EXECUTIVE SUMMARY

FOZ DO IGUAÇU INTERNATIONAL AIRPORT
CATARATAS
SBFI/IGU

November/2020

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INTRODUCTION

The Infrastructure Ministry published, in the Union Official Journal, in the Edition Number 52, on March 18th, 2019, the Public Call Notice 2/2019, with the main goal to select projects, surveys, investigation and technical studies to subsidize the modelling of the concessions for the expansion, exploitation, and maintenance of the following airports:

South Cluster

Curitiba/PR – Afonso Pena;
Foz do Iguaçu/PR – Cataratas;
Navegantes/SC – Ministro Victor Konder;
Londrina/PR – Governador José Richa;
Joinville/SC – Lauro Carneiro de Loyola;
Bacacheri/PR;
Pelotas/RS;
Uruguaiana/RS – Rubem Berta;
Bagé/RS Comandante Gustavo Kraemer.

North Cluster

Manaus/AM – Eduardo Gomes;
Porto Velho/RO – Governador Jorge Teixeira de Oliveira;
Rio Branco/AC – Plácido de Castro;
Cruzeiro do Sul/AC;
Tabatinga/AM;
Tefé/AM;
Boa Vista/RR – Atlas Brasil Cantanhede.

Central Cluster

Goiânia/GO – Santa Genoveva;
São Luís/MA – Marechal Cunha Machado;
Teresina/PI – Senador Petrônio Portella;
Palmas/TO – Brigadeiro Lysias Rodrigues;
Petrolina/PE – Senador Nilo Coelho;
Imperatriz/MA – Prefeito Renato Moreira.

According to the Public Call Notice 2/2019, the Grupo de Consultores em Aeroportos (GCA) presented the following reports for each airport: **Market Reports, Engineering Studies, Environmental Studies and Economic and Financial Evaluation**. Furthermore, it presented a complementary Economic Financial and Evaluation Report, for each Cluster, which aimed the economic financial feasibility assessment of the airports that form the Cluster.

The purpose of the Executive Summary is to present the main arguments, information and conclusions of each one of the Foz do Iguaçu International Airport/PR Cataratas – SBFI/IGU report. For a better understanding of the studies, it is recommended the reading of the reports.

1 MARKET REPORT

This section presents a Summary of the Market Report for the **Foz do Iguaçu International Airport/PR Cataratas** (IATA IGU or ICAO SBFI), the 21st busiest airport in Brazil and the 2nd busiest in the state of Paraná. SBFI processed 2.3 million passengers in 22 thousand operations in 2018.

1.1 Overview

The Airport lies in the city of Foz do Iguaçu, known worldwide for its namesake waterfalls, the main attraction of the Iguaçu National Park. The city is in the Brazil-Argentina-Paraguay triple border, which is a strong source of demand for air transport.

Because of the region's tourist attractions, like the Waterfalls (15 km from SBFI) and the Bird Park (5 km from SBFI), tourism has become the city's main economic activity. In 2018 alone, the number of visitors at Foz do Iguaçu increased by 9.3[1]%.

Foz is also known for Itaipu Binacional, the world's largest hydroelectric power plant by generation capacity, and held jointly by the Brazilian and Paraguayan governments. In addition to being highly relevant to the country's energy matrix, the plant is a regional tourist attraction and hosted more than 1 million visitors[2] in 2018.

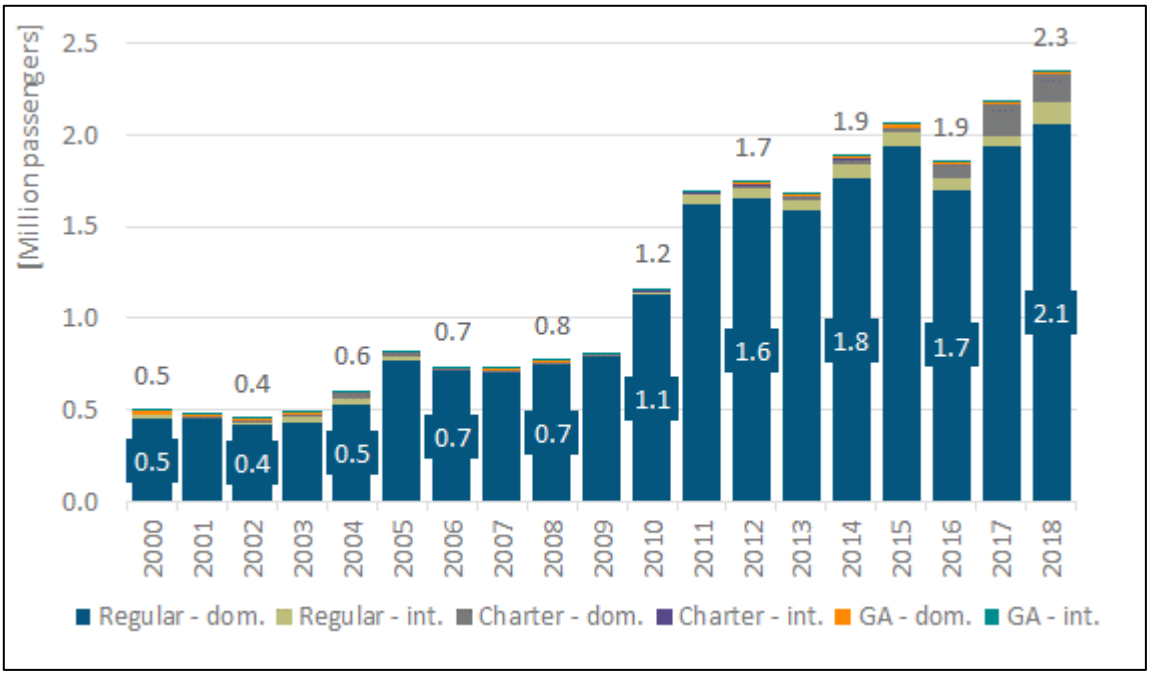
Figure 1-1: Foz do Iguaçu region

Source: Google Earth

The region is therefore a strong source of demand for SBFI, where passenger throughput increased five-fold from 2000 to 2018, when it logged 2.3 million passengers (9.0% average annual growth rate).

[1] Source: https://foz.portaldacidade.com/noticias/turismo/numero-de-turistas-estrangeiros-nas-cataratas-do-iguacu-cresceu-93-em-2018.
[2] Source: https://www.itaipu.gov.br/turismo/estatisticas.

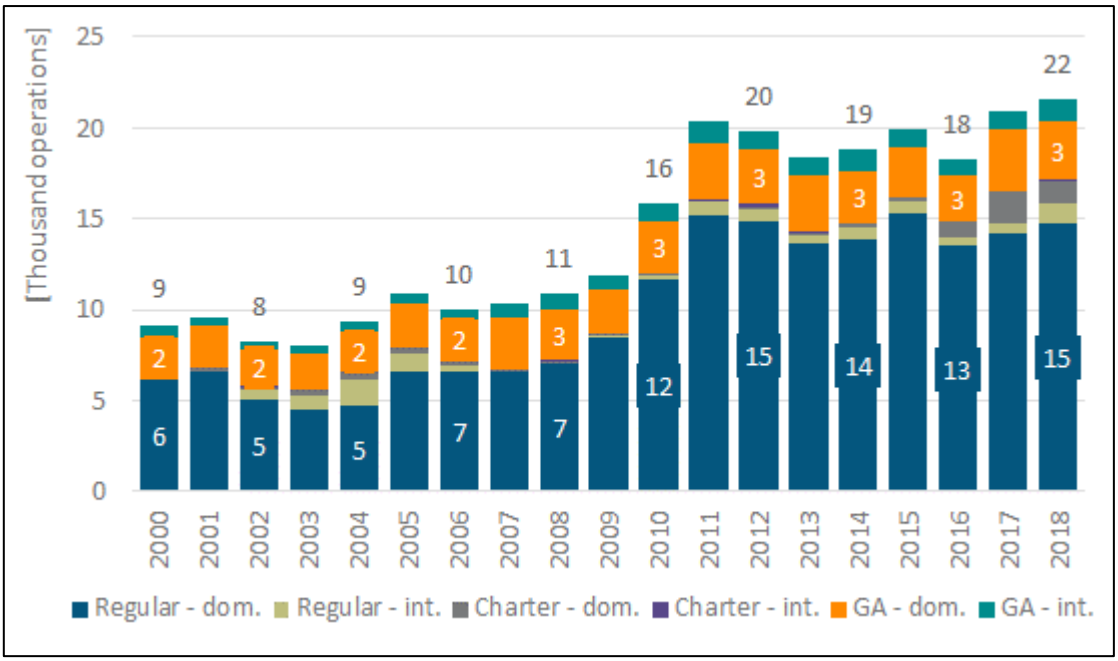
Figure1-2: Passenger history (origin, destination and connections) for the Airport



Source: Infraero

The Airport had 22 thousand operations in 2018, of which 69% were regular domestic flights,15% were domestic general aviation, 6% were non-regular domestic flights, and 5% were regular international flights (Figure1-3).

Figure1-3: Annual operations history (landings and take-offs) at the Airport



Source: Infraero

In 2018, the Airport had 11 regular domestic routes[3] to every Brazilian Region, except the North, as Figure1-4 shows (line thickness reflects relative route frequency)

Figure1-4: Map of the Airport's domestic routes in 2018

Source: OAG and ANAC

In 2018, 24% of all domestic passengers at SBFI had their origin/destination at Galeão (SBGL), 21% at Guarulhos (SBGR) and 12% at Curitiba (SBCT). In addition, an estimated 70% of domestic passengers at SBFI flew on direct flights, while 30% had stops.

Concerning international routes, SBFI had flights to Lima, Peru (Figure1-5) in 2018.

[3] Only considers routes with twice weekly or greater frequency (SBBR, SBCG, SBCT, SBFL, SBGL, SBGR, SBKP, SBPA, SBRJ, SBSP and SBSV).

Figure1-5: Map of the Airport's international routes in 2018

Source: OAG and ANAC

The main final destinations for SBFI's international passengers are Buenos Aires (Argentina) and Lima (Peru). Because of the currently small number of international routes, 71% of international passengers with origin or destination at SBFI must connect elsewhere, mostly at SBGR.

Regarding the pandemic impacts, it stands out that the airport continued to receive flights from the essential airline network and, therefore, never had its operations completely interrupted. However, the demand in March and April 2020 were, respectively, 65% and 1% of the previous month.

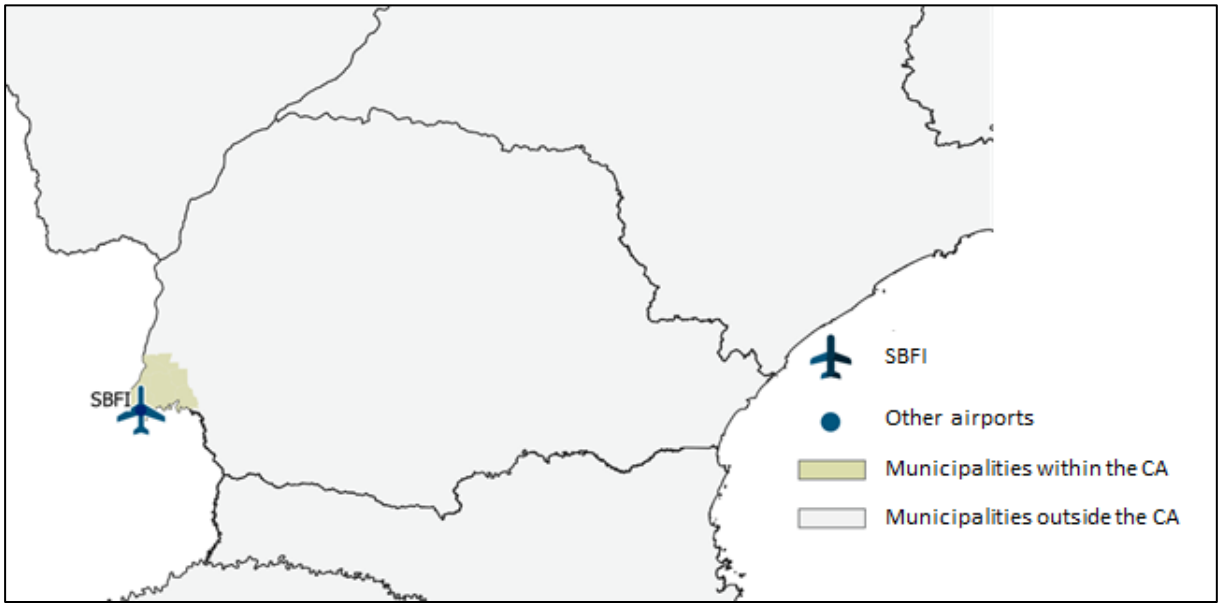
As concerns cargo handling, the Airport processed 1 thousand tons in 2018 (ANAC data) in the holds of commercial passenger flights.

Catchment area

SBFI's Catchment Area (CA) is defined based on the "City Catchment Areas" ("Regiões de Influência das Cidades" – REGIC)[4] study, by the Brazilian Geography and Statistics Institute (IBGE), which comprehensively covers a range of economic and socio-cultural aspects of the population.

According to the REGIC, Foz do Iguaçu is under the influence of Cascavel, which by its turn is influenced by the Metropolis of Curitiba. Therefore, the Foz do Iguaçu CA lies within the Cascavel CA and, more generally, within Curitiba's. Overall, Foz do Iguaçu CA covers 7 municipalities.

Figure1-6: Airport CA according to the REGIC



Source: REGIC, ANAC and GCA Consortium

To forecast the Airport's volumes and demand profile, the CA was adjusted to compatibility with the effective passenger catchment area according to the origins and destinations survey published in the study Brasil Que Voa (BQV), which EPL[5] conducted in 2014.

1.2 Demand forecasts

The Airport's demand has been forecast based on multivariate regression analyses whose parameters have been selected by means of tests with several potential independent variables for each flow analyzed.

1.2.1 Passengers

Domestic passengers

To forecast domestic passengers with origin or destination in the CA[6], the study ran regressions using Brazil's GDP, World GDP and the CA's average fares, adjusting GDP elasticity in the long term based on

[4] Source: IBGE. *Regiões de Influência das Cidades 2007*, IBGE, Rio de Janeiro, 2008. The IBGE has published other and more current Urban-Territorial Division studies, but they reference the same hierarchical review of municipalities as produced for the 2007 study, that is, their hierarchy is simplified, but consistent with the one in the 2007 study.
[5] EPL is a Federal-government agency focused on country-wide transportation & logistics planning.
[6] Includes the Cascavel Airport.

the passengers-to-per-capita GDP ratio of large countries to reflect the reduction of the marginal propensity to fly as average income increases.

Once domestic demand had been forecast for the CA, the study distributed it across competing airports based on their historic market shares, among other factors. Finally, compatibility adjustments were made between forecast demand and 2019 volumes; additional consistency adjustments were made with international passenger forecasts[7] and adjustments regarding the COVID-19 pandemic.

Connecting and layover[8] passengers were forecast as function of the Airport's increased airline-network capillarity and domestic connections rate benchmarks.

International passengers

All international airports in Brazil compete for this passenger flow. Therefore, Brazilian demand is initially forecast based on Brazil GDP, World GDP, average airline fare in Brazil and international QAV[9] price, also adjusting for long-term GDP elasticity and considering the effects of the demand reduction due to the COVID-19 pandemic.

Then the method forecasts SBFI's total passengers with international origins or destinations, regardless of whether on international (direct) or domestic (indirect) flights. Then the study estimates the evolution of the percentage demand from direct international flights departures, both in existing routes and in routes to be created over the duration of the concession. This phase of the forecast is integrated with the aircraft routes and operations forecast described ahead.

General aviation passengers

For general aviation passengers, the report first forecasts total aircraft operations based on several independent variables, such as Industrial GDP and Brazilian fleet (taking into account the effects of the pandemic). Then total passengers are estimated based on usual pax/operation parameters.

Total passengers

Figure1-7 shows the consolidated results of the above forecasts. Total passengers at SBFI will grow 4.9% p.a. from 2021, the first, and 2050, the final full year of the concession, at which time 9 million passengers are expected.

[7] Because a share of domestic passengers have international origins or destinations, the creation of international routes at the Airport over time requires domestic forecast adjustments, with the replacement of domestic passengers with international ones associated with the routes created, and the addition of domestic passengers for international connections.
[8] Passengers who do not deplane at the Airport and therefore generate no fee revenues.
[9] Jet fuel.

Figure1-7: Total passengers forecast at the Airport by flow type

Source: GCA Consortium

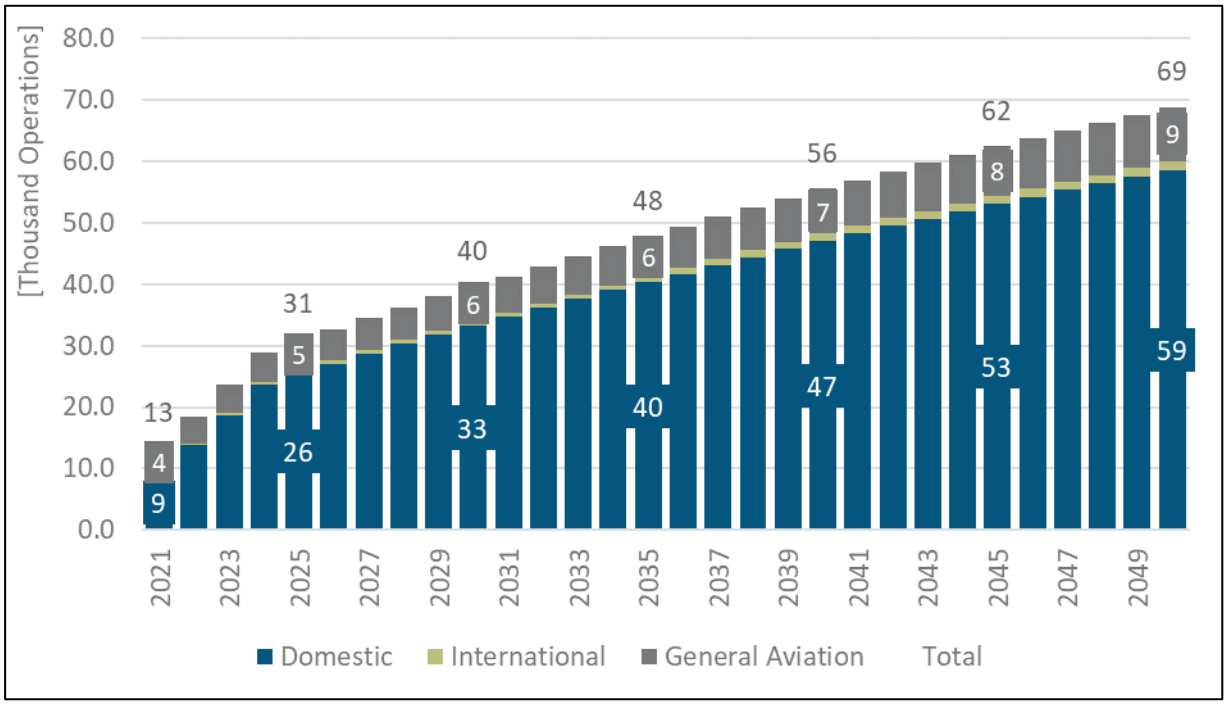
1.2.2 Aircraft operations and airline network

Domestic and international aircraft operations

Commercial aircraft operations were forecast based on passenger flows by origin-destination (OD) pairs, load factor, and aircraft mix, and are related with the evolution of the Airport's airline network. As demand increases, routes that existed before the pandemic are restored and new routes become feasible (the triggers for route creation vary according to the distance and allocated aircraft type) – therefore, the mix and number of aircraft evolves in harmony with the forecast airline network.

The study forecasts that in 2050 the Airport will log 59 thousand domestic and 1.4 thousand international commercial aviation operations, with average annual growth rates of 6.7% (between 2021 and 2050) and 4.0% (between 2025 and 2050), respectively. For general aviation, 8.8 thousand operations are forecast in 2050, a growth of 2.5% p.a.

Figure1-8: Total annual Airport operations forecast

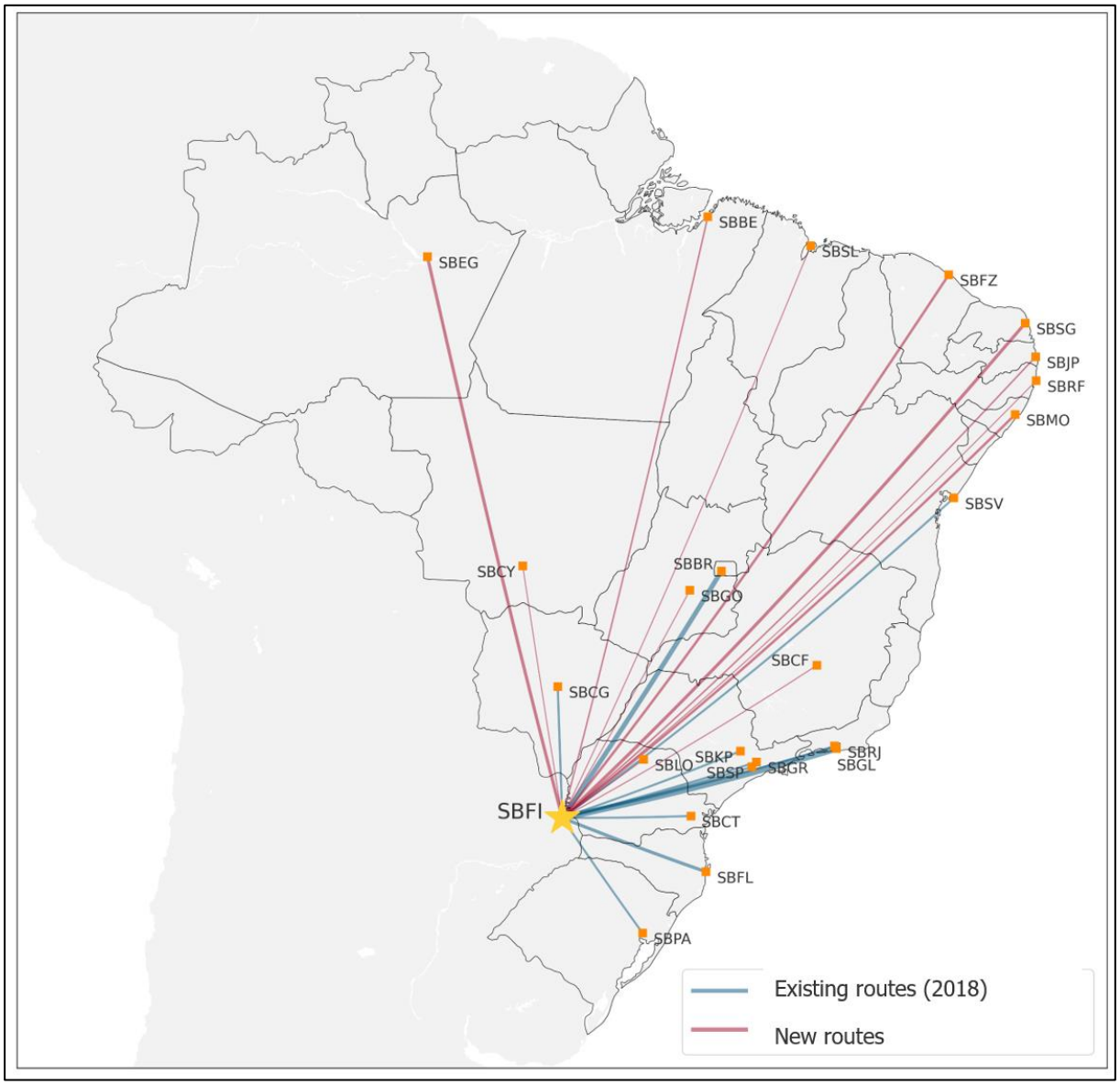


Source: GCA Consortium

Airport insertion in the airlines network

Driven by the region's importance for tourism, SBFI connects with major state capitals and economic hubs in Brazil, such as Curitiba, São Paulo, Rio de Janeiro, Campo Grande and Brasília. During the concession, new connections between SBFI and as-yet unserved state capitals are expected, particularly in the North region of Brazil, which is so far not connected, and the Northeast as well. As Figure1-9 shows, the number of connected destinations from SBFI is expected to more than double in 2018-2050, from 11 to 23.

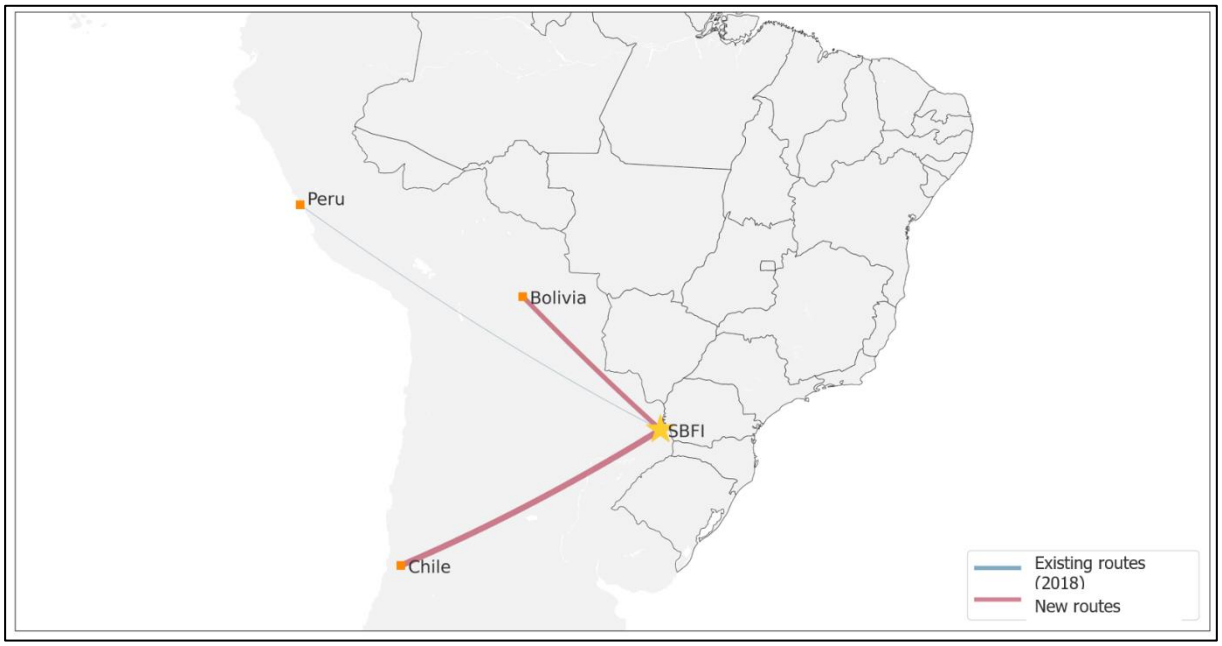
Figure1-9: Domestic commercial routes in 2050



Source: GCA Consortium

As for the international network, it is expected that routes to Peru will be restored. In addition, new routes to Chile and Bolivia will arise between 2018 and 2050, as displayed in Figure1-10.

Figure1-10: International commercial routes in 2050



Source: GCA Consortium

1.2.3 Peak demand and restrictions

The Airport's main systems have been sized to meet demands at more intense flow times, so that users will receive appropriate service levels according to previously established criteria and, no severe operational and economic impacts will take place.

For Passenger Terminal (PT) areas and processors at airports flying more than one million passengers per year, like SBFI, the applicable service level criterion is based on the 30th busiest hour of the year. The results have been calculated for 2018 based on Infraero records and forecast according to domestic peak-factor benchmarks (peak demand/annual demand).

Table 1-1: 1-hour peak demand (30th event) at the Airport – Baseline year, concession start and concession end

Nature	Flow	2018	2021	2050
Domestic	Departure	728	482	1,258
	Arrival	721	477	1,246
	Connecting	16	11	28
	Simultaneous	1,093	724	1,888
International	Departure	155	-	271
	Arrival	152	-	266
	Connecting	-	-	-
	Simultaneous	158	-	277
Simultaneous	Departure	728	475	1,254

Nature	Flow	2018	2021	2050
	Arrival	721	471	1,242
	Connecting	16	10	28
	Simultaneous	1,093	714	1,883

Source: Infraero and GCA Consortium

For the runway system, the report considers maximum commercial aircraft operations per hour over a period of one year. As with passengers, the forecast embraces peak-factor benchmarks. It has been forecast that the Airport will have a peak of 19 commercial aircraft runway operations per hour in 2050.

Dimensioning also considers peak usage of apron positions based on 2018 maximum usage records [10] and peak factor benchmarks. According to the forecasts, a minimum 20 apron positions will be required by the end of the concession period.

Given the various systems' capacities (see Engineering Report), the study assesses potential restrictions on forecast demand. No restrictions on growth are expected in the light of the Airport's forecast improvement and expansion works.

1.2.4 Cargo

Concerning international cargo, forecasts show export and import flows reaching 1 thousand and 3 thousand tons respectively in 2050. Domestic cargo flows are forecast to total 2 thousand tons by the end of the concession.

Both cargo traffic projections, international and domestic, consider the impact of the pandemic due to the restriction on people movement, to the economic downturn and to the changes in consumption behaviors.

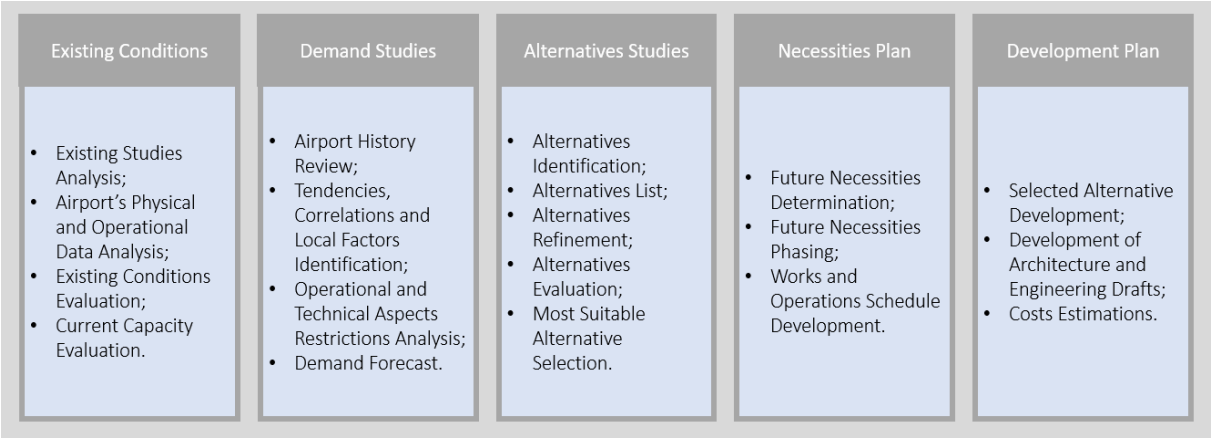
[10] Based on ANAC data.

2 ENGINEERING STUDIES

This section presents the Executive Summary of the Engineering Studies for the concession of the Foz do Iguaçu International Airport/Cataratas – SBFI/IGU.

The Engineering and Related Studies Report has been developed according to the methodology presented in Figure 2-1.

Figure 2-1: Study Methodology



Source: GCA Consortium.

Below, in brief explanations, the results and premises of each phase of the studies are presented. For further details, please check the complete studies report.

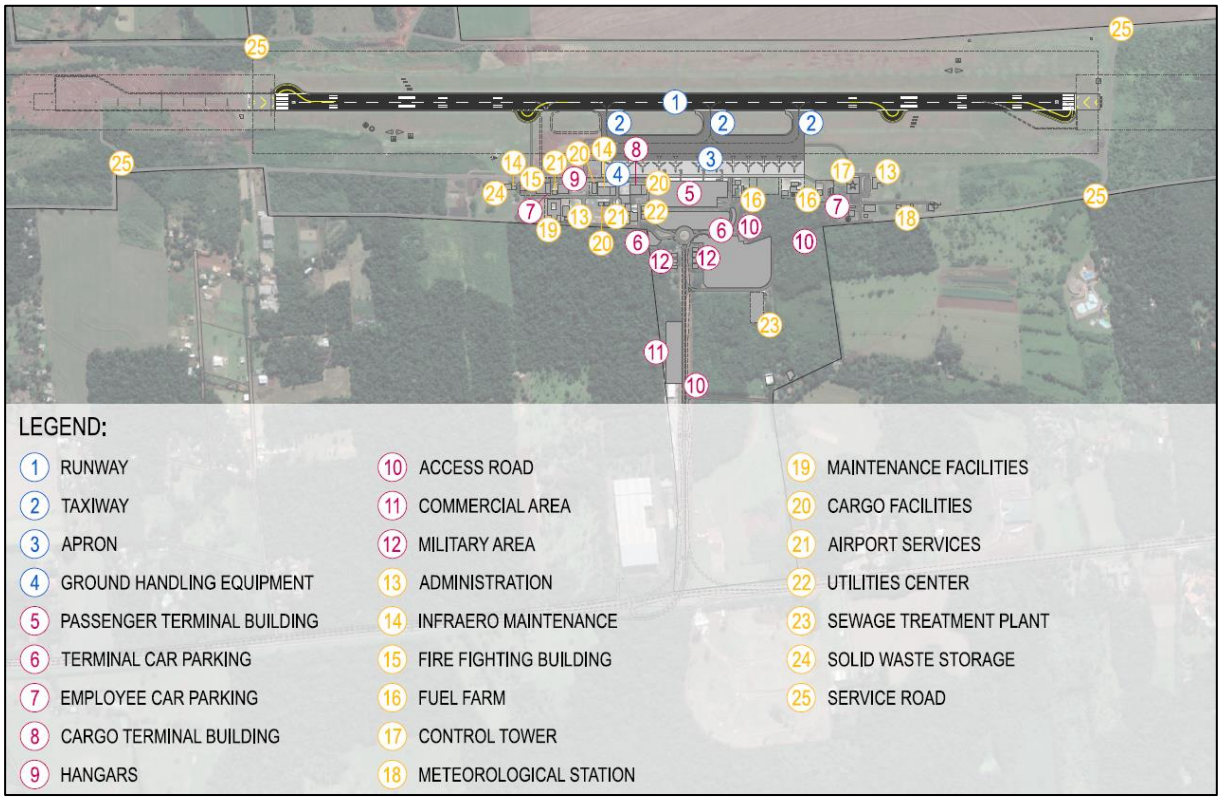
2.1 Existing Conditions

2.1.1 Current Situation

The current situation characterization is extremely important for an appropriate development of the Airport Site. Through it, it's possible to have an accurate understanding of the existing restrictions and opportunities for the expansion of the Airport complex. Among other aspects, the comprehension of the current situation involves operational, security, legal and social-environmental matters.

In order to characterize the present situation, it has also been evaluated the current operation and it has been done the identification of the existing infrastructures, by on-site visits, and of the main development plans and available studies. The Figure 2-2 illustrates the identification of the main existing facilities.

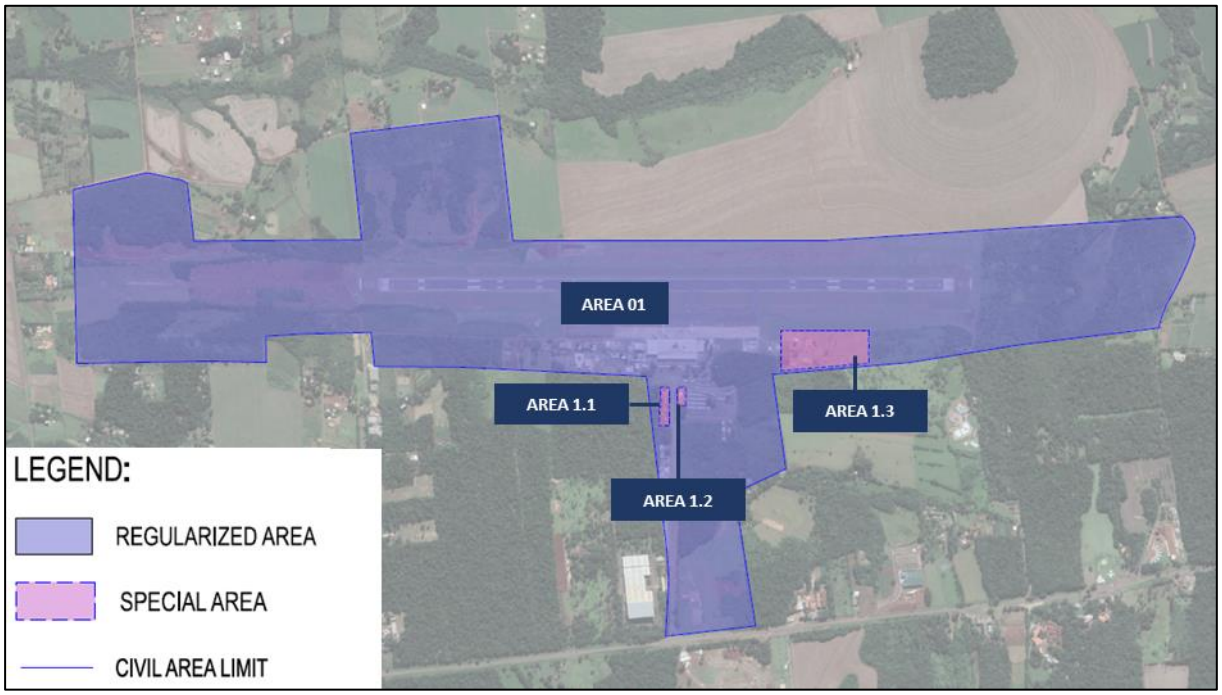
Figure 2-2: Current Facilities Situation



Source: GCA Consortium.

Furthermore, regarding the present patrimonial situation, it should be noted that the airport under study is in a regularized patrimonial area. The regularized estates belong to the Federal Union in possession of INFRAERO. The Figure 2-3 presents the patrimonial situation of the Airport.

Figure 2-3: Patrimonial Limits of the Airport Site



Source: Google Earth, GCA Consortium.

Currently, there are works in progress at the Airport, whose projects have been approved by INFRAERO. These works have as main objectives the expansion of the current PTB, the reform of the drainage system of the Runway and the reform of the Sewage Treatment Unit. According to the SAC/MI guidance, until the start of the concession period, the ongoing works must proceed. From this date on, the remaining services must be completed by the concessionaire and the remaining costs considered in the financial modeling of this study. Since the works in the Airport are expected to be completed until this date, there won't be residual costs related to these works to be considered by CAPEX.

2.1.2 Installed Capacity Evaluation

The analysis of the installed capacity is one of the phases in the existing conditions evaluation process. In this stage are evaluated the capacity conditions according to the appropriate levels of service. Thus, it has been developed the capacity assessment for all airport systems. The installed capacities of the main systems are presented below.

2.1.2.1 Runway, Taxiway and Apron System

Table 2-1 and Table 2-2 summarize the results obtained from the installed capacity analysis and the existing demand for the runaways, taxiways and aprons systems. The taxiways were assessed based on geometric width and code of the aircraft design restrictions.

Table 2-1: Runway Capacity

Component	Current Capacity	Demand	Situation
Runway (mov/h)	12,0	11	Suitable

Source: GCA Consortium.

Table 2-2: Taxiways Capacity

Taxiway	Width (m)	Width Without Shoulders (m)	RBAC154 Code	Critical Aircraft	Situation
Taxiway A	35	29	D	AT76	Suitable
Taxiway B	42.6	35.6	E	AT76	Suitable
Taxiway C	36	30	D	AT76	Suitable

Source: AIP, GCA Consortium.

In order to measure the current capacity of the main aircraft aprons, the static and dynamic capacities were analyzed for five different scenarios. Each scenario prioritizes the maximum use of the most restrictive aircrafts, or rather, the occupying positions F, E, D and C in descending order of priority. The Table 2-3 shows the static capacity for the five scenarios evaluated.

- Scenario 1: Aircrafts code F, E, D, and C operating simultaneously, in descending order of priority;
- Scenario 2: Aircrafts code E, D and C operating simultaneously, in descending order of priority;
- Scenario 3: Aircrafts codes E and C operating simultaneously, in descending order of priority;
- Scenario 4: Aircrafts Codes D and C operating simultaneously, in descending order of priority;
- Scenario 5: Only aircrafts code C operating.

Table 2-3: Aprons Static Capacity

Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Boarding Bridge Positions	F/E/D/C	E/D/C	E/C	D/C	C
A	0	0	0	0	0
B	0	0	0	0	0
C	4	4	4	4	4
D	0	0	0	0	0
E	0	0	0	0	0
F	0	0	0	0	0
Remote Stands	F/E/D/C	E/D/C	E/C	D/C	C
A	0	0	0	0	0
B	0	0	0	0	0
C	8	8	8	8	10
D	0	0	0	1	0

Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
E	0	1	1	0	0
F	1	0	0	0	0
Positions (Remotes + Boarding Bridges)	F/E/D/C	E/D/C	E/C	D/C	C
A	0	0	0	0	0
B	0	0	0	0	0
C	12	12	12	12	14
D	0	0	0	1	0
E	0	1	1	0	0
F	1	0	0	0	0
Total Boarding Bridges	4	4	4	4	4
Total Remote Stands	9	9	9	9	10
Total Number of Stands	13	13	13	13	14

Source: PDC Chart, GCA Consortium.

In order to evaluating the hourly dynamic capacity of the main apron, the static capacity obtained by the average occupation time of each aircraft code for the same scenarios was considered, obtaining the total dynamic capacity, as shown in Table 2-4.

Table 2-4: Aprons Dynamic Capacity

Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Average turning time (min)	F/E/D/C	E/D/C	E/C	D/C	C
A	15	15	15	15	15
B	25	25	25	25	25
C	45	45	45	45	45
D	75	75	75	75	75
E	85	85	85	85	85
F	130	130	130	130	130

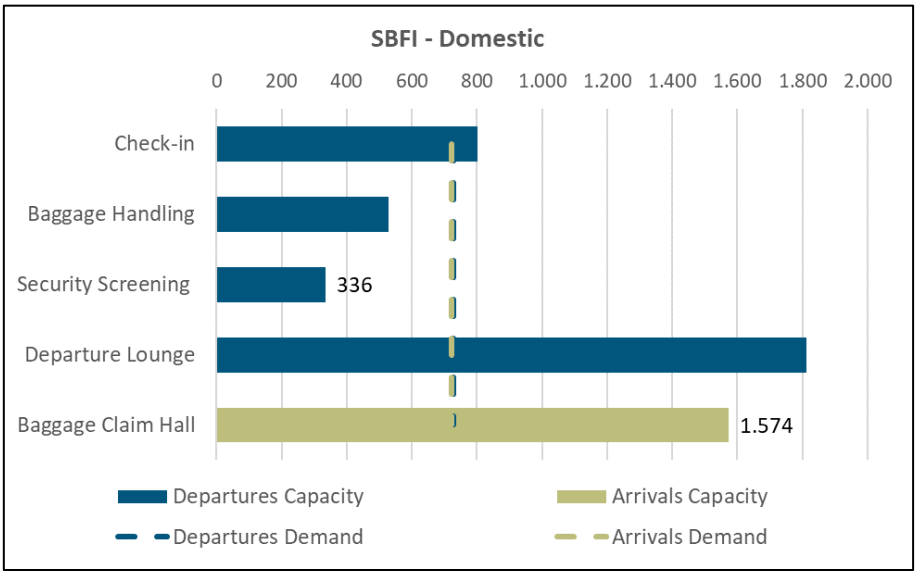
Type	Scenario 1	Scenario 2	Scenario 3	Scenario 4	Scenario 5
Capacity	F/E/D/C	E/D/C	E/C	D/C	C
A	0	0	0	0	0
B	0	0	0	0	0
C	16	16	16	16	19
D	0	0	0	1	0
E	0	1	1	0	0
F	0	0	0	0	0
Total	16	17	17	17	19

Source: GCA Consortium.

2.1.2.2 Passenger Terminal System

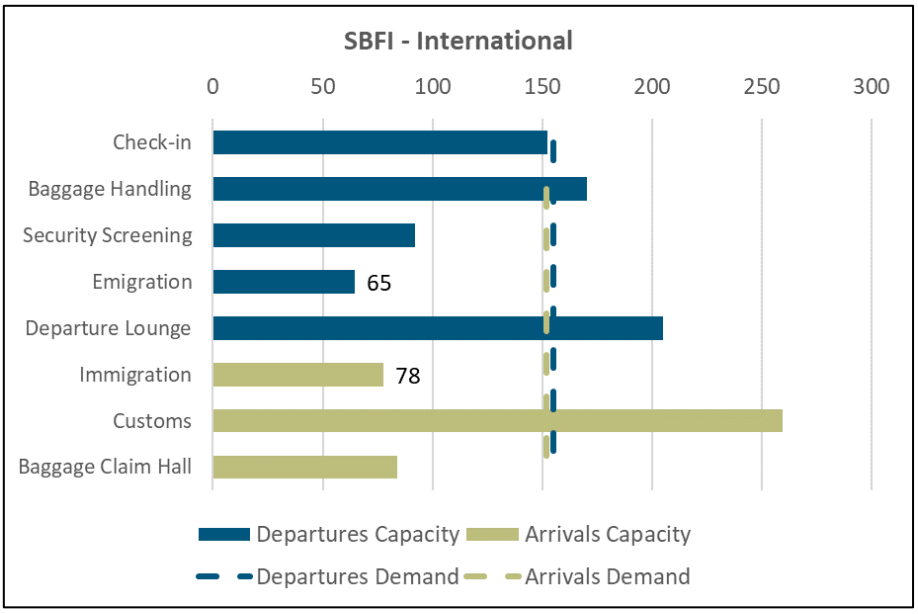
Figure 2-4, Figure 2-5 and Figure 2-6 summarize the results obtained from the installed capacity and the existing demands of the departures and arrivals flows. The components of the terminal were evaluated considering the international and domestic segments.

Figure 2-4: Terminal's Components Capacity – Domestic



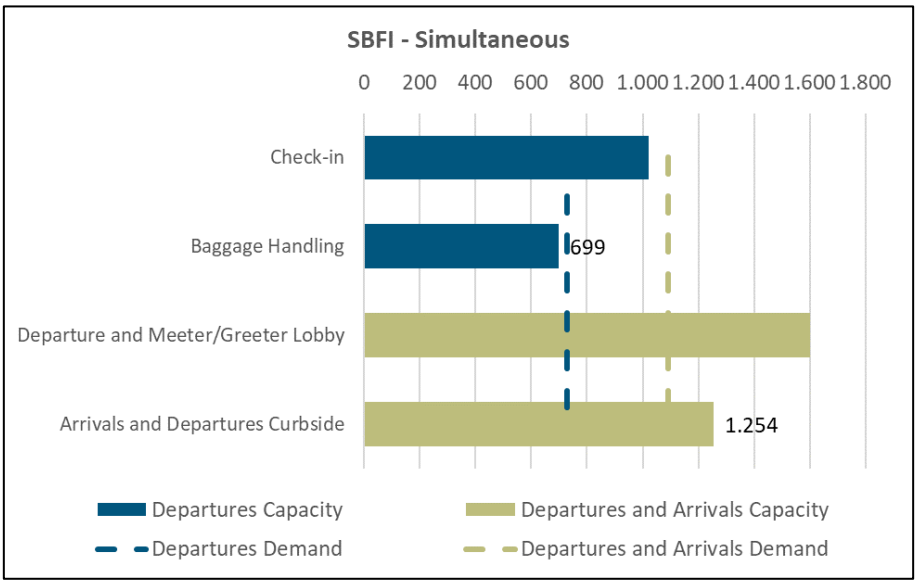
Source: GCA Consortium.

Figure 2-5: Terminal's Components Capacity – International



Source: GCA Consortium.

Figure 2-6: Terminal's Components Capacity – Simultaneous



Source: GCA Consortium.

2.1.2.3 Other Facilities

Regarding the current condition of other systems, the following observations can be noticed, about the present situation described on Table 2-5.

Table 2-5: Other Components Capacity Summary

Component	Facilities Description
Aeronautical Infrastructure	• **Operation:** presents technical capability for day/night non-precision VFR/IFR operation for both thresholds (14-32) and IFR day/night accuracy CAT I for threshold 14. With PAPI systems at both thresholds, the runway is capable of landing jet aircraft by either threshold.
Cargo Terminal System	• **Cargo Terminal Building:** not suitable to current demand. • **Airside Aprons:** suitable to current demand. • **Landside Aprons:** not suitable to current demand. • **Cargo Terminal Parking:** suitable to current demand.
General Aviation System	• **General Aviation Terminal:** there is no General Aviation Terminal currently and as the demand is less than 25,000, the sector is suitable to current needs. • **General Aviation Aprons:** not suitable to current demand. • **General Aviation Hangars and Aprons:** not suitable to current demand. • **General Aviation Terminal Parking:** suitable to current demand.
Administration and Maintenance System	• **Administration:** suitable to current demand. • **Maintenance:** suitable to current demand.
Operation Support System	• **Fuel Farm:** suitable to current demand. • **Fire Fighting Installations:** not suitable to current demand.
Airlines Support System	• **Cargo Processing:** suitable to current demand. • **Airlines Support Maintenance:** not suitable to current demand. • **Maintenance and Hangars:** not suitable to current demand.
Industrial Support System	• **Mail:** suitable to current demand. • **Catering:** not suitable to current demand. • **Airport Services:** not suitable to current demand.
Basic Infrastructure System	• **Electric Power:** suitable to current demand. • **Water Consumption:** not suitable to current demand. • **Sewage Treatment:** suitable to current demand. • **Solid Waste:** not suitable to current demand.

Source: GCA Consortium.

2.2 Demand Studies

In order to evaluate the current capacity to accommodate the forecast demand and the investments needs over the concession period, market reports and forecasts of passenger demands, aircrafts operations and freight have been developed. The Figure 2-7 shows the results of the studies of demand.

Figure 2-7: Demand Forecast Summary

Source: Market Reports.

2.3 Necessities Plan

Given the demand projections and the installed capacity, the infrastructures required to meet the expected demand were evaluated for all airport systems. The following Figure 2-8, shows a summary of infrastructure needs for the airport throughout the development stages considered for the period of analysis. The requirements of each stage are based on the existing infrastructure in face of the projected demand. Thus, the installed infrastructures have been kept, reallocated or expanded according to the anticipated needs.

Figure 2-8: Necessities Plan

SBFI	Phase 1	Phase 2	Phase 3
Airside System			
Runway	Intervention	Suitable	Suitable
Taxiways	Intervention	Intervention	Intervention
Aprons	Intervention	Intervention	Intervention
Ground Handling Equipments	Suitable	Intervention	Intervention
Passenger Terminal System			
Passenger Terminal Building	Intervention	Intervention	Intervention
Car Parking	Intervention	Intervention	Intervention
Access Roads	Intervention	Suitable	Suitable
Aeronautical Infrastructure			
Navigation Aids	Intervention	Suitable	Suitable
Air Cargo Terminal System			
Air Cargo Terminal Building	Intervention	Suitable	Suitable
Car Parking	Intervention	Suitable	Suitable
Access Roads	Suitable	Suitable	Suitable
General Aviation System			
General Aviation Terminal Building	Intervention	Suitable	Suitable
Aprons and Taxiways	Intervention	Suitable	Suitable
Car Parking	Suitable	Suitable	Suitable
Access Roads	Suitable	Suitable	Suitable
Administration and Maintenance System			
Administration	Intervention	Suitable	Suitable
Maintenance	Intervention	Intervention	Intervention
Operations Support System			
Fuel Farm	Suitable	Intervention	Intervention
Firefighting Building	Intervention	Intervention	Suitable
Airlines Support System			
Air Cargo and Maintenance Facilities	Intervention	Intervention	Intervention
Maintenance and Hangars	Suitable	Suitable	Suitable
Industrial Support System			
Mail	Suitable	Suitable	Suitable
Catering	Intervention	Intervention	Intervention
Airport Services	Intervention	Intervention	Intervention
Basic Infrastructure System			
Eletric Power	Intervention	Suitable	Suitable
Water Consumption	Intervention	Intervention	Intervention
Sewage Treatment	Intervention	Intervention	Intervention
Solid Waste	Intervention	Suitable	Suitable

Source: GCA Consortium.

Furthermore, an infrastructure needs summary for the airport with its main information and components over the 30 years considered for the analysis period is presented in Table 2-6.

Table 2-6: Main Components Necessity Summary

SBFI	Current	Phase 01	Phase 02	Phase 03
DEMAND	**2018**	**10 Years**	**20 Years**	**30 Years**
Annual Passengers Movements				
Regular Aviation	2,268,395	3,977,914	5,646,622	7,008,424
General Aviation	14,710	18,829	24,333	29,475
Total	2,283,105	3,996,743	5,670,955	7,037,899
Cargo (tons)				
Total	17,575	1,209	2,069	3,798
Aircraft Movements				
Passengers	16,088	34,015	48,233	60,062
Air Cargo	1	-	-	-
General Aviation	4,423	5,669	7,308	8,837
Total	20,512	39,684	55,541	68,899
RUNWAY SYSTEM				
Design Aircraft Code	C	E	E	E
Number of Runways	1	1	1	1
Runway Length (m) (1)	2,105	3,000	3,000	3,000
Operation Type	PA1	PA1	PA1	PA1
APRON SYSTEM				
Passengers Apron (2)				
Contact Stands	4C	6C	8C	8C
Remote Stands	12C	10C	10C	12C
Total Number of Stands	16C	16C	18C	20C
Cargo Apron (2)				
Total Number of Stands				
PASSENGERS TERMINAL SYSTEM				
Departure Peak Hour Capacity	600	1,023	1,125	1,265
Arrival Peak Hour Capacity	1,254	1,013	1,114	1,253
Terminal Building				
Total Area (m^2)	21,750	31,215	35,565	38,115

SBFI	Current	Phase 01	Phase 02	Phase 03
Baggage Handling System				
Processing Capacity (bhp)	699	849	1,026	1,148
Car Parking				
Total Area (m²)	36,880	37,880	44,530	54,943
Number of lots	1,366	1,403	1,649	2,035
Curbside				
Departure Curbside Length (m)	120	181	215	240
Arrival Curbside Length (m)	120	179	213	238
Total Length (m)	240	360	428	478
Ground Handling Equipment				
Total Area (m²)	1,730	4,610	4,080	4,310
CARGO TERMINAL SYSTEM				
Cargo Terminal Building Area (m²)	870	1,000	1,000	1,000
GENERAL AVIATION SYSTEM				
General Aviation Terminal (m²)	-	-	-	-
Total Number of Stands	8	7	7	7
General Aviation Terminal Car Parking	-	-	-	-
Hangars and Aprons Area (m²)	810	2,399	2,399	2,399
ADMINISTRATION AND MAINTENANCE SYSTEM				
Administration [3]				
Total Area (m²)	1,160	917	1,529	1,532
Maintenance				
Total Area (m²)	2,410	2,875	3,475	4,275
OPERATION SUPPORT SYSTEM				
Fuel Farm				
Total Area (m²)	9,240	5,200	7,130	8,730
	617	1,192	1,622	1,947
Fire fighting Building				
Category	7	7	7	7
Total Area (m²)	3,990	5,000	5,000	5,000

SBFI	Current	Phase 01	Phase 02	Phase 03
AIRLINES SUPPORT SYSTEM				
Maintenance Area (m²)	360	3,610	4,860	6,110
Cargo Processing Area (m²) (4)	1,550	960	960	960
Aircraft Maintenance Area (m²)	-	-	-	-
INDUSTRIAL SUPPORT SYSTEM				
Mail Area(m²)	-	-	-	-
Catering Area (m²)	-	1,400	2,000	2,400
Airport Services Area (m²)	430	3,600	5,000	6,200
BASIC INFRASTRUCTURE SYSTEM				
Water Tank (m³)	406	1,126	1,576	1,946
Solid Waste Area (m²)	255(5)	475	475	475
Electric Power Area (m²)	1,648	3,028	3,028	3,028
Sewage Treatment Units (6)	- (7)	5	7	9

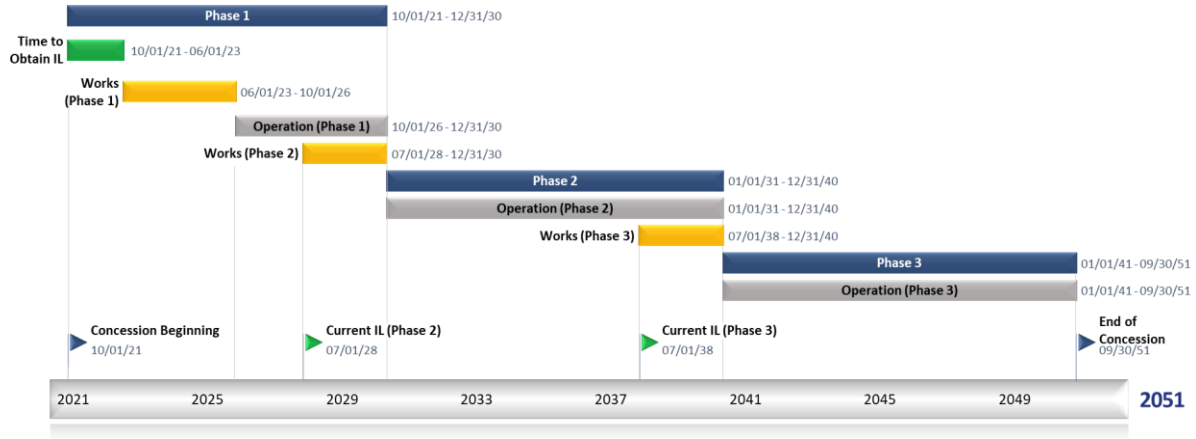
(1) It's been considered the Landing Distance Available (LDA).
(2) The cargo apron can be reversible, that means, shared with the commercial aviation.
(3) The area can be considered inside the PTB.
(4) Area can be considered inside the PTB or Cargo Terminal Building.
(5) Existing Solid Waste Area is inadequate, a new system is proposed.
(6) Compact Sewage Treatment Unit, D70 model.
(7) Currently the airport has an area of 2,624 m² designated to Sewage Treatment Units.

Source: GCA Consortium.

After scheduling needs, based on the capacity of the airport systems, it was possible to define for each component when the interventions should be initiated, so that the service level can be maintained throughout the period.

Considering the concession starts in 2021, it's estimated a 20-month period to get the installation licenses (IL) necessary to start the works. After obtaining those licenses, the work can be started. Thus, as a result of the interaction of several planning elements, the work and operation phases were set, as shown in Figure 2-9.

Figure 2-9: Phasing and Works Estimated Schedule



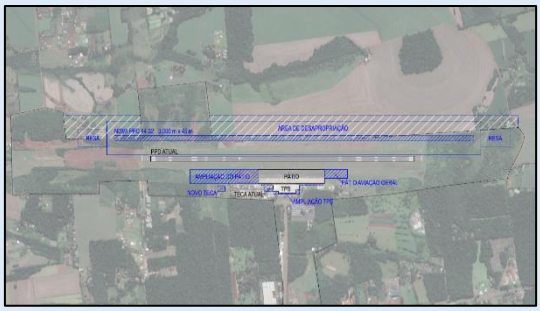
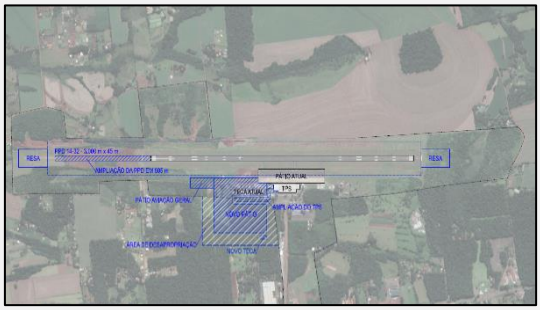
Source: GCA Consortium.

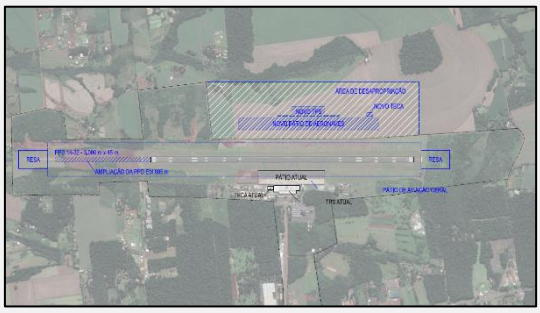
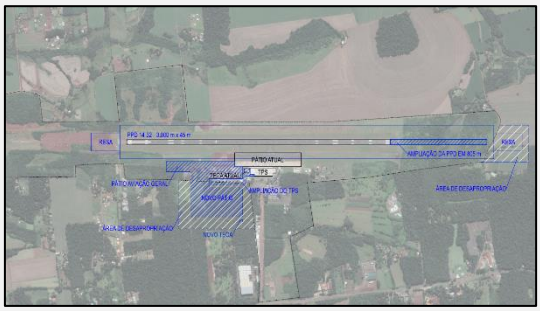
2.4 Alternatives Study

In order to choose the best alternative for the development of the airport site, it was considered the best solution for all infrastructure non-conformities, allowing the future development of the airport site in an optimized way, assuring a high level of service for all installations, minimizing the interference in the existing facilities and presenting compatible costs with the airport revenues during the concession period.

The proposed alternatives and their main characteristics are presented in Figure 2-10.

Figure 2-10: Proposed Alternatives

Alternative 01		• New runway with 3,000 m for 4E IFR CAT I operations (Costs > R$ 60 MM); • Passenger terminal building extension by approximately 12,000 m² (Costs > R$ 130 MM); • Apron reform and extension of 23,000 m² (Costs > R$ 16 MM); and • Expropriation of 550,000 m².
Alternative 02		• Runway extension of 805 m (Costs > R$ 15 MM); • Passenger terminal building extension by approximately 12,000 m² (Costs > R$ 130 MM); • Apron reform and extension of 250,000 m² (Costs > R$ 80 MM); and • Expropriation of 250,000 m².

Alternative 03		• Runway extension of 805 m (Costs > R$ 15 MM); • New passenger terminal building implementation with 24,000 m² (Costs > R$ 150 MM); • New apron implementation with 42,000 m² (Costs > R$ 18 MM); and • Expropriation of 1,000,000 m².
Alternative 04		• Runway extension of 805 m (Costs > R$ 15 MM); • Passenger terminal building extension of approximately 12,000 m² (Costs > R$ 130 MM); • Apron reform and extension of 88,000 m² (Costs > R$ 28 MM); and • Expropriation of 350,000 m².

Source: GCA Consortium.

The presented costs were obtained from reference figures by square meter (m²) and have the purpose to compare in a macro way the different alternatives. The detailed cost analysis was made only for the chosen alternative and it is presented in the CAPEX report.

Among the studied solutions, alternative 03 clearly implies the greater implementation costs, including larger expropriation area, without bringing significant capacity improvement to the system, and therefore it was discarded.

Alternatives 02 and 04 suggest the existing runway expansion, at thresholds 14 and 32, respectively, along with restauration and expansion of the passenger terminal. Although these solutions imply lesser implementation costs, they restrict the operation of code E aircrafts. Thus, once that it is considered the best alternative regarding operational aspects and also the most aligned with the assumptions defined in the current Master Plan, alternative 01 was selected as the most advantageous one.

2.5 Development Plan

After the selection of the most appropriate alternative and the Requirement Plans, it was designed the airport's development plan for the concession period. Furthermore, it was developed an architecture and engineering preliminary design. Thus, the costs of the project and operation along the implementation phases were estimated in order to enable the airport economic-financial modeling.

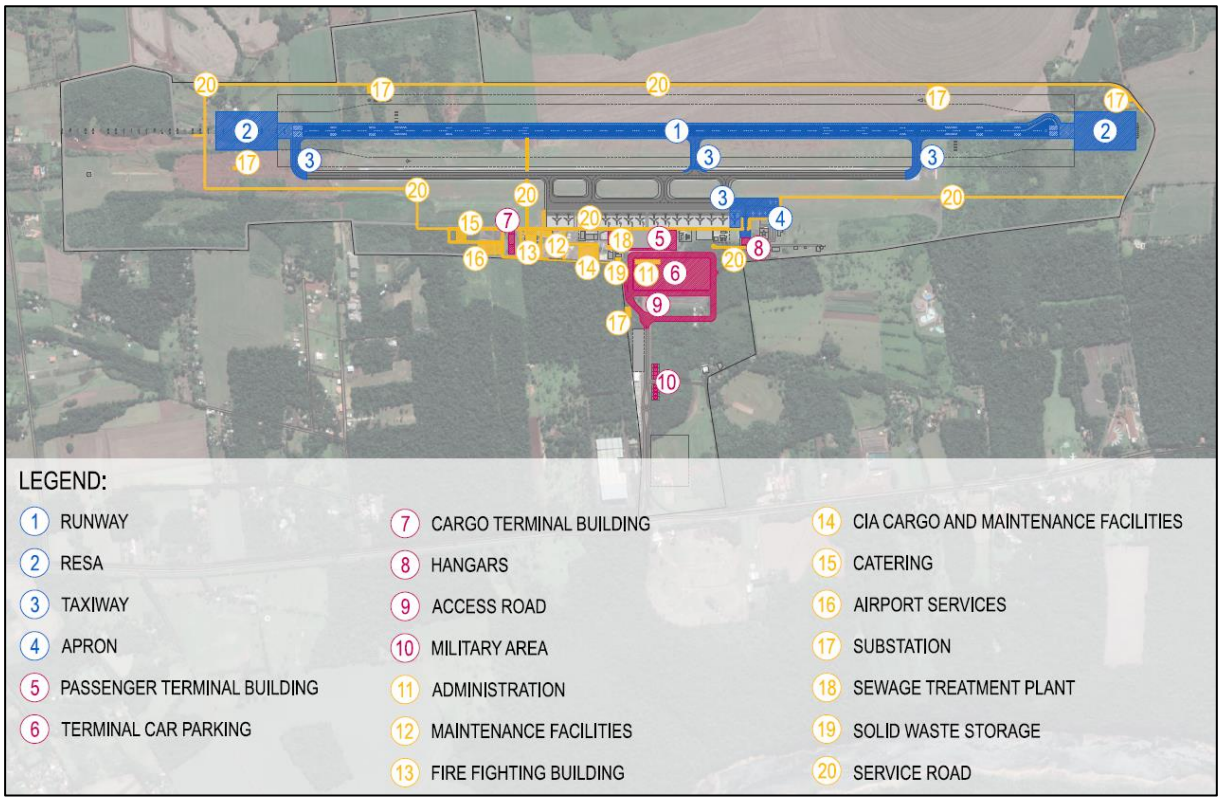
Below, the main investments for each phase of the planning are presented, as well as the implementation plants identifying the interventions at the airport and their subsequent level of details.

2.5.1 Phase 1

The first phase of the concession is expected to occur between the years 2024 and 2030, since the period between 2021 and 2024 will be used to get both the environmental licenses and carry out the constructions, so that all proposed works meet the demand of the year 2030.

In the Figure 2-11, it is presented the implementation proposed to Foz do Iguaçu International Airport, considering Phase 01.

Figure 2-11: Development Plan – Phase 01 Implementations



Source: GCA Consortium.

The main interventions proposed in this phase are:

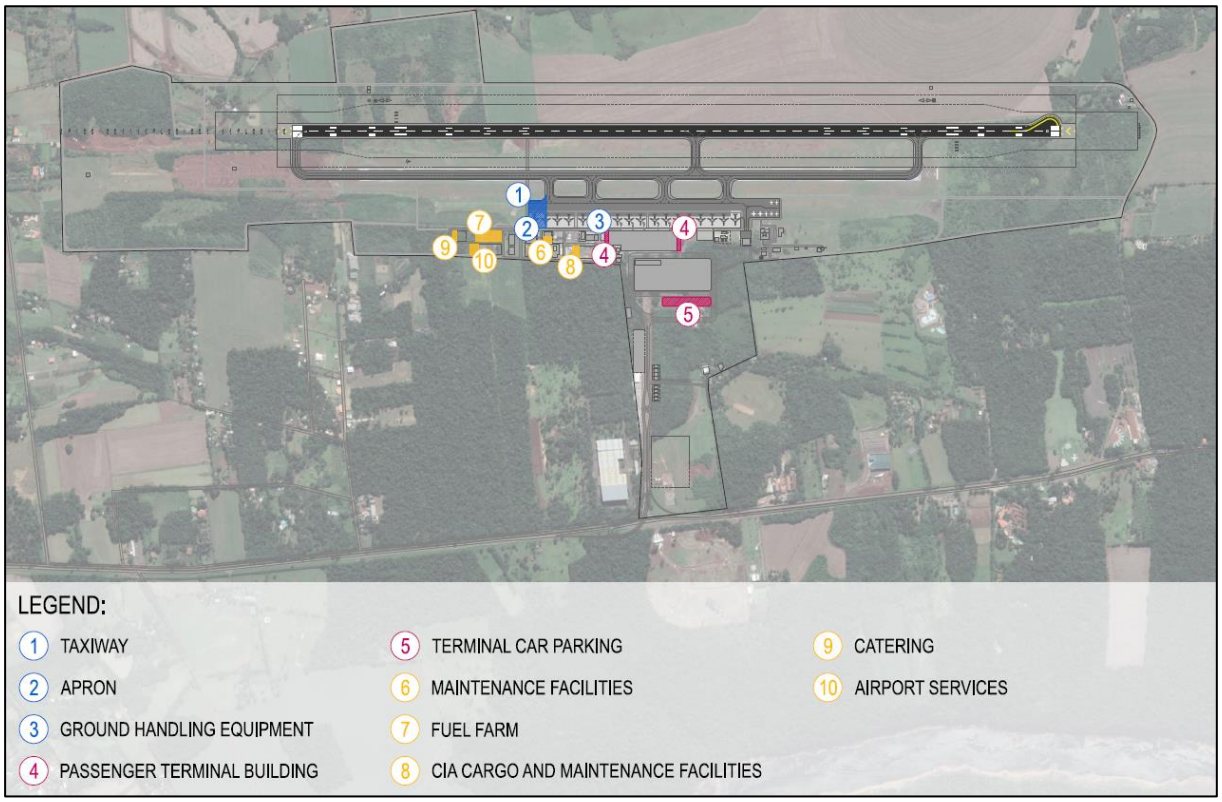
- Construction of the new Runway 15/33, and the current Runway becomes a parallel taxiway E;
- Leveling of the Runway Strip, implementation of RESAs in both thresholds and construction of shoulders at the new runway 15/33;
- Ampliation of the parallel taxiway and implementation of access taxiways F, G and H;
- Extension of the apron 1 for general aviation and its taxilane D;
- Implementation of apron 2 for general aviation;
- Extension of the PTB, reconstruction of the car parking lot and road access; and
- Implementation of new boarding bridges.

2.5.2 Phase 2

The second phase of the operation is expected to be between the years 2031 and 2040, since the period for obtaining the environmental licenses and carrying out the constructions happen in the previous phase, in order to all proposed works meet the demands of the year 2040.

In Figure 2-12, it is presented the proposed implementation for the Foz do Iguaçu International Airport, considering the Phase 02.

Figure 2-12: Development Plan – Phase 02 Implementations



Source: GCA Consortium.

The main interventions proposed for this phase are:

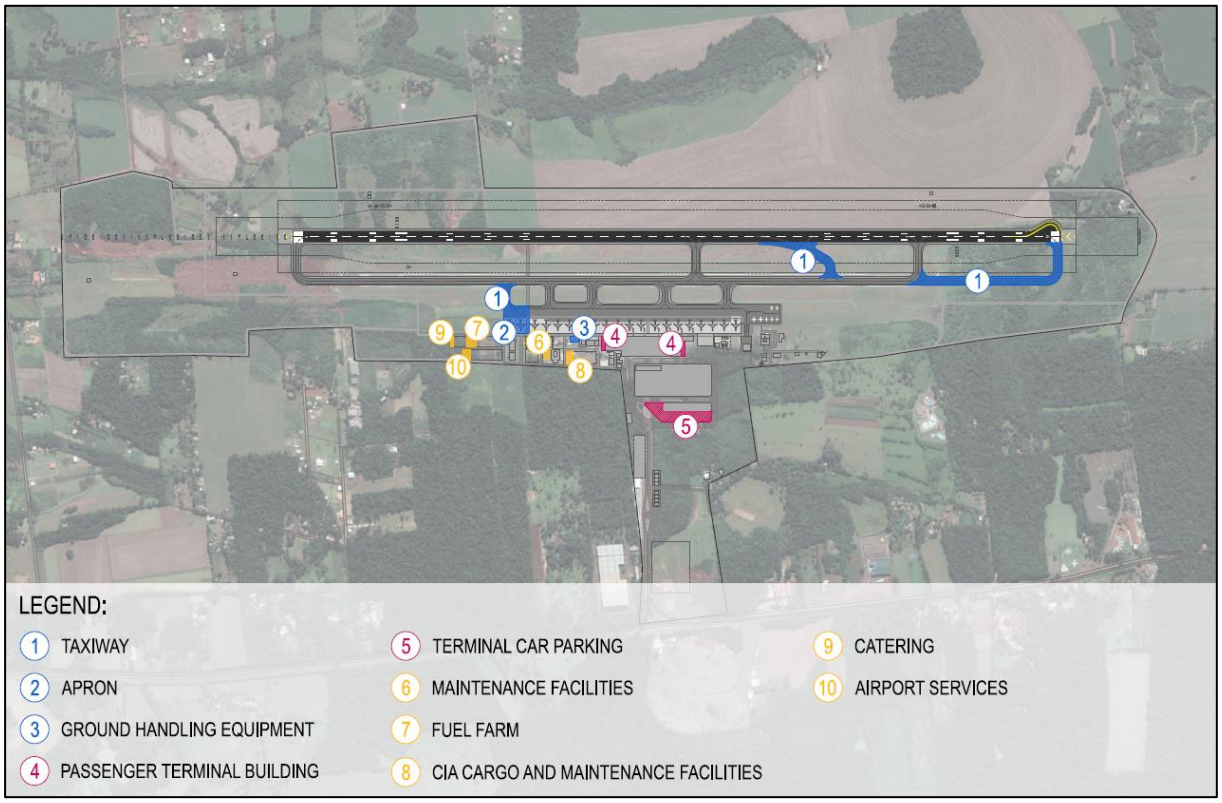
- Ampliation of apron 1 and its taxilane D;
- Ampliation of the PTB and its car parking lot; and
- Implementation of new boarding bridges.

2.5.3 Phase 3

The third phase of operation is expected to occur between the years 2041 and 2051, since the period for obtaining the environmental licenses and constructions take place in earlier stage, so that all proposed works meet the demands of 2050.

In Figure 2-13, presents the implementations proposed for the Foz do Iguaçu International Airport, considering Phase 03.

Figure 2-13: Development Plan – Phase 03 Implementations



Source: GCA Consortium.

The main proposed interventions for this phase are:

- Ampliation of apron 1 and its taxilane D;
- Extension of a parallel taxiway E and construction of access taxiways K, L and M; and
- Extension of the PTB and its car parking lot.

2.6 CAPEX

To elaborate the budget for the planned investments, prices were considered in accordance with the reference tables of SINCRO and SINAPI, in order to get referential unit cost per airport component. It was also considered the BDI rate, according to the TCU guidance and SICRO methodology. So, from the planned investments, unit costs and BDI rate, it was obtained the budget for the investments to the airport development. The Table 2-7 summarize the investments by implementation phase.

Table 2-7: CAPEX – Summary per Phase

DESCRIPTION	VALUES [R$]
Phase 1 Airport Expansion	353,989,512.09
Phase 2 Airport Expansion	62,141,707.29
Phase 3 Airport Expansion	75,782,009.44
Airport Expansion Subtotal	**491,913,228.82**
Phase 1 Airport Expropriations	20,356,386.44
Phase 2 Airport Expropriations	-
Phase 3 Airport Expropriations	-
Airport Expropriations Subtotal	**20,356,386.44**
CAPEX Total	**512,269,615.26**

Source: GCA Consortium.

The Table 2-8 compiles the investment, maintenance and expropriation expenses values for each phase, considering the investments used for the resurfaces in the runaway system (which is included in “Maintenance” in Table 2-8).

Table 2-8: Components Summary

DESCRIPTION	DEVELOPMENT (R$)	MAINTENANCE (R$)	EXPROPRIATION (R$)	VALUES [R$]
Phase 1 Airport Expansion	346,763,673.39	7,225,838.70	-	353,989,512.09
Phase 2 Airport Expansion	41,990,133.77	20,151,573.52	-	62,141,707.29
Phase 3 Airport Expansion	58,791,128.89	16,990,880.55	-	75,782,009.44
Airport Expansion Subtotal	**447,544,936.05**	**44,368,292.77**	**-**	**491,913,228.82**
Phase 1 Airport Expropriations	-	-	20,356,386.44	20,356,386.44
Phase 2 Airport Expropriations	-	-	-	-
Phase 3 Airport Expropriations	-	-	-	-
Airport Expropriations Subtotal	-	-	**20,356,386.44**	**20,356,386.44**
CAPEX Total	**447,544,936.05**	**44,368,292.77**	**20,356,386.44**	**512,269,615.26**

Source: GCA Consortium.

3 ENVIRONMENTAL STUDIES

The Report 3 – Environmental Studies was elaborated to comply with the *Public Notice (Edital de Chamamento Público) N. 2/2019* regarding projects presentation, surveys, investigations and technical studies required to subsidize the concession modeling for expansion, exploration and maintenance of the Airport of Foz do Iguaçu.

The report presents all the environmental studies performed in the field and in the office, by means of primary and secondary data, including a detailed assessment of every document provided by the Secretariat of Civil Aviation (*Secretaria de Aviação Civil – SAC)*, disclosed in Data Room, and of environmental processes verified at the Environmental Institute of Paraná (*Instituto Ambiental do Paraná – IAC)*) on July 19 and October 14, 2019.

These data oriented the technical field visit to the Airport of Curitiba, which occurred on May 15, 2019.

Environmental studies were conducted in order to meet the guidelines presented by the public notice, considering that all of the requirements were properly addressed in the report, according to certain analytical chronology, by means of careful evaluation of the airport's compliance with the respective licensing procedures, expansion studies, master plans and previous environmental studies.

The airport of Foz do Iguaçu is located in Foz do Iguaçu city, in the extreme West of Paraná state, in Brazilian borders with Paraguay and Argentina.

The airport's history began in the 30s, when in 1933 the negotiations for acquiring a land where an aviation field could be built, not only for strategy purposes, but for establishing a line of Military Air Mail covering the Foz do Iguaçu and Guaíra region. The first landing occurred in 1935. In 2012, when the Iguazu Falls (*Cataratas do Iguaçu*) became one of the New Seven Wonders of Nature, the airport began new expansion and modernization stages.

The airport of Foz do Iguaçu is regular concerning the operating licensing of its current activities and infrastructure. The Environmental Institute of Paraná (*Instituto Ambiental do Paraná – IAP)*, the environmental agency of Paraná state, is responsible for the environmental licensing of the enterprise. Information on the Operating Licenses (OL) is detailed below.

Chart 3-1: Operating License Data

License	Issuing Agency	Process n.	Issue	Expiration	Status
6.901	IAP	13.689.418-8	July 23, 2018	July 23, 2022	Effective

Source: GCA Consortium.

The report detailed the compliance *status* of Operating Licenses (OL) n. 6.901/2018 constraints, as well as the historical and relevant points of the processes.

Portaria n. 656/2015-DPCA, of Water Institute of Paraná, issued for granting effluents disposal in Tigre River, expired on October 4th, 2019 and needs to be renewed, considering occasional flow adequations, considering the recently installed ETE.

Since the beginning of its operations, the enterprise received several expansion and improvement constructions. The environmental report presents the main actions, constructions, intended constructions and their respective environmental licenses obtained after 2013.

The following documents were surveyed and reported, regarding the airport manager: authorizations, license agreements and other licenses, including those obtained by its concessionaire enterprises. A list of ongoing agreements, with the activities susceptible to licensing, was also presented.

Regarding the regularity of the enterprise, notifications and non-compliances of the airport were surveyed and exhibited to several agencies, National Agency of Sanitary Vigilance (*Agência Nacional de Vigilância Sanitária -Anvisa*) and National Agency if Civil Aviation (*Agência Nacional de Aviação Civil -ANAC*).

There is a legal procedure at Federal Public Ministry of Paraná State (*Ministério Público Federal/PR*) regarding the compliance with RBAC 164/2014 issued by ANAC on fauna risk management at the airport of Foz do Iguaçu, as a way of improving the accidents prevention system. The airport has IPF (valid until May 31, 2024) and PGRF submitted recently to ANAC.

There are 04 Infraction Notices, among them, one was issued by ANVISA, other concerns the CNPJ of the airport of Foz do Iguaçu.

The information on past notices and fines do not oblige the next manager, which is not responsible for their payments. However, the current airport manager is responsible for eliminating the facts that originated such notices, as well as for managing ongoing mitigating or recovering actions.

A socio-environmental assessment of the Airport of Foz do Iguaçu was performed and presented by means of the socio-environmental diagnosis in this report, considering the following aspects:

- Soil Use and Coverage including approaches to water resources, permanent preservation areas (APP) and vegetation;
- Irregular superficiaries and occupations in the airport assets area;
- Potential of Cave Occurrence;
- Mining rights;
- Fauna and Fauna Risk;
- Noise;
- Atmospheric Emissions;
- Energy;
- Basic Sanitation including approaches to water supply, effluents, solid waste and drainage system;
- Degraded areas, erosions and silting;
- Environmental Risks/Emergencies;
- Conservation Units, Protected Assets and Communities, including the analysis of heritage, archeological or pre-historical sites and traditional communities;
- Stakeholders engagement;
- Environmental Management System.

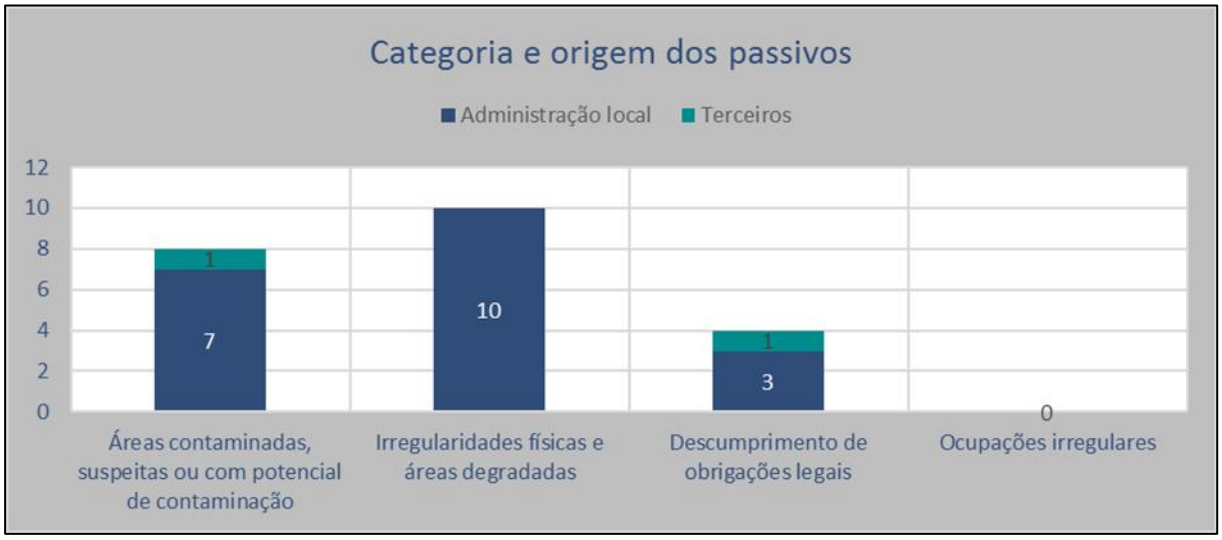
Some of the significant issues identified regarding the aspects above mentioned are:

- In the airport site there are water bodies and Permanent Preservation Areas;
- The airport has a registered legal reserve area;
- There are superficiaries at the site, 08 military residences and 02 entertainment areas;
- There are mining titles issued in the airport of Foz do Iguaçu site;

- The airport management currently destines waste for municipal collection. However, it is classified as a great waste generator and shall promote its waste disposal by a hired company.
- At the slope of the runaway end there is a significant erosion issue, and PPD drainage system requires enhancements.

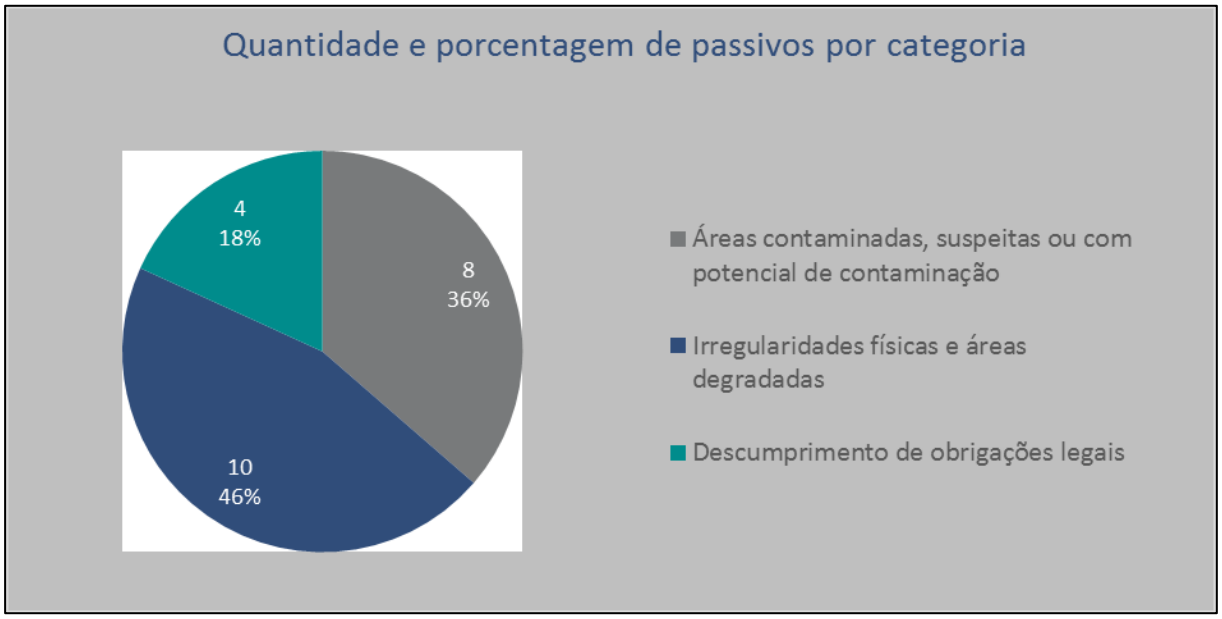
During the preparation of this document, existing socio-environmental passives were surveyed, evaluated and priced. For the Airport of Foz do Iguaçu, 22 passives were identified, 20 originated by local administration and only 02 by third parties. From this total, 36% were related to contaminated areas, 46% to physical irregularities and degraded areas and 18% to noncompliance with legal obligations. No passives related to irregular occupations were identified.

Figure 3-1: Category And Source Of The Passives



Source: GCA Consortium.

Figure 3-2: Quantity And Percentage Of The Passives By Category

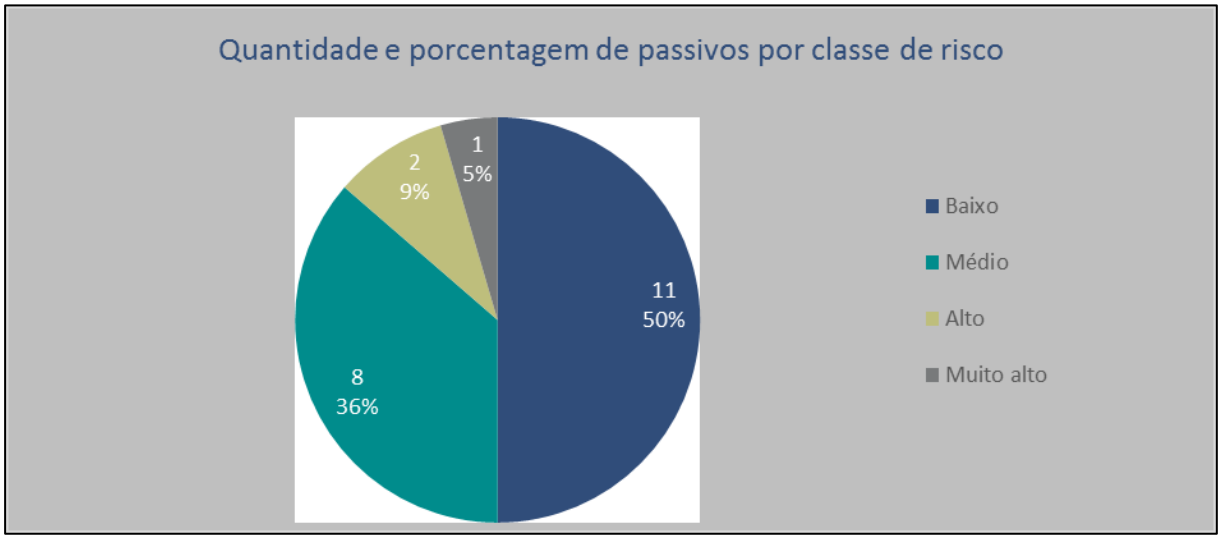


Source: GCA Consortium.

The classification of passives identified according to their Risk Class was assessed based on a methodology adapted from FMEA (*Failure Mode and Effects Analysis).*

Considering the current scenario, the Airport of Foz do Iguaçu presents passives classified as of Very High, High, Medium and Low risks. The passives classified as of Very High to High risk shall be managed in the short run, and the passives classified as of Medium to Low risk may be managed according to their respective criticalities in short or medium term.

Figure 3-3: Quantity And Percentage Of Passives By Risk Class



Source: GCA Consortium.

The study includes a detailed analysis of current and future compatibility of the airport activities and soil use, dedicated to verify if the protection plan against obstacle, the noise zoning plan and airport

safety area were properly incorporated in the guidelines and legislation that regulates the occupation of the airport's neighboring areas.

In order to guarantee the good development of the enterprise, the neighboring areas shall continue to be compatible with the airport activities. To achieve this goal, the airport manager shall update and approve the appropriate plans, especially in case of meaningful alterations in operation and infrastructure.

The study also estimated the quantity of people affected by the aeronautical noise levels, according to the chart below, for the Current and Future development scenarios.

Chart 3-2: Aeronautical Noise Impacts On The Neighboring Population In The Current And Future Scenario

Area inside noise contours	Number of people living inside the contours		Number of residences inside the contours	
	Current Contours	Future Contours	Current Contours	Future Contours
65 -70dB	0	5	0	1
70 - 75dB	-	-	-	-
75 - 80dB	-	-	-	-
80 - 85dB	-	-	-	-

Source: GCA Consortium.

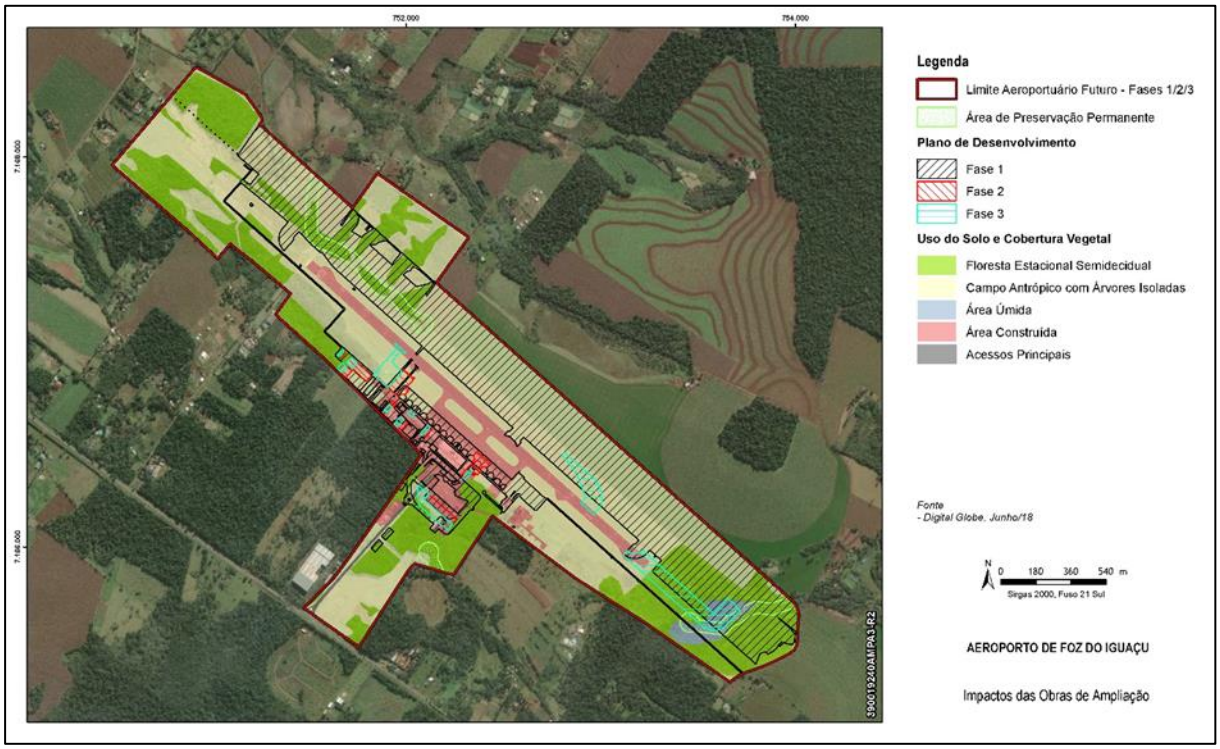
Regarding risks to the Fauna, the study identified the main focuses of attraction inside the Airport Safety Area (ASA), a circular area with 20 km of radius, marked from the geometric center of the longest runway. We highlight the focuses related to agricultural activities, fishing and neighboring parks. Thus, the airport manager shall help the municipality to monitor the focuses and to develop educational actions in order to avoid the appearance of new focuses.

Based on all these surveys, the main goal of the study was fulfilled, especially regarding the legal and environmental restrictions of the airport and its neighboring areas. Socio-environmental criteria to be incorporated to the project were identified and oriented the Development Plan in order to minimize environmental impacts.

The airport presents some environmental restrictions that may hinder its expansion. The future airport manager is supposed to request the alteration of the Legal Reserve already registered, according to the guidelines of *Portaria* IAP n. 055, of March 20, 2018. The construction of a new PPD, aiming at, among others, the yard, aircrafts and TPS regularization – that are in the runaway side or the transition surface –, will require a soil deposit importation of 1.6 million cubic meters.

Therefore, the Development Plan for the Airport considered every restriction and environmental criteria surveyed in the study. The solution proposed is the one with the lowest environmental impact in the airport region and that allows its compliance with applicable legislation. The following figure shows the impact of expansion works on soil use and coverage.

Figure 3-4: Impact Of The Adequation Constructions On Soil Uses And Coverage



Source: GCA Consortium.

Evaluating the construction works impact on soil use and coverage in the Airport of Foz do Iguaçu, during the Development Plan implementation in its three phases, vegetation suppression will be required. The interventions shall be made in 61.98% in the Anthropic Fields areas with isolated tree individuals; 22.52% in the Semideciduous Seasonal Forest, 13.27% in the already constructed areas, 2.04% in wetland areas e 0,19% in existing accesses. Interventions in APP will also be necessary, only for Phases 1 and 3, with 6.73% and 0.57%, respectively, of the intervention areas located in permanent preservation areas.

Concerning socio-environmental risks associated to the project, *i.e.*, situations that may impair or delay the execution of foreseen activities and constructions, three risk situations were identified and summarized below.

Chart 3-3: Risks And Their Respective Strategies To Minimization

Socio-environmental risk management at the Airport	
RISK SITUATION 1	Intense population density in the airport's surroundings
Identified risk	• Airport operations may affect the neighboring population with unpleasant levels of noise. • Conflicts between airport activities and surrounding soil use and occupations.
Strategies to minimize the risk	• To establish technical partnership with Foz do Iguaçu municipality to incorporate the Specific Noise Zoning Plan (PEZR) in municipal legislation and in the procedures of real estate approval in areas affected by the airport noise contours and other use and occupation restrictions concerning operational safety.

Socio-environmental risk management at the Airport	
	• To perform educational and awareness activities with the surrounding Community on the importance of preserving and respecting the airport's property limits.
RISK SITUATION 2	Delay in expropriation procedures related to areas required for the new PPD construction
Identified risk	• Delay on constructions execution. • Occasional judicial conflicts with the owners regarding values and payments.
Strategies to minimize the risk	• To perform technical partnerships with municipal administration of Foz do Iguaçu and INFRAERO to follow up the actions.
RISK SITUATION 3	Delay on negotiations with the environmental agency concerning Legal Reserve
Identified risk	• Delay on constructions execution.
Strategies to minimize the risk	• To perform technical partnerships with municipal administration of Foz do Iguaçu and INFRAERO to follow up the actions before IAP, based State Decree n. 11.515/2018 and *Portaria* IAP n. 055/2014.

Source: GCA Consortium.

Considering that the local availability of input and raw material suppliers, and of waste disposal sites required to implement the Development Plan are essential to the Project feasibility, the Environmental Report listed potential licensed suppliers to help estimating costs in the Report of Engineering and Related Issues.

The study also presents the licensing guidelines required for the entire concession period, accompanied by the respective schedules for the implementation and operation phases of the airport.

For the Operational phase, considering that the airport of Foz do Iguaçu is regularized, and that the concession begins in the second half of 2021, the Operating License renewal shall be requested by the new airport operator. Normally, the licenses issued for Airport of Curitiba expire in 4 years. Therefore, the airport manager will receive the airport with an Operating License valid until July 2022.

Based on these conditions, the chart below presents recommendations to the future airport manager, regarding the conduction of the airport's operating licensing:

Chart 3-4: Recommendations For Conducting The Airport's Operating Licensing

Recommendations for conducting the airport's operating licensing
Once you took over the airport's management, you must request the license titularity transference to your name and CNPJ.
During the airport operation, all the constraints of the future Regularization Operating License (or similar) must be addressed. Periodical reports on the activities' execution must be presented to the environmental agencies.
To request the OL renewal at least 120 days before its expiration date, according to paragraph 6th incise III of article 2 of State Decree n. 47.400 of December 4th, 2002.
After the end of each construction phase, if authorized by means of an Installation License, the entrepreneurship shall request these constructions to be included in the current operating license, avoiding the issuing of several OL for the same airport enterprise.

Source: GCA Consortium.

Besides of the operating environmental licensing of the airport, the airport operating activities will be regular by the issuing of authorizations, exemptions and complementary grants and documentation approval by regulatory public agencies. The chart below presents the estimated timeframes used in the present study.

Chart 3-5: Estimated Timeframes For Other Authorizations, Grants And Licenses

Description	Estimated timeframe	TOTAL
Regularization/Renewal/ Transference of Grant for water resources use (AA[1]) and Grant Issuing (OC[2])	2 months (AA[1]) 2 months (OC[2])	4 months
Regularization of Federal and State Technical Registration (AA[1])	2 months (AA[1])	2 months
Elaboration/Regularization/Renewal of IPF and PGRF (AA[1]) and validation in ANAC (OC[2])	15 months (AA[1]) 3 months (OC[2])	18 months
Elaboration /Regularization of noise contours and PZR (AA[1]) and validation and registration in ANAC (OC[2])	6 months (AA[1]) 3 months (OC[2])	9 months
Regularization of PBZPA and PZPANA(AA[1]) and validation in ANAC and DECEA (OC[2])	6 months (AA[1]) 4 months (OC[2])	10 months
Mining block request to DNPM (AA[1]) and mining block issue (OC[2])	2 months (AA[1]) 2 months (OC[2])	4 months

Notes:

[1] AA- Airport manager

[2] OC- Responsible agency

Source: GCA Consortium.

Regarding the expansion and adequation constructions phase, the Development Plan proposed for Airport of Foz do Iguaçu will be implemented in three phases. The chart below summarizes the licensing assumptions for each phase.

Chart 3-6: Licensing Assumptions For The Expansion And Adequation Constructions Of Airport Of Foz Do Iguaçu

Evaluated aspects	Phase 1	Phase 2	Phase 3
Impact degree of the constructions	High	Medium	Medium
Licensing agency	IAP (State)	IAP (State)	IAP (State)
Applicable licenses	PL and IL	IL effective in Phase 1*	IL effective in Phase 1*
Studies to be performed	EIA/RIMA and PCA	-	-
Maximum estimated timeframe for studies and licensing	20 months	Effective licensing	Effective licensing

*Legislation foresees that the IL may be renewed up to the execution of constructions from Phase 2 and Phase 3.

Source: GCA Consortium.

The Phase 1 constructions of the Development Plan, including the construction of a new PPD, expansion of taxiways and yards, among other structures, were classified as of high environmental impact. So, an Environmental Impact Study and its respective Environmental Impact Report (EIA/RIMA) is required to subsidize the Preliminary License – PL issue.

Concerning IL issue, the environmental agency use to demand the elaboration of an Environmental Control Plan (*Plano de Controle Ambiental - PCA*) or an Environmental Basic Plan (*Plano Básico Ambiental - PBA*), detailing the environmental programmes to be implemented during the construction phase for controlling and mitigating the impacts described by the study that subsidized the PL issue. Therefore, the goal and content of both studies are similar. The Environmental Studies report considered that the environmental agency will request the PCA elaboration.

Still concerning Phase 1 constructions, for enterprises subject to EIA/RIMA elaboration, the entrepreneur shall support the installation and maintenance of conservation unit from the Integral Protection Group (*Grupo de Proteção Integral*), according to the National System of Conservation Units (*Sistema Nacional de Unidades de Conservação - SNUC*). So, 0.5% from Phase 1 total investments of the socio-environmental budget will be destined to environmental compensation in conservation units.

For Phases 2 and 3 the same IL, effective for Phase 1, will be used, appropriately subsidized by previous studies, that shall be previously elaborated considering the construction works foreseen for all the development phases. We highlight that IL is effective for 06 years and may be renewed until the end of the concession.

The estimated timeframes for the environmental licensing of the constructions considered the impact degrees previously described, results being presented below.

Chart 3-7: Estimated Timeframes For Licensing Constructions Of High Environmental Impact

Description	Estimated timeframe
EIA/RIMA elaboration for PL issue	9 months (AA[1])
PCA elaboration for IL issue (simultaneous to EIA/RIMA elaboration)	3 months (AA[1])
RAEIA/RIMA analysis and new PL issue	6 months (OA[2])
PCA review and compliance with the constraints after the PL issue	1 month (AA[1])
Analysis and new IL issue	4 months (OA[2])
TOTAL	**20 MONTHS**

Notes:

[1] AA- Airport manager

[2] OA- Environmental Agency

Source: GCA Consortium.

The airport manager should also analyze verify other authorizations required to enable the Development Plan, concerning the licensing of all its three phases. The chart below summarizes this evaluation for Airport of Foz do Iguaçu.

Chart 3-8: Environmental Authorizations And Procedures Required For Rio Branco

Authorization/Procedure	Applicability for the Development Plan
Municipality Opinion	Applicable
Authorization for Vegetation Suppression (ASV) and/or Intervention in APP	Applicable
National Institute of Historical and Artistical Heritage (*Instituto do Patrimônio Histórico e Artístico Nacional - IPHAN*) Opinion	Applicable
Grant of water resources use	Applicable
Mining Block	Applicable
Authorization from Conservation Units Managers	Applicable
Authorization for intervention in traditional communities or its surrounding zones	Not applicable
Obtainment of the Evaluation Report Malarigen Potential (*Laudo de Avaliação do Potencial Malarígeno - LAPM)* and Certificate of Sanitary Condition (*Atestado de Condição Sanitária - ATCS*)	Applicable

Source: GCA Consortium.

To achieve excellence in socio-environmental management, this study presented mitigation measures, suggestions on Sustainability Guidelines, Environmental Management System, Environmental Plans and Programmes and Environmental Development Indexes to the future airport manager, considering all the environmental subjects assessed herein.

Finally, the study presents the socio-environmental cost budget foreseen for the expansion constructions (CAPEX) and for the airport operation (OPEX), summarized below:

Chart 3-9: Socio-Environmental Costs In R$ Estimated For The Airport Of Foz Do Iguaçu

Activity	Phase 1	Phase 2	Phase 3	TOTAL
Licensing and Analysis Fees	6,907.83	2,254.78	2,254.78	11,417.39
Environmental Studies	1,039,937.66	-	-	1,039,937.66
Environmental Management of the Constructions	4,281,887.98	2,052,654.34	2,052,654.34	8,387,196.66
Vegetation Suppression and Forest Compensation	2,571,358.54	2,066.93	149,643.74	2,723,069.22
Confirmatory Investigation of Passives	576,115.12	-	-	576,115.12
Environmental Passives Recuperation	450,000.00	-	-	450,000.00
Environmental Compensation SNUC *	1,680,779.76	198,427.61	281,773.73	2,160,981.09
Total	**10,606,986.88**	**2,255,403.66**	**2,486,326.59**	**15,348,717.13**

* Corresponds to 0.5% of the investment value, in case of significant environmental impact, analyzed by EIA/RIMA

Source: GCA Consortium.

Chart 3-10: Environmental OPEX Estimated For The Airport Of Foz Do Iguaçu

Item	Activity	Total Cost (R$)
2.1	Environmental Licensing Fees	710,366.16
	OL Renewal	*14,758.56*
	TCFA – IBAMA	*695,607.60*
2.2	Operation Environmental Management	9,548,810.18
2.3	Elaboration of PBZPA and PZPANA	205,678.91
2.4	Fauna Management Programme	3,574,361.15
	PF and PGRF Elaboration	*2,494,361.15*
	Fauna handling actions	*1,080,000.00*
2.5	Noise Management Programme	89,252.79
2.6	Energy and Air Emissions Management Programme	23,817.19
2.7	Water Resources and Effluents Management Programme	5,099,518.40
	Sampling Plan Elaboration	*23,817.19*
	Water Resources Monitoring	*5,075,701.21*
2.8	Solid Waste Management Programme	37,282.87
2.9	Social Communication, Environmental Education and Training	829,344.89
	TOTAL	**20,118,432.55**

Source: GCA Consortium.

The Environmental Studies maintained the innovations presented in the study is elaborated by GCA Consortium of the 5th Round of Airport Concessions from Federal Government, which culminated in the concession of 12 airports for private initiative. They are:

- Analysis of soil use and occupation inside noise contours, by means of identifying the quantity of residences and their respective areas, people and average quantity of people per residence based on census information (IBGE, 2010);
- Survey of focuses of fauna attraction, using criteria defined by specific aeronautical legislation;
- Survey and analysis of collision indexes involving aircrafts and fauna, according to data provided by CENIPA;
- Identification of areas vulnerable to the airport activities, since there are fauna and flora species of restrict distribution located in regions under the aerodrome influence, according to ICMBIO criteria;
- Risk evaluation of environmental passives based on a methodology adapted from FMEA (Failure Mode and Effects Analysis);
- Indexes proposition according to GRI Standards (version 2016) and GRI G4- Airport Operator *Sector Disclosures* (version 2013) references, correlating them to the Sustainable Development Goals (*Objetivos de Desenvolvimento Sustentável -ODS*), to the IFC Performance patterns, and with the guidelines of Global Pact.

In addition, with the participation of several professionals specialized in the environment area and with effective practice on airport operation, the flowing innovations were performed in the Environmental Studies:

- Identification of all kinds of irregular superficiaries and occupations in the property and the expansion area;
- Survey of potential cave occurrences in the airport area and its surroundings;
- Information on the existence of mineral deposits in the airport area and its surroundings;
- Evaluation of mining rights in the airport area and its surroundings;
- Amplification of identified classes of environmental passives and its respective results presented by an Excel spreadsheet, with friendly and intuitive interface;
- Survey on receptors sensitive to aircraft noise – public institutions, hospitals and schools – located inside the airport noise contours;
- Indication of licensed potential suppliers of inputs and raw materials, close to the airport, for the Development Plan constructions;
- Indication of licensed sites for adequate waste disposal, close to the airport;
- Evaluation of the airport position on the ranking of airports used for animal traffic, as well as proposition of actions to prevent traffic;
- Use of indicators from the Guide of Good Practices for Elaborating Indicators of Operational Safety elaborated by the Brazilian Group of Operational Safety in Airport Infrastructure (BAIST), published in August 2019;
- Quantification of the expansion construction impacts in Permanent Preservation Areas (APP) and proposition of differentiated forest compensation, according to local legislation;

- Use of data on water, obtained by SPT drilling performed by GCA, to guide the estimated budget of Confirmatory Investigations and sites with suspected contamination in the airport;
- Incorporation of sustainable proposals in the Development Plan;
- Definition of Sustainability guidelines for the airport operations, aligned with the policies adopted by the Ministry of Infrastructure.

4 ECONOMIC AND FINANCIAL EVALUATION

This section presents the Executive Summary of the Economic and Financial Evaluation for the 30-year concession of **Foz do Iguaçu International Airport - SBFI** modelled between 01/October/2021 and 30/September/2051. Currently, the airport's total revenue is R$53MM and its EBITDA margin is 35% (considering 2018 data)[11].

Revenues

The economic and financial evaluation is based on revenue projections which include:

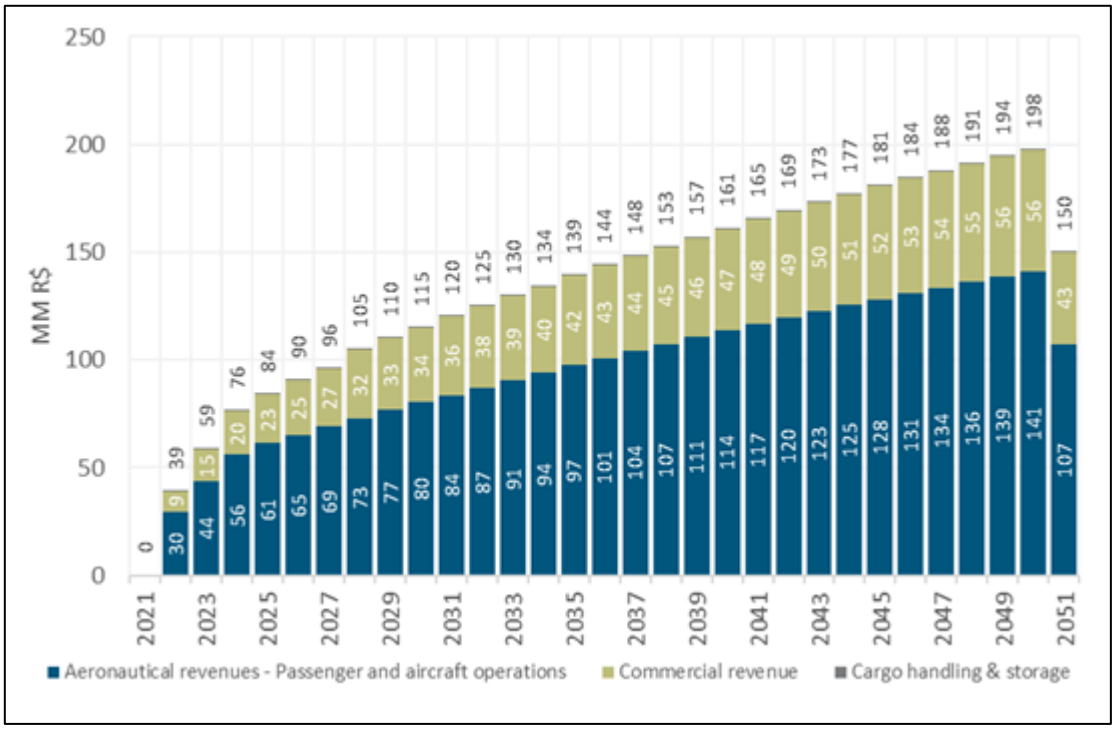
- Aeronautical revenues, resulting from regulated fees on the various operation types. These have been categorized as passenger and aircraft fees and cargo handling and storage fees;
    - Aeronautical revenues – passengers and aircraft operations: applicable to both passenger flows (domestic and international boarding or connection fees) and aircraft operation and parking, by operation type (domestic and international landing and parking fees, and landing and boarding and parking fees for general aviation);
    - Cargo handling and storage: due for cargo handling and storage services where rendered directly by the Airport operator at the air cargo terminal (TECA), and may divide into import, export and domestic cargo;
- Commercial revenues, related to services and goods provided to passengers, airlines and other business users, i.e. retail, food & beverages, car parking, aircraft fuelling, car rental etc.

Forecasts for Aeronautical revenues are based on expected Airport throughput, which include passenger flows, cargo, mix of aircraft types and aircraft operations, and their respective regulated fees. Meanwhile, forecasts for commercial revenues consider not only expected demands and their respective impacts over each category of business, but also efficiency gains resulting from contract renegotiations between the concessionaire and the lessees of commercial areas, following market benchmarks.

Total revenues are expected to grow an average of 4.6%p.a. between 2023 and 2050 (first and final full year of the concession). Commercial revenues share will increase during the concession period, from 25% in 2023 to 29% in 2050.

11 All monetary value presented in this report is given in constant Real (R$) values based on January/2019 real prices, following SAC/MI guidance.

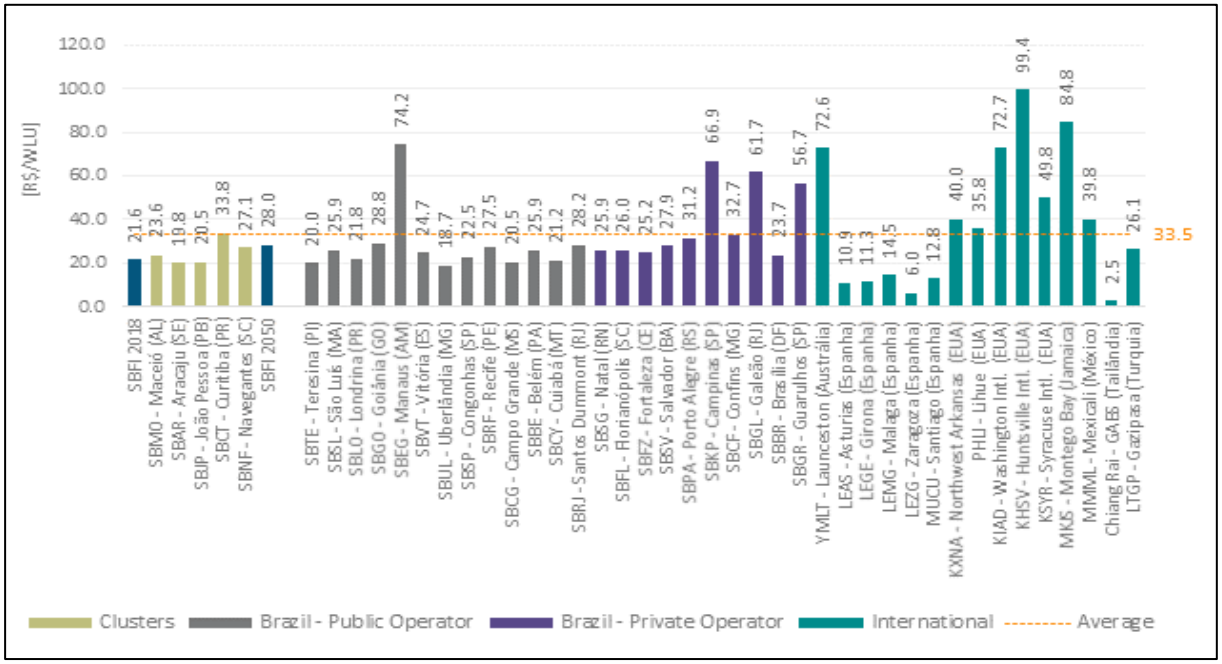
Figure 4-1: Total revenues during concession



Source: GCA Consortium.

In 2050, the Airport's revenue per WLU will be R$28.0. Airport indicators are below the average of comparable airports (Figure 4-2).

Figure 4-2: Revenue per WLU benchmark



Source: GCA Consortium.

Costs and expenses

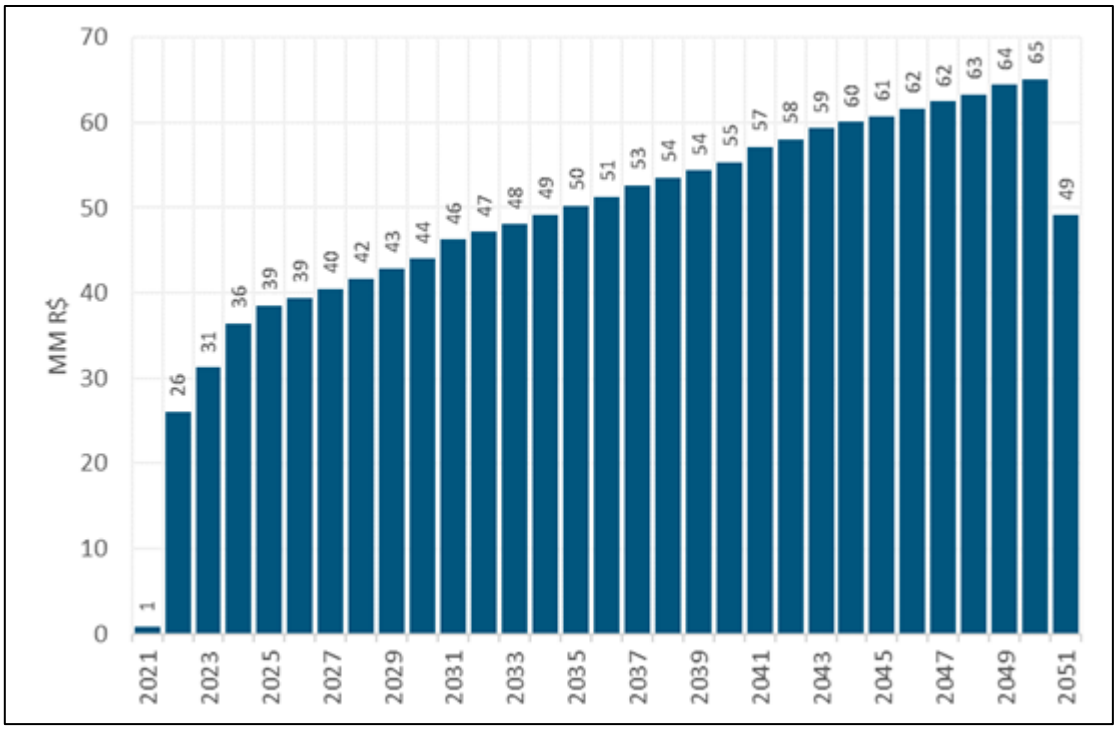
Airport operating costs and expenses are mainly related to personnel and outsourced services, in addition to utilities and public services and consumables.

After the concession, the concessionaire will take up new obligations, which include performance bond, socio-environmental expenses and property tax (IPTU). The concessionaire must also pay grants, applicable according to the feasibility of the concession and therefore not discussed under this item.

Costs and expenses forecast take into account the most appropriate forecast drivers for each item, that is, the variables that best explain the evolution of the observed costs. Additionally, costs and expenses forecasts were based on current values and considered initial efficiency gains derived from private management as well as economies of scale, determined from benchmark analyses.

Total costs and expenses forecasts show an annual average growth rate of 2.8% between 2023 and 2050, increasing from R$31MM to R$65MM (Figure 4-3). Personnel and Outsourced services costs are the most significant, representing 47% and 33% of total costs in 2050, respectively.

Figure 4-3: Costs and expenses during concession (prior to grant values)



Source: GCA Consortium.

It is important to emphasize that, before entering into the concession agreement, the concession holder will be required to settle funds for Infraero's staff readjustment program, reimbursement to authors of the feasibility studies, and compensation to São Paulo stock exchange (B3) for holding the auction (Table 4-1).

Table 4-1: Obligations to be met prior to signing the contract

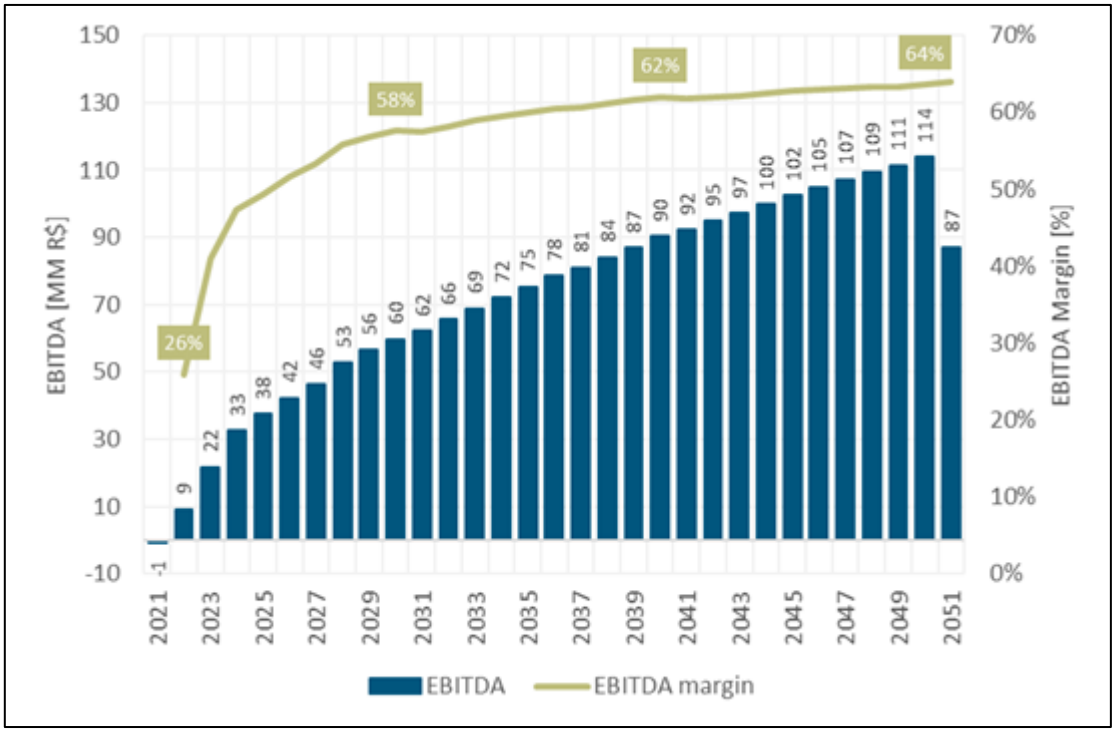
Values in MM R$	TOTAL
OBLIGATIONS TO BE MET PRIOR TO SIGNING THE CONTRACT	**(37.3)**
Funds for Infraero's staff readjustment program	(32.7)
Reimbursement to authors of the feasibility studies	(4.5)
Payment to B3 for holding the auction	(0.1)

Source: GCA Consortium.

EBITDA and margin

Net of grant payments, the concession EBITDA is forecast to be R$22MM in 2023 and to reach R$114MM in 2050 (Figure 4-4), with an average growth of 6.3%p.a. EBITDA margins increase is forecast throughout the concession due to expected economies of scale.

Figure 4-4: EBITDA and EBITDA margins during concession



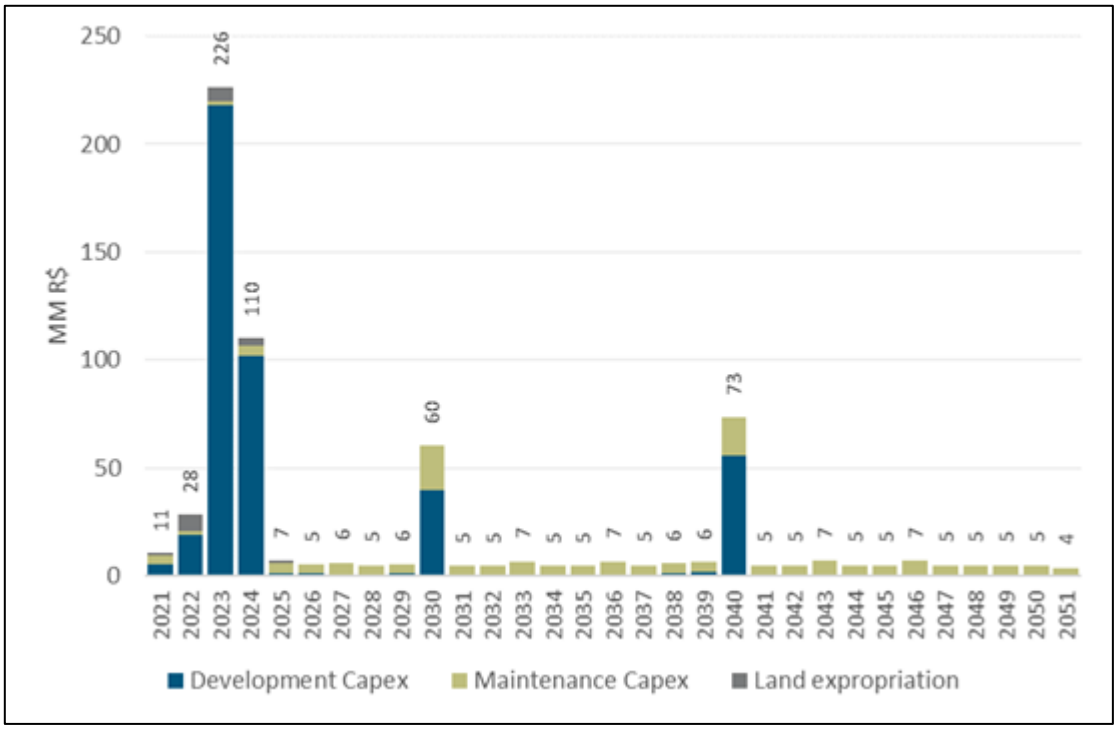
Source: GCA Consortium.

CAPEX

The development plan, expansion of airport assets to meet growing demands and ensure appropriate level of service, requires a total investment of R$642MM.

Development investments (topical and intended to expand airport assets, including expropriations) will be divided into different phases and amount to a total R$468MM. Maintenance investments (periodical and intended to maintain and replace assets, including re-paving cycles) add up to R$174MM throughout the concession period (Figure 4-5).

Figure 4-5: CAPEX during concession

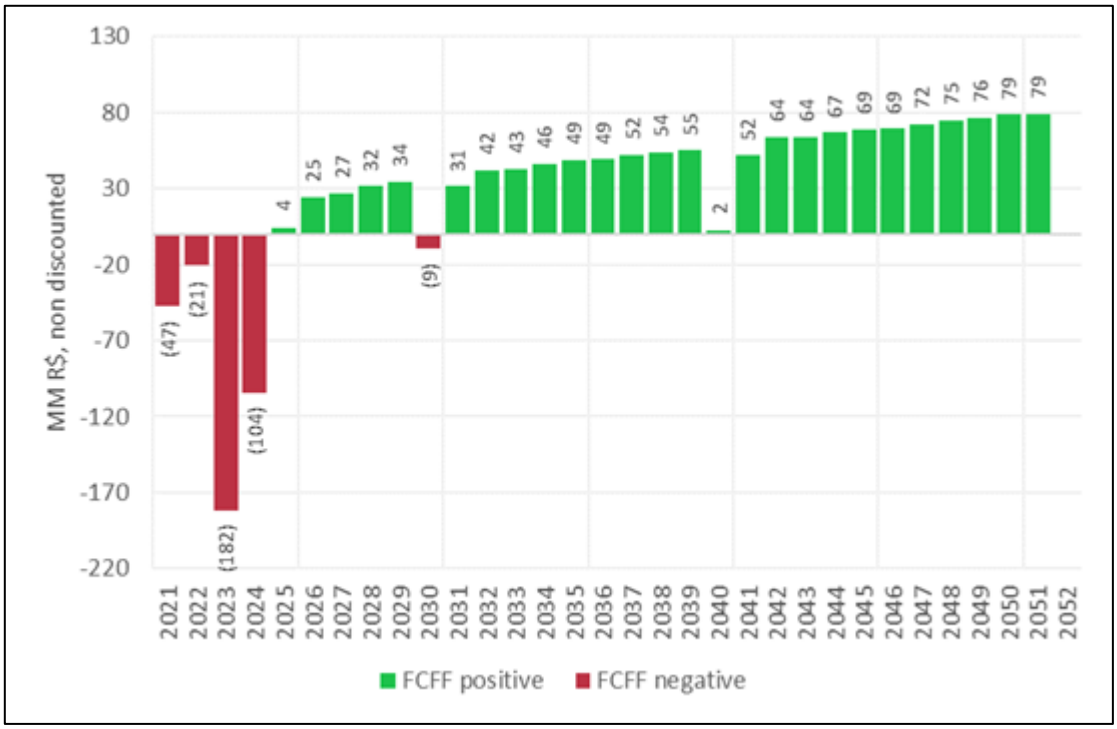


Source: GCA Consortium.

Evaluation of concession's financial feasibility

The project's forecasted free cash flow (FCFF) is presented in Figure 4-6 , which shows the FCFF is positive during most of the concession, except during investment cycles, that require funding. The project's IRR, prior to grant values, is 8.5%p.a. (real) and its MIRR is 7.5%p.a. (real).

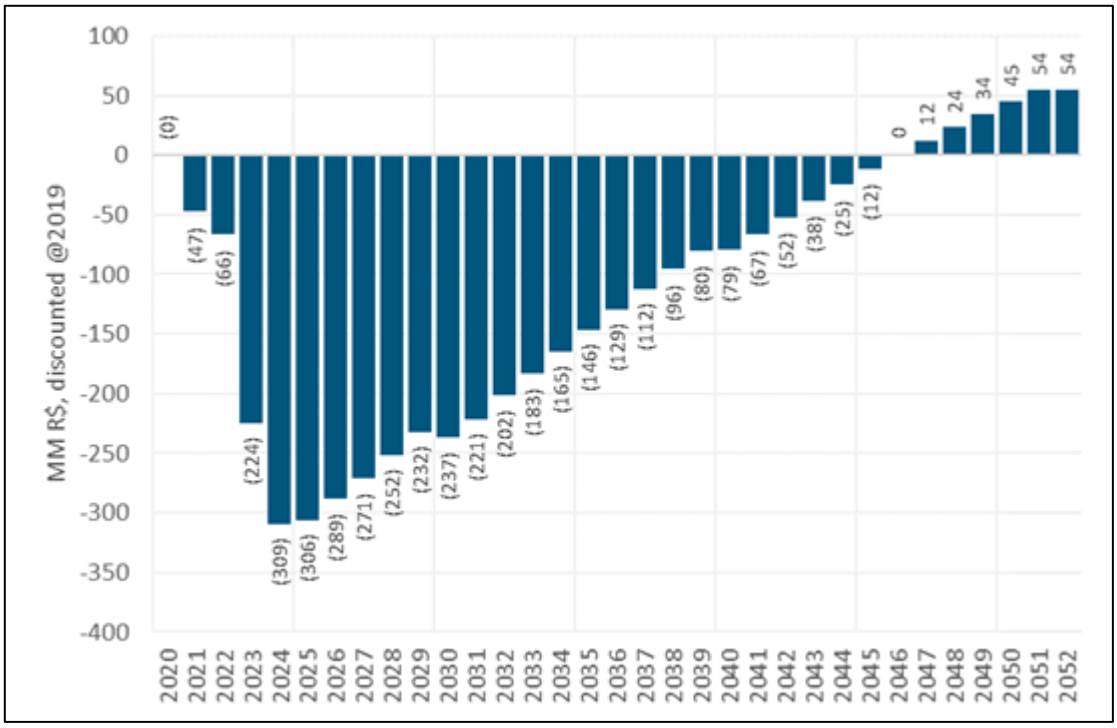
Figure 4-6: Free cash flow to firm (non-discounted – prior to grant values)



Source: GCA Consortium.

The cumulative discounted FCFF (given the referential weighted average cost of capital – WACC set at 7.23%p.a., real), from which the NPV net of grant payments is determined, is shown in Figure 4-7. The NPV of the project is **R$54.4MM** (net of grant payments). Since the internal rate of return is higher than the cost of capital and the NPV is positive, the concession is financially feasible.

Figure 4-7: Cumulative discounted free cash flow to firm (net of grant payments)



Source: GCA Consortium.

Definition of grant payments

Once the concession's financial feasibility is confirmed, it is possible to determine the grant payments that allow for a fair return to the concessionaire, given the project's risk pattern (i.e. identical to the costs of capital).

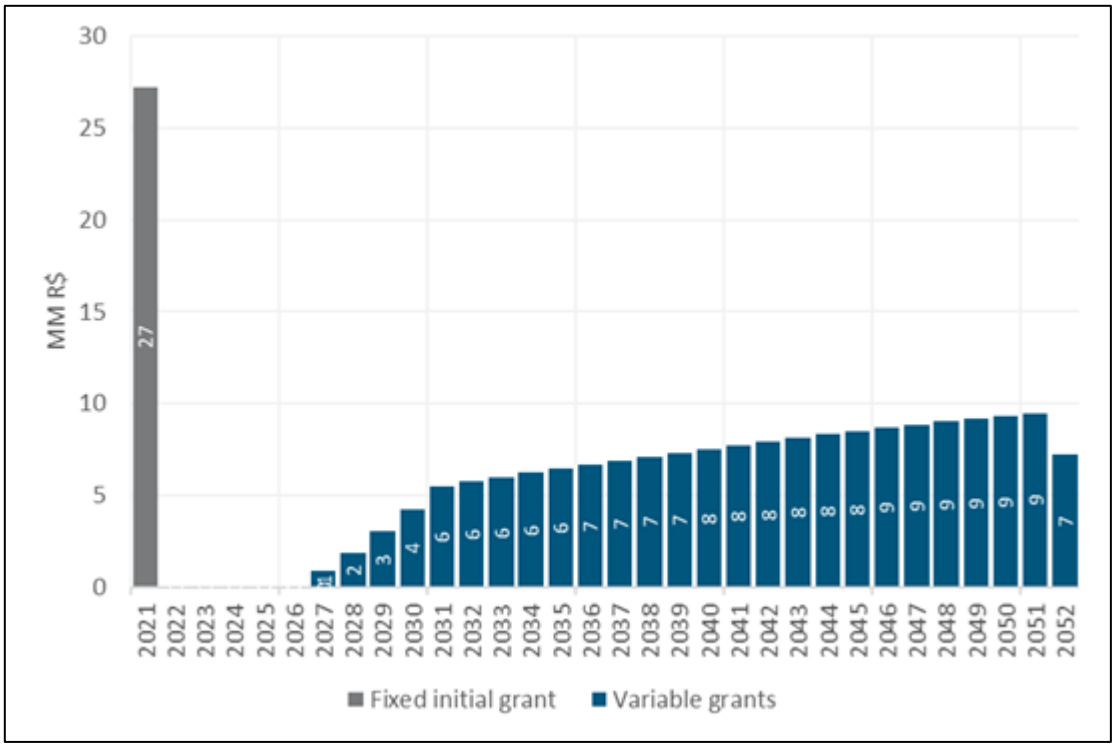
- SAC/MI defined grant payments divided in an initial fixed payment, equivalent to 50% of pre-grants NPV (to be paid by the concessionaire as lump sum upon entry into the agreement), and variable annual payments (equal to a percentage of the concession holder's gross revenues in each period)[12] and set so that project NPV = 0 at the regulatory cost of capital.

Resulting grants are:

- Fixed initial payment: R$27.2MM (based on January/2019 real prices);
- Variable payments: final percentage of 5.0% of gross revenues.

12 The following methodology is prescribed: on the fifth full calendar year of the concession, the concession holder will begin to determine the variable grant, to be proportional with the previous fiscal year's gross revenues. From the 6th to the 8th calendar year, the concession holder will recognize increasing shares – at 40%, 60% and 80% - of the final variable-grant percentage. From the 9th calendar year, the final variable grant rate would apply (that is, the rate set to make the concession' NPV equal to zero). According to the applicable provisions, payment may be made until May of the year immediately subsequent to that of the determination – therefore, the first payment has been assumed to be made in 2027, and the final one in 2052.

Figure 4-8: Grant payments flow during concession



Source: GCA Consortium.

Table 4-2 shows the sum of the grant payments flow over the concession period in two forms: (i) non-discounted; and (ii) at present value net of cost of capital.

Table 4-2: Total grants to the government (discounted and non-discounted)

Values in MM R$	Total, non discounted	Total discounted @7.23% a.a.
TOTAL	205	74
Fixed initial grant	27	27
Variable grants	177	47

Source: GCA Consortium.

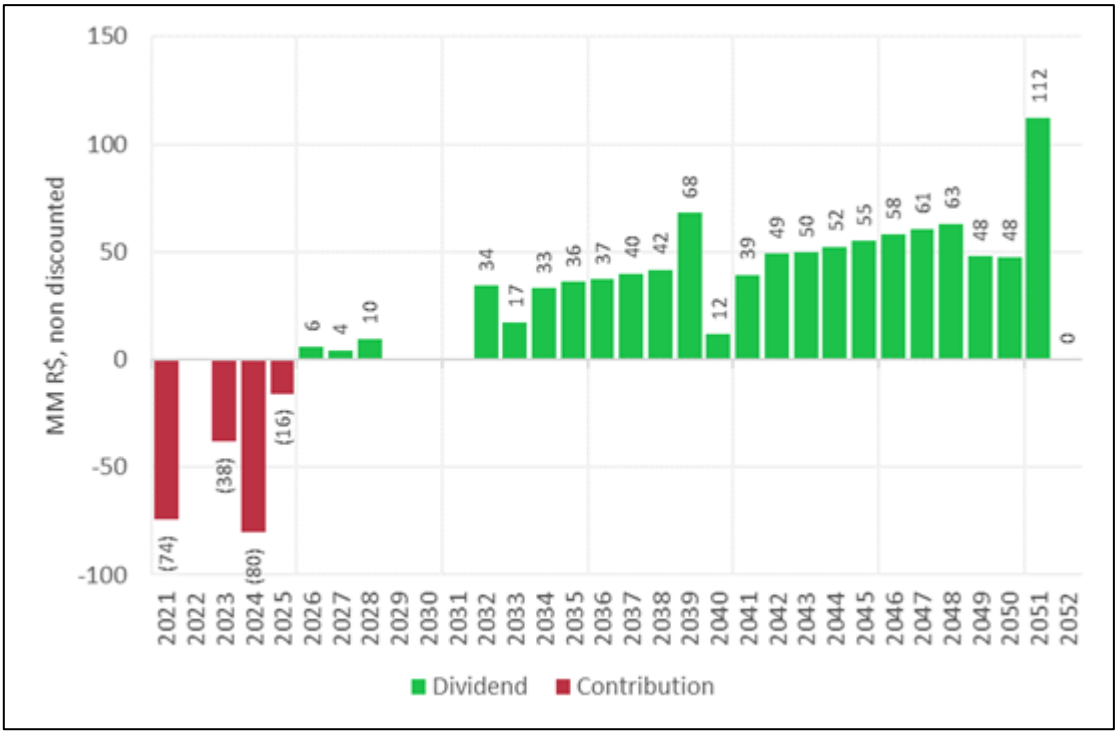
Attractiveness to shareholders

Analyses of the project's attractiveness to shareholders consider: (i) third-party funding (long term BNDES loan and issuing of debentures, given market conditions and minimum covenants); (ii) equity needs; and (iii) the possibility of dividend payments throughout the concession.

Figure 4-9 presents the forecast flows of capital injections and dividend distributions. The concessionaire needs to inject equity resourses during the first development phase, collecting increasing dividends over the remainder of the concession period. Dividend distribution is interrupted only during funding and respective grace periods and is immediately followed by accumulated resource distribution. In 2039 there is a new funding cycle and the availability of cash leads to an anticipation of the dividends distribution, with a reduction in the distribution in subsequent years. Between 2049 and 2050 distribution is limited when minimum capital stock requirement must be met. By the end of the

concession the paid-in capital is returned to shareholders. The equity IRR, calculated based on contribution and dividend flows, is 8.7%p.a. (real).

Figure 4-9: Contribution and dividend flows, non-discounted (post-payment of grants)



Source: GCA Consortium.