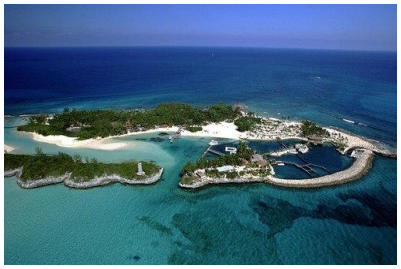
Feasibility studies for the rehabilitation of a selection of Bahamian airports

Draft Cost-benefit analysis






ALG TRANSPORTATION INFRASTRUCTURE & LOGISTICS

September 2016

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1 Context of the project

The economy of the Bahamas is mainly driven by tourism. Based on 2014 figures, the tourism sector generates 51,000 direct jobs (equivalent to 27% of the total jobs) and an estimated additional of 98,000 indirect jobs[1] (52%).The country's economy has experienced a slight improvement after the worldwide financial crisis in 2008 and the local recession that ensued in 2009 and 2010. The nation has one of the highest incomes per capita in the Caribbean, and its national GDP has grown at an average rate of 1.5% *per annum* since the end of the recession. In general terms, The Bahamas' GDP grows following the trends of the US, its main trade partner and driver of the tourism sector of the Bahamas. In the present, the dollar of the Bahamas is officially pegged with the US Dollar.

For the past lustrum, the country has been able to attract and sustain significant tourist developments such as the Atlantis Resort, Sandals and Melia in Nassau, Club Med in San Salvador and Aquatic Park in Paradise Island, and is currently undergoing the construction of the USD 2.6 billion Baha Mar Cable Beach Redevelopment Project. This facility expects to accommodate hotel brands such as Morgans, Rosewood and Hyatt in the coming years.

In line with the mentioned tourism development plans, the Government of the Bahamas has kicked off important transportation related infrastructure projects, including the redevelopment of the country's main international airport (Nassau LPIA); the deepening of the Nassau Harbour (which is now capable to accommodate the world's largest passenger vessel), and the creation of a new industrial port outside downtown Nassau.

From an air transport perspective, The Bahamas has carried out significant reforms within the air transport institutional framework, championed by the Ministry of Transports and Aviation (MOTA) in collaboration with the IDB. Over the past five years, the MOTA has promoted the separation of regulatory functions from the service provision functions; has created a new Airports Authority and has formulated a strategic optimization of the national airport network in order to rationalize the utilization of resources.

Consequently, The Bahamas has improved the overall level of compliance of the air transport sector with the International Civil Aviation Organization (ICAO) Standards and Recommended Practices (SARPs). The country's scoring at the last Universal Safety Oversight Audit Programme (USOAP) carried out in 2015 was close to the global average in most of the audited areas. Nevertheless, the lowest scoring was related to Aerodromes (20% of effective implementation) stating the challenges faced by the MOTA to implement SARPs both in airport infrastructure and airport operations.

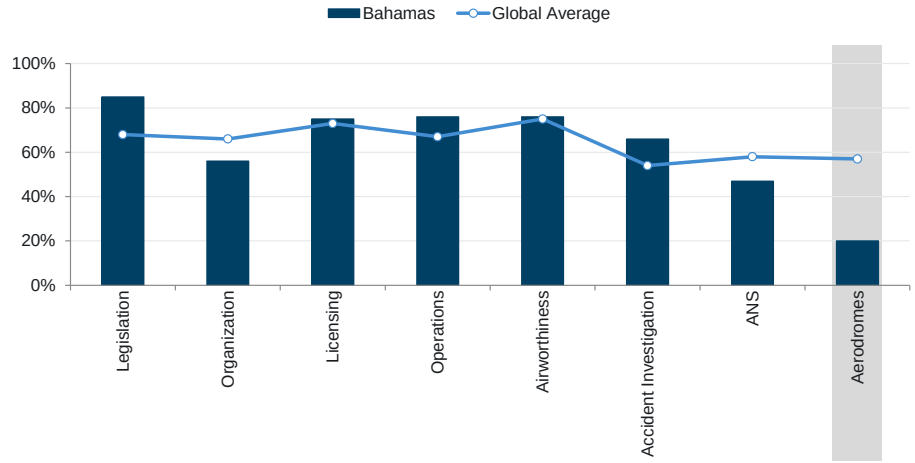

Figure 1: Overall Effective Implementation (% EI) in Bahamas vs. Global Average

SOURCE: ICAO-USOAP CAM 2009 – 2015

Improving the levels of safety in the Family Islands airports is particularly challenging due to the large number of small airports required to serve the scattered population in the archipelago. In this regard, it is of paramount importance to ensure that the commercial airports in the Islands comply with the ICAO standards.

[1] *Source: World Travel and Tourism Council*

In the development of the air transport sector, the IDB should be committed with the full compliance of ICAO's standards and recommended practices with respect to the airport infrastructure. Any development of the airport network could not overlook the required infrastructure that has to be in place according to the requirement set forth on ICAO's Annexes 14 and 17.

2 Definition of objectives

A Cost Benefit Analysis (CBA) has been conducted with the objective of measuring the social impact that the *"Feasibility studies for the rehabilitation of a selection of Bahamian airports" project* will have on The Bahamas in general and on the local economy in particular.

The economy of the Bahamas is heavily dependent on its tourism sector. In order to maintain tourism as a cornerstone of the nation's growth, the Ministry of Transports and Aviation (MOTA), in cooperation with the Ministry of Finance and the ministry of Works and Urban Development, has taken the initiative to assess the financial feasibility for the upgrade and expansion of the airports of the Family Islands.

The present study has been sponsored by the IDB and has evaluated the level of investments required in 14 airports across the Family Islands. It has analysed potential combinations of profitable and non-profitable airports in order to identify the bundling option that is most financially-sound to support the Government's development plans. As an outcome of the feasibility assessment, a group of four airports has been selected: Marsh Harbour, Treasure Cay, Exuma and North Eleuthera airports (Marsh Harbour, Exuma and North Eleuthera are the busiest airports of the Family Islands). For the purpose of this CBA, Marsh Harbour and Treasure Cay airports will be considered together as an airport system, given its proximity (both of them are located in Abaco Island at a distance of 45 kilometres from each other), complementary capabilities and potential cost efficiencies.

Figure 2: Maps for Abaco, Exuma and Eleuthera and Harbour Islands

The required investments at the airports have been categorized into three groups:

1) Upgrading of airfield infrastructure to comply with ICAO's (International Civil Aviation Organization) SARPs
2) Expansion projects of both airfield and terminal facilities to meet with the current and future traffic demand
3) Recurrent investments required to maintain the facilities up to standards throughout the period

The identified investments will not only enhance the current levels of safety and security at the airports (benefiting all their users), but will also stimulate tourism growth by facilitating the development of the prime economic sector of The Bahamas and boosting the general economic development of the Bahamas. The immediate benefit expected from the proposed investment programme is the upgrade of the airport infrastructure to comply with international safety and security regulations, which Family Island airports fail to meet as of today. If SARPs are not adopted at these airports, they will not be eligible for the certification granted by the Civil Aviation Authority of the Bahamas, failing to provide solid operational guarantees to airlines. A prolongation of this situation could lead to the suspension of flights, causing a large impact on the national economy. Thus, the main objectives of the project are to enhance safety and security levels at Family Island airports, maintain those standards and enable traffic growth.

Bearing in mind the objectives of the project, the present document reviews the scenarios, assumptions and methodological approach that were followed to assess the socio-economic impact of the project.

3 Project financials (summary)

This chapter summarizes the financial results of the project, which are detailed in the "Feasibility studies for the rehabilitation of a selection of Bahamian airports – Final report" document. The assumed evaluation period is of 25 years (between 2017 and 2042), in line with the minimum expected lifetime of the main assets to be built within the project's scope.

The project cash-flow takes into account earnings from operation and capital expenditures, adjusted with working capital and interest perceived as financial income from debt service reserve account. The project cash flow is adjusted with annual reviews of working capital and operational financial income.

Short term capital expenditures account for USD 49.7 M (in real terms, base year 2016), as it is shown in the following table.

Required investments[2]	Cost ('000 USD)	Sub-total ('000 USD)
New terminal building in ELH	16,690	**33,500**
Security and firefighting facilities in ELH	1,880	
Runway repavement in ELH	3,690	
New apron and taxiways in ELH	5,440	
Other ICAO compliances in ELH: Drainage well, RESAs, turn pads, markings, apron floodlighting and lighting repairs	600	
ICAO compliances in GGT: RESAs, turn pads, markings, windsock, apron floodlighting, push-back vehicle and jet blast deflector	840	
ICAO compliances in MHH: New aerodrome beacon, obstacle hazard lights and correct runway overlay transition	105	
ICAO compliances in TCB: RESAs, turn pads, markings, windsock, clearing of tress and vegetation, lighting repairs	445	
Security fence in TCB	1,040	
Pavement reconstruction in GGT	2,795	
New terminal building, security fence and firefighting facilities in GGT	15,750	**16,200**
Other developments in the selected airports	425	

Figure 3: Short-term investments (Real base year 2016, '000 USD)

SOURCE: ALG

Total capital expenditure required throughout the 25-year period adds up to USD 89.6 M (in real terms, base year 2016) which translates into USD 109.8 M in nominal terms: USD 45.8 M correspond to North Eleuthera Airport (42%), USD 34.2 M to Exuma Airport (31%) and USD 29.8 M to Marsh Harbour and Treasure Cay Airports (27%).

For consistency purposes, all figures in the following chapters are expressed in nominal terms.

[2] Investments' categories presented in Figure 3 have been consolidated differently compared to investments' categories presented in the "Final report" pages 75 to 78 (i.e. terminal building concept includes its associated Project Management costs)

3.1 Marsh Harbour and Treasure Cay Airports

The operation of the Marsh Harbour/Treasure Cay Airport system is expected to provide 44% average EBITDA margin throughout the 25-year period, evolving from USD 1.4 M in 2018 (first full year of operations) to USD 7.6 M in 2041 (last full year of operations). Annual operating margins are expected to grow gradually throughout the 25-year period in line with the expected traffic evolution. The total EBITDA generated between 2017 and 2042 accounts for USD 95.4 M.

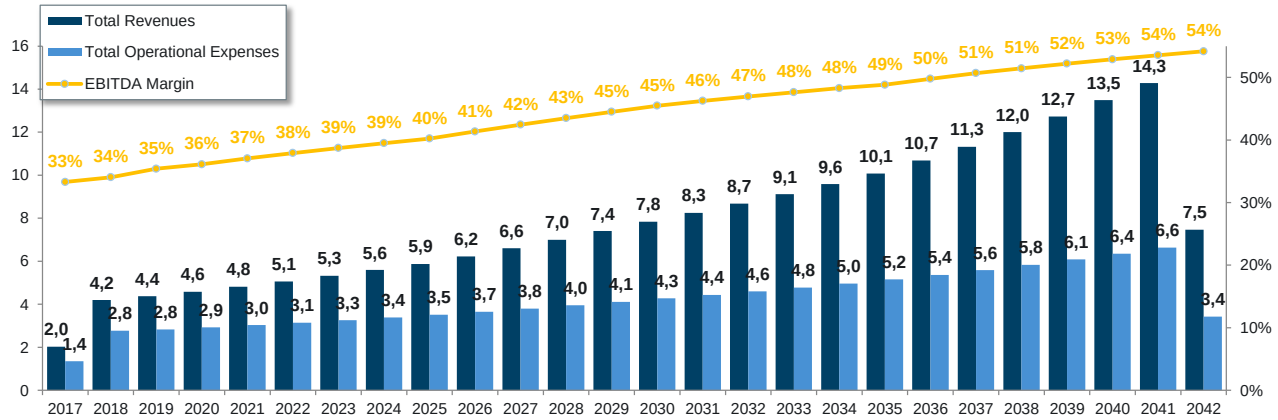

Figure 4: Revenues, Opex & EBITDA margin of the project at MHH & TCB 2017-2042 (in nominal USD M)

NOTE: IT HAS BEEN ASSUMED THAT THE FIRST AND LAST YEAR (2017 AND 2042) ACCOUNT FOR 6 MONTHS EACH.
SOURCE: ALG

The project cash flow throughout the period remains mainly positive. Apart from the initial cash-out in 2017, only in 2024 and 2029 the annual cash flow goes down to negative figures due to major recurrent capital expenditures.

Figure 5: Project Cash Flow before Taxes at MHH and TCB 2017-2042 (in nominal USD millions)

NOTE: SET-UP COSTS OF C. 1 USD M IN 2017 ADDED TO CAPITAL EXPENDITURES PRESENTED IN FIGURE 2
SOURCE: ALG

Given the low level of initial investment required at Marsh Harbour and Treasure Cay Airports and its positive operating margin, the Internal Rate of Return (IRR) of the project cash flow is of 55.80% and the return period for the initial investment is of just two years.

3.2 Exuma Airport

The operation of Exuma Airport is expected to provide 38% average EBITDA margin throughout the period, evolving from USD 0.8 M in 2018 to USD 3.4 M in 2041. Operating margins are expected to fall in 2019 due to an expected increase in operating expenses when the new terminal building facilities enter into service: The new terminal facilities of the airport are expected to enhance commercial revenues but will also require higher operating costs. Operating margins are expected to grow gradually after 2019, once the projected

developments in Exuma Airport are completed. The total EBITDA generated between 2017 and 2042 accounts for USD 40.1 M.

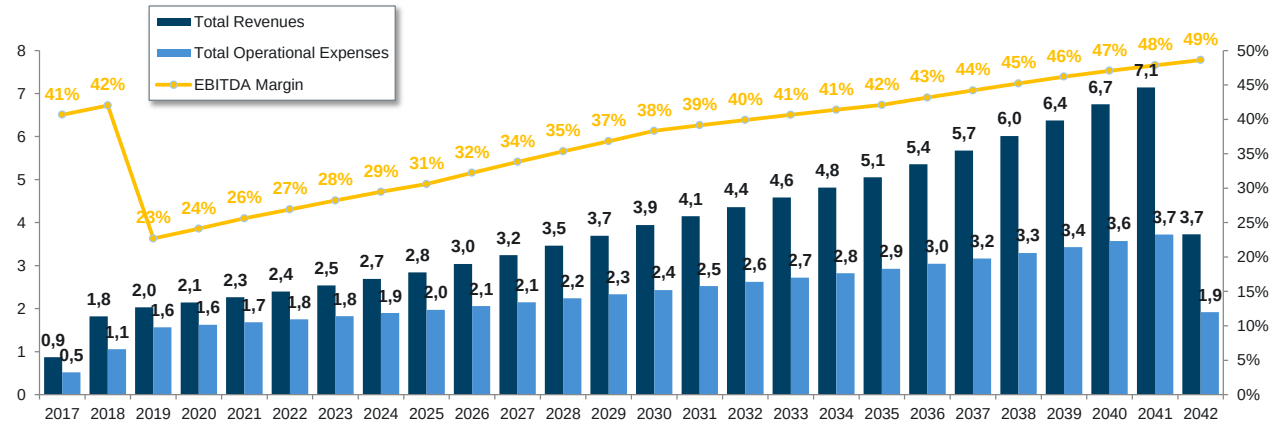

Figure 6: Revenues, Opex & EBITDA margin of the project at GGT 2017-2042 (in nominal USD millions)

NOTE: IT HAS BEEN ASSUMED THAT THE FIRST AND LAST YEAR (2017 AND 2042) ACCOUNT FOR 6 MONTHS EACH.
SOURCE: ALG

The cash flow throughout the period remains mainly positive. Apart from the initial cash-out period, only the 3 years with major recurrent investments (2024, 2028 and 2038) cause the airport's cash flow to go down to negative figures.

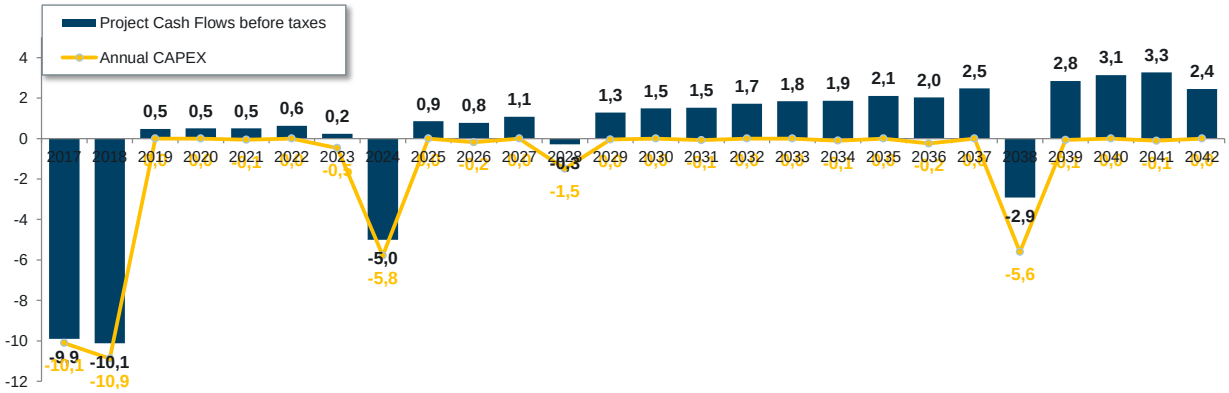

Figure 7: Project Cash Flow before Taxes at GGT 2017-2042 (in nominal USD millions)

NOTE: SET-UP COSTS OF C. USD 1 M IN 2017 ADDED TO CAPITAL EXPENDITURES PRESENTED IN FIGURE 2
SOURCE: ALG

Based on these results, the Internal Rate of Return (IRR) of the project cash flow at Exuma Airport is of 1.2%, and the return period for the initial investment is estimated to be 23 years.

3.3 North Eleuthera Airport

The operation of North Eleuthera Airport is expected to provide 25% average EBITDA margin throughout the period, increasing from 0.4 USD M in 2018 to USD 1.8 M in 2041in the next 25 years. Operating margins are expected to fall in 2019 due an expected jump in the airport's operating expenses once the new terminal building facilities enter into service. After that year, operating margins are expected to grow gradually (as it also is projected at Exuma Airport). The total EBITDA generated between 2017 and 2042 is of USD 19.3 M.

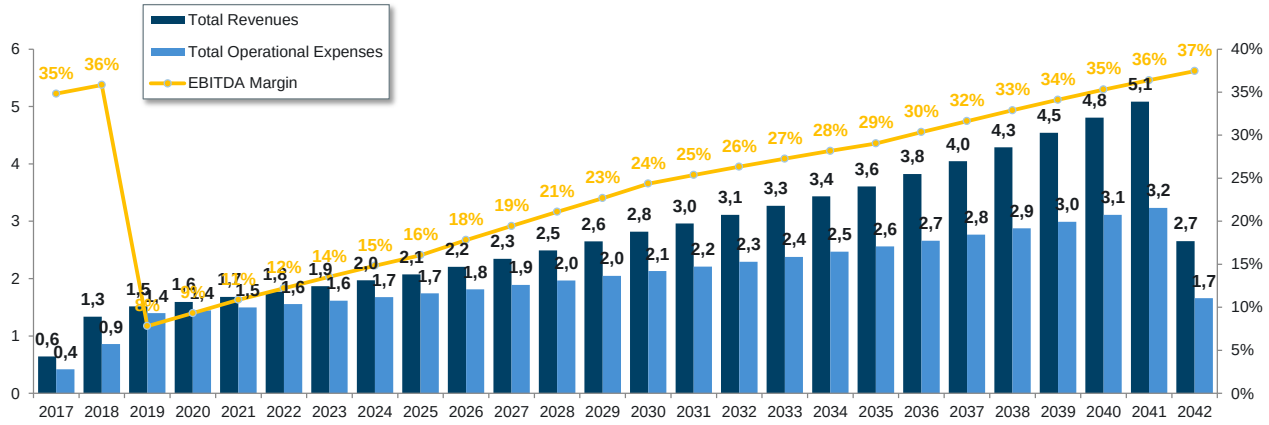

Figure 8: Revenues, Opex & EBITDA margin of the project at ELH 2017-2042 (in nominal USD millions)

NOTE: IT HAS BEEN ASSUMED THAT THE FIRST AND LAST YEAR (2017 AND 2042) ACCOUNT FOR 6 MONTHS EACH.
SOURCE: ALG

The cash flow throughout the period remains mainly positive. A similar evolution to that of Exuma Airport is observerd, with only 5 years of negative cash flow throughout the period, caused by recurrent investments.

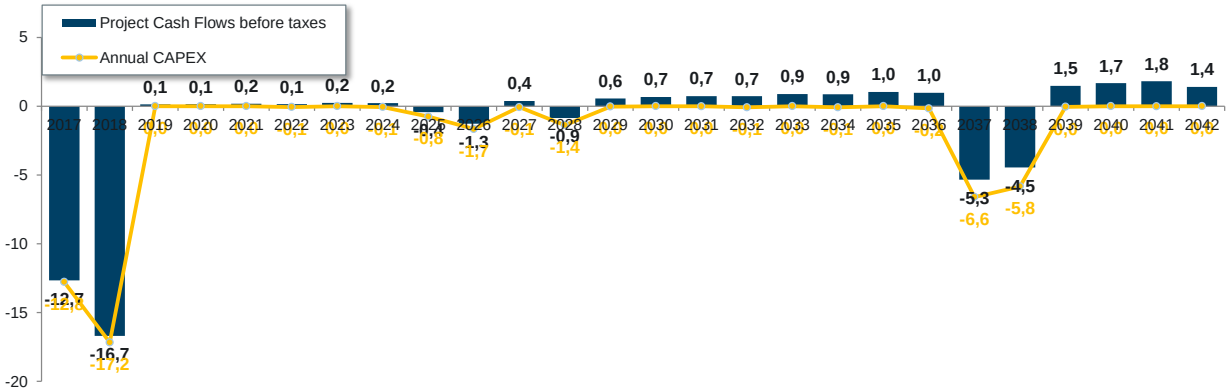

Figure 9: Project Cash Flow before Taxes at ELH 2017-2042 (in nominal USD millions)

NOTE: SET-UP COSTS OF C. 1 USD M IN 2017 ADDED TO CAPITAL EXPENDITURES PRESENTED IN FIGURE 2
SOURCE: ALG

However, due to the high level of investment required in the short-term, the Internal Rate of Return (IRR) of the project cash flow is -11.1%.

4 Methodological approach

4.1 Cost Benefit Analysis methodology

The methodology used in this CBA is based on the guidelines established by the *"Guide to cost benefit analysis of investment projects*" document published by the European Commission (2014 version). The document outlines the basic methodological principles to determine the economic advantages and disadvantages of an investment in order to assess the welfare change attributable to it. In line with the best practices recommended by the mentioned methodological guide, the following steps have been taken prior to the development of the cost-benefit analysis:

1. Analysis of the socio-economic context of the country
2. Market assessment, evaluation of potential traffic growth scenarios and definition of a development requirement for the most feasible scenarios
3. Project identification, including: infrastructure development, expansion works, operating costs and maintenance programme
4. Detailed funding needed to execute the works that are required
5. Financial analysis for the project

Once the project financials have been identified, the CBA can be carried out following a four-step methodology:

1. Definition of possible socio-economic scenarios driven by the implementation of the project
2. Identification of social benefits and beneficiaries generated by the project
3. Calculation of the socio-economic return of the project
4. Sensitivity analysis of the main drivers of the socio-economic model

4.2 Definition of the evaluated scenarios

Two **scenarios** are compared in the cost-benefit analysis:

- **"Without project" scenario**: this scenario considers capacity constraints and foresees demand spill-overs if the current facilities in the selected airports are not expanded to cope with the expected demand growth. In this scenario, demand would be constrained and the forecasted growth would not be fully achieved. In such case:
    - Marginal outbound traffic would be forced to look for alternative means of transport such as maritime routes to near-by islands or alternative airports in the island, thus increasing travel times in a significant proportion
    - A share of the marginal inbound traffic will also be forced to look for alternative means of transport that would significantly increase travel times. The rest of the marginal inbound traffic would not consider alternative means of transport to reach Family Islands and would instead choose another destination that can be reached directly by air transport within an equivalent trip distance and travel time
- **"With project" scenario:** The main objective of the project is to tackle all safety and security deficiencies in the four airports and the expansion of the airport facilities to cope with the expected growth in air transport demand. The "With project" scenario assumes an unconstrained evolution of traffic demand in line with the traffic forecast for the selected airports.

  Furthermore, the "With project" scenario entails the correction of all safety deficiencies in the selected airports and their full compliance with ICAO SARPs. Improving the level of safety in the Family Islands Airports is a critical objective promoted from the Government of Bahamas. Even if the economic benefits of enhancing airport safety are not quantified, it is of paramount importance for the social development of the Islands and it is a key enabler of the economic growth.

4.3 Identification of beneficiaries

The main identified benefits associated to the project are:

- **Time savings:** the project will allow the achievement of time savings that would not be possible if current facilities are not expanded, as traffic demand will not have constraints with the construction of the new airport facilities
- Local expenditure generated by the marginal increase of **tourism**, which is in turn enabled by the airport expansions (indirect impact)

Based on the previous, the social **stakeholders** that would benefit the most from the project are:

- **Domestic and international passengers (marginal demand)**, who would benefit from increased capacity and unconstrained traffic growth through time-savings (both domestic and international)
- **Local population** of the selected islands, who would benefit from the economic activity enabled by the project (employment and local consumption made by those tourists who would otherwise choose not come to the Island if the proposed developments were not materialized)
- **The country as a whole**, who would benefit from the contributions to the public treasury made by the tourism sector as a result of the implementation of the project (fiscal contribution of tourists who would not choose The Bahamas as a destination if the proposed airport developments were not to be carried out)

Potential reductions of environmental externalities have not been considered for the CBA (conservative assumption). Alternative means of transport are likely to increase the environmental impact, while the proposed airport developments are not expected to create additional environmental costs.

Moreover, other benefits with minor impact (*i.e.* marginal benefits obtained from additional airport activity) or other social benefits of a more qualitative nature (*i.e.* contribution to the improvement of local workforce skills) have not been taken into account.

Finally, an Environmental and Social (EandS) management programme is expected to be put in place as a result of the project, which would further reduce any potential environmental externalities. For further information, please refer to the project's EandS report.

4.4 Main assumptions used to calculate the socio-economic return

The following assumptions have been considered for the evaluation:

- **Airport capacity constraints:** socio-economic benefits have been considered for the passengers (demand), specifically enabled by the "With project" scenario. North Eleuthera and Exuma airports are currently at capacity while Marsh Harbour is expected to reach saturation level in the mid-term. It has been assumed that once demand in each airport reaches saturation[3], it will start affecting demand growth as follows:
    - During the first 5 years after reaching saturation, demand will continue to grow unconstrained. This assumes that airlines could adapt to the new situation by trying to operate off-peak periods
    - Between years 5 and 15 after saturation, traffic would start to be affected by the saturation of the facilities (constrained traffic growth) and traffic growth rates will become 50% lower than the ones that are expected if the proposed airport expansions are carried out
    - Finally, after 15 years, it is considered that traffic will not be able to continue growing

  The marginal demand (number of passengers) that would be unable to reach their destination in the Family Islands through the selected airports due to lack of airport capacity has been estimated based on the aforementioned assumptions. It has then been divided into two categories, depending on the passenger's choice (*i.e.* those who decide to travel to the same destination by other means of transport by increasing their journey times and those who choose not to travel to the Family Islands).

[3] Please refer to the capacity-demand analysis for further information

- **Enabled tourism**. Constrained demand growth in the "Without project" scenario would leave a number of unattended potential passengers, forcing them to look for alternative means of transportation to the selected islands or to alternative destinations. Therefore, a de-stimulation of inbound traffic (tourism) growth must be considered. The sensitivity analysis of tourism de-stimulation due to airport saturation and increased travel times follows a double approach:
    - *Supply-demand assessment:* Family Island airports are now competing with other destinations within an average of 1.25 hours of travel time to attract U.S tourism. Once airports reach saturation levels, inbound traffic will have to make use of secondary airports in the same islands (an option that is only available in North Eleuthera) or use maritime transportation (via Nassau). This situation will increase the average travel times significantly (from 3 to 8 hours, depending on the airport). Given the increased time range, Family Islands would have to compete with all other comparable tourism destinations in the Caribbean, such as: Barbados, Santa Lucia, Dominica, Virgin Islands, Aruba and Martinique, among others. Applying market share distribution to the expected increase of supply, international direct traffic to the Family Islands could be reduced by 85%.
    - *IATA analysis on demand stimulation due to new direct routes:* IATA's research on traffic stimulation effects shows that for origin-destination pairs accounting for 60,000 to 80,000 annual passengers, demand is stimulated around 40% when a direct route is created. Therefore, the same de-stimulation can be expected when airports reach saturation and marginal demand cannot be transported by direct routes. Moreover, this de-stimulation could be higher bearing in mind that IATA does not consider changes in mode of transport such as transitioning from plane to boat (which would be necessary in this case).

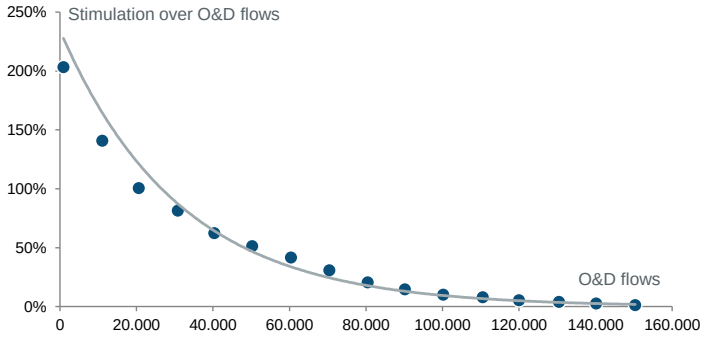

Figure 10: Traffic stimulation expected when a new route is created (percentage)

NOTE: STIMULATION STUDY DONE BY IATA BY USING A BENCHMARK OF ROUTES CREATED IN DIFFERENT MARKETS
SOURCE: IATA

Based on these analyses and following a conservative approach, the CBA has therefore assumed that:

- At least 30% of the marginal inbound international traffic would not come to Abaco and Exuma Islands once Exuma and Marsh Harbour airports reach saturation.
- At least 5% of the marginal inbound international traffic in North Eleuthera would be lost if passengers are forced to travel to the secondary airport of the Island (Governor's Harbour) and then transported by taxi to their final destination in the north of the Island.

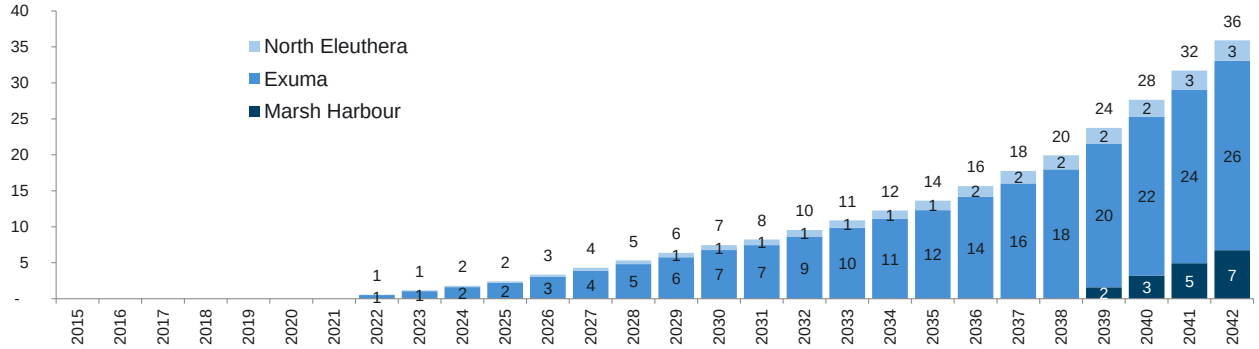

Figure 11: Tourism enabled by airport expansion (000' pax)

SOURCE: ALG

- **Increasing journey times:** Based on the previous assumption where 30% of the marginal inbound traffic in Marsh Harbour Airport and Exuma Airport and 5% in North Eleuthera would not materialize in the "Without project" scenario, the remaining marginal inbound traffic will have to look for alternative means of transport. It has also been considered that 100% of the domestic and international outbound traffic will also look for alternative means of transport (conservative approach). The volume of demand impacted by the increasing journey times at each airport is illustrated below.

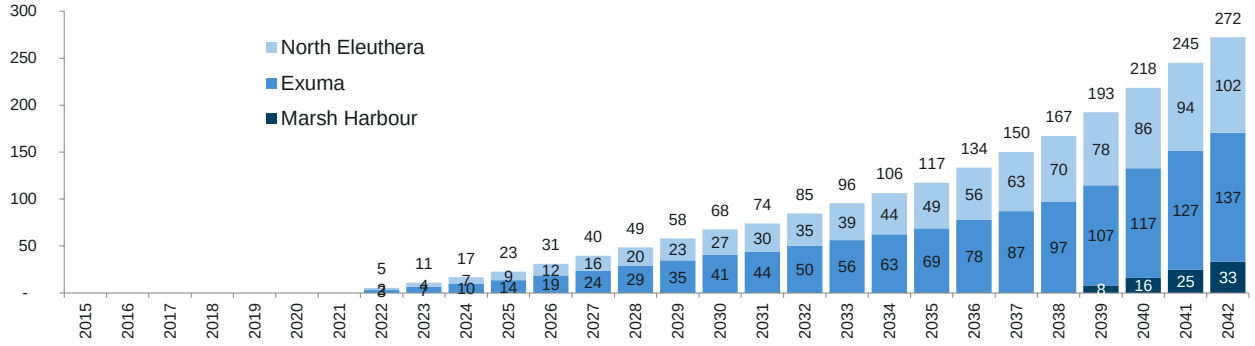

Figure 12: Demand affected by increasing journey times (000' pax)

SOURCE: ALG

Expected travel times without using the selected airports have been estimated based on the best alternative identified for each one of the airports:

- For Marsh Harbour Airport and Exuma Airport, the alternative mean of transport would be to travel by boat to Nassau. From Nassau, international passengers would have to go to the airport to proceed with their flights.
- For North Eleuthera Airport, passengers would lose the possibility to travel directly once the airport saturates. Instead, they would have to fly from Nassau to Governor's Harbour Airport and take a road transport to the north of the Island from there. International passengers would also incur in additional trip times when connecting through Nassau to take the flight to Governor's Harbour Airport.

Marsh Harbour		Exuma		North Eleuthera	
DOM	**INT**	**DOM**	**INT**	**DOM**	**INT**
3.4 h	7.4 h	4.6 h	8.6 h	0.7 h	2.9 h

Figure 13: Increased trip times (hours)

SOURCE: ALG

- **Value of time** (**VT**). There is a cost associated to the additional time that these passengers will consume to reach the selected Family Islands' destinations. Thus, the "With Project" scenario considers the time-saving created through airport expansions as a socio-economic benefit. The value of the saved time has been adopted assumed based on hourly gross domestic product per capita in the US and in The Bahamas.
  - 4.1 USD/h for outbound international traffic
  - 8.8 USD/h for inbound international traffic
  - 8.1 USD/h for weighted average domestic traffic

The time savings are calculated as: $(t_2 - t_1) * VT$

Where:

- VT is the opportunity cost per passenger of the extra time used in a journey which users could dedicate to other socio-economic activities.

- The differential $(t_2 - t_1)$ is the additional time employed in all passenger journeys as identified in the table above.

- **Tourism contribution to public treasury via VAT:** Calculations are based on the average expenditure per visitor in The Bahamas, estimated at 2,000 USD per stay[4], including taxes. These expenditures are considered to be mainly related to hotel accommodation and food and beverage. Out of this expenditure, 7.5% represents a contribution to the public treasury of the Bahamas through VAT.

- **Tourism contribution to local economy:** The net expenditure per visitor in hotels and restaurants can be divided into operating costs associated to delivering the hospitality services and operating profits. Operating costs in the North American hospitality sector represent around 73%[5] of sales, while operating costs in restaurants/Food and Beverage establishments account for 80% of sales. Applying such typical industry margins to the average expenditure per visitor in The Bahamas, hotels and restaurants spend around 1,389 USD per guest to deliver their services. These operating costs can be further broken down into[6]:

  - Labour costs: 30 to 45%
  - Inventory: 20 to 40%
  - Utilities: 5 to 10%
  - Marketing and sales: 5 to 10%
  - IT: 5 to 10%

  Of the previous operating cost categories, labour is considered to be the net contributor to the local economy, bearing in mind that most of the workforce employed in Family Islands are Bahamians (and local residents). Utilities are also considered to contribute to the local economy as they are provided locally. Regarding the other cost streams, supplies for inventory are not considered as major socio-economic benefit generators as most of consumable goods in the Bahamas are imported. Marketing and IT costs are also not considered as main economic benefit generators, as they can be borne in hotel companies' headquarters, and not necessarily in The Bahamas. Out of these three cost categories, only 20% of their value is considered as a contribution to the local economy.

  Based on the previous, an average 53% of hotels and restaurants' operating costs are therefore considered as socio-economic benefits driven by tourism expenditure in Family Islands, which in average represents 733 USD per visitor (37% of the 2,000 USD average spend per visitor VAT included). This contribution only applies to the restrained inbound tourism traffic that would only reach the Family Islands' destinations with the materialization of the project.

4 Source: Ministry of Tourism - Average expenditure per visitor during their vacations in The Bahamas, excluding cruise tourists
5 Source: Stern NY university faculty research program 2016
6 Indra Business Consulting (ALG's parent company) Tourism and Leisure benchmark 2015

5 Outcomes of the Cost Benefit Analysis

The total socio-economic benefit of the project is calculated as the sum of contributions for the different beneficiaries identified in the "With project" scenario, as opposed to the "Without project" one:

- Time saving benefits
- The tourism sector's contribution to the public treasury via VAT
- The tourism sector's contribution to the local economy

5.1 Marsh Harbour and Treasure Cay Airports

The graph below shows the total socio-economic benefits by adding up the three main benefits for the Marsh Harbour Airport and Treasure Cay Airport System.

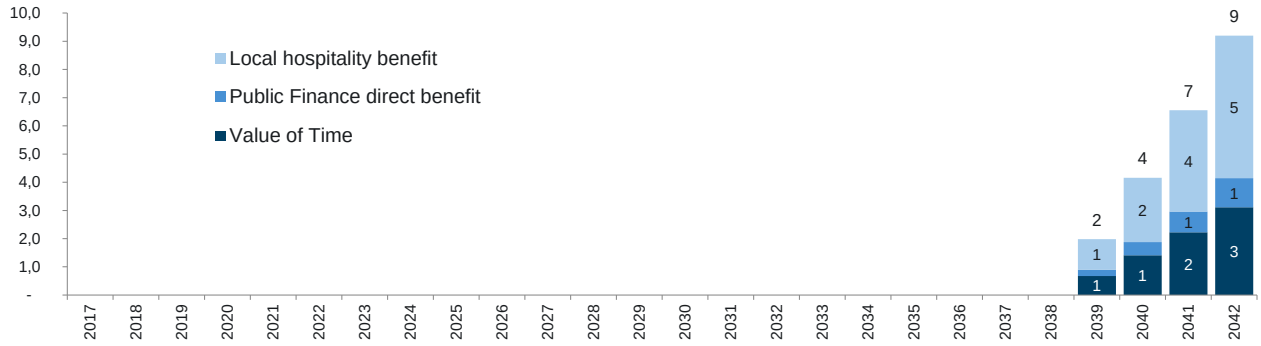

Figure 14: Socio-economic benefits of the project at MHH and TCB 2017-2042 (in nominal USD millions)

NOTE: THE DETAILED SOCIO-ECONOMIC BENEFIT CALCULATIONS FOR EACH AIRPORT AND TYPE OF BENEFIT CAN BE SEEN IN ANNEX 1.
SOURCE: ALG

The socio-economic cash flow is obtained by adding the social benefits to the cash flow of the project, as it is shown below (this figure can be obtained by adding up Figure 5 and Figure 14).

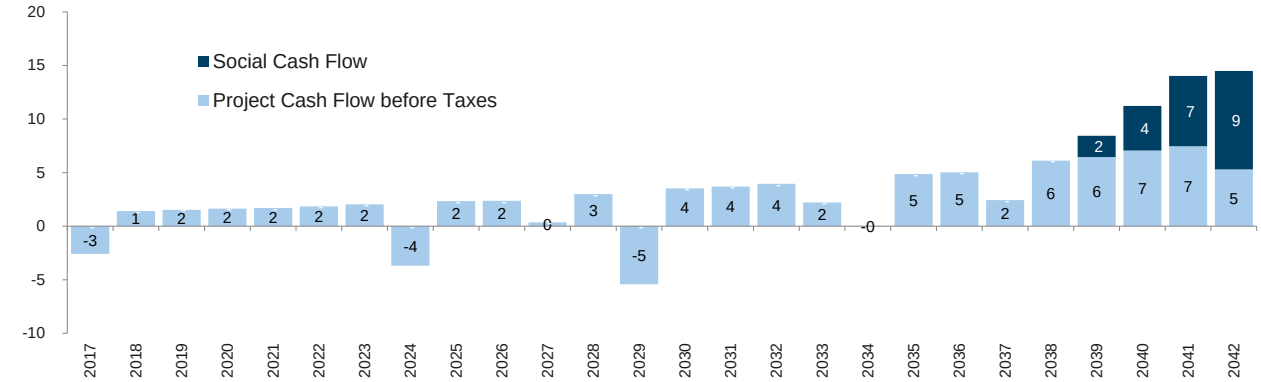

Figure 15: Socio-economic cash-flow of the project at MHH and TCB 2017-2042 (in nominal USD millions)

SOURCE: ALG

The accumulated socio-economic cash flow for the project is positive during the second year, with an Economic Return Rate (ERR) of 55.81 %. Economic Net Present Value (ENPV) discounted at the social discount rate of 12.0% (recommended by the IDB) is of USD 10.6 M. Socio-economic returns for the project are illustrated below.

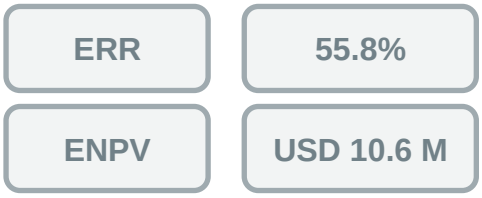

Figure 16: ERR and ENPV of the project at MHH and TCB (percentage, USD M)

SOURCE: ALG

Sensitivity analysis

The sensitivity analysis measures the variations on ERR and ENPV taking into account:

- A variation of +/- 20% in traffic; and
- A variation of +/- 20% in capital expenditures

The results of the sensitivity analysis are summarized in the tables below.

		Capex				
		-20%	-10%	0%	10%	20%
Traffic	20%	116,8%	106,1%	97,1%	89,3%	82,5%
	10%	91,1%	82,9%	75,9%	69,7%	64,1%
	0%	67,8%	61,5%	55,8%	50,7%	45,9%
	-10%	45,7%	40,5%	35,7%	31,2%	26,8%
	-20%	24,6%	20,6%	17,1%	14,1%	11,5%

		Capex				
		-20%	-10%	0%	10%	20%
Traffic	20%	20,2	19,4	18,5	17,7	16,9
	10%	16,3	15,5	14,6	13,8	13,0
	0%	12,3	11,5	10,6	9,8	9,0
	-10%	7,1	6,2	5,4	4,6	3,8
	-20%	3,1	2,3	1,5	0,7	-0,2

Figure 17: Sensitivity analysis of ERR (left) and ENPV (right) of the project at MHH and TCB (percentage, USD M)

SOURCE: ALG

Provided the range of sensitivities that were assessed, the positive socio-economic impact of the project at Marsh Harbour and Treasure Cay Airport system is not diminished in any case.

5.2 Exuma Airport

The graph below shows the total socio-economic benefits by adding up the three main benefits for Exuma Airport. The detailed socio-economic benefit for each airport and type of benefit can be seen in Annex 1.

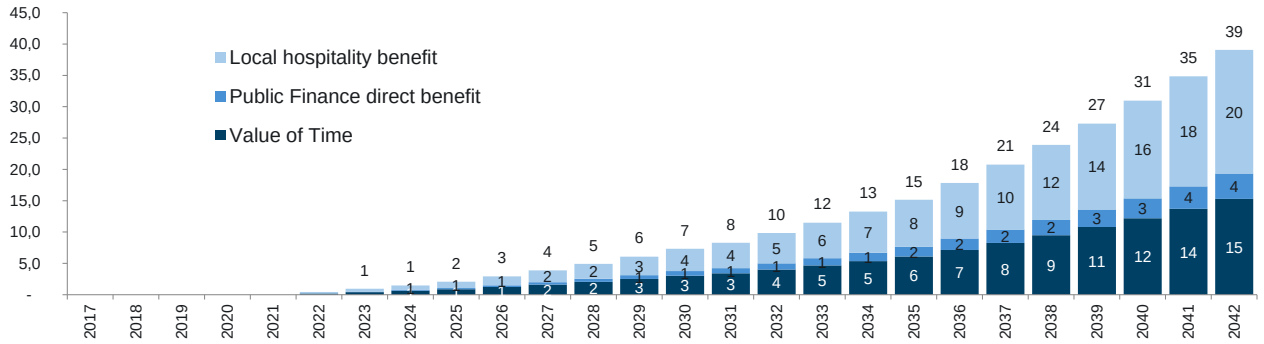

Figure 18: Socio-economic benefits of the project at GGT 2017-2042 (in nominal USD millions)

NOTE: THE DETAILED SOCIO-ECONOMIC BENEFIT CALCULATIONS FOR EACH AIRPORT AND TYPE OF BENEFIT CAN BE SEEN IN ANNEX 1.

SOURCE: ALG

The socio-economic cash flow is obtained by adding the social benefits to the cash flow of the project, as shown below (this figure can be obtained by adding up Figure 7 and Figure 18).

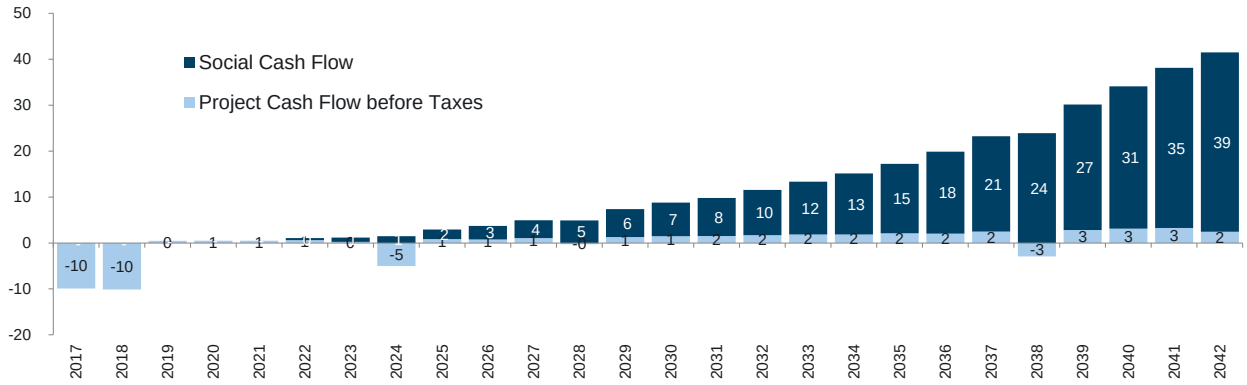

Figure 19: Socio-economic cash-flow of the project at GGT 2017-2042 (in nominal USD millions)

SOURCE: ALG

The accumulated socio-economic cash flow for the project becomes positive after the twelfth year of the project, with an Economic Return Rate (ERR) of 16.9 %. The Economic Net Present Value (ENPV) discounted at the social discount rate of 12.0% (recommended by the IDB) is of USD 16.5 millions. Socio-economic returns for the project are illustrated below.

ERR	16.9%
ENPV	USD 16.5 M

Figure 20: ERR and ENPV of the project at GGT (percentage, USD millions)

SOURCE: ALG

Sensitivity analysis

The sensitivity analysis measures the variations on ERR and ENPV taking into account:

- A variation of +/- 20% in traffic; and
- A variation of +/- 20% in capital expenditure

The results of the sensitivity analysis are summarized in the tables below.

		Capex				
		-20%	-10%	0%	10%	20%
Traffic	20%	21,3%	20,1%	19,1%	18,2%	17,4%
	10%	20,1%	19,0%	18,0%	17,2%	16,4%
	0%	18,9%	17,8%	16,9%	16,1%	15,3%
	-10%	15,0%	14,1%	13,3%	12,6%	11,9%
	-20%	11,0%	10,2%	9,5%	8,8%	8,3%

		Capex				
		-20%	-10%	0%	10%	20%
Traffic	20%	29,6	27,6	25,6	23,5	21,5
	10%	25,1	23,1	21,0	19,0	17,0
	0%	20,6	18,5	16,5	14,5	12,4
	-10%	7,9	5,9	3,8	1,8	-0,2
	-20%	-2,3	-4,3	-6,4	-8,4	-10,4

Figure 21: Sensitivity analysis of ERR (left) and ENPV (right) of the project at GGT (percentage, USD millions)

SOURCE: ALG

The sensitivity analysis for Exuma Airport shows the project's resilience to significant variations of its main drivers; even with 20% reductions in traffic together with a CAPEX 20% higher than expected, the ERR would be of 8.3%.

5.3 North Eleuthera Airport

The graph below shows the total socio-economic benefits that are obtained by adding up the three main benefits for North Eleuthera Airport. The detailed socio-economic benefit for each airport and type of benefit can be seen in Annex 1.

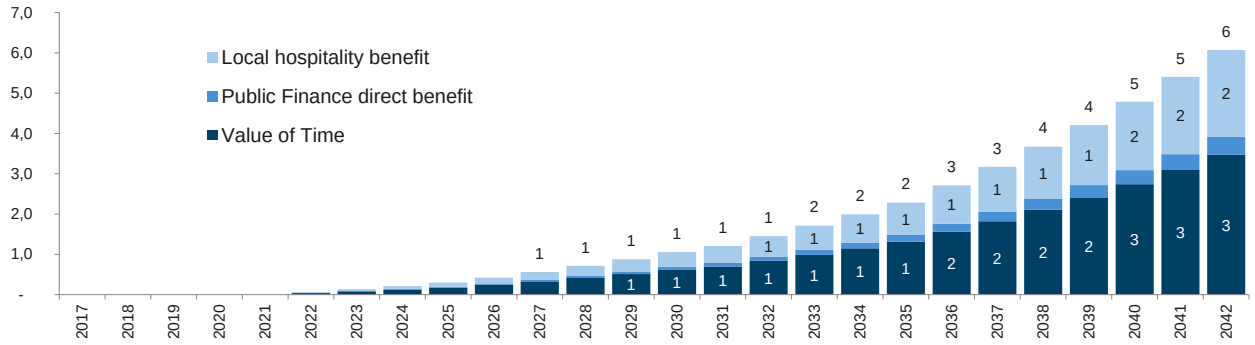

Figure 22: Socio-economic benefits of the project at ELH 2017-2042 (in nominal USD millions)

NOTE: THE DETAILED SOCIO-ECONOMIC BENEFIT CALCULATIONS FOR EACH AIRPORT AND TYPE OF BENEFIT CAN BE SEEN IN ANNEX 1.
SOURCE: ALG

The socio-economic cash flow is obtained by adding the social benefits to the cash flow of the project, as it is shown below (this figure can be obtained by adding up Figure 9 and Figure 22).

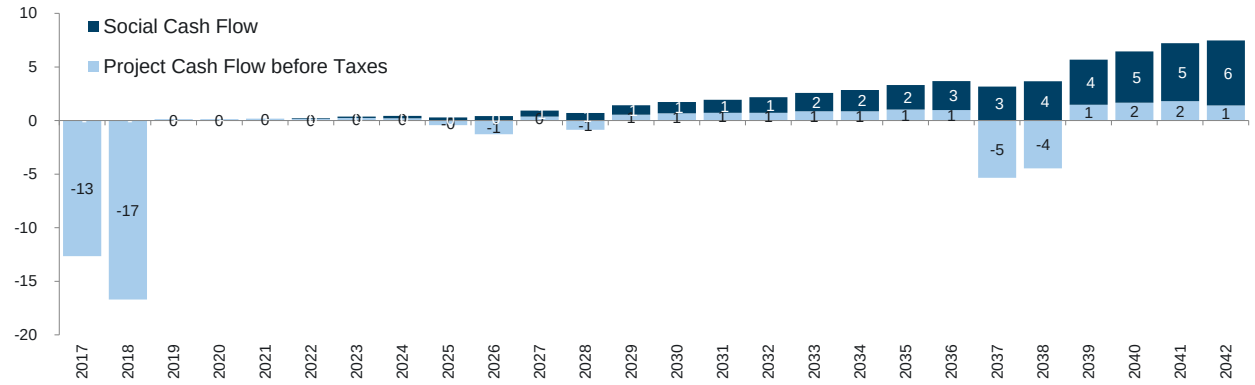

Figure 23: Socio-economic cash-flow of the project at ELH 2017-2042 (in nominal USD millions)

SOURCE: ALG

The accumulated socio-economic cash flow for the project becomes positive after the 21st year of the project, with an Economic Return Rate (ERR) of 2.2%. The Economic Net Present Value (ENPV) discounted at the social discount rate of 12.0% (recommended by the IDB) is of USD -19.7 M. Socio-economic returns for the project are illustrated below.

ERR	2.2%
ENPV	USD -19.7 M

Figure 24: ERR and ENPV of the project at ELH (percentage, USD millions)

SOURCE: ALG

Sensitivity analysis

The sensitivity analysis measures the variations on ERR and ENPV taking into account:

- A variation of +/- 20% in traffic; and
- A variation of +/- 20% in capital expenditure

The results of the sensitivity analysis are summarized in the tables below.

Traffic \ Capex	-20%	-10%	0%	10%	20%
20%	6,0%	5,1%	4,3%	3,6%	2,9%
10%	5,0%	4,1%	3,3%	2,6%	1,9%
0%	3,9%	3,0%	2,2%	1,5%	0,9%
-10%	1,3%	0,5%	-0,3%	-1,1%	-1,8%
-20%	-2,1%	-3,0%	-3,9%	-4,7%	-5,6%

Traffic \ Capex	-20%	-10%	0%	10%	20%
20%	-11,4	-14,1	-16,7	-19,4	-22,0
10%	-12,9	-15,5	-18,2	-20,9	-23,5
0%	-14,3	-17,0	-19,7	-22,3	-25,0
-10%	-17,0	-19,6	-22,3	-25,0	-27,6
-20%	-19,2	-21,9	-24,5	-27,2	-29,9

Figure 25: Sensitivity analysis of ERR (left) and ENPV (right) of the project at ELH (percentage, USD millions)

SOURCE: ALG

Given the elevated amount of required short-term investments at North Eleuthera Airport, the ERR is positive in most of the cases but does not reach 12% in any scenario (the social discount rate recommended by the IDB). It should be stressed, however, that although the targeted ERR of the project does not reach 12%, the required investments are still of paramount importance to guarantee the required infrastructure defined by ICAO. The airport should comply with the ICAO's SARPS regardless of their economic justification, as a basic commitment to the international standards of aviation defined by ICAO.

Sensitivity analysis (cont.): Safety occurrence case at North Eleuthera Airport

The basis for this analysis is the non-compliance with ICAO SARPs identified in North Eleuthera airport. The main safety concern in North Eleuthera is the lack of lateral separation between the aircraft parking area and the runway, which forces aircraft to park inside the runway strip (less than 75 m from the runway centreline). Other non-compliances that increase the risk of safety occurrences include the lack of adequate visual aids and the poor maintenance conditions of the runway, among others.

Tackling these non-compliances is one of the main goals of the Project. Therefore, this analysis considers the possibility that of a safety occurrence would happen in the future in the “Without Project” scenario. In the unlikely event of a safety incident in North Eleuthera, carriers could suspend international routes to the airport. This situation would have two main impacts on demand:

- The current outbound international passengers (local population) would be forced to travel via Nassau and from there to their final destination, incurring in additional travel times
- The current international inbound passengers (tourists) would have the option to travel to the Island via Nassau, also incurring in additional travel times, or could otherwise choose another Caribbean destination within the same travel time

Given that this situation would impact all international passengers (who nowadays benefit from direct international routes) they can be considered as beneficiaries of the Project and therefore associated social benefits should quantified:

- Time savings associated to direct international routes that could be suspended in case of safety occurrence, as an alternative to international transits via Nassau
- Local expenditure generated by tourism that would eventually stop coming to the island in case international direct routes are suspended.

On the one side, the tourism enabled demand in this case has been defined as the share of inbound passengers who are dissuaded from travelling to The Bahamas due to the loss of connectivity. On the other side, there would be time-saving benefits for all international passengers who would still decide to go to the Island via domestic connecting flight.

In order to estimate these dual impact, the same hypothesis defined previously for North Eleuthera would remain valid:

- At least 5% of the inbound international traffic in North Eleuthera would be lost due to the suspension of direct international routes
- The rest of the international traffic would have to carry out longer travel times, i.e. via Nassau

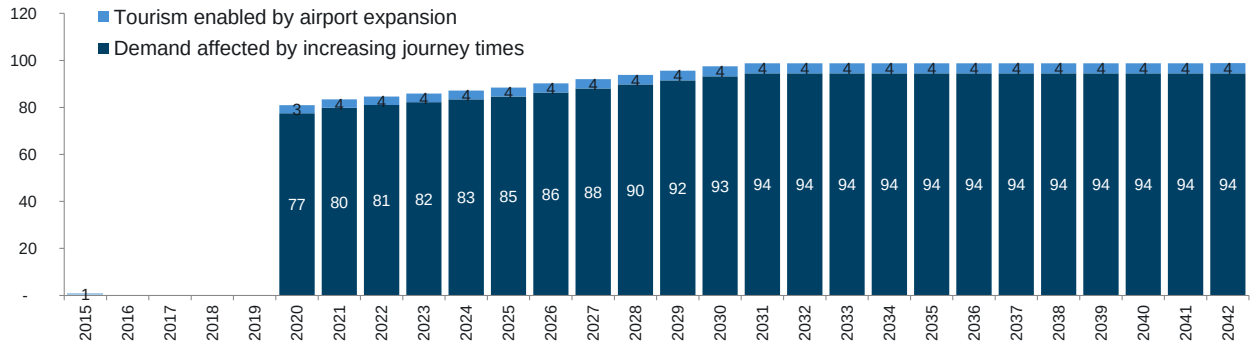

Figure 26: Tourism and time savings enabled demand at ELH - Safety occurrence case - (000' pax)

Source: ALG

The socioeconomic benefits of this specific case can be obtained by using the same parameters (time saving and contribution to the economy) as those presented in chapter 4.4 for North Eleuthera Airport.

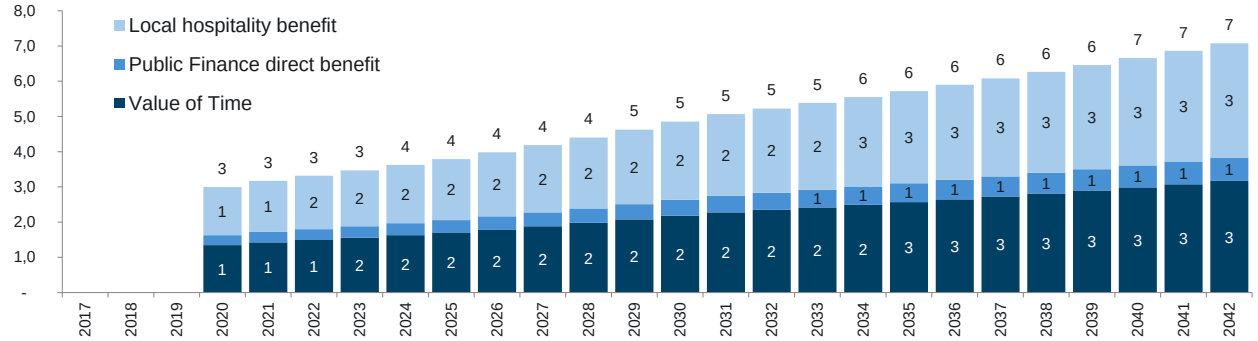

Figure 27: Socio-economic benefits of the project at ELH - Safety occurrence case - 2017-2042 (in nominal USD millions)

SOURCE: ALG

The figure below shows the result of adding the socioeconomic benefits for the Safety occurrence case to the outcomes of the Base Case of the Cost Benefit Analysis for North Eleuthera (this figure can be obtained by adding up Figure 23 and Figure 27).

In order to make this Case a valid Base Case scenario, the socioeconomic benefits attributed to preventing a safety occurrence (figure 27 above) should be factored by the probability of such occurrence.

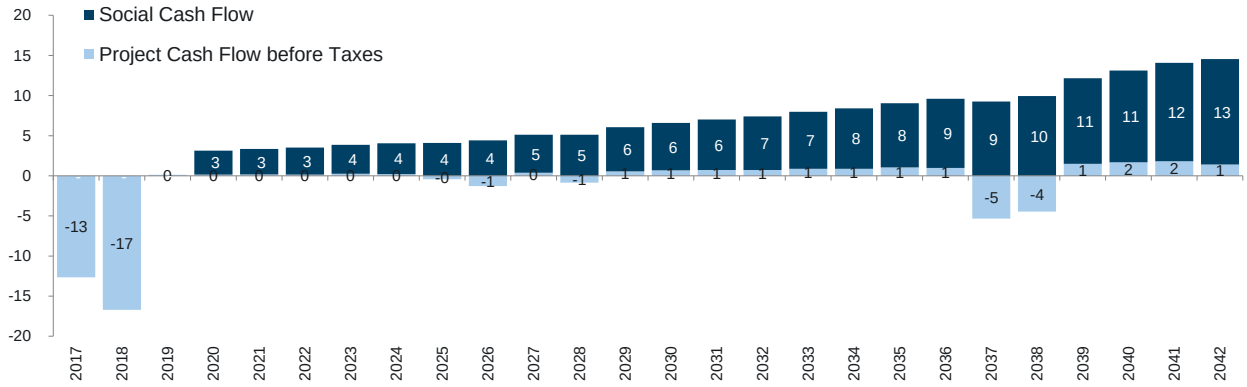

Figure 28: Socio-economic cash-flow of the project at ELH - Safety occurrence case - 2017-2042 (in nominal USD millions)

SOURCE: ALG

If the socioeconomic benefits for the Safety occurrence case are directly added to the outcomes of the CBA the Economic Return Rate (ERR) would become 13.2% and Economic Net Present Value (ENPV) discounted at the social discount rate of 12.0% would be USD 3.1 M.

ERR	13.2%
ENPV	USD 3.1 M

Figure 29: ERR and ENPV of the project at ELH - Safety occurrence case (percentage, USD millions)

SOURCE: ALG

5.4 Conclusions of the Cost Benefit Analysis

The project is expected to have a positive impact for the economy of the Bahamas and the selected airports' islands.

	Internal Rate of Return (IRR) of the project cash flow	Economic Return Rate (ERR) of the CBA cash flow
Four selected airports bundle	**3.6%**	**13.2%**
Marsh Harbour and Treasure Cay	55.80%	55.81%
Exuma	1.2%	16.9%
North Eleuthera	-11.1%	2.2% (13.2%)[7]

Figure 30: Summary IRR and ERR for the selected airports

SOURCE: ALG

Social benefits are expected to trickle down to the local population and the public treasury shortly after the project's implementation.

Apart of the expected socio-economic return, the main benefit for the population of the Bahamas will be the enhancement of air transport safety and security in the busiest airports of the Family Islands. In addition, this benefit is expected to last beyond the lifetime of the project, also favouring the next generation of Bahamians.

The analysis carried out above has provided a justification, financially and economically, for the execution of a set of investments. However, in the particular case of the airport of North Eleuthera, the economic benefit target of 12% was not reached. This failed target cannot be interpreted as a waiver to carry out the necessary investments. These investments requirements identified to comply with the ICAO's SARPs are not optional but compulsory, and represent an essential commitment to safety and security of aviation in The Bahamas. It is highly recommended that these investments are implemented regardless of the lack of economic justification, but on the merits of the healthy development of the air transport in the Family Islands.

[7] ERR of 13.2% would correspond to Safety Occurrence case (pages 20 to 22) in which the benefits of considering the occurrence of a safety incident in the "without project" scenario have been added to the CBA of North Eleuthera (without factoring by the probability of such occurrence)

6 Annex: Main CBA assumptions table

Real terms, base Year 2016	2017	2018	2019	2020	2025	2030	2035	2040
Value of time								
Enabled demand (000' pax)								
Marsh Harbour								
Domestic	-	-	-	-	-	-	-	6.9
Outbound	-	-	-	-	-	-	-	1.6
Inbound	-	-	-	-	-	-	-	7.5
Total	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**16**
Exuma								
Domestic	-	-	-	-	7.3	21.1	33.5	54.0
Outbound	-	-	-	-	1.2	3.7	6.5	11.2
Inbound	-	-	-	-	5.1	15.8	28.7	51.4
Total	**-**	**-**	**-**	**-**	**14**	**41**	**69**	**117**
North Eleuthera								
Domestic	-	-	-	-	4.0	11.6	19.5	32.8
Outbound	-	-	-	-	0.8	2.3	4.2	7.3
Inbound	-	-	-	-	4.3	13.3	25.1	45.6
Total	**-**	**-**	**-**	**-**	**9**	**27**	**49**	**86**
Unitary Value of time ($/pax)								
Marsh Harbour								
Domestic	27.5	27.5	27.6	27.6	27.6	27.7	27.7	27.8
Outbound	30.4	30.4	30.4	30.4	30.4	30.4	30.4	30.4
Inbound	65.2	65.2	65.2	65.2	65.2	65.2	65.2	65.2
Exuma								
Domestic	37.3	37.3	37.4	37.4	37.4	37.5	37.6	37.7
Outbound	35.3	35.3	35.3	35.3	35.3	35.3	35.3	35.3
Inbound	75.8	75.8	75.8	75.8	75.8	75.8	75.8	75.8
North Eleuthera								
Domestic	5.8	5.8	5.8	5.8	5.8	5.8	5.8	5.9
Outbound	11.7	11.7	11.7	11.7	11.7	11.7	11.7	11.7
Inbound	25.1	25.1	25.1	25.1	25.1	25.1	25.1	25.1
Tourist Expenditure								
Enabled demand (000' pax)								
Marsh Harbour								
Public Finance direct benefit	-	-	-	-	-	-	-	3.2
Local hospitality benefit	-	-	-	-	-	-	-	3.2
Exuma								
Public Finance direct benefit	-	-	-	-	2.2	6.8	12.3	22.0
Local hospitality benefit	-	-	-	-	2.2	6.8	12.3	22.0
North Eleuthera								
Public Finance direct benefit	-	-	-	-	0.2	0.7	1.3	2.4
Local hospitality benefit	-	-	-	-	0.2	0.7	1.3	2.4
Unitary Expenditure ($/ pax)								
Public Finance direct benefit	75	75	75	75	75	75	75	75
Local hospitality benefit	367	367	367	367	367	367	367	367
Bahamas CPI	1.3%	1.7%	1.7%	2.2%	3.0%	3.0%	3.0%	3.0%
Accumulated CPI	1.01	1.03	1.05	1.07	1.24	1.43	1.66	1.93

Figure 31: Main CBA assumptions table

SOURCE: ALG

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