this context, as the waste management facilities in the island become more sophisticated, a Waste Management Plan will have to be put in place which promotes waste minimisation, as well as an increased level of recycling. Ultimately, targets should be imposed as part of this Plan.</p> <p>In addition to the above, it should be ensured that any international waste is incinerated in line with international requirements. The new operator will have to investigate the possibility of this waste stream being managed in the island's existing incinerator. Where this is not an option, consideration will have to be given to the installation of an onsite facility. If such facility needs to be installed, it should be ensured that this offers the possibility of heat recovery and energy generation.</p>		
	<p>The airport is not required to operate under a waste permit or maintain any waste transfer records on a mandatory basis.</p>	<p>It recommended that the new operator confirms that all waste contractors used by the airport are suitably licensed to conduct these operations. Waste generation and transfer statistics should also be kept, in line with best practice. This should be captured in the Waste Management Plan recommended above.</p>	●	<p>Improvements to waste management practices and development of a Waste Management Plan are unlikely to be material in nature.</p>
<p>Hazardous materials</p>	<p><u>Asbestos</u></p> <p>No asbestos survey has been completed for the airport, but site management believes there is no asbestos present on site. During the fire station investigation, some exposed areas of ceiling insulation were observed, which may have the potential to contain asbestos.</p>	<p>It is recommended that an asbestos survey be conducted for the airport to establish the presence or absence of asbestos on site. Where present, a management plan will have to be developed. Should any asbestos be identified in frail condition, it will have to be ensured that this is appropriately removed in line with best international practice (see WB EHS Guidelines for</p>	●	<p>Asbestos removal is only likely to be material where substantial amounts of asbestos require removal. Based on information provided, this is less likely. A</p>



Category	Description of Findings	Implications	Risk	Proposed Action
	<p>Construction and Decommissioning) and disposed of as hazardous waste.</p> <p>Where demolition of buildings is proposed as part of the Project, a demolition (more detailed) asbestos survey will have to be conducted prior to any demolition taking place. Any asbestos identified will have to be removed in line with the recommendations made above.</p>			<p>unitary cost for demolition works has been provided in</p>
<p><u>ODS</u></p> <p>No information has been provided through documentation or during the site visit in relation to the presence of ODS within refrigeration equipment present within the airport.</p>	<p>As part of the United Kingdom of Great Britain and Northern Ireland's ratification of the Montreal Protocol, it is specified that this is also ratified on behalf of Turks and Caicos as a dependent territory. Under this Protocol, signatories commit themselves to phase out ODS, including gases such as R22. In the absence of information on the age, condition and refrigerant gas and charge of units at the airport, the need for replacement of gas could not be established.</p> <p>Most refrigeration equipment is proposed to be replaced as part of the Project</p>		<p>Removal of R22 through HVAC systems replacement. (cost included in redevelopment cost).</p>	
<p><u>PCBs</u></p> <p>Site management could not confirm if there are any PCBs within electrical equipment on site. However, it was confirmed that the airport's electricity substation (located opposite to the arrivals terminal exit and adjacent to the car park) is owned and operated by the island's electricity supplier (Fortis). The airport does not have any responsibilities in relation to the maintenance or upgrades of this plant.</p>	<p>Although PCBs may be contained within smaller electrical switchgear within the airport, the highest risk, associated with the substation, is associated with third party plant. Any PCBs on airport's equipment will have to be managed in line with best practice and any removed PCB containing oils (although unlikely to be significant) will have to be disposed of as hazardous waste.</p>		<p>Management of any PCBs (where present) - unlikely to be material.</p>	
<p><u>Radioactive materials</u></p> <p>No information was provided in relation to radioactive materials present on site. Airport representatives interviewed are not aware of the need of any permits to manage any such substances at the airport.</p>	<p>It is not unusual for certain airport equipment, such as X Ray equipment, to contain radioactive substances. It will need to be ensured that these substances are</p>		<p>Radioactivity monitoring to continue (minor OPEX costs).</p>	



Category	Description of Findings	Implications	Risk	Proposed Action
Sustainable surface access	<p>The airport is only accessible to the public by road. There is a network of taxis that tend to operate as hotel shuttles, as well as private hotel transfers. There is one car rental company operating from the airport (using the car park as a base). Other car rental facilities operate from external premises, driving the vehicles to the airport as and when required.</p> <p>The island does not have a widespread infrastructure provision to support the roll out of electrical vehicles, although we understand it is an objective of the current government to address this and increase the availability of electrical vehicles in the island.</p>	<p>adequately managed to prevent any releases, although this is not expected to me of material consideration.</p> <p>The new operator may wish to explore the operation of shuttle transport to the various resorts in a way which is more efficient than the current one. This will also serve to alleviate traffic at the drop-off /pick up area.</p> <p>As EV infrastructure becomes more readily available at the airport, consideration will have to be given to the installation of charging stations at the car parks to facilitate the transition to this means of transportation.</p>		<p>Engagement with taxi and car rental facilities to improve shuttle system and transition to EV, not material to the transaction.</p>
General environmental management	<p>The airport does not operate under an Environmental Policy or Environmental and Social Management System (ESMS). The only environmental plan which is known to have been implemented at the airport is a wildlife management plan.</p> <p>In addition, the airport does not have an Environmental Manager or anyone with dedicated responsibilities for environmental management. Responsibility may indirectly sit with the engineering / maintenance department when they are responsible for maintenance of the plant. However, on interview of this staff their awareness of environmental requirements was observed to be limited.</p> <p>In the absence of a person or team with environmental responsibilities, third parties operating at or serving the airport (e.g. the fuel farm operators) are not regularly audited for environmental compliance.</p>	<p>As a priority, the new operator will have to implement an Environmental Policy and ESMS. Although such implementation will not have material implications, it is important that this is completed as this will ensure compliance with any regulatory and contract requirements. Consideration will have to be given to certification of the system under ISO14001.</p> <p>The implementation of this management system will have to be entrusted to a suitably qualified environmental manager or team, who will be responsible for ensuring compliance with legal and contractual requirements as set out above. In addition, the department should also be responsible for auditing and engaging with third parties at the airport in relation to environmental matters.</p>		<p>Implementation of robust ESMS by a suitably qualified environmental manager or team (Minor OPEX costs on an annual basis).</p>
	None of the existing buildings are understood to be currently certified under any Green Building accreditation scheme.	Any new terminal building will need to be designed to LEED Silver, BREEAM 'Very Good' or Edge Level 2.		Costs of compliance to be considered as part of development costs.

Social Considerations






Category	Description of Findings	Implications	Risk	Proposed Action
<p>H&S: general management and risk assessment</p>	<p>The airport is not understood to have developed a H&S Policy or implemented a dedicated H&S management system or plan. H&S matters tend to be considered as part of the wider Safety Management System, which is managed by the airport's Safety Director. Upon interview, the Safety Director confirmed that employees' safety does fall under his remit of responsibility. In addition, there is a Safety Committee which meets quarterly, to discuss safety matters, including H&S. A copy of the minutes of the last meeting was requested for review, but it is currently pending.</p> <p>It is understood that the airport does complete H&S risk assessment and does hold a risk register to this end. However, the Safety Director confirmed that risks assessments may not cover all activities undertaken at the airport or cover all risks associated with a given activity. A copy of a sample risk assessment and the risk register have also been requested for review, but these are also pending.</p> <p>No information was provided on H&S provisions imposed or required for any third parties operating at the airport.</p>	<p>A full H&S Plan and system should form part of the airport ESMS. In order to enable the new operator to develop and implement a robust system, a full H&S audit should be conducted in order to assess the elements already in place and operated by the airport, and to better understand how to supplement these. Consideration will have to be given to certification of the system under ISO45001.</p> <p>As part of this work, a review of the existing risk assessments will also have to be conducted to ensure these are 'suitable and sufficient', covering all activities and potential risks.</p> <p>The system will also need to include a procedure on how to review and engage with third parties on H&S matters.</p> <p>In order for the above to be successfully completed, an assessment of in-house knowledge and expertise should be conducted. Where necessary, additional training should be provided to the H&S team to allow them to fulfil the role.</p> <p>Although the structuring and resourcing of H&S management is unlikely to be material in nature, the consequences of not adequately implementing these systems may incur material implications in the form of fines, accident claims and reputational impacts.</p> <p>Consideration should be given to including H&S requirements on third party contracts.</p>	<p></p>	<p>Conduct full audit of H&S systems (minor OPEX cost)</p> <p>Upgrades to system as necessary (Minor OPEX cost)</p>



Category	Description of Findings	Implications	Risk	Proposed Action
H&S: training	<p>Based on the information provided by the Safety Director, it is understood that the airport has implemented a H&S training program which is provided to all employees. This includes H&S induction, yearly refresher training and training for anyone who needs to renew its airport pass. There is no further information in relation to the content of this training and whether specific tool box talks are also included in the program.</p>	<p>Although in principle, the approach to training described by management appears to be adequate, the suitability of the content and frequency could not be reviewed on the basis of available information.</p> <p>As part of the audit recommended above, a full review of training schedules, matrices and content should be conducted. Where identified as necessary training programs should be reviewed and complemented.</p>		See above.
H&S: occupational exposure	<p>The airport provides PPE to all employees and this is mandatory for all members of staff working airside, in line with legal requirements. The exact PPE provided could not be specified and it was not possible to ascertain who PPE provision is actually linked to risk assessment. During the site visit, airside staff was observed to be using high visibility vests and ear protection where working near aircraft. Some hazard signage was observed in parts of the airport, although this could be improved.</p> <p>No information was provided on interview in relation medical surveillance offered to employees that are subject to occupational exposure (e.g. audiometry for those subject to high levels of noise, etc).</p>	<p>As part of the audit recommended above, a full review of the PPE and occupational exposure monitoring should be conducted, linking these and any corrective measures to the outcomes of updated risk assessments.</p>		See above.
H&S: accidents, incidents and enforcement	<p>It is reported that every head of department is responsible for keeping records of any accidents occurred within their department. Any accidents occurred at the airport are reported and investigated. The outcomes of the investigation are then discussed at the Safety Committee for agreement of any corrective measures which may need to be implemented as a result. A sample accident investigation form was requested but is currently pending. As minutes of the Safety Committee meetings are also outstanding, the nature of corrective measures considered could not be verified.</p> <p>The Safety Director confirmed that there have been no major accidents or fatalities at the airport in the recent years. Accidents at the airport are reportedly very few, with only one taking place in 2021, involving the trap of a hand within a roller which did not result in significant injury.</p> <p>Further information has been requested from the legal advisor in relation to any recent or ongoing claims in relation to H&S matters. However, it has been confirmed this has not been received by the legal advisor to date.</p>	<p>Further information is currently pending from the legal advisor in relation to claims and prosecutions related to H&S.</p> <p>Current accident numbers (which are abnormally low for this type of asset) suggests that only major or more serious accidents may be getting recorded at present. It is recommended that minor accidents and near misses also be recorded as these could be lessons learnt to be obtained from these which may prevent more serious accidents in the future.</p>		<p>Ongoing liaison with the legal advisor.</p> <p>Full review of accident recording and investigation protocols (minor OPEX costs)</p>

Category	Description of Findings	Implications	Risk	Proposed Action
Emergency planning	<p><u>Aviation safety</u></p> <p>An analysis of the airport's compliance with ICAO SARPs has been conducted and identified that there are no non-compliances according to the current operation mode (VFR). The airport is namely certified and has thus developed a Safety Management System (SMS).</p> <p>The SMS documents the framework for the implementation of safety principles and processes to manage the safety risks associated with the aerodrome operation. The SMS also includes policies on safety, drugs and alcohol, personal protective equipment (PPE), security and safety reporting. However, it should be noted that the consultant has not been able to review the mentioned document.</p> <p>In addition, there is a TCIAA Safety Manager to identify trends and implement mitigating measures. In addition, not significant aviation accidents are understood to have occurred at the airport.</p> <p><u>Emergency Preparedness</u></p> <p>The airport has implemented an Emergency Plan, which covers all potential emergency situations at the airport. A copy of this Plan has been requested but has not been provided for review.</p> <p>Under the Plan, it is understood that the airport's fire department coordinates all emergency planning and management. There is a fire station located adjacent to the terminal building. This was noted to hold one fire truck and an incident command vehicle at the time of the visit. Fire fighting equipment is kept inside the station building, with foams stored within a locked portacabin just outside. These facilities are in the process of being relocated to the southern part of the runway to a new facility which will provide for appropriate training space.</p> <p>According to the Safety Director, emergency drills take place on a yearly basis.</p>	<p>No current material risks identified, although certification and update of the SMS will have to be completed by the new operator following the implementation of the project.</p>	<p></p>	<p>No current material issues identified.</p>
		<p>As a copy of the Plan has not yet been provided for review, the adequacy of its contents could not be verified. Elements which could not be confirmed include:</p> <ul style="list-style-type: none"> • Procedures for reporting of emergencies • Occupant and staff response to emergencies • Evacuation, relocation, and shelter-in-place procedures appropriate to the buildings, their occupancy, emergencies, and hazards • Design and conduct of emergency drills • Type and maintenance of fire systems at the terminal building <p>Given the shallow waters surrounding the Providenciales island, the airport is the main gateway for aid in the event of a disaster. In order to ensure expedited recovery and functioning of the airport in this event, a full review of emergency</p>	<p></p>	<p>Review Emergency Plan and conduct fire safety audit. OPEX (minor costs)</p> <p>Potential upgrades to manage fire safety</p>

Category	Description of Findings	Implications	Risk	Proposed Action
Employment: staff composition	<p>According to available information, in the period 2021-22, the airport had an average headcount of 338 staff, although the HR representative interviewed confirmed that at the time of the visit the exact headcount was 321, with an existing budget to bring in 18 new hires in 2022. It was confirmed that ATC, safety and security, cleaners and fire brigade staff are all employees of TCIAA. However, immigration officers and ground handling staff are understood to be external.</p> <p>No further information has been provided in relation to staff composition by gender, age and grade (and/or skilled/unskilled). However, it has been confirmed that in line with legal requirements there is a minimum age of 18 requirement for employment by TCIAA. Further information has been requested in this respect, and is currently awaited.</p>	<p>planning should be conducted by the new operator. A fire safety audit will also need to be completed to ascertain whether any upgrades are required in this respect (e.g. replacement of fire detection systems, compartmentalisation of buildings, upgrades to means of egress, etc).</p> <p>No staff retrenchment is proposed as part of the Project. Staff numbers are proposed to self adjust with growth projected for the airport.</p> <p>Further analysis of staff diversity and inclusion may have to be performed by the new operator once data becomes available.</p>		<p>Assessment of Diversity and Inclusion at the Airport Company. (minor OPEX costs)</p>
Employment: working conditions	<p>Based on our interviews, it is understood that there have been some concerns raised in relation to staff pressures as tourism increases in the island, in particular whether this growth will be able to be accommodated with current local residents or will have to be largely dependent on immigration.</p> <p>Airport staff are employed both under permanent and fixed term contracts, although the exact split between these two types of employees has not been provided. Further information is awaited from the legal advisor on the adherence of these contracts to TCi laws and regulations, although management confirmed these are compliant with any legal requirements.</p> <p>The type of employment contracts and conditions offered to contractors working at the airport are not known. According to the Procurement Manager interviewed, third party contracts are not known to include minimum employment / social requirements.</p>	<p>Although based on the staffing projections outlined above, this is unlikely to become an issue for the Airport Company, this may present some challenges when it comes to construction workers, particularly in the context of considerable ongoing construction projects in the hospitality sector. Consideration may have to be given to bringing in workers from neighbouring countries to fulfil the contract.</p> <p>It is currently unclear how many staff are working under fixed term contracts. The number of employees under this type of contract and length of contract should be better understood in order to assess their entitlement to additional benefits under legal requirements.</p>		<p>Potential staffing issues for construction works. (potential delays if staff cannot be procured and additional immigration costs)</p> <p>Review type of employment contracts and conditions offered to contractors. (legal issue) Ensure adequate working</p>

Category	Description of Findings	Implications	Risk	Proposed Action
	<p>No information is currently available in relation to working conditions offered under employment contracts. However, according to the staff cost sheet provided, the following benefits are known to be offered at present:</p> <ul style="list-style-type: none"> • Paid overtime – unclear what the average working hours are under contract and how overtime is calculated, although an allowance is identified under this category. • Payment of national insurance and national health insurance – there is no confirmation that the Airport Company is up to date with payments in this respect. • Housing allowance – according to the HR representative interviewed this is paid for any employee from other islands who comes to work at Providenciales Airport and is paid for a period of five years. • Transport allowance – employees relocating from other islands are also entitled to a transport allowance to travel to and from the airport. The timeframe for which this is considered is not known. • Medical insurance – unclear whether this relates to private medical insurance as opposed to the national health insurance described above. • Other allowances – such as shift allowance, responsibility allowance, etc. Some of these allowances are unclear what they reward. <p>It is understood that the airport is in the process of implementing a Pension Fund for all of their employees. The new pension fund will require employees and employees to</p>	<p>The inclusion of minimum HR requirements into third party contracts (including respect of human rights) should be reviewed and considered. In addition, as part of any third party audits, employment conditions by third parties should also be conducted in order to review compliance with any such requirements.</p> <p>Working conditions of construction workers will need to be considered. This will have to include employment terms, including respect to human rights, adequate remuneration and provision of suitable accommodation. In relation to the latter, any worker camp will have to follow guidance under the IFC's Workers' Accommodation: Processes and Standards.</p>	<p>Legal information outstanding</p>	<p>conditions offered to third party employees and construction workers.</p>

Category	Description of Findings	Implications	Risk	Proposed Action
	<p>make a 3% contribution calculated over the base salary. However, it is understood that the Airport Company will be required to retrospectively contribute with a 3% per annum per year work with a maximum of 16 years (when the Airport Company was formed).</p> <p>Although staff turnover is not monitored closely, interviews with airport HR representatives revealed that the Airport Company currently experiences a high turnover, with 22 staff leaving the company in 2021 and 11 staff having left the company so far in 2022. During our interviews, it was noted that many of the managerial staff at the airport have only been in post for a relatively small number of years, which means that in many cases specific knowledge is lost.</p>	<p>Staff turnover and absenteeism should be monitored at the airport more closely. Consideration should be given to undertaking exit interviews and staff satisfaction surveys in order to identify the main reasons for leaving. This will in turn allow management to implement measures that allow better staff retention.</p>		<p>Monitor turnover rates, implement exit interviews and staff surveys to try to curve turnover (minor OPEX costs)</p>
Employment: unionised workforce	<p>There is no unionised workforce at the airport. It is understood that TCI has only passed legislation in relation to the right to unionised. Therefore, there are still no formalised unions operating in the island.</p>	<p>With the entry into force of the new legislation, there is a possibility that workforce at the airport over time will unionise. This may result in the requirements to agree Collective Bargaining Agreements in the future, which imposes more favourable employment conditions.</p>		<p>Potential for increased staff costs in the future (potential OPEX in the future)</p>
Employment: HR practices and procedures	<p>It is understood that the airport has implemented an HR Manual. As a copy of the manual has not yet been provided, the contents thereof could not be ascertained. However, it was reported that this contains certain HR policies that apply for the Airport Company (unclear which ones). No information could be provided on the existence of any grievance or whistleblowing mechanisms in place for the workplace.</p>	<p>The new operator should review the HR manual and develop a suite of HR policies (in line with IFC and ILO recommendations) as required to complement the existing Manual. This should be supported by a grievance and whistleblowing mechanism.</p>		<p>Development and implementation of a HR policies and a grievance and whistleblowing mechanism as necessary (minor OPEX costs).</p>
Employment regulatory action	<p>The HR representative confirmed that there are three ongoing legal disputes all of which are for wrongful or unlawful dismissal. It was further reported that none of the claims are of material nature.</p>	<p>Further information has been requested in relation to these three cases from the legal advisor. However, it has been confirmed that nothing has yet been received in this respect.</p>		<p>Further investigation into the status of employment matters at the airport.</p>
	<p>The airport has not completed a stakeholder mapping exercise and there is no formal Stakeholder Engagement Plan in force at the airport. Consequently, and based on our</p>	<p>The new operator will have to develop and fully implement a Stakeholder</p>		<p>Develop Stakeholder</p>

Category	Description of Findings	Implications	Risk	Proposed Action
<p>Community and stakeholder engagement</p>	<p>observations and interviews, stakeholder engagement has been assessed to be currently patchy.</p> <p>Airport management interviewed suggested that the airport has a good relationship with its stakeholders. However, interviews maintained with FBOs, airlines and third party operators at the airport suggested a lack of transparency in decision making and communications</p> <p>There is no appointed Community Liaison officer at the airport to manage the relationship with neighbouring residential and hospitality communities and there is no forum for discussion.</p> <p>In addition, during our stakeholder engagement interviews, it was reported aspects of community integration could also be improved (e.g. disabled access, family rooms, etc).</p>	<p>Engagement Plan to apply throughout the Project (from design to operation of a modernised airport). In developing such plan, a full stakeholder mapping exercise will have to be developed. The Plan will need to include a prioritisation exercise of stakeholders (identifying those that are critical to airport operations) and outline the means and frequency of engagement.</p> <p>Stakeholder engagement should be managed as part of the ESMS to be developed for the airport.</p> <p>In addition, consideration should be given to improving public environmental and social disclosures as well as providing a conduit for feedback. This could be done through the airport's website.</p>		<p>Engagement Plan as part of the ESMS (minor OPEX Costs)</p> <p>Appoint a stakeholder liaison officer and set up channels of communication with key/ critical stakeholders (minor OPEX costs)</p> <p>Improvements to E&S disclosures (minor OPEX Costs).</p>
	<p>There is no Grievance Redress Mechanism in place. No information could be provided by the airport management representatives interviewed in relation as to how community complaints and grievances are addressed. However, it was reported that as far as they are aware, there have been no complaints in relation to noise and other airport impacts on communities.</p>	<p>It is not unusual that with the introduction of a private operator, formal complaints may increase in number. In our experience, the absence complaints is not representative of this type of assets.</p> <p>Consequently, a Grievance Mechanism should be established to formally address community grievances. This should be part of the airport's ESMS.</p>		<p>Inclusion of the development and implementation of a Grievance Redress Mechanism within the Concession Agreement. (minor OPEX costs).</p>
<p>Archaeology and cultural heritage</p>	<p>It is understood that there are only a limited number of heritage sites in the island. The closest to the island is Chesire Hall, a former cotton plantation. This is located approximately 300m northeast of the airport.</p>	<p>No development is proposed outside the existing airport perimeter and therefore no impact is proposed on this site.</p>		<p>No material issues identified.</p>
<p>Land acquisition and</p>	<p>No development is proposed outside of the existing airport perimeter, therefore no land acquisition and involuntary displacement is required as part of the Project.</p>	<p>No current material issues identified.</p>		<p>No material issues identified</p>

Category	Description of Findings	Implications	Risk	Proposed Action
involuntary displacement				

Annex 1. Environmental, climatological, and social setting

Environmental setting

Information pertaining to Providenciales Airport's site is not readily available in the absence of a former ESIA or detailed environmental management documentation. The following sections mainly refer to the Providenciales Island and Turks and Caicos national level (when information was available), and to the Caribbean Islands region.

Geography and Geology ¹

Turks and Caicos is located in the Lucayan Archipelago, to the north of the Caribbean Sea, within the Bahamian Archipelago.

Turks and Caicos is formed by two groups of tropical islands: the Caicos islands and Turks islands, with a total of 40 islands and cays. The Turks Islands group consist of Grand Turk and Salt Clay islands, both inhabited, and six uninhabited cays. The Caicos Islands group are formed by 6 main islands: North Caicos, Middle Caicos, East Caicos, West Caicos, South Caicos, and Providenciales, where the Providenciales Airport is located. Except for East and West Caicos, the islands are inhabited.



Figure 1. Turks and Caicos
Source: WorldAtlas

A 22 miles wide and over 7,000 feet deep marine trench, the Turks Island Passage, divides Turks islands from the Caicos Islands.

The islands consist of flat limestone formed by coral reefs and are ringed by sandy beaches. Caves and 'blowholes' exist in Turks and Caicos' limestone cliffs².

The entire territory of Turks and Caicos consist of lowlands. 55.9% of the land area has an elevation below five metres³, and the highest point in Turks and Caicos are the Blue Hills on the northwest Caicos (Providenciales) with an elevation of 49m.

¹ Information presented in this section is mostly based on information extrated from WorldAtlas. Available at: <https://www.worldatlas.com/maps/turks-and-caicos>

² Caribbean islands, coastal ecology and geomorphology

³ <https://data.worldbank.org/country/turks-and-caicos-islands?view=chart>

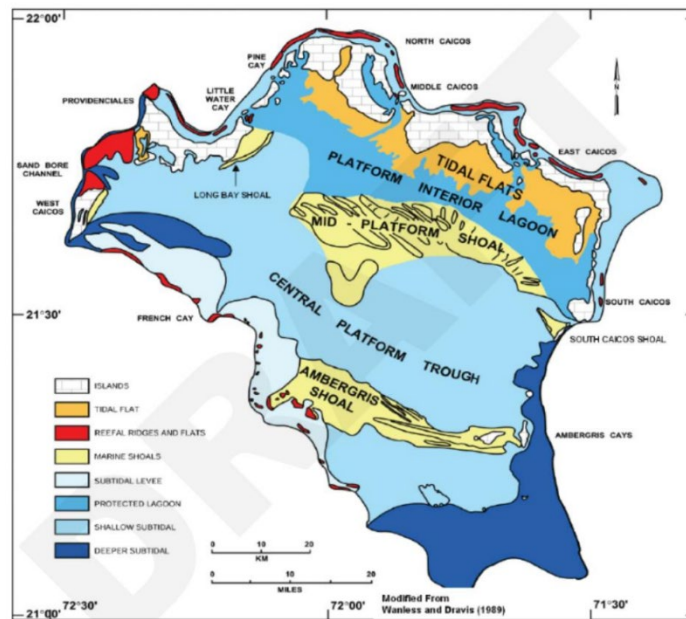


Figure 2. Marine features of Caicos Plateau

Source: Draft National Physical Sustainable Development Plan

Hydrogeology ⁴

The Turks and Caicos have a few freshwater reserves at ground level. On limestone islands such as Turks and Caicos, which are mostly flat and low lying, there are no possibilities for large scale surface storage. In addition, groundwater may be present in thin lens-shaped bodies. These lenses are found in a very delicate equilibrium with saline seawater and can be destroyed by improper extraction, drought or tidal waves.

The Turks and Caicos Islands are water scarce, with very limited natural freshwater resources potable water is typically sourced from reverse osmosis desalination of brackish, underground water on the islands of Providenciales and Salt Cay; while on the less populated islands, many homes have sizeable cisterns to store water (which have been required by law), and these may be replenished either from rainwater or via truck borne water supplies. Non-potable water resources including sea water and brackish groundwater are also utilized for flushing toilets.

Hydrology

The small limestone islands of the Caribbean, such as Turks and Caicos Islands, form lens-shaped bodies overlying deeper more saline groundwater. Lens development is found to be principally controlled by the permeability of the limestone and in particular by the type of permeability. In Providenciales Island, the water bodies correspond to fissure-controlled groundwater flow ⁵.

The islands receive limited rainfall and are occasionally stricken by drought. The Caicoses receive more rainfall than the Turks Islands and can support agriculture that is not possible in the Turk.

⁴ Information on this section was obtained from the Caribbean Water and WasteWater Association. Available at: https://cwwa.net/country_profile/turks-and-caicos-islands/#water-supply (Accessed 10/06/22)

⁵ *Influence of Geology and Krast Development on the Formation of Freshwater Lenses on Small Limestone Islands*. British Geological Survey, UK, 1988 p 423-428.

Environmental Hazards ⁶

Hurricanes

Located in the heart of the Atlantic hurricane belt, Turks and Caicos is subject to hurricanes and tropical storms especially during the August – November period. This is due to change in atmospheric pressure and sea surface temperature ⁷.

Tropical storms and hurricanes are the primary cause of extreme water levels, wind and wave conditions that can cause beach erosion and infrastructure damage. Over the past 50 years, Turks and Caicos have had 18 named storms pass within 75 miles, six of which were 'major hurricanes. Tropical storms that do not make direct landfall can still affect the island's shorelines and are also a hazard for the coastal development.

Droughts

Turks and Caicos is susceptible to draughts during dry season, particularly in years with strong influence of the the El Niño effect. A Caribbean high-resolution drought atlas spanning 1950–2016 indicates that the region-wide 2013–2016 drought was the most severe event during the multi-decadal period.

More information on droughts and El Niño effect can be found in the climatological section below.

Flood risk

A significant proportion of Providencia Island has low land elevation (Figure 3) and therefore is vulnerable to coastal flood, particularly in the event of tropical storms.

Turks and Caicos susceptibility to floods is aggravated by the sea level rise caused by climate change. This will be expanded in the following sections.

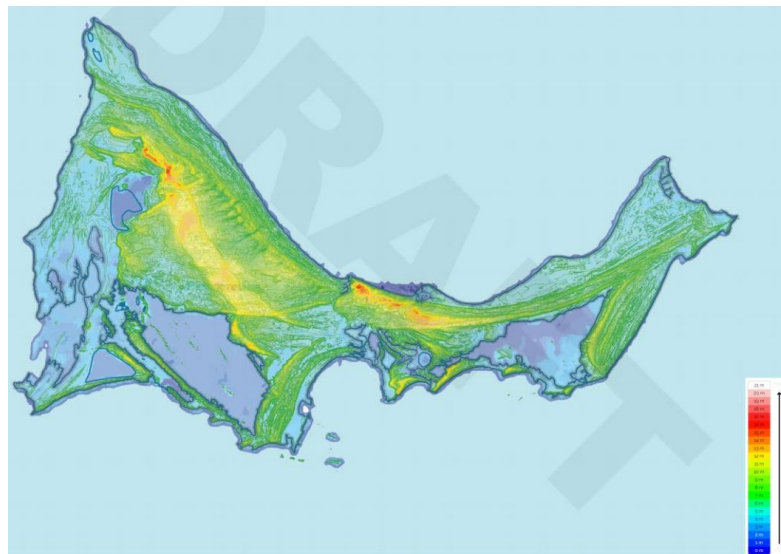


Figure 3. Providenciales elevation and hydrology
Source: Draft National Physical Sustainable Development Plan

Tsunamis

The main cause of tsunamis are underwater earthquakes.

Tsunamis are rare in the Caribbean, but the proximity of Turks and Caicos to Puerto Rico and Hispaniola trenches make the country susceptible to this type of hazard.

Thinkhazard! Classifies Turks and Caicos risk of tsunamis as 'low', which means that there is more than a 2% chance of a potentially damaging tsunami occurring in the next 50 years.

⁶ Information presented in this section is mainly based on the draft of the National Physical Sustainable Development Plan, published by the Government of the Tusk and Caicos Island in 2020. Available at: <https://www.gov.tc/planning/plan>

⁷ Caribbean Regional Climate Center. Available at: <https://rcc.cimh.edu.bb/caribbean-climatology/>

Protected areas

Figure 4 shows the three national parks, three nature reserves, and two areas of historic interest located in the Providenciales island, all included within the Crown Lands. This island has experienced the most environmental degradation among the Turks and Caicos Islands due to the poor management of ongoing developments.

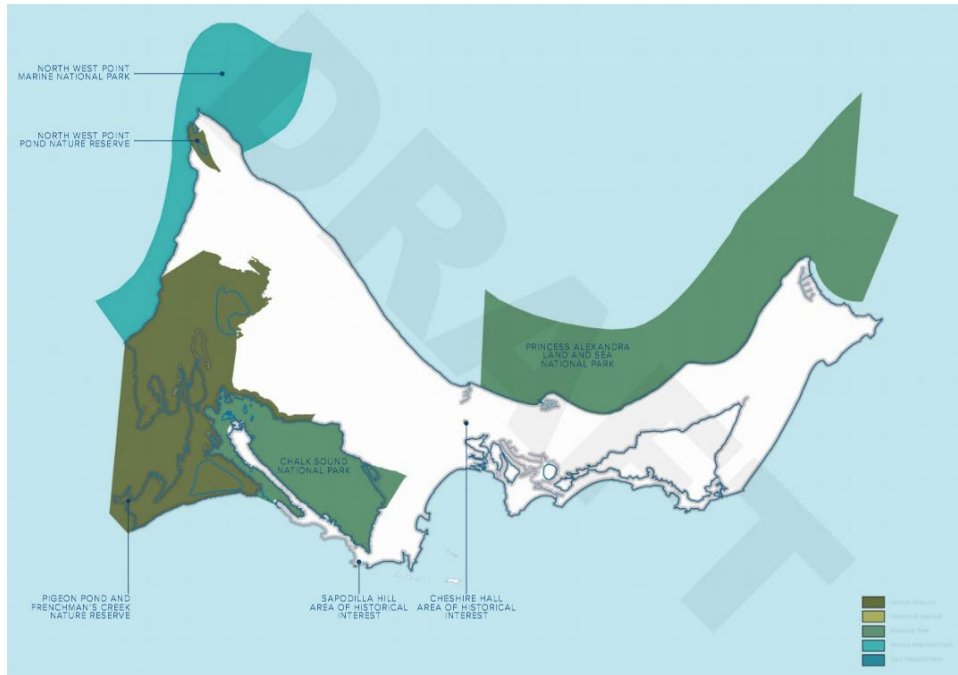


Figure 4. Providenciales sites of interest
Source: Draft National Physical Sustainable Development Plan

Figure 5 shows that the Chalksound National Park is in close vicinity to the airport.

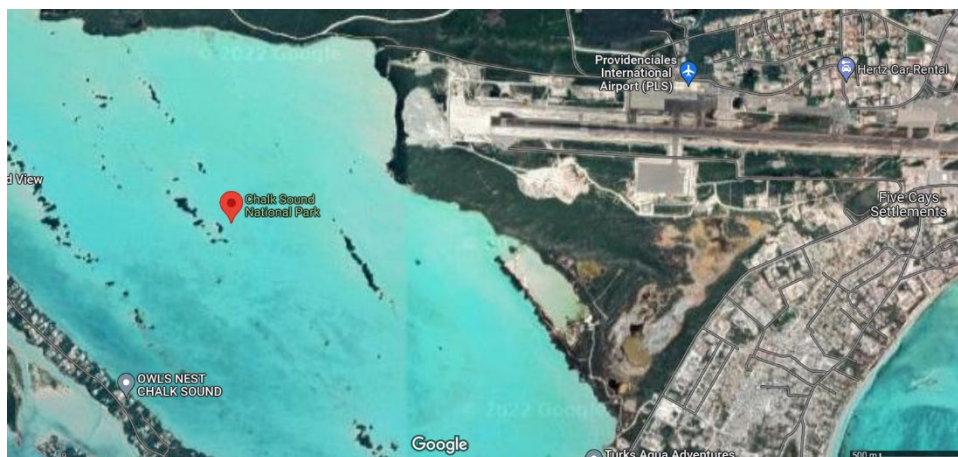


Figure 5. Satellite Image of Chalk Sound National Park and Providenciales International Airport
Source: Googlemaps

Climatological setting

Contextual Information⁸

Turks and Caicos is located on the boundary of the tropical and subtropical zones and, as such, has a semi-tropical or subtropical marine climate, which is moderated by the warm waters of the Gulf Stream. The islands experience warm, humid conditions year-round, though with more seasonal variations than the Southern Caribbean islands.

As the other Caribbean Islands, Turks and Caicos has one dry and one wet season each year. Wet season runs from April/May to November/December, dry season during the other half year⁹.

Monthly Climatology of Min-Temperature, Mean-Temperature, Max-Temperature & Precipitation 1991-2020
Turks and Caicos Islands

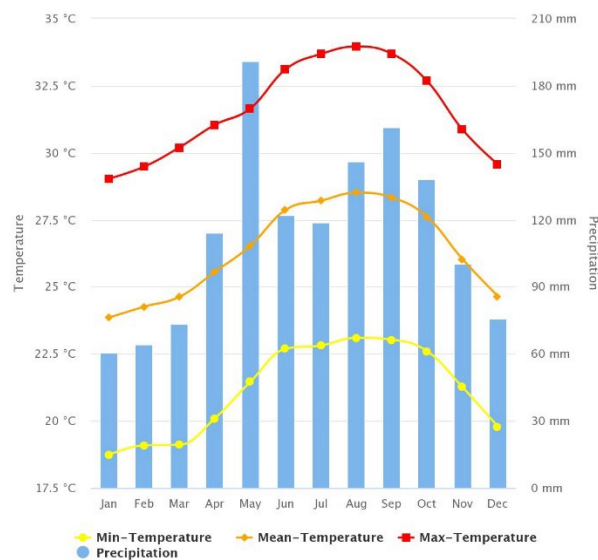


Figure 6. Monthly Climatology of Min-Temperature, Mean-Temperature, Max-Temperature & Precipitation 1991-2020 Turks and Caicos Islands.

Source: World Bank Knowledge Portal

Inter-annual variability in climate is clearly shown in Figures 7 and 8, and is strongly influenced by the El Niño Southern Oscillation (ENSO). El Niño episodes bring warmer and drier conditions between June and August.

Air temperature is fairly high in Turks and Caicos, with an annual average temperature variation between 25.8C and 27.0C in the period 1990-2020. Max temperatures can reach 34C during the hottest month of the year. Heat stress much higher during wet season, especially during dry spells (no relief from intensely humid heat by rain and cloudiness)^{Error! Bookmark not defined.}

Records indicate that the mean annual temperature increased by around 1.4 °C between 1901 and 2020, as shown in Figure 7.

⁸ Information presented in this section is primarily based on the UNFCCC and World Bank Knowledge Portal where information on climate change is published on a decade-by-decade basis; most of the available information relates to the Bahamas, some specific cases for Turks and Caicos.

⁹ Information based on the general characteristics of the Caribbean Region from the Caribbean Regional Climate Center. Available at: <https://rcc.cimh.edu.bb/caribbean-climatology/>

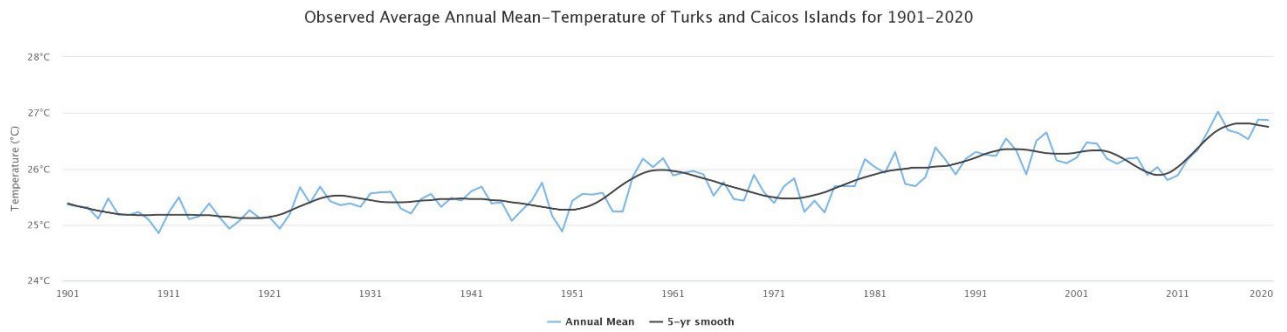


Figure 7. Annual Mean-Temperature Turks and Caicos 1901-2020.
Source: World Bank Knowledge Portal

Mean annual rainfall in Turks and Caicos varied from 900mm to 1750mm between 1990-2020. There have been no significant or consistent changes observed for mean precipitation since 1950. However, particularly dry periods have occurred in the certain years.

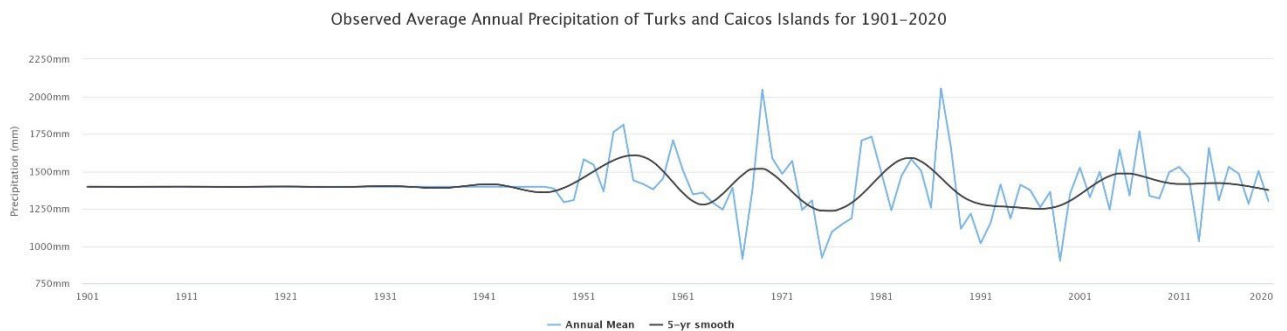


Figure 8. Annual Mean-Precipitations Turks and Caicos 1901-2020.
Source: World Bank Knowledge Portal

Climatological Projections ¹⁰

As all small islands, Turks and Caicos is particularly vulnerable to the effects of climate change, despite its low contribution to global greenhouse gases. The mayor impacts are sea level rise; increase in temperature (including sea water temperatures); and increase in the frequency and intensity of extreme weather events (floods, draughts and hurricanes).

The reliance of the country's economy on tourism, an industry supported and reliant on the natural environment, marine resources and coastal infrastructure, makes the country highly vulnerable to climate change and associated natural hazards. This is particularly evident for coral reefs (susceptible to the increase of sea water temperature) and the 65% of all marine species in the Caribbean that are dependent on coral reefs.

Air Temperature

Climatological modelling for Turks and Caicos indicates an increase in mean-temperature for all the scenarios, as shown in Figure 9. In its latest report, the IPCC reported that monthly mean temperature is projected to increase up to 1.2C between 2040-2060 and up to 3.0C between 2080-2100 under the highest emission pathway (RCP 8.5) for the Caribbean.

According to Thinkhazard!, Turks and Caicos have an extreme heat risk.

¹⁰ Information for this sections was mainly obtained from the WorldBank Climate Change Knowledge Portal, and the IPCC AR6 report. Available at: <https://climateknowledgeportal.worldbank.org/country/bahamas> and https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC_AR6_WGI_Regional_Fact_Sheet_Small_Islands.pdf

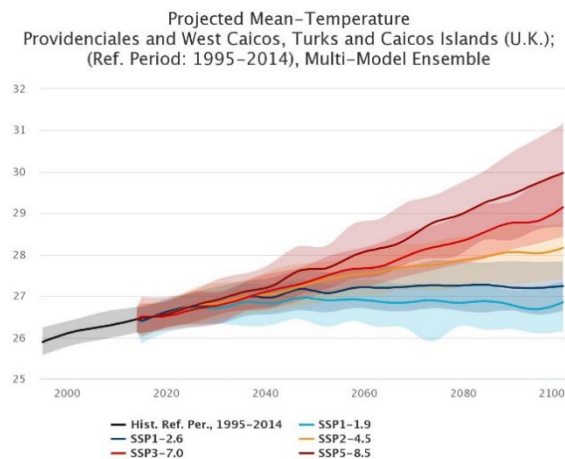


Figure 9. Projected Average Annual Temperature in Providenciales and West Caicos, Turks and Caicos Islands.
Source: World Bank Group, Climate Projections

Precipitation

According to the IPCC AR6 report, more extreme seasonality is the general trend projected for East Caribbean. As for the entire region of the Caribbean Islands, precipitation in Turks and Caicos are projected to decrease: the declining trend in rainfall during June–July–August will continue in coming decades (high confidence at 2°C global warming and above).

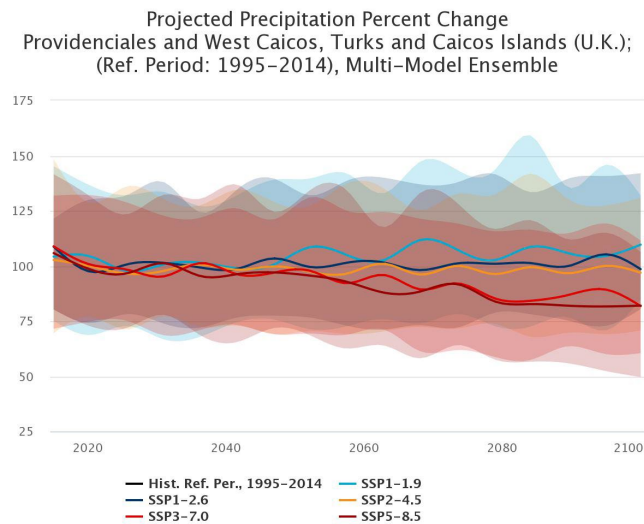


Figure 10. Projected Precipitation Percent Change in Providenciales and West Caicos, Turks and Caicos Islands.
Source: World Bank Group, Climate Projections

Climatic Emergencies

Sea Level Rise (SLR)

The projected SLR is expected to bring risk to coastal developments due to accelerated erosion as well as the potential for more damaging events during extreme weather events. In the long term, SLR may cause the loss of entire beaches and other coastal resources.

The projections show devastating effects for the island, with 100% of beaches to be lost under a 2mts SLR scenario.

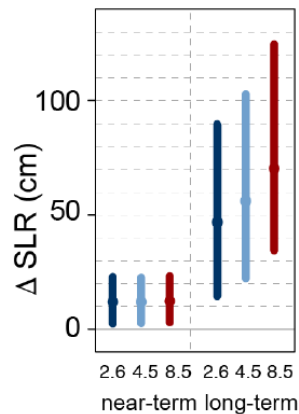


Figure 11. Projection for Caribbean mean changes in annual sea level rise in the near term (2021) and long-term (2081-2100) for three scenarios, relative to 1995-2014
Source: IPCC AR6 (2022)

Hurricanes

The Caribbean and found it to be particularly vulnerable to climate change, resulting in extreme hurricane rainfall events being as much as five times more likely in a warmer world.

Droughts

The declining trend in rainfall and the higher evapotranspiration under a warming climate will result in increased aridity and more severe agricultural and ecological droughts in the Caribbean Islands. A 1°C increase in temperature (from 1.7°C to 2.7°C) could result in a 60% increase in the number of people projected to experience a severe water resources stress from 2043–2071. This is expected to be aggravated by the more extreme seasonality projected ¹¹.

Existing and Proposed Mitigation Policies

The Draft National Physical Sustainable Development Plan, published by the Government of Turks and Caicos Islands in 2020, outlines the environmental objectives of Turks and Caicos to strengthen its resilience:

- Growth management
- Preservation and conservation efforts
- Follow national park ordinance in relation to land use decisions
- Investment and usage of renewable energy
- Protect native flora and Fauna
- Coastal development and management: shoreline protection
- Maritime network resilience
- Natural disaster resilience

Further details on the strategies to achieve these objectives can be found in the Government of Turks and Caicos Island publication.

Social setting

According to World Bank data the total population of Turks and Caicos is approximately 38,718 (2020), with a growth rate of +1.4%. Not all of the 40 islands and cays are inhabited. Providenciales, where the Providenciales airport is located, is the most populated island with three quarters of the total population and has seen the greater increase in population in recent years, according to the latest census in 2012 (Figure 11). The average household size in Providenciales is 3.1 persons/household, and has also drastically increased in the last decade due to immigration.

¹¹ IPCC sixth assessment report, working group 1 – the physical science basis, 2022. Available at: https://www.ipcc.ch/report/ar6/wg1/downloads/factsheets/IPCC_AR6_WGI_Regional_Fact_Sheet_Small_Islands.pdf

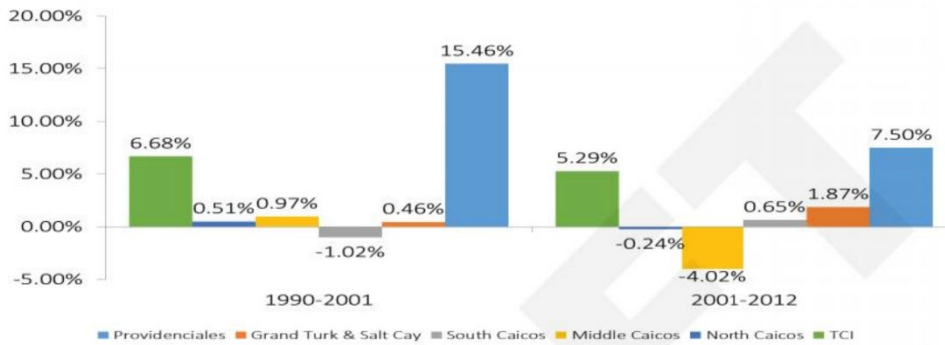


Figure 12. Average annual growth of population by island (1990-2012)
Source: Draft National Physical Sustainable Development Plan

The average age in Turks and Caicos is 33.1. The age group 15-61 is the largest with 56.1% of the total population. For non-belongers, this percentage is even higher at 66.9%, which can be explained by the strong immigration of workers to support the tourism and hospitality sectors.

The split of ethnic groups and countries of citizenship was as following in 2012:

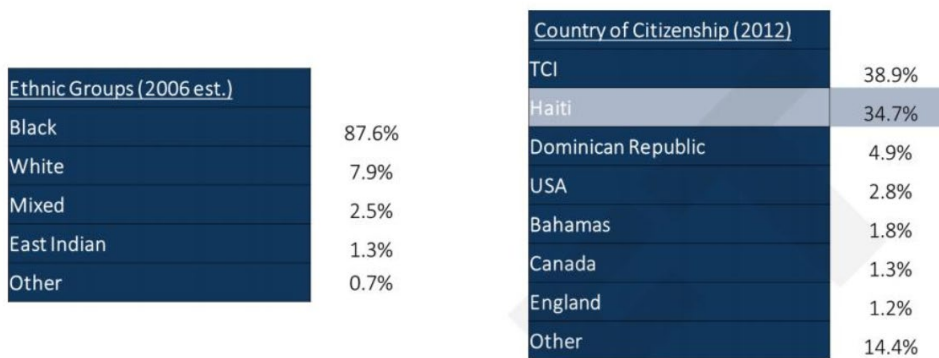


Figure 13. Demographic snapshot: ethnic and country of citizenship (2012)
Source: Draft National Physical Sustainable Development Plan

The capital of Turks and Caicos is Cockburn Town, Grand Turk. Travel between island mostly depends on or sea and air, as the only islands connected by bridge are North and Middle Caicos.

Life expectancy at birth in 2015 was 76.9 years in men and 82.6 years in women¹².

English is the main language and american dollars is the currency used in Turks and Caicos. Tourism and off-shore financial companies are the two largest industries in Turks and Caicos. From the 1980s until now, tourism and hospitality has been the largest source of economic prosperity for Turks and Caicos. 94% of hotel rooms and condos keys are in Providenciales.

The Providencial Island has one medical centre, a university, and numerous schools, including five state schools (three primary schools and two secondary school) and several private schools.

12 PanAmerican Health Organization. Available at: <https://www.paho.org/en/turks-and-caicos-islands#:~:text=Life%20expectancy%20at%20birth%20in,and%2082.6%20years%20in%20women.>

Annex 2. Noise Impact Assessment

Introduction

The main objective of this section is to assess the noise impact produced by the airport's operations at Providenciales Airport (PLS). To this end, we have developed a comprehensive noise assessment based on the forecasted traffic demand and the estimated air navigation procedures.

The methodology used for the noise impact assessment integrates several disciplines including aeronautical, territorial, and environmental, complemented with the analysis of national and international policies as well as regulations.

The noise impact produced by aircraft operations depends namely on several factors such as:

- Aircraft model, engine, and maximum take-off weight (MTOW).
- Number of daily take-offs and landings.
- Flight profile.
- Horizontal flight path.
- Runway usage.
- Airport operations slots.
- Topography of the airport environment.
- Prevailing climatic conditions.
- Location of urban areas in relation to airport infrastructure and runway thresholds.

The study concludes with the recommended mitigation measures adapted to the territorial reality of the airport aiming to minimize the environmental impact thereof and to guarantee the feasibility of the airport system.

Experience in the sector allows not only modelling the noise impact, but also understanding the influence of all required inputs and policies as well as establishing and managing corresponding mitigation measures.

The noise impact assessment methodology followed for PLS consists of five main steps: review of policies and regulations, traffic inputs and forecasts, noise impact analysis, land use analysis and mitigation measures.

- **Regulatory analysis.** To assess the airport's compliance in relation to noise levels, the legislative framework that defines applicable metrics and noise exposure thresholds is assessed – either defined by national regulation or good practices in absence of the previous one.
- **Basic inputs and traffic forecast.** Collection of the basic inputs such as physical data of the airport and runway, meteorological conditions, departures & arrivals routes, etc. Definition of the traffic scenarios, based on the selected design day, and its projection as per the estimated traffic forecast to assess future scenarios.
- **Noise impact analysis.** The final analysis of the noise contours for the different scenarios considers both the regulatory framework and the inputs to identify the potential noise impact of airport's operation on the airport surroundings with a particular focus on the identification of sensitive areas.
- **Land-use analysis.** Land use –as per noise limitations- in the airport surroundings is considered in order to perform a complete impact assessment and determine the potential mitigation measures but also to develop guidelines to prevent the future impact on non-developed areas.
- **Mitigation measures.** Recommendations and mitigation measures for the impact of noise are analyzed, as well as its implementation through an adequate global noise management plan, based on applicable best practices.

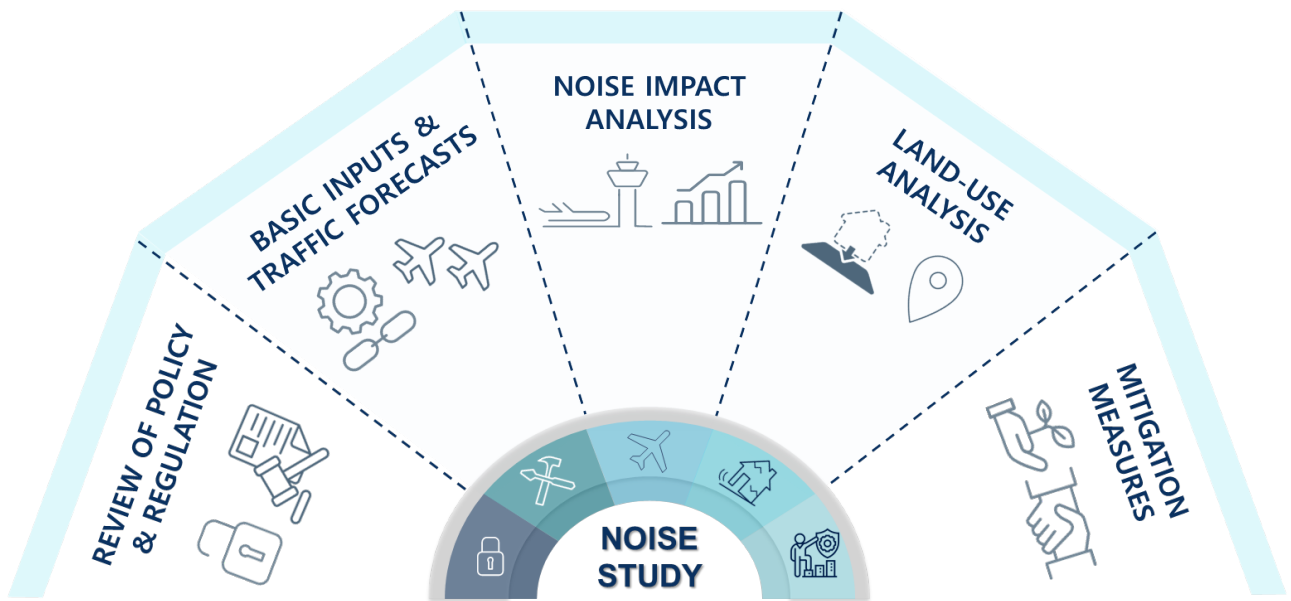


Figure 1. Methodology applied for the elaboration of noise studies

Source: ALG analysis

Existing regulatory framework and recommendations

ICAO has established increasingly stringent civil aircraft noise certification standards which determine maximum acceptable noise levels for different aircraft during take-off and landing phases.

In particular, ICAO adopted a set of aircraft noise standards integrated in Annex 16 (Volume 1) of the Convention on Civil Aviation (Chicago Convention). In this manner, aircraft are classified according to their year of design, type, and weight. For each type, a maximum noise emission level (expressed in effective perceived noise units in dBs) is established. These noise levels are calculated based on the following criteria: level, frequency, distribution, and time variation of aircraft noise. Generally, for the same category of aircraft, the more modern and lighter the aircraft, the quieter it will be.

While significant progress has been made since 1990 in reducing aircraft noise at origin through technological advances, the proliferation of different noise standards around the world has led to a variety of national laws and regulations that resulted in barriers to airport capacity expansion and economic growth. Consequently, ICAO was interested in developing a holistic approach that would provide an even more common global framework and solution to local airport noise problems and encouraged the participation of a wider range of aviation partners.

In 2001, the ICAO Assembly endorsed the concept of a "Balanced Approach" to aircraft noise management to assist airports in developing mitigation measures, contained in Document No. 9829. The Balanced Approach is based on four main pillars: **noise source reduction**, **land use planning and management**, **operational noise mitigation procedures**, and **operational restrictions**. In 2007, the Assembly reaffirmed the principle of the Balanced Approach and urged Member States to recognize the role of ICAO in addressing aircraft noise problems.

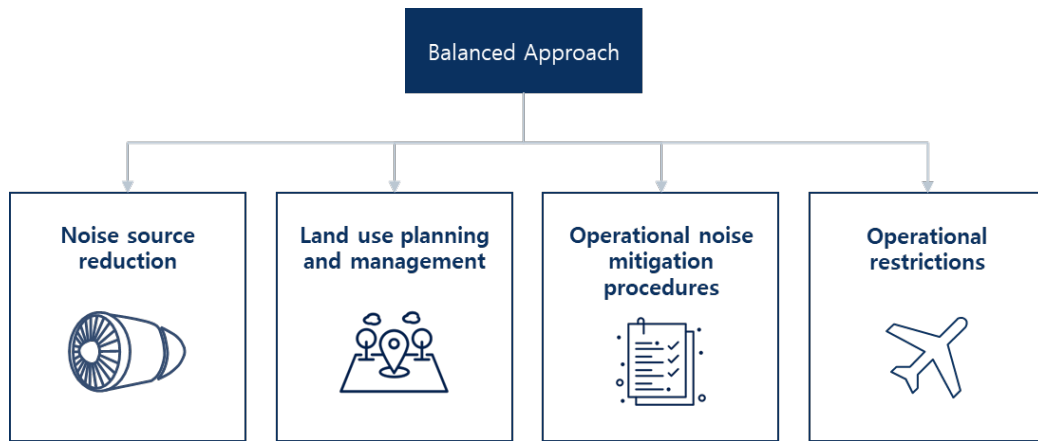


Figure 2. ICAO's Balanced Approach
Source: ICAO

ICAO Document No. 9829 has become the guidance material for aircraft noise management for airport operators. However, it should be noted the importance of coordination and participation by all stakeholders of the air transport industry in carrying out the measures proposed in the Balanced Approach, as well as local authorities responsible for managing land use measures.

International practices

At international level, countries establish their own regulations regarding the management of environmental noise. Nevertheless, Turks & Caicos does not have specific legislation for aeronautical noise. Thus, an international benchmarking has been conducted.

Benchmarking of acoustic regulations shows that European standards are the most restrictive and environmentally friendly (i.e., UK) although it is the World Health Organization (WHO) that establishes the most restrictive accepted noise limits; 45 dB during the day and 40 dB at night.

The World Bank has also developed the so-called World Bank Group Environmental, Health, and Safety Guidelines (known as the “EHS Guidelines”) that defines general recommendations that countries should follow when tackling noise management. These guidelines define an acoustic regulation framework that includes noise management.

Country/ Organization	Policy	Night period	Metric	Day limit residential buildings	Night limit residential buildings	Day limit quite zone	Night limit quite zone
Colombia	Resolution 627 of 7th April of 2006 (MADS)	21h-7h	L_{Aeq}	65 dB	55 dB	55 dB	50 dB
FAA	AC 150/5020-1 (1983)	22h-7h	L_{dn}	65 dB	55 dB	45 dB	45 dB
Brazil	ANAC, RBAC 161 – Noise Zoning Plans, Emenda 01, (2013)	22h-7h	L_{DNL}	65 dB	65 dB	40 dB	40 dB
Spain	Law 37/2003 (2012*) RD 1367/2007	23h-7h	L_{Aeq}	60 dB	50 dB	55 dB	45 dB
Italy	Ministerial Decree dated 31 October 1997	22h-6h	L_{eq}	55 Db	45 dB	50 dB	40 dB
WHO	Guidelines for community noise (2018)	22h-7h	L_{den}	45 dB	40 dB	-	-

Country/ Organization	Policy	Night period	Metric	Day limit residential buildings	Night limit residential buildings	Day limit quite zone	Night limit quite zone
UK (Heathrow)	Aircraft Noise Contour Model, DfT (CAA)	23h-7h	L _{Aeq}	57dB	48 dB	-	-
Dominican Republic	Environmental Regulation against Noise (Environmental State Secretary)	21h-7h		60 dB	50 dB	55 dB	50 dB
World Bank	Residential, institutional, or educational areas (EHS Guidelines)	22h-7h	L _{Aeq}	55 dB	45 dB	-	-

Figure 3. Benchmarking of acoustic regulations
Source: ALG Analysis

Metrics applied

For the valuation of the effect of noise exposure, its quantification requires the use of noise metric or noise indicator, based on which the results from different cases can be compared. The most common types are average A-weighted equivalent sound pressure levels that integrate the time-varying noise level of a particular source over a specific period of the day (e.g. 24 h, or the day or the night), or compound metrics that include a penalization of the evening and/or nighttime (e.g. Ldn for day and night timeframes, or Lden for day, evening and night timeframes) to account for the elevated noise sensitivity in these time periods.

For PLS, FAA’s reference measurement methodology as well as the noise limits applied have been considered. The Airport Noise Compatibility Planning (14 C.F.R. Part 150) specifies the use of Ldn metric both as a limit for reporting noise as well as the limit for entitlement to noise compensation. This indicator gives a different weighting to the 2 periods of the day because people are more sensitive to noise during the night periods. The night period is penalised with 10dB as can be seen in the following formula.

It must be taken into account that the formula contemplates a cumulative period of 24h, and therefore it is necessary to adapt it to adjust it to the airport operation, which does not operate at night.



Airport Noise Compatibility Planning (14 C.F.R. Part 150)

Established the “day-night average sound level” (DNL or Ldn) as the noise metric for describing community noise

$$DNL = Ldn = 10 \cdot \log \left[\frac{1}{24} \cdot \left(16 \cdot 10^{\frac{L_{day}}{10}} + 8 \cdot 10^{\frac{10+L_{night}}{10}} \right) \right]$$

Compensation limit	Reporting limits
<h2>65 dBA</h2> <ul style="list-style-type: none"> - DNL 65 decibels (dB) as the threshold of significant aircraft noise as well as incompatible residential land use and compensation - The Schultz Curve shows that the limit set by the FAA of 65 dBA results in 10% of people highly annoyed 	<h2>65 dBA</h2> <ul style="list-style-type: none"> - Airports must formally submit a Noise Exposure Map (NEM) and a Noise Compatibility Program (NCP) - An airport’s NEM (49 U.S.C. §47503) is a scaled geographic visualization of an airport, its noise contours, and the surrounding area that depicts existing and future community noise exposures - The NEM includes the layout of the airport property, runway location, and continuous DNL noise contours at the 65, 70, and 75 dB levels, as well as the location of noise sensitive public buildings nearby.

Figure 4. Regulatory framework: United States of America
Source: ALG Analysis

Methodological approach

We have selected IMPACT software for the noise assessment. IMPACT is a web-based modelling platform created by Eurocontrol that allows the user to obtain noise contours in the selected airport. The modelling tool is based on an extensive reference-data warehouse and all calculations are performed on dedicated servers hosted by Eurocontrol. The tool is compliant with most recent editions of noise calculation method recommended by ICAO.

The methodology is applied as follows:

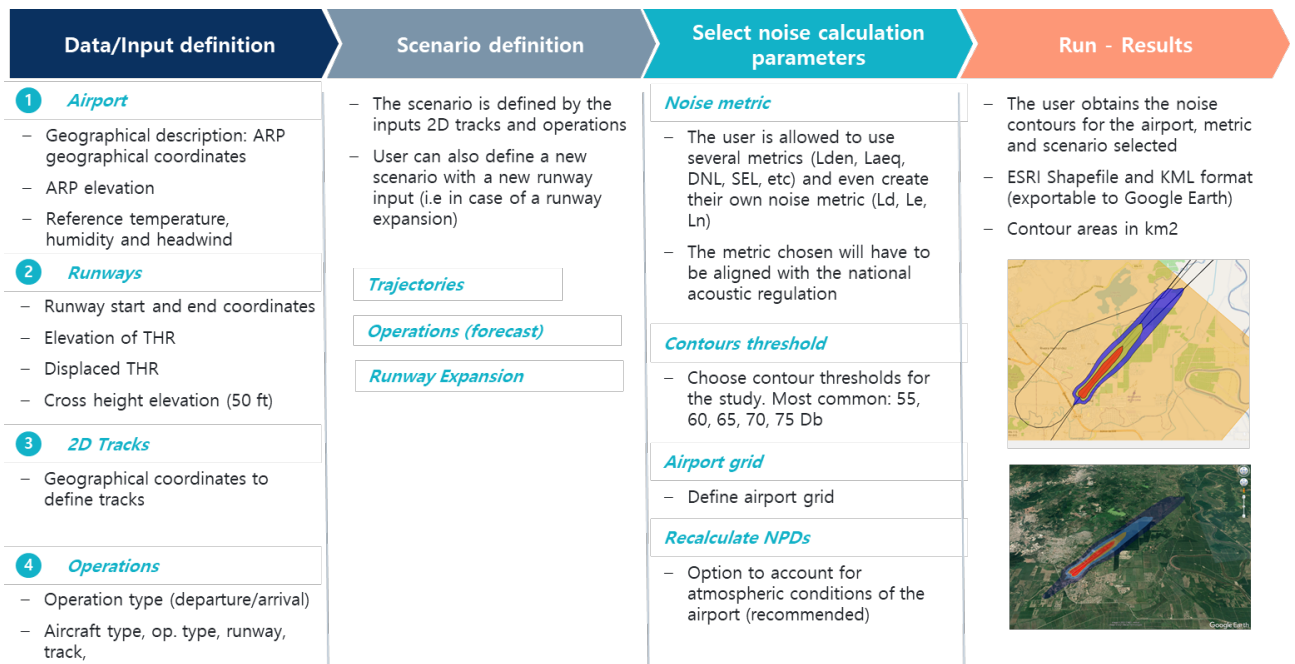


Figure 5. IMPACT Methodology
Source: ALG Analysis

Airport and runway definition

The first inputs are the physical characteristics of the airport such as runway coordinates and elevation, reference elevation of the airport, and reference temperature.

The AIP is the main source to obtain the characteristics of the airport and runway description, but this document has not been provided for the analysis. Thus, the following characteristics have been estimated using Google Earth to reassure the data.

Providenciales International Airport



ICAO/IATA Code: MBPV/PLS

ARP Elevation

6.4m/21ft*

Reference Temperature	32.2°C
RWY Length	2,804m
Threshold	Coordinates
10	21° 46'27.94"N 72° 16'55.94"W
28	21° 46'23.16"N 72° 15'18.52"W

*Note: In the absence of the AIP, the geographical center point of the runway has been considered as the ARP.

2D trajectories

For the modelling of the airport's noise impact, it is necessary to define the flight paths followed by the aircraft. To this end, the approach (STAR) and departure (SID) charts published in JEPPESEN air navigation charts database have been used, combined with the information extracted from Flightradar24, which publishes, in real time, the trajectory of the selected flights in order to define horizontal trajectories adjusted to reality. The trajectories have also been analyzed according to the distribution of flights by type of operation: arrivals and departures.

As it has been observed, Runway 10 is the preferred runway with 95% of operations, while the other 5% operate in Runway 28. This assumption applies for departures and arrivals.

Regarding arriving operations, after analyzing a series of historical flights with different origins and dates together with the instrumental approach charts, the approach flight trajectories have been defined mostly aligned with the runway as it can be observed in the SIDs charts where the last 5 miles of the approach procedure is aligned with the runway. Therefore, two arrival tracks have been defined: one for Runway 10 and another for Runway 28.

Regarding departing operations, based on Flightradar24 observations, it has been identified that the majority of departures take the northbound trajectory as most of these operations are heading to the United States. Nonetheless, it has been observed that some routes such as the one to Santo Domingo (SDQ) in Dominican Republic and CAP in Haiti alongside the route to Kingston (KIN) in Jamaica use the southbound track. Thus, for departing flights three different tracks have been defined, northbound and southbound departure from Runway 10 and a departure track from Runway 28 aligned with the runway.

The assumed share of operations for each trajectory considers RWY use as follows:

RWY Use	Departures	Arrivals
THR10	95%	95%
THR28	5%	5%

Figure 6. Runway use
Source: ALG Analysis

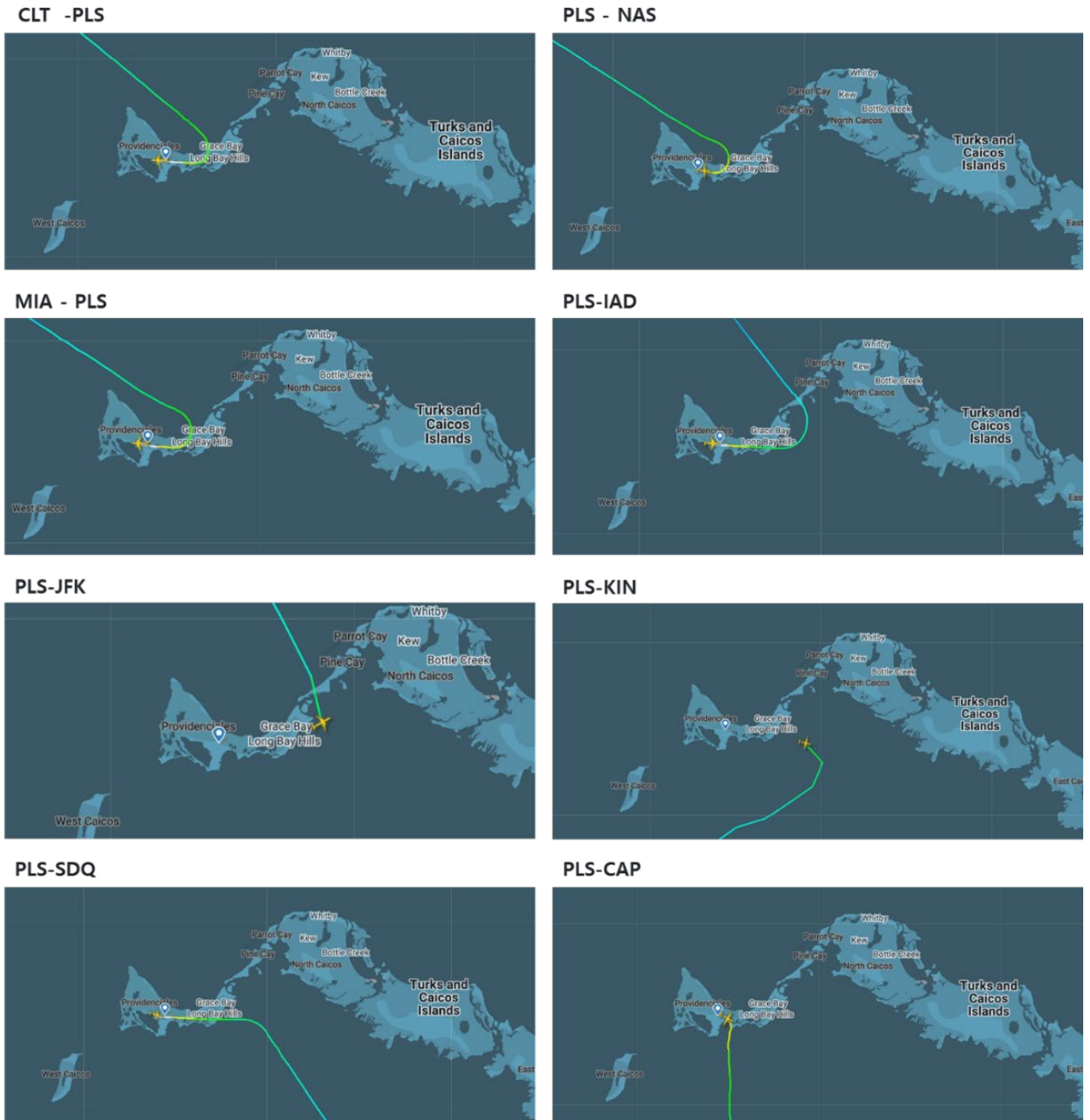


Figure 7. Departure trajectories at PLS
Source: Flightradar

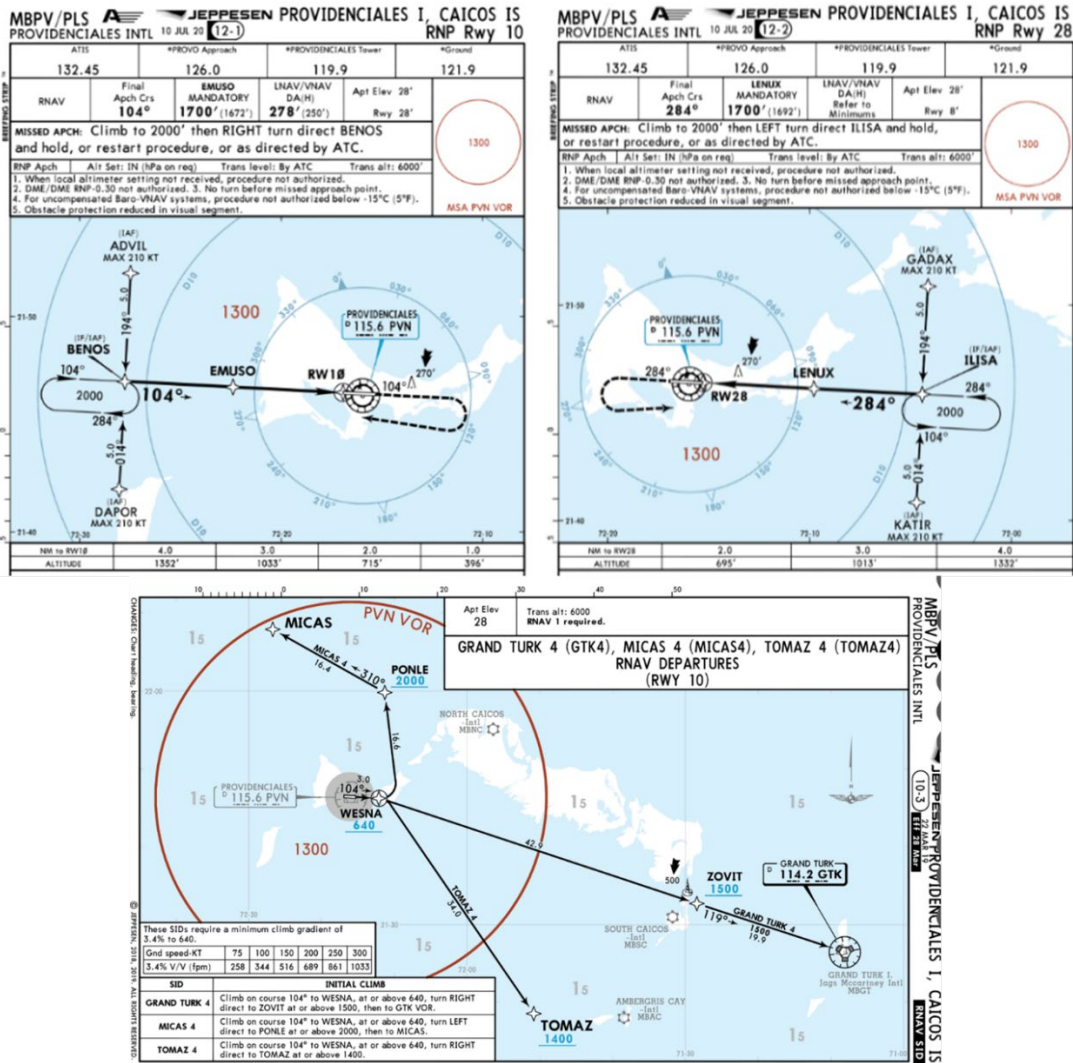


Figure 8. SIDs and STARs in PLS
Source: AIP

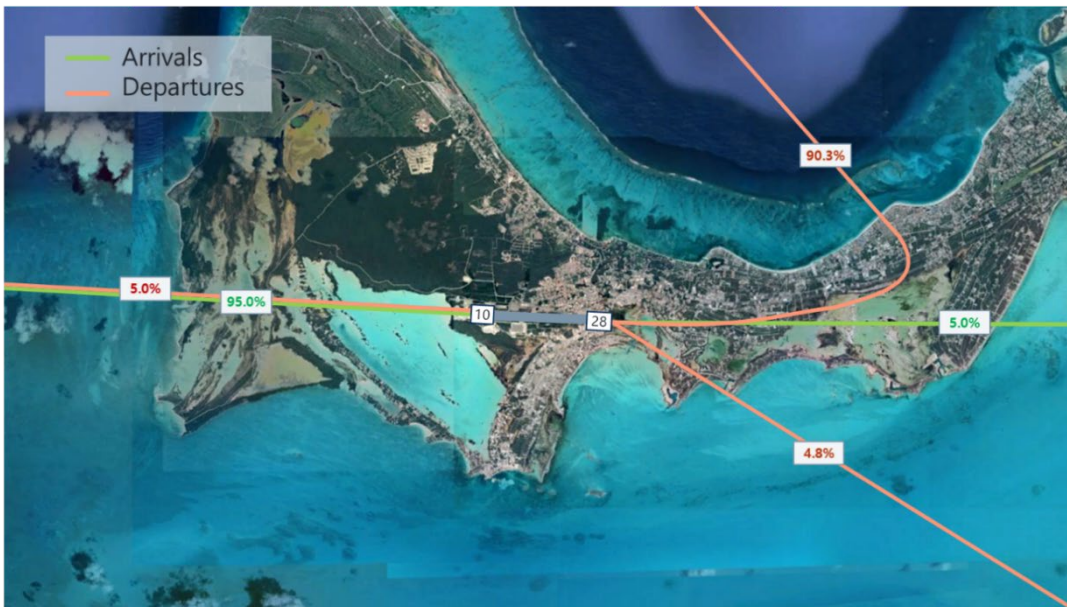


Figure 9. Defined 2D Tracks and share of use for PLS

Operations

The operations entered in the simulation tool correspond to the daily operations of the design day defined in the traffic forecast and the infrastructure development plan. The design day defined for PLS is 8th January 2022, and all the inputs (operations, fleet mix, and day/evening/night distribution) are based on traffic figures provided by TCIAA.

For the input data, the airport's aircraft mix in 2022 has been taken into account, as well as the distribution of operations according to their time slot (day, afternoon, and night) as shown in the table below. It should be noted that the design day could include operations outside the airport's operating hours that would have been authorized. However, the airport currently operates only during the day (7h-22h) with VFR.

The analysis shows that the most frequently operated aircraft are the B737 family (Code C), which account for approximately half of the design day's flights.

Operation	Code	Model	Day (7h-22h)	Night (22h-7)
Departures	C	B737-700	4	0
	C	B737-800	12	0
	C	B737-900	1	0
	C	EMB190	1	0
	C	A220	1	0
	C	A319	1	0
	C	A320	2	0
	C	A321	3	0
	B	BE1900-D	2	0
	B	C402	3	0
	B	DHC-6	2	0
	B	EMB120	1	0
Arrivals	C	B737-700	4	0
	C	B737-800	12	0
	C	B737-900	1	0
	C	EMB190	1	0
	C	A220	1	0
	C	A319	1	0
	C	A320	2	0
	C	A321	3	0
	B	BE1900-D	2	0
	B	C402	3	0
	B	DHC-6	2	0
	B	EMB120	2	0

Figure 10. Operation in the design day (2022)

For the calculation of the 2053 noise footprint, the projected growth for 2053 presented in the traffic projections for each aircraft code has been used. It should be noted that the mitigation of the noise impact caused by the operation of aircraft is directly linked to the renewal of the fleet by airlines, as they are using more modern and quieter aircraft.

ATMs	Aircraft Code	% Growth 2022-2053
Domestic/Regional	B	168.3%
International	B	29.3%
	C	45.2%
	E	30.1%

Figure 11. Evolution of operations by aircraft code

As the forecast traffic assumes a domestic traffic boost, domestic code B aircraft will experience the largest increase (168.3%). Considering the growth of operations of each aircraft family, the following table shows the estimation of operations expected in 2053.

Operation	Code	Model	Day (7h-22h)	Night (22h-7)
Departures	C	B737-700	6	0
	C	B737-800	19	0
	C	EMB190	1	0
	C	A220	1	0
	C	A319	1	0
	C	A320	3	0
	C	A321	4	0
	B	BE1900-D	5	0
	B	C402	8	0
	B	DHC-6	5	0
	B	EMB120	3	0
	B	EMB145	3	0
Arrivals	C	B737-700	6	0
	C	B737-800	19	0
	C	EMB190	1	0
	C	A220	1	0
	C	A319	1	0
	C	A320	3	0
	C	A321	4	0
	B	BE1900-D	5	0
	B	C402	8	0
	B	DHC-6	5	0
	B	EMB120	5	0

Figure 12. Operations in the design day (2053)

Noise impact analysis

The noise footprints have been calculated for the two scenarios, 2022 and 2053. It should be noted that the footprint has been obtained with the L_d metric, which only takes into account the noise footprint during daylight hours, leaving out the 23h-7h period.

Noise limits used in international practices, specifically those defined by the FAA for residential buildings, have been taken as a reference for this study. Since the airport does not operate at night (VFR), the contour of the 65dB footprint is the only critical limit.

	Night period	Metric	Day limit	Night limit
FAA	22h-7h	L_{dn}	65 dB	55 dB

Figure 13. Acoustic regulation considered

Noise contours for 2022

The noise footprints obtained for PLS in the reference scenario, 2022, are shown in the image below.

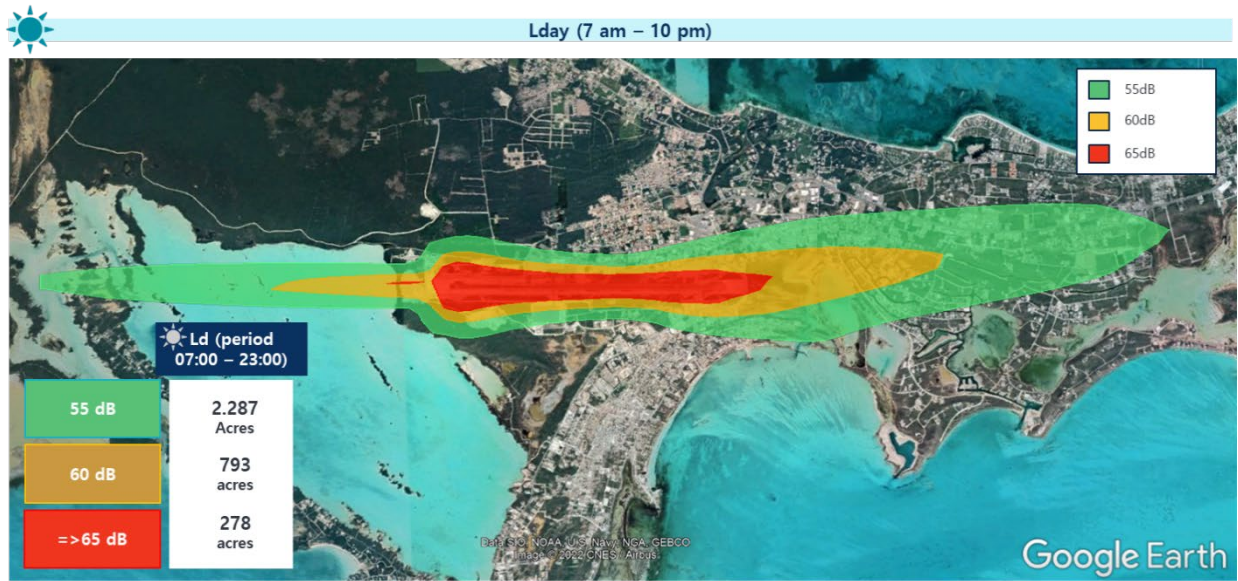


Figure 14. Noise impact (2022)

To assess the noise impact in the vicinity of the airport, the areas affected by the 65dB isophone are analyzed in more detail. As observed in the figure below, **no population areas are affected by the 65dB footprint, concluding that there is no serious noise impact.**

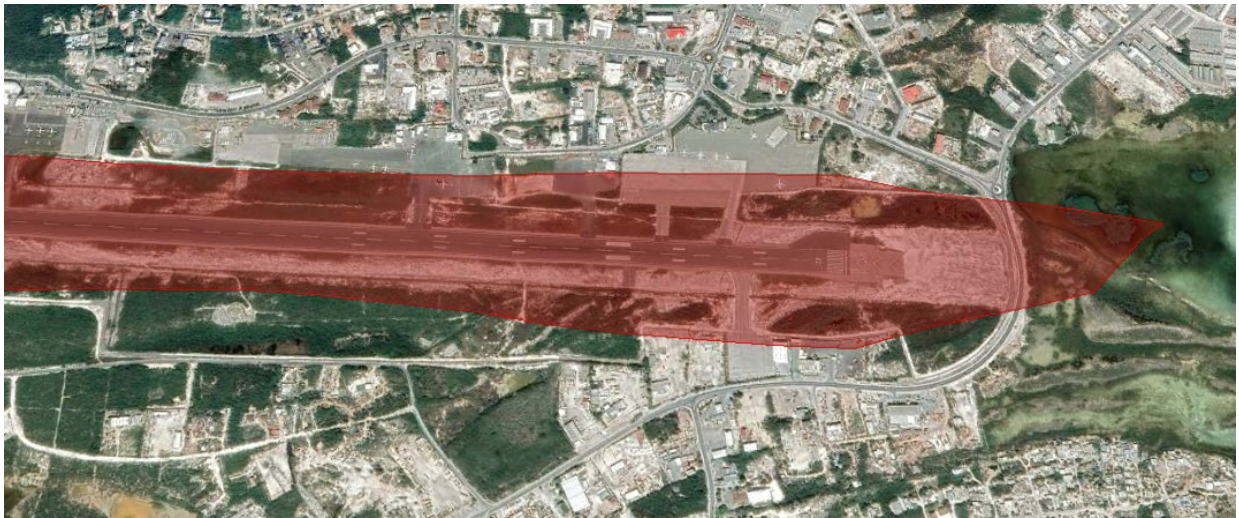


Figure 15. Area affected by the 65dB isophone (2022)

Noise contours for 2053

The noise footprints obtained for Provo airport in the reference scenario, 2053, are shown in the image below. It should be noted that the estimates for 2053 have been calculated based on the assumption that the airport will continue operating only during daytime. In case that the airport decides to start operating at night, a new noise impact assessment would be required to evaluate this timeframe.

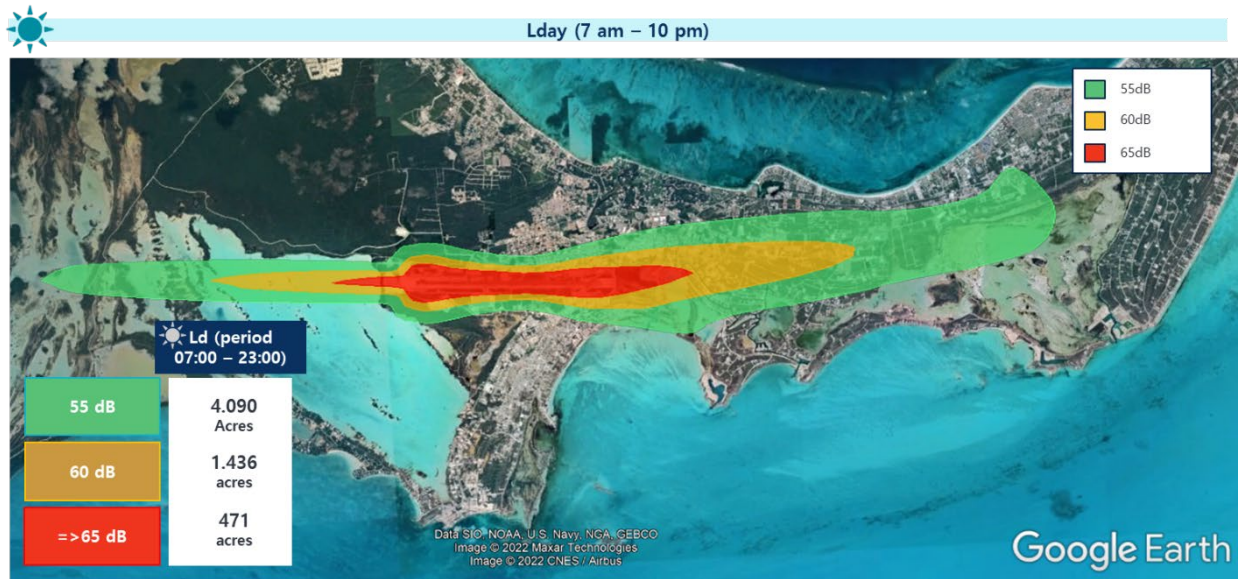


Figure 16. Noise impact (2053)

As stated in the previous scenario (2022), **no population areas affected by the 65dB footprint have been identified, concluding that there is no serious noise impact.**



Figure 17. Area affected by the 65dB isophone (2053)

Conclusions

The conducted noise impact assessment enables to determine the noise exposure driven by PLS operations. **The footprints obtained for both periods (2022 and 2053) show that, considering FAA established acoustic limits (65 dB during daytime for residential areas), PLS has minor impact on the households of the airport' surroundings** as the number of operations during the day is approximately 70-120 ATMs with code B and code C aircraft.

Despite the current minor noise impact, it is important to consider that currently all the operations take place during the day period (7 AM – 10 PM) and none occur during nighttime wherein operations would have a penalization of 10 dB and therefore it can be expected to have a higher noise impact in case of operations during nighttime.

In 2053, the level of impact is expected to increase compared to 2022 due to the increase in operations. **However, despite the increase in the area affected, the population found under the contour is not significantly higher than in 2022.**



Figure 18. Comparison between 65dB footprint in 2022 and 2053

The operation of the airport does not show a significant noise impact on the population, and therefore no urgent mitigation measures are required to reduce noise levels. However, it is necessary to consider good practices for airport noise management, which are based on five pillars: technology, industry engagement, operations, mitigations, and community engagement.

Practices for managing environmental noise at an airport

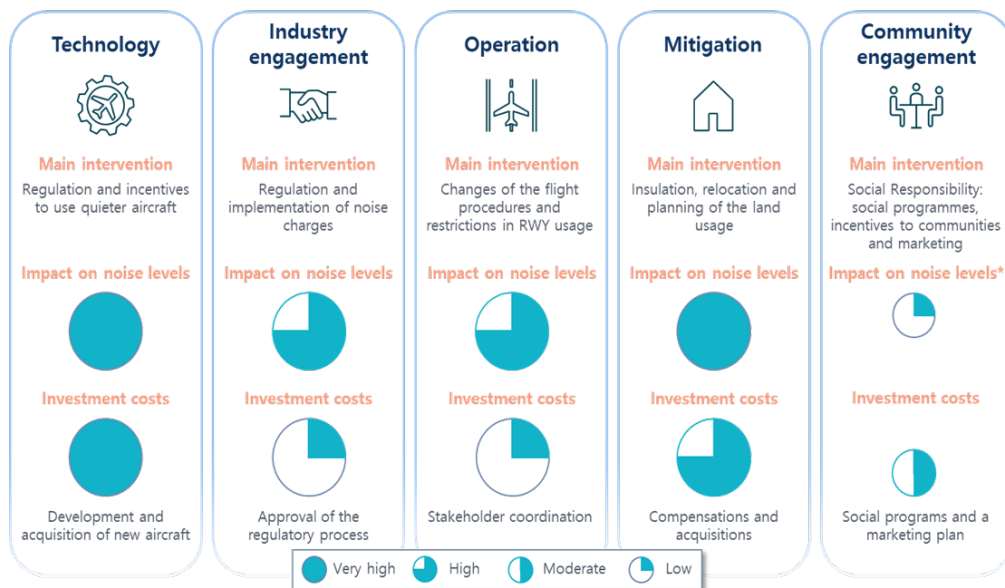


Figure 19. Good practices for airport noise management

The mitigation measures are outlined below. However, it should be noted that their implementation requires coordination between the various stakeholders involved in air transport: airlines, manufacturers, airport operators, etc.

Technology:

- Apply charges for aircraft exceeding noise limits in accordance with noise standards.
- Encourage airlines to modernise their fleet and push to phase out noisy aircraft that do not comply with ICAO regulations.
- Survey noise levels every 5 years and report to the respective municipality to consider future land use.

Operations

- Alternate the use of different runway headways, where feasible, in order to minimise noise impact.
- Implement CDA (Continuous Descent Approach) operations.
- Study alternative trajectories that allow the noise footprint to be diverted to an area that is not populated or includes sensitive points.

Mitigations

- Based on our assessment, no material mitigation is expected as part of the project.
- Engagement with the planning regulators is strongly recommended to ensure planning permission for residential and other sensitive uses is not granted within the 65dB contour of the airport. Amendments to the Building Code should also be sought to provide guidelines on noise performance for new buildings beyond the 65dB contour.
- In the event that impacts are identified in the longer term, consideration will have to be given to the installation of insulation systems for residential dwellings or sensitive buildings in areas above the maximum permissible noise levels. This is unlikely to be required within the term of the PPP with the current airport operating hours (daytime only).
- Ground noise should be further studied, and where impacts are identified, consider the creation of natural noise barriers such as tree planting.
-

Community

- Increase interaction with residents through the implementation of a noise complaints service and transparent management of related information (complaints, reports, noise results, etc.).

Annex 3. Preliminary Assessment of Aircraft and Vehicles Impact on Climate Change (GHG Emissions)

Greenhouse gas emissions estimations (current and future)

This section contains the calculations methodology and results of the Greenhouse Gas (GHG) Emissions estimations for PLS.

Every airport operation generates greenhouse emissions and atmospheric pollutants that affect local and global air quality, and thus, it is necessary to assess the impact that the airport has on this environmental aspect but also on the people's health.

The assessment relies on a limited data set and is supplemented with industry standards and benchmark assumptions. It is further noted that certain carbon conversion factors specific to Turks & Caicos are also outstanding and therefore reasonable alternatives have been employed in this iteration of the model to present an overall picture of estimated emissions. It is highlighted that this does not constitute a full carbon foot-printing exercise, but rather an estimate of emissions where suitable data is available.

In the absence of available studies related to GHG emissions at PLS, the first step is to develop the base emission scenario. This should include an analysis of the current situation, with an inventory of gas emissions and a list of compliance with usual environmental criteria.

The mentioned analysis will serve as the basis to set corrective measures to reduce emissions and obtain environmental certifications that show the commitment of the airport's operator with the climate change. This includes, among others, ACA certifications - *Airport Carbon Accreditation* - of the ACI -*Airport Council International*- or LEED certifications - *Leadership in Energy & Environmental Design*- of the US Green Building Council in the case of buildings.

The inventory of emissions has been conducted following the methodology based on: 1) Document 9889 – Airport Air Quality Manual of the International Civil Aviation Organization (ICAO) and 2) the FAA AEDT software, whereby the following airport's emissions categories have been assessed:

- Aircraft emissions.
- External vehicle emissions (passengers and employees).

Aircraft LTO and surface access vehicles emissions

When calculating aircraft emissions for an airport, the methodology of Document 9889 is based on the LTO cycle (Landing + Take-Off, Landing + Take-off), divided into take-off, ascent, approach and taxiing; assigning to each stage an operation time and a motor power. The European Environmental Agency (EEA) offers a thorough database including a large number of aircraft models and the most typical engine associated to it that allows the user to calculate the fuel consumption during a LTO cycle for a specific operation and accounts for the time of taxi-in and taxi-out as well as the different thrust power during the different phases of the LTO cycle.

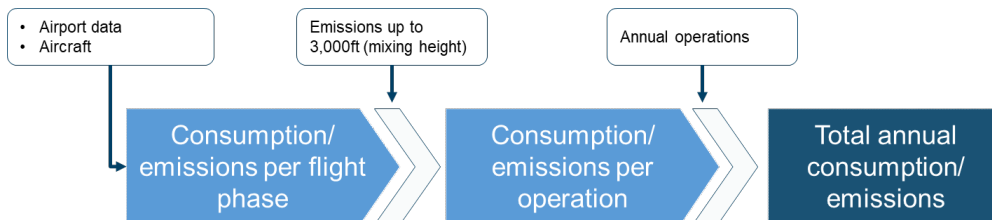


Figure 14. Aircraft emission calculation methodology
(Sources: ALG)

In this manner, it is defined the fuel consumption of each aircraft and amount of gases emitted in a normal landing-take-off cycle, up to the "mixing height", 3,000 feet (914 m). For aircraft, fuel consumption and CO₂, CO, HC, VOC, NMHC, NO_x, SO_x and PM₁₀ emissions have been estimated.

Aircraft	Fuel (kg)	CO ₂ (kg)	CO (kg)	HC (kg)	NO _x (kg)	PM10 (kg)
320	615.96	1,940.27	4.42	0.25	8.19	0.05
A220	446.34	1,405.97	5.33	0.53	4.93	0.03
A-319	506.61	1,595.83	5.21	0.40	5.41	0.04
A320	615.96	1,940.27	4.42	0.25	8.19	0.05
A321	614.50	1,935.69	3.53	0.71	10.41	0.05
B737	562.38	1,771.49	5.43	0.33	6.33	0.04
B738	648.62	2,043.14	4.50	0.24	8.63	0.06
B739	675.34	2,127.31	4.36	0.22	9.53	0.06
BE1900	8.57	26.89	11.00	0.21	0.01	-
C402	22.26	69.69	21.37	0.03	0.05	-
DHC-6	42.44	133.60	21.46	0.43	0.22	-
E120	213.72	673.21	2.63	0.22	2.11	0.01
E145	213.72	673.21	1.95	0.31	2.58	0.01
E190	446.34	1,405.97	5.33	0.53	4.93	0.03

Table 1. Average consumption and emissions of aircraft in PLS up to 3,000 feet (arrival + departure, in kg)

Sources: ALG Analysis and EEA/EMEP LTO Cycle emissions calculator

The total emissions of aircraft are obtained multiplying the emissions of the aircraft by the number of annual operations and divided by two (to calculate an average between take-off and landing, since only one of them takes place in PLS on each flight) and the results are presented in the following table.

Consumption / Emission (Tonnes)	2019	2053
	LTO Total	LTO Total
Jet Fuel	7,557.5	12,504.8
CO ₂	23,805.4	39,388.9
CO	119.6	197.8
HC	4.9	8.2
NO _x	98.7	163.4
PM _{total}	0.6	1.0

Table 2. Fuel consumption / annual emissions (in tonnes)

Sources: ALG Analysis and EEA/EMEP LTO Cycle emissions calculator

It should be considered that the results presented are a baseline scenario in which no additional emission reduction measures are taken.

Emissions from external vehicles

Due to lack of data, only external vehicles emissions have been calculated for this iteration of the report. These emissions are expected to be calculated during the next iteration of the assessment.

As for the gases emitted by external vehicles, CO₂ emissions have been estimated based on the following assumptions:

1. Number of annual vehicles for 2021 and 2053 obtained from the surface access capacity-demand analysis included in the Draft Indicative Development Plan.
2. Average CO₂ emission per passenger and kilometre of 0.133kg for medium size cars and 0.069kg for minibuses (Sources: UK Department of Environment - DEFRA).
3. To consider that in 2053 the technological and innovation situation in the automobile sector will have advanced resulting in an increase in efficiency and therefore less emissions. To that end, it has been assumed a 10% reduction of the emissions factor for 2053.
4. 18km per trip.
5. 2.5 passengers in private vehicles and taxis, 1.5 in employee vehicles, 20 in buses.

Vehicle typology	Tonnes CO ₂ 2021	Tonnes CO ₂ 2053
Passenger vehicles	1,637	3,259
Taxis	234	466
Buses	243	483
Staff vehicles	0	0
Total	2,113	4,208

Table 3. Annual CO₂ emissions from external vehicles
Sources: ALG Analysis

Finally, the inventory of total CO₂ emissions from PLS results in a total of 25.9k tonnes emitted in 2021 and 43.6k tonnes in 2053.

Category	Tonnes CO ₂ 2021	Tonnes CO ₂ 2053
Aircraft LTO cycle	23,805.43	39,388.92
Surface Access Vehicles	2,113.18	4,208.14
Total	25,918.61	43,597.07

Table 4. Total annual CO₂ emissions
Sources: ALG Analysis

It is important to highlight that these calculations are carried out considering the current technology in the different airport and automobile sectors and with the current energy sources whose origin is fossil fuels. In this regard, both the policies of the Government and the operators tend to minimize the impact on climate change with the use of renewable energy.