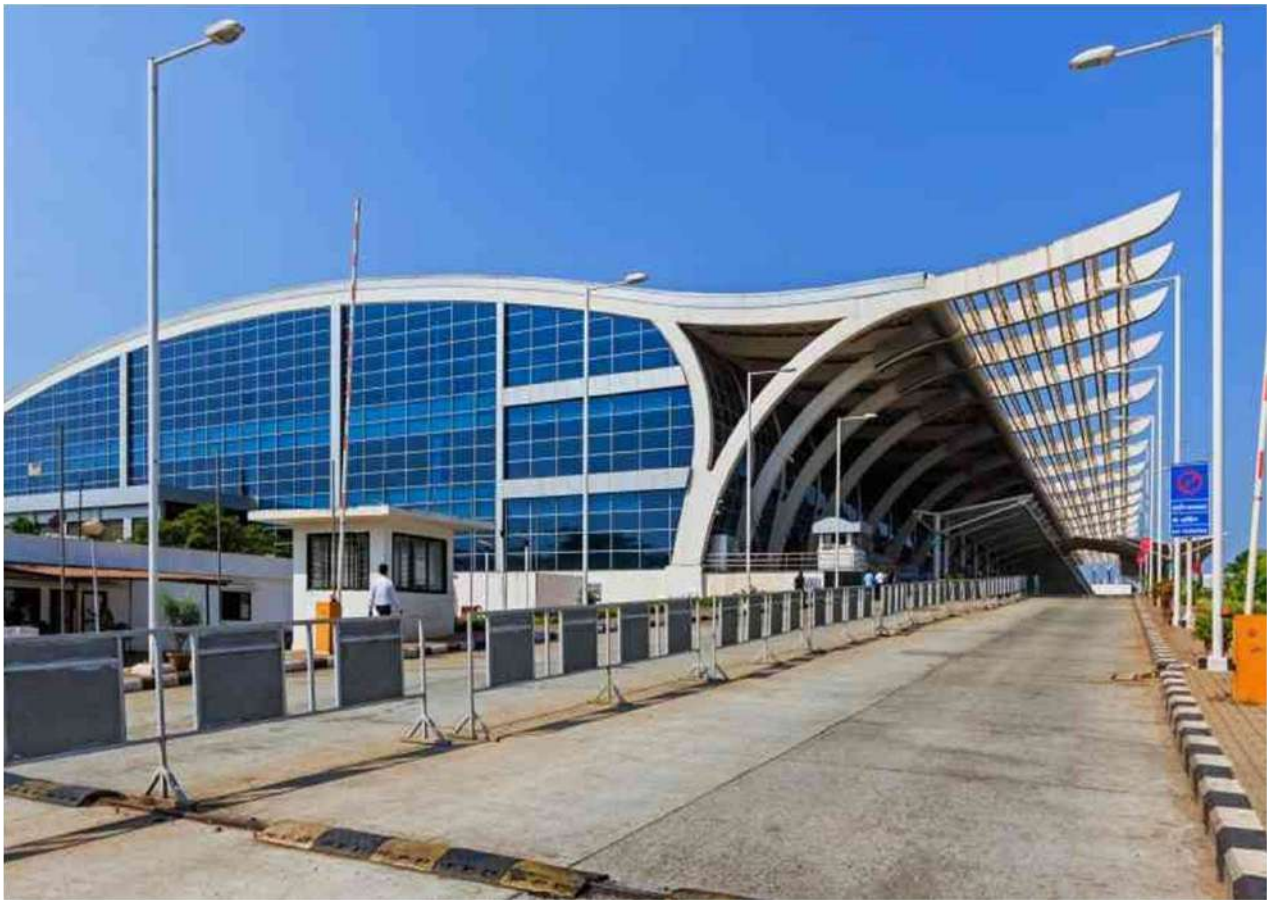
PRE-FEASIBILITY REPORT

EXPANSION OF DABOLIM AIRPORT, GOA IN RESPECT OF EXTENSION OF EXISTING INTEGRATED TERMINAL BUILDING AND EXISTING APRON AT DABOLIM VILLAGE, SOUTH GOA DISTRICT IN GOA



ENVIRONMENT CONSULTANT

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EXECUTIVE SUMMARY

1. EXECUTIVE SUMMARY

Goa Airport belongs to Ministry of Defense (Indian Navy) and Airports Authority of India (AAI) maintains an International Civil Enclave for facilitation of civil aircraft operation. Indian Navy provides air traffic services for the airport.

2006, the Indian Civil Aviation Ministry announced a plan to upgrade Dabolim Airport. This involved constructing a new international passenger terminal (after converting the existing one to domestic) and adding several more aircraft stands. The environmental clearance for the same was obtained on 15th March, 2008.

The present proposal is for extension of existing Integrated Terminal Building towards East by demolition of Old Terminal Building, internal modification of existing Integrated Terminal Building and extension of existing Apron towards East to facilitate 3 no. code C Aircraft (AB-321/B739-900) parking. The site is located in Dabolim village, South Goa District. The site is approachable by NH-17 which is adjacent to the site in Northern direction. Dabolim Railway Station is located at a distance of 1 km in NE direction.

This project is independent and is not linked with other projects' which may attract directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.

As per current traffic data the Dabolim Airport at Goa handled 8.46 million passengers in 2018-19. The existing integrated terminal building which handles both domestic and international passengers is near saturated, therefore it is proposed to expand the existing integrated terminal building by demolishing the old terminal building to cater to the passengers' convenience in future growth of Goa Airport. The airport is expected to handle as on date, total number of passengers per annum 8.46 million (as of Y-2018-2019). This may increase in the future.

There is no space available for car park at ground level. A multilevel car parking was constructed for 400 cars.

A fuel farm of 8000 m^2 including all ancillary and administrative facilities with minimum inter-distances as per oil industry norm exists within the Airport premises.

At present, Dabolim Airport at Goa requires 350 KLD of fresh water which is sourced from PWD, Goa.

After expansion, the fresh water requirement will be 700 KLD which also will be sourced from PWD, Goa.

During the construction stage, water will be sourced primarily through tankers arranged by the contractors as per specifications.

The present power requirement of the airport is 3.5 MVA which aster expansion will be 4.5 MVA and is sourced from Goa Electricity Department.

Twin bin waste collection system– green bins for bio-degradable wastes and blue bins for non-biodegradable wastes shall be provided for solid waste collection. Waste collection shall be done and temporarily stored at identified locations before disposing as per established laws and procedures.

Hazardous waste shall be treated in accordance with Hazardous Waste Management Rules 2016, Batteries waste shall be handled in accordance with Batteries (Management and Handling) Rules, 2001 and E waste as per E waste Management Rules, 2016.

The area in which the expansion is proposed lies within the airport premises and no additional land is to be acquired for this purpose. Hence this proposal does not involve any rehabilitation & resettlement issues.

INTRODUCTION

2. INTRODUCTION

2.1 BACKGROUND

Goa Airport belongs to Ministry of Defense (Indian Navy) and Airports Authority of India (AAI) maintains an International Civil Enclave for facilitation of civil aircraft operation. Indian Navy provides air traffic services for the airport.

Goa civil enclave is connected to several domestic and international destinations including all major cities in India like Mumbai, Bengaluru, Hyderabad, Chennai, Delhi, Srinagar, Kolkata, Pune, Patna, Ahmedabad, Cochin, Chandigarh, Indore and International destinations like Kuwait, Dubai, Sharjah, Doha, Muscat, Abu Dhabi, Kuala Lumpur, Moscow etc.

The airport was built, in 1955, by the Government of the Estado da Índia Portuguesa, on 249 acres (101 ha) of land, as the Aeroporto de Dabolim, which was later officially renamed to Aeroporto General Bénard Guedes.[8] Until 1961, the airport served as the main hub of the Portuguese India's airline TAIP (Transportes Aéreos da Índia Portuguesa). In April 1962, it was occupied by the Indian Navy's air wing when Major General K.P. Candeth, who had led the successful military operation into Goa, "handed over" the airport to the Indian Navy before relinquishing charge as its military governor to a Lieutenant Governor of the then Union Territory of Goa, Daman and Diu in June 1962.

Due to capacity constrains at the terminal and air traffic congestion due to strong military and naval presence, the second airport at Mopa was proposed and is already under early stage of construction with scheduled completion in 2020.

In 2006, the Indian Civil Aviation Ministry announced a plan to upgrade Dabolim Airport. This involved constructing a new international passenger terminal (after converting the existing one to domestic) and adding several more aircraft stands. The environmental clearance for the same was obtained on 15th March, 2008.

To increase the handling capacity of runway, a parallel taxiway has been proposed to be constructed jointly by AAI and Indian Navy, for which Environmental Clearance was obtained on 3rd January, 2018.

The present proposal is for extension of existing Integrated Terminal Building towards East by demolition of Old Terminal Building, internal modification of existing Integrated Terminal Building and extension of existing Apron towards East to facilitate 3 no. code C Aircraft (AB-321/B739-900) parking.

	
Existing Dabolim Airport	**Proposed Mopa Airport**

2.2 PROJECT PROPONENT

The Government of India constituted the International Airports Authority of India (IAAI) in 1972 to manage the nation's international airports while the National Airports Authority was constituted in 1986 to look after domestic airports. The organizations were merged in April 1995 by an Act of Parliament and was named as Airports Authority of India (AAI). This new organization was to be responsible for creating, upgrading, maintaining and managing civil aviation infrastructure both on the ground and air space in the country.

It also manages a total of 125 Airports, including 18 International Airports, 7 Customs Airports, 78 Domestic Airports and 26 Civil Enclaves at Military Airfields. AAI also provides Air Traffic Management Services (ATMS) over entire Indian Air Space and adjoining oceanic areas with ground installations at all Airports and 25 other locations to ensure safety of Aircraft operations.

AAI has four training establishments viz. The Civil Aviation Training College (CATC) at Allahabad, National Institute of Aviation Management and Research (NIAMAR) at Delhi and Fire Training Centers (FTC) at Delhi & Kolkata. An Aerodrome Visual Simulator (AVS) has been provided at CATC and non-radar procedural ATC simulator equipment is being supplied to CATC Allahabad and Hyderabad Airport. AAI has a dedicated Flight Inspection Unit (FIU) with a fleet of three aircraft fitted with flight inspection system to inspect Instrument Landing Systems up to Cat-III, VORs, DMEs, NDBs, VGSI (PAPI, VASI) and RADAR (ASR/MSSR).

2.3 TYPE OF PROJECT

The present proposal is for extension of existing Integrated Terminal Building towards East by demolition of Old Terminal Building, internal modification of existing Integrated Terminal Building and extension of existing Apron towards East to facilitate 3 no. code C Aircraft (AB-321/B739-900) parking. The proposed project falls in Category 7(a) of the Schedule vide EIA notification 2006 amended to date involving preparation of Environment Impact Assessment study and Environment Management Plan. However general condition is not applicable to this project. This project is independent and is not linked with other projects' which may attract directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.

2.4 AIRPORT SECTOR PROFILE

India's transformation from an agrarian economy to an urbanized one is an inevitable consequence of GDP growth led by service sector and saturation of agricultural productivity. Air connectivity can ensure integration of such urbanizing areas with the rest of the country and national economy. Development of appropriate connectivity between robust urban agglomerations could check the influx of migrants to large metro and provide for more balance regional development.

The civil air transport network has been called the Real World Wide Web. It has been observed that the improvement in air connectivity has brought tremendous benefits to users of air transport services by:

- Reducing time spent in transit,
- Increasing the frequency of service,
- Allowing for shorter waiting times and better targeting of departure and arrival times;
- Improving the quality of service, such as reliability, punctuality and quality of the travel experience.

India is the 9th largest civil aviation market in the world. In FY 2016-17, civil aviation sector witnessed a growth of around 20-25%.

Improvements in connectivity will effectively contribute to the economic performance of the wider economy through enhancing its overall level of productivity. **Table 2.1** shows the quantum of passengers handled at major airports in India in last few years.

Table 2-1: Passenger Handled at Major Airports in India (in million)

Sl. No.	Airports	City	State	2012-13	2013-14	2014-15	2015-16	2016-17
1	Indira Gandhi International Airport	Delhi	Delhi	34.34	36.9	41.0	48.4	57.7
2	Chhatrapati Shivaji International Airport	Mumbai	Maharashtra	30.2	32.2	36.6	41.6	45.2
3	Meenambakkam Airport	Chennai	Tamil Nadu	12.8	12.9	14.3	15.2	21.5
4	Kempegowda International	Bengaluru	Karnataka	12.0	12.8	15.4	18.9	22.8

Sl. No.	Airports	City	State	2012-13	2013-14	2014-15	2015-16	2016-17
	Airport							
5	Netaji Subhash Chandra Bose International Airport	Kolkata	West Bengal	10.1	10.1	10.9	12.7	15.8
6	GMR Hyderabad International Airport Limited	Hyderabad	Telangana	8.4	8.8	10.5	12.4	15.1

Source: Airports Authority of India

2.5 AIR CONNECTIVITY PATTERN

In India, with its geographical spread interspersed with deserts, seas, forests and hilly terrain, regional and remote area air connectivity can play a crucial role in this context. Establishing or relying on railway / road networks for connecting such parts of the country may not be time effective or even viable (technically /financially).

Also, while railway and road networks may be viable connectivity options to other parts of the country (not impacted by issues of terrain, security, etc.); air connectivity provides a key advantage in terms of time saving.

The routes connecting Tier-2 towns / cities to Tier-3 towns / cities 1, only constitute about 7% of the air transport market in India in terms of seat deployment. While routes can be configured innumerous ways in terms of combination of frequencies, timing of the flights and aircraft sizes, a number of these routes are likely to witness traffic that can be better serviced using small aircraft such that the aircraft could be optimally utilized over the day as well as achieve viable PLF.

2.6 NEED OF THE PROJECT

As per current traffic data the Dabolim Airport at Goa handled 8.46 million passengers in 2018-19. The existing integrated terminal building which handles both domestic and international passengers is near saturated, therefore it is proposed to expand the existing integrated terminal building by demolishing the old terminal building to cater to the passengers' convenience in future growth of Goa Airport. The airport is expected to handle as on date, total number of passengers per annum 8.46 million (as of Y- 2018-2019). This may increase in the future.

2.7 EMPLOYMENT OPPORTUNITIES

The direct employment during construction phase in proposed project will be 200 skilled, unskilled and professional workforce including temporary and permanent employees shall be required. These workforces shall be hired locally in order to generate the employment to the local people. While during the project operation stage for the purposes of day-today professional and maintenance works about 1200 staff is existing in the airport which is sufficient for operation.

2.8 STRUCTURE OF THE REPORT

The purpose of this report is to establish techno-economic feasibility for the proposed project. The report is divided into 9 chapters excluding this chapter and Executive Summary, the details of which are summarized below:

Chapter 3: Project Description- This chapter discusses the details of the project like location, project salient features, project magnitude, summary of proposed infrastructure and various other requirements like water, power, construction materials etc.

Chapter 4: Site Analysis- This chapter discusses the site profile, landform, and existing land use and drainage pattern. The land details, climate and meteorological parameters are also described in various sections of the chapter. The traffic forecast is also mentioned in this chapter.

Chapter 5: Planning Considerations- This chapter discusses the considerations of planning of various features like terminal building and other facility with existing features like Runway, Apron, Apron Shoulder, Taxi Track, Runway Shoulder, boundary wall, perimeter roads and parking facilities.

Chapter 6: Proposed Infrastructure- This chapter discusses the Concept Plan for aviation support facilities and utilities also provides for the redevelopment & re-planning of existing airport. The Concept Plan for the proposed airport defines the ultimate scope of the proposal and the development of facilities in accordance with the requirements of traffic. Earlier discussion on Traffic Analysis and Project Sizing are used as the basis for planning of the various components.

Chapter 7: Rehabilitation and Resettlement (R&R) Plan- This chapter discusses the R&R study due to the proposed project area.

Chapter 8: Project Schedule & Cost Estimates- This Chapter describes the total investment and cost regarding the project.

Chapter 9: Analysis of Proposal (Financial & social benefits to the locals) - This chapter summarizes the Analysis of proposal for Dabolim Airport, Goa.

PROJECT DESCRIPTION

3. PROJECT DESCRIPTION

3.1 INTRODUCTION

Goa International Airport, also known as the Dabolim airport, is the sole airport in the state of Goa, located in the city of Dabolim in Goa, India. It operates as a civil enclave in a military airbase named INS Hansa. It is 1 km from the nearest city Vasco da Gama and about 10 km from the state capital Panjim.

TYPE OF PROJECT

The proposed project is expansion project of existing integrated terminal building and apron at Dabolim Airport, Goa. The existing civil enclave of the airport which is maintained by AAI is spread over an area of 14 ha of land.

The proposed project falls in Category 7(a) of the Schedule vide EIA notification 2006 amended to date involving preparation of Environment Impact Assessment study and Environment Management Plan.

This project is independent and is not linked with other project/s which attracts directly or indirectly any provisions of schedule of EIA notification 2006 amended to date.

3.2 LOCATION & LINKAGE

The airport is located near Vasco da Gama, which is the largest city of Goa. The details of location of the airport are given in **Table 3.1**.

Table 3-1: Project Description

Description	Details			
Project Site	Dabolim Village, South Goa District, Goa			
Survey No.	Survey no. 80 & 81			
Coordinates	**Points**	**Latitude**	**Longitude**	
	A	15°23'05.56" N	73°49'59.86" E	
	B	15°22'52.86" N	73°50'02.31" E	
	C	15°22'58.74" N	73°50'32.67" E	
	D	15°23'08.97" N	73°50'30.83" E	
	E	15°23'08.77" N	73°50'19.86" E	
	F	15°23'06.76" N	73°50'05.43" E	
	G	15°23'06.90" N	73°50'02.70" E	
Total Area of Airport				
Access Road	NH-17		Adjacent	N
District Headquarter	Margao		20 km	SE
Nearest Town	Sancoale		3.0 km	ESE
Nearest Railway Station	Dabolim Railway station		1 km	NE
Nearest Airport	Belgaum Airport		99 km	NE

3.3 DETAILS OF ALTERNATIVE SITES

As the proposed project is for expansion of existing integrated terminal building to cater the increasing number of passengers and the existing apron for parking of AB-321 and B-737-900 aircrafts, no alternative sites have been explored.

3.4 SIZE AND MAGNITUDE OF OPERATION

An integrated passenger terminal building with all modern facilities was commissioned in December 2013 capable of handling 2750 peak hour domestic and international passengers simultaneously. During the year 2016-17, Goa Civil Enclave handled 8.46 million passengers in 2018-2019

The integrated terminal building has provision for 8 aerobridges of which 5 have been installed in the first phase. The building is suitable to handle 2000 Domestic passengers and 750 International passengers during the peak hour.

Existing Integrated Terminal Building at Dabolim Airport, Goa

3.5 PROJECT DESCRIPTION

The proposal involves construction of 18300 m^2 of centrally air conditioned as extension of existing integrated terminal building. The extended terminal building shall be capable of handling at least 3450 (domestic - 2700 + international - 750) passengers during peak hour.

The proposal is also for expansion of existing Apron to the eastern side having an area of 15000 m^2 to accommodate 2 numbers of AB-321/B-737 type of aircrafts in power-in push out configuration space for Ground Support Equipments.

The project layout showing existing and proposed features is given in **Figure 1**.

3.6 CONSTRUCTION MATERIAL

The basic raw materials quantity envisaged for construction is mentioned in **Table 3.2**.

Table 3-2: Construction material (Estimated)

Sl. No	Description	Quantity
1	Cement	1,92,260 bags
2	Sand	24,224.8 cum
3	Aggregates	18,168.5 cum
4	Bricks	6,96,941 numbers
5	Reinforcement steel	18,872.2 tonnes

The construction material used in the project will be sourced from local approved vendors through the contractor and the specification will be as per the conditions laid in contract.

3.7 RESOURCE OPTIMISATION

The resource optimization is always prerequisite for any development project. In quest towards resource optimization in proposed project the tradition practices are substituted by modern practices involving water reduction, rain water harvesting, energy conservation etc.

As per the Bureau of Indian Standards, the per capita water requirement varies with building type. For the present airport, per capita water consumption for passengers has been considered to be as low as 25 lpcd. Measures have been proposed to reduce the consumption of fresh water through efficient practices and devices. Some of these practices include:

- Regulating flow rate of fixtures used in toilets.
- Dual plumbing system
- By installations of sensor-based urinals such as magic eye sensor, the water use is reduced to 0.4 liters per flush.
- A normal tap works at a flow rate as high as 20 lpm. Use of low flow faucets along with other water saving devices such as auto control valves, pressure reducing devices, aerators and pressure inhibitors for constant flow, magic eye solenoid valve, and self-operating valves can result in 25 – 50% of water savings.
- Rainwater harvesting for ground water recharge

AAI is following GRIHA (Green Rating for Integrated Habitat Assessment) system for sustainable and environment friendly design. All the new buildings will be constructed as per the ECBC (Energy Conservation Building Code) norms and obtain 4 star GRIHA rating.

3.8 WATER REQUIREMENT & SUPPLY

3.9.1 Water Source & Demand

At present, Dabolim Airport at Goa requires 350 KLD of fresh water which is sourced from PWD, Goa.

After expansion, the fresh water requirement will be 700 KLD which also will be sourced from PWD, Goa.

During the construction stage, water will be sourced primarily through tankers arranged by the contractors as per specifications.

Table 3-3: Water Requirement

S.no	Parameters	Unit	Quantity	Water Consumption (LPCD*)		Water Requirement in KLD**			Wastewater Generation (KLD)			Sewage Treatment Plant in KL
				Fresh	Recycled	Fresh	Recycled	Total	Fresh 80%	Recycled 95%	Total	
A	**OPERATION PHASE**											
a	Passengers	No.	41000	15	7	615.00	287.0	902.00	492.00	272.65	764.65	**SBT technology 600 KL**
b	Visitors	No.	4000	9	5	36.00	20.0	56.00	28.80	19.00	47.80	
c	Staff	No.	1500	25	10	37.50	15.0	52.50	30.00	14.25	44.25	
e	Kitchen & Restaurant Seats	No.	400	20	10	8.00	4.0	12.00	6.40	3.80	10.20	
	Floor & Window cleaning	Sq. m	9500	0	2	0.00	19.0	19.00	0.00	0.00	0.00	
f	HVAC	TR	3000	0	15	0.00	45.0	45.00	0.00	0.00	0.00	
g	Landscaping	Sq. m	45000	0	2.5	0.00	112.5	112.50	0.00	0.00	0.00	
Sub-total (A)						**696.50**	**502.50**	**1199.00**	**557.20**	**309.70**	**866.90**	
B												
a	Daily Labour	No.	200	45	0	9.0	0.0	9.0	7.2	0.0	7.2	**Septic Tanks &**
Total Water Demand in KLD						**9.0**	**0.0**	**9.0**	**7.2**	**0.0**	**7.2**	

3.9 POWER REQUIREMENT & SUPPLY

The present power requirement of the airport is 3.5 MVA which aster expansion will be 4.5 MVA and is sourced from Goa Electricity Department.

3.10 SOLID WASTE GENERATION & DISPOSAL

Construction phase: Solid waste during construction phase will be collected and disposed as per established laws and Procedures. The Organic waste will be treated at site. Approximately 0.002 MT of construction waste and 0.008 MT of demolition waste will be generated from the project.

Operation phase: Twin bin waste collection system– green bins for bio-degradable wastes and blue bins for non-biodegradable wastes shall be provided. Waste collection shall be done and temporarily stored at identified locations before disposing as per established laws and procedures.

Hazardous waste shall be treated in accordance with Hazardous Waste Management Rules 2016, Batteries waste shall be handled in accordance with Batteries (Management and Handling) Rules, 2001 and E waste as per E waste Management Rules, 2016.

During operation phase, around 4.1 tonnes per day of waste will be generated.

SITE ANALYSIS

4. SITE ANALYSIS

4.1 INTRODUCTION

Site analysis is a pre-design research activity which focuses on existing and potential conditions on and around the building site. It is an inventory of the site factors and forces, and how they coexist and interact. The purpose of the analysis is to provide thorough information about the site assets and liabilities prior to starting the design process. The typical site analysis includes the site location and size, neighborhood context, zoning, legal aspects, geology, physiographic (natural and man-made features), hydrology, soils, vegetation, wildlife, climate, culture, pedestrian and vehicular circulation, access, utilities, historic factors, density, sensory stimuli, and any other factor deemed appropriate for the particular site. This chapter discusses the site Profile, landform, and existing land use and drainage pattern. The land details, climate and meteorological parameters are also described in various sections of this chapter.

4.2 LOCATION & CONNECTIVITY

The site selected for proposed expansion lies within the existing airport premises. The site is located in Dabolim village, South Goa District. The site is approachable by NH-17 which is adjacent to the site in Northern direction. Dabolim Railway Station is located at a distance of 1 km in NE direction.

4.3 LAND FORM, LAND-USE AND LAND OWNERSHIP

The land for the expansion is within the airport premises and under the possession of AAI. The proposal is for expansion of the existing integrated terminal building and the existing apron. No additional land is required for the proposed expansion.

4.4 TOPOGRAPHY

The project site more or less flat with elevation ranging from 44 - 47 m amsl. The general slope is towards South.

4.5 EXISTING LAND-USE PATTERN

The site for expansion is occupied by the old terminal building having an area of 18,872 m^2 which is presently being used for AAI offices.

4.6 EXISTING INFRASTRUCTURE

Presently, the airport has the following infrastructure:

- Runway – Orientation is 08-26
- Size – 3458 m x 45 m

- Surface – Asphalt
- Existing Apron – covering an area of 4.5 ha, suitable for parking 8 nos. of AB-321/B737-900 or 5 nos. of AB-321/B737-900 + 2 nos. of B747-400.
- Integrated Terminal Building- having an area of 65,000 m² to cater for 4.5 million passengers annually.
- Old Terminal Building – having an area of 18,872 m^2 which is presently being used for AAI offices.

The old terminal building built in 1983-1996 in phases having an area of 18,872 m^2 is presently being used for AAI offices and a part of the terminal i.e. the international arrival portion is modified for use as Common User Domestic Cargo Terminal for time being. A part of the Terminal Building towards the runway shall be demolished due to operational requirement to meet DGCA CAR clearance for the proposed Parallel Taxi Track.

The integrated terminal building having an area of 65,000 m² area was commissioned in December to cater for 4.5 million passengers annually. It has provision for 8 aerobridges, out of which 5 have been installed in the first phase. The terminal also features an in-line baggage scanning system and a state-of-art sewage treatment plant. The building is suitable to handle 2000 domestic passengers and 750 international passengers during the peak hour. The terminal also features an in-line baggage scanning system and a state-of-art sewage treatment plant. The building is suitable to handle 2000 domestic passengers and 750 international passengers during the peak hour.

Existing Integrated Terminal Building	
Basement Floor	17000 m^2
Ground Floor	17500 m^2
First Floor	14000 m^2
Second Floor	13500 m^2
An additional Western Side Finger has been constructed to facilitate passenger movement through aerobridges having an area of approximately 3000 m^2 (1000 m^2 per floor)	

The existing Apron of integrated Passenger Terminal Building is suitable for parking 8 aircrafts (AB-321/B737-900) or 5 nos. of AB-321/B737-900 + 2 nos. of B-747-400 (all in contact position).

There is no space available for car park at ground level. A multilevel car parking was constructed for 400 cars.

A fuel farm of 8000 m^2 including all ancillary and administrative facilities with minimum inter-distances as per oil industry norm exists within the Airport premises.

Capacity & Dimension of Tanks				
Tank Type	Product [PESO - Class]	Capacity (in KL)	Diameter (m)	Height (m)
Vertical, Above Ground	ATF [Class-B]	475	9.0	7.4
	ATF [Class-B]	475	9.0	7.4
	ATF [Class-B]	575	9.0	9.1

Capacity & Dimension of Tanks				
	ATF [Class-B]	575	9.0	9.1
Horizontal, Above Ground	ATF [Class-B]	15	2.0	5.3
Vertical, Above Ground	Fire Water	1182	12.0	10.1
Vertical, Above Ground	Fire Water	938	10.0	12.0

4.7 CLIMATIC DATA FROM SECONDARY SOURCES

The data obtained from the Meteorological Department of India for Panjim observatory has been utilized. The summary of 30 years average data is presented in the **Table 4.1**.

Table 4-1: Climatological Data as per IMD Panjim (Goa), 1971-2000

Sl. No.	Parameters	Description of the Season				
1	Rainfall in mm	Total Annual Rainfall is 2892.6 mm				
		Winter (Dec to Feb)	**Months**	**Total rainfall (in mm)**		
			December	2.2		
			January	0.4		
			February	0.0		
			Total	**2.6**		
		Summer (Mar to May)	March	0.1		
			April	4.2		
			May	66.7		
			Total	**71.0**		
		Monsoon (June to Sept)	June	910.4		
			July	942.7		
			August	595.8		
			September	219.4		
			Total	**2668.3**		
		Post-Monsoon (Oct to Dec)	October	123.3		
			November	27.5		
			December	2.2		
			Total	**153.0**		
2	Temperature (Mean Daily Temp. in ^{0}C)	Winter (Dec to Feb)	**Months**	**Max**	**Min**	**Avg**
			Dec	32.6	20.9	26.8
			Jan	32.0	20.0	26.0
			Feb	31.8	20.6	26.2
			Average	**32.1**	**20.5**	**26.3**
		Summer (Mar to May)	Mar	32.2	23.3	27.8
			Apr	33.0	25.5	29.3
			May	33.4	26.5	30.0
			Average	**32.9**	**25.1**	**29.0**
		Monsoon (June to Sept)	June	30.4	24.9	27.7
			Jul	29.0	24.3	26.7
			Aug	28.9	24.1	26.5
			Sep	29.9	24.1	27.0

Sl. No.	Parameters	Description of the Season				
			Average	**29.6**	**24.4**	**27.0**
		Post-Monsoon (Oct to Dec)	Oct	31.7	24.0	27.9
			Nov	32.9	22.5	27.7
			Dec	32.6	20.9	26.8
			Average	**32.4**	**22.5**	**27.4**
3	Relative Humidity in per cent	Winter (Dec to Feb)	**Month**	**08.30 hrs**	**17:30 hrs**	
			Dec	71.0	57.0	
			Jan	77.0	56.0	
			Feb	78.0	58.0	
			Average	**75.3**	**57.0**	
		Summer (Mar to May)	Mar	79.0	64.0	
			Apr	75.0	67.0	
			May	74.0	68.0	
			Average	**76.0**	**66.3**	
		Monsoon (June to Sept)	Jun	87.0	83.0	
			July	90.0	86.0	
			Aug	91.0	86.0	
			Sep	90.0	81.0	
			Average	**89.5**	**84.0**	
		Post-Monsoon (Oct to Dec)	Oct	85.0	76.0	
			Nov	75.0	64.0	
			Dec	71.0	57.0	
			Average	**77.0**	**65.7**	
4	Wind-speed	Winter (Dec to Feb)	**Month**	**Speed (kmph)**		
			Dec	8.5		
			Jan	8.9		
			Feb	9.3		
			Average	**8.9**		
		Summer (Mar to May)	Mar	9.2		
			Apr	10.2		
			May	11.3		
			Average	**10.2**		
		Monso17on (June to Sept)	Jun	13.7		
			July	15.3		
			Aug	13.0		
			Sep	8.9		
			Average	**12.7**		
		Post-Monsoon (Oct to Dec)	Oct	8.1		
			Nov	8.2		
			Dec	8.5		
			Average	**8.2**		

4.8 SOCIAL INFRASTRUCTURE AVAILABLE

The following types of social infrastructure and facilities are available at Vasco da Gama which is located near the Dabolim Airport, Goa.

- Hospital with ambulance facility;

- Banks;
- Post offices;
- Bus stations;
- Fire stations;
- Secondary schools;
- Police stations;
- Shopping complexes;
- Sports infrastructures;
- Community halls;
- Primary health care centres.

PLANNING BRIEF

5. PLANNING BRIEF

5.1 INTRODUCTION

The purpose of this chapter is to present the Planning Concepts for Dabolim Airport, in terms of both vision and reasoning. Therefore, several basic assumptions have been established, which are intended to direct the future planning of the Airport. These assumptions are supported by the aviation activity forecasts and include a commitment for continued airport operation, which supports local and regional needs.

Airport planning and design primarily depends upon availability of land, its topography, orientation, accessibility, etc. Traffic is the other major factor that decides the size of runway, terminal building and other related infrastructure required for the proposed airport. The site and traffic studies have been discussed in the preceding chapters. Based on the site and traffic studies the planning and conceptual design of the proposed airport is discussed in this chapter.

5.2 PLANNING CONCEPT

Aerodrome code of Dabolim Airport is 4C. Aerodrome Reference Code is defined by the characteristics of the aircraft intended to use the airport. The parameters to categorize the Aerodrome reference code by ICAO are mentioned in **Table 5.1**.

Table 5-1: Categories of Aerodrome based on Aero plane Reference Field Length

Code Number	Aero plane reference field length
1	Less than 800m
2	800m up to 1200m but not including 1200m
3	1200m up to 18000m but not including 1800m
4	Over 1800m

Source: ICAO

Table 5-2: Categories of Aerodrome based on Wing Span & Outer Main Gear Wheel Span

Code Letter	Wing span	Outer main gear wheel span
A	Up to and not including 15m	Up to and not including 4.5m
B	15m up to and not including 24m	4.5m up to and not including 6m
C	24m up to and not including 36m	6m up to and not including 9m
D	36m up to and not including 52m	9m up to and not including 14m
E	52mup to and not including 65m	9m up to and not including 14m
F	65m up to and not including 80m	14m up to and not including 16m

Source: ICAO

5.3 POPULATION PROJECTION

As per current traffic data the Dabolim Airport at Goa handled 8.46 million passengers in 2018-19. The airport is expected to handle as on date, total number of passengers per annum 8.46 million (as of Y-2018-2019). This may increase in the future.

Table 5-3: Traffic Projection of Dabolim Airport

Year	A/C movements/year (in Nos.)	Passengers (in million)
2016-17	47,801	6.85
2017-18	52,467	7.75
2018-19	57,608	8.76
2019-20	63,266	9.91
2020-21	69,495	11.22

Source: Airports Authority of India

5.4 LAND-USE PLANNING

The present proposal is for the following purposes:

1. Extension of existing Integrated Terminal Building towards East by demolition of Old Terminal Building.
2. Internal modification of the existing Integrated Terminal Building.
3. Extension of existing Apron towards East to facilitate 3 no. of code C aircraft (AB- 321/ B737-900) parking.

The area statement is given in **Table 5.4**.

Table 5-4: Area Break-up

S.NO.	FEATURES	AREA
Coverage Area		
1.	Old terminal building	1.67 Ha
2.	New Integrated Terminal Building	2.0 Ha
3.	Proposed terminal building	0.20 Ha
4.	Existing Apron	4.68 Ha
5.	Proposed Area of Apron Expansion	1.5 Ha
Built-up Area		
6.	Old terminal building	18,872 m²
7.	New Integrated Terminal Building	65,000 m²
8.	Proposed terminal building	18,300 m²

Source: Airports Authority of India

5.5 ASSESSMENT OF INFRASTRUCTURE DEMAND

The proposed building shall be provided with aesthetically appealing and soothing interior decoration matching with the existing modern structure.

The design of terminal building is to include media planning, retail area planning, F & B plan, etc. Other requirements for Terminal Building include provision for snack bar counter, travel requisite, pharmaceutical shops, airlines offices & ticket selling counters, ATM / bank counters etc., meet and greet area, first aid room, caretaker room with store and other facilities.

5.6 AMENITIES/FACILITIES

The following facilities will be available in the proposed airport

- Baggage handling system
- Passenger boarding bridges
- Flight information and displays
- Sewage treatment facility
- Fire fighting system
- Security equipments
- Bookshop
- Restaurant

PROPOSED INFRASTRUCTURE

6. PROPOSED INFRASTRUCTURE

6.1 INTRODUCTION

The Concept Plan for the Dabolim Airport, Goa defines the scope of the proposal and the development of facilities in accordance with the requirements of traffic.

It is the overall objective of this effort to produce a balanced airside and landside complex to serve forecast aviation demands. The primary goal of the Master Plan is to define a development concept which allows for the airport to be marketed, developed, and safely operated for the betterment of the region and its users. With this in mind, the following development objectives have been defined for this planning effort:

- Maintain an attractive, efficient, and safe aviation facility in accordance with government, state, and local regulations.
- Develop facilities to efficiently serve general aviation users and encourage increased use of the airport, including business and corporate activity.
- Provide efficiency and safety through additional facility improvements which will meet the long term planning horizon level of demand for the airport and region.
- Ensure that any recommended future development is environmentally compatible.
- Enhance local economic development through maximizing the use of available property.
- Identify opportunities for approved non-aeronautical use of certain areas on the airport to further diversify airport facility revenue generating potentials.

6.2 INDUSTRIAL AREA

6.2.1 Civil Works

- Construction of 18,300 m² centrally air-conditioned as extension of existing Integrated Terminal Building with all modern facilities and amenities. The extension is design such that after construction the extended Terminal Building (65,000+18,300 = 83,300 m²) shall be capable of handling at-least 3450 (2700 Domestic + 750 International) passengers during peak hour. The building shall be provided with aesthetically appealing and soothing interior decorating matching with the existing modern structure.
- Departure area, Arrival area, Security Hold area and Concourse area are planned to be provided with adequate nos. of toilets for gents, ladies and differently-abled persons; along with drinking water facility. Suitable number of ramps are planned to be provided for entry and exit of

differently-abled persons in Departure and Arrival area. Provision of battery operated buggies for senior citizens/ differently-abled persons as per requirement. Additional fixtures/urinals in the toilet to be provided for arrival passengers arriving together at one time.

- The design of Terminal building to include Media planning, Retail area planning, F & B plan, etc. The design should include the required arrangement for its regular maintenance so as to make it in-built part of execution. Solar power generation viz. solar lighting, solar roofing system, etc. shall be provided. Maintenance friendly roofing, false ceiling & building façade system including provision of regular cleaning with maintenance hoists, hooks, etc. including cat walk / rope suspended platform / gondola etc. to be provided on both inside and outside of terminal building.

- Basement Floor (4,500 m^2): The basement level of the extension shall include extension of the baggage make up and break down systems, services and an additional 8 m wide ramp for trolley movement. The Departure passengers drop off kerb with a set of escalators and elevators to reach the departure level is planned at the eastern end.

- Ground Floor (4,500 m^2 - approximately): The extension building shall have 1 Nos island of 32 check in counters each to have total 96 check in counters (64 existing counters) in the total building along with toilets baggage conveyor belts, queuing space, segregation railing, back-up offices for Airlines, facilitation counters, weighing machines, counters, automated baggage drop system etc.

- Mezzanine Floor (200 m^2 approximately): The extension building shall have a mezzanine floor at +3m level which shall have a ramp toilet and a domestic arrival corridor to facilitate movement of Domestic incoming passengers to Baggage claim area at ground foor.

- First Floor (4,800 m^2 approximately): The extension building shall have a full row of domestic security check counters along with toilets and offices. It shall also cater for Domestic security Hold with 3 nos. additional Exit gates to PBB with F&B and retail outlets. Escalators, staircase and lift connectivity between Domestic SHA on First floor in extended portion and relocated Domestic SHA on Second floor is also proposed.

- Second Floor (4,500 m^2 approximately): The existing domestic and international passenger movement within the terminal is proposed to be interchanged at first and second floors so that the SHA with the existing building on eastern side becomes Domestic SHA. The extension building shall have Domestic security Hold with F&B and retail outlets in continuation to the existing security hold area and connecting with the proposed domestic security hold on the first floor with a series of escalators and stairs.

Other requirements for Terminal Building:

- Provision for Snack Bar counter, Travel Requisite, Pharmaceutical shops, Airlines offices & ticket selling counters, ATM / Bank counters etc., Meet and Greet area, First Aid room, Facilitation counters, caretaker room with store, and other facilities, infrastructure for advertisements and Art work at suitable locations.
- Adequate space for airline offices, CISF, AAI etc. along with required staff toilet, concessionaire offices, and backup offices for GHS etc. is to be planned and provided.
- Provision of VIP/CIP lounges/Business lounges /Premium Lounges/ Airline lounges, transit lounge (if required) with adequate number of chairs, furniture, furnishings etc. in the Departure Lounge, Check-in area, Security Hold area and Arrival Lounge at suitable location both for arrival and departure passengers.
- Provision of water supply pumping arrangement system, Water Filtration, water cooler & R.O/U.V. Filters, Sewage Treatment Plant (STP) & Effluent Treatment Plant (ETP) as per norms and as per site conditions.
- Horticulture-landscaping, drainage system, water supply, Rain Water Harvesting etc.
- Sub-station, A/C plant room and related service facilities. Provision to be made for the AC Plant Room vertical through AHU rooms, backup Generators for essential services, etc.
- Provision of acoustics for effective functioning of PA system.
- Providing city side compound wall depicting local architecture and with proper gates.

The provision of the rooms in central location of the building at Ground Floor with air conditioners and adequate no. of Power points of 15 Amp and 3 phase power supply for UPS as mentioned below:

i) Equipment Room Minimum size: 5mtr x 7mtr Purpose: Housing CCTV Servers/ Recorder/ Switches/Racks. FIDS & PA Racks and other equipments.

ii) UPS & Battery Room Minimum size: 3mtr x3mtr Purpose: Housing Batteries & UPS for CCTV, FIDS, PA Systems and other equipments.

iii) CCTV Monitoring Room Minimum size: 5mtr x 4mtr

Purpose: Housing CCTV video wall/monitors, PCs etc. and Monitoring/Surveillance of airport by security personnel through CCTV cameras.

iv) Workshop/Maintenance Room Minimum size: 5mtr x 4mtr

Purpose: For repair and keeping spares of the equipment under this and maintenance and watch of all these sophisticated systems.

6.2.2 Electrical Works

- Internal and external electrification for Terminal Building Complex, associated buildings, Car Park and roads i/c boom barriers etc.
- Augmentation of main power supply, Substation Equipments, DG Sets for Secondary Power supply and associated ancillary buildings.
- Central air-conditioning with provision of vertical air-conditioning concept & BMS.
- Provision of conveyor belts (Departure Check-in and Arrival Baggage Claim) with In- line X-ray inspection System and other equipments.
- Fire detection, alarm and protection system with Fire Control Room.
- Provision of automatic sliding doors at exit & entry points of Terminal Building.
- Additional Escalators & Elevators with matching staircase as per drawing.
- Provision of minimum additional three (3) Passenger Boarding Bridges (PBB) to make overall PBB's to 11 (i.e. existing 5 + Proposed 3 + Additional 3).
- Provision of adequate number of Signages of world class standard, inside and outside the terminal building, car park area & City side approach road and air side area for guidance of passengers and visitors.

6.2.3 Airport Systems

- Public address system and car calling system.
- Surveillance Close circuit TV system (SCCTV) and provision of adequate number of close circuit TV monitors, in the Security Control Room etc.
- Provision of Flight Information Display System (FIDS) with adequate number of Display Devices in departure, arrival and security hold area for passenger facilitation.
- Provision of adequate number of X-ray machines for scanning Cargo, Registered Baggage (RB)/ Hand Baggage (HB), including provision of required number of ETDs, DFMDs and HHMDs, as per BCAS norms.
- Provision of adequate no. of VHF FM Sets (Walkie-Talkie, Base Stations and Mobile Stations).
- Provision of Telephone Exchange / digital EPABX/ IP EPABX system for Terminal Building including telephone/ intercom instruments, wiring etc.

6.2.4 IT Systems

- Passive and Active networking components such as OFC, UTP cabling, Routers, Core & Access switches and accessories. Provision of Raceways, Cable trays and Conducting and Cabling.
- One room of 400 sq. ft. area with provision of 3 pin power supply for IT UPS.
- 2.4m x 3.0m Switching room for IT Networks with UPS Supply where all the IT gadgets should be within 90 meters of cable length
- Server room and adequate space for keeping network switches along with electrical power points and UPS.
- Access control system as per BCAS requirement
- Provision of internet, VPN bandwidth, Wi fi system along with raceways/conducting and cable trays.

6.2.5 Commercial Works

Provision of CUTE and CUSS systems.

6.2.6 Modifications to the Existing Terminal Building

Ground Floor:

- One island of check in counters (32 counters) to be relocated and instead 2 numbers Baggage claim belts to be added in the same location.
- Sliding glass partitions to be constructed for simultaneous multiple use of baggage belts.

Second Floor:

- The domestic security hold area and international security hold area to be interchanged such that the international security hold is towards the western finger.
- The domestic security hold once shifted to the eastern side shall be continuous with the domestic security hold in the extension of terminal building.
- The glass partition separating international and domestic security hold to be modified.

6.2.7 Demolition of Existing Old Terminal Building

The old terminal building which was to be partially demolished for construction of parallel taxi track shall be totally demolished including its approach ramps for construction of the extension of Integrated Terminal Building & Apron.

6.2.8 Proposed Expansion of Existing Apron

CIVIL WORKS

- Expansion of existing apron to the eastern side having an area of 15000 m² to accommodate 3 nos. of AB-321/B-737 type of aircraft in power-in push out configuration Space for Ground Support Equipment. Slopes on Apron, including those on an aircraft stand taxi lane, shall be sufficient to prevent accumulation of water on the surface of the apron but shall be kept as level as drainage requirement permit. On an aircraft stand the maximum slope shall not exceed by 1%.
- Demolition of existing shoulder 1863 m^2 in area and construction of pavement of apron strength.
- The apron should have strength to cater to the operation of AB-747-400 type of aircraft.
- Rerouting the existing drainage and/or provision of new drainage connecting the existing drainage system at appropriate location for protecting the extended portion of apron and terminal building, if necessary.
- Technical evaluation and declaration of pavement strength after the completion of work and prior to commissioning.
- Provision of hard stand of rigid pavement along the eastern shoulder edge of the apron for parking & movement of Ground Support Equipment and vehicles.
- Provision of intermediate holding position marking (on the perpendicular portion of taxiway, apron aircraft stand markings, apron edge marking, apron safety lines including wing tip clearance and service road boundary lines as required by the parking configurations and ground facilities), taxiway centre line marking, taxiway side stripe marking, additional transverse stripes at the intersection of taxiway with apron and taxiway with runway, mandatory instruction marking wherever required as per DGCA (CAR) and Aerodrome Design Manual Part-IV (Visual Aids).
- Removal of obstruction, if any, in the portion of extension of apron.

Electrical Works

- Provision of apron edge lights and mandatory instruction signs and other illuminated information signs.
- Augmentation of power supply, if any.
- Provision of apron flood lights for the extended portions of the apron to meet the required illumination standards as per DGCA (CAR) and Aerodrome Design Manual Part-IV (Visual Aids).
- Rerouting of any electrical or communication cables in the areas of proposed extension of apron.

6.3 RESIDENTIAL AREA

No residential area is proposed in the present proposal.

6.4 GREENBELT

The existing greenbelt area will be maintained.

6.5 SOCIAL INFRASTRUCTURE

No social infrastructures are proposed in the present proposal.

6.6 CONNECTIVITY

The site is located in Dabolim village, South Goa District. The site is approachable by NH-17 which is adjacent to the site in Northern direction. Dabolim Railway Station is located at a distance of 1 km in NE direction.

6.7 DRINKING WATER MANAGEMENT

At present, Dabolim Airport at Goa requires 350 KLD of fresh water which is sourced from PWD, Goa.

After expansion, the fresh water requirement will be 700 KLD which also will be sourced from PWD, Goa.

6.8 SEWERAGE SYSTEM

The existing sewerage system will cater for the need after the expansion as well. The existing STP based on MBBR technology has capacity of 300 KLD which will be augmented to 600 KLD in future.

6.9 SOLID WASTE MANAGEMENT

Construction phase: Solid waste during construction phase will be collected and disposed as per established laws and Procedures. The Organic waste will be treated at site. Approximately 0.002 MT of construction waste and 0.008 MT of demolition waste will be generated from the project.

Operation phase: Twin bin waste collection system– green bins for bio-degradable wastes and blue bins for non-biodegradable wastes shall be provided. Waste collection shall be done and temporarily stored at identified locations before disposing as per established laws and procedures.

Hazardous waste shall be treated in accordance with Hazardous Waste Management Rules 2016, Batteries waste shall be handled in accordance with Batteries (Management and Handling) Rules, 2001 and E waste as per E waste Management Rules, 2016.

During operation phase, around 4.1 tonnes of waste will be generated.

6.10 POWER REQUIREMENT, SUPPLY & SOURCE

The present power requirement of the airport is 3.5 MVA which aster expansion will be 4.5 MVA and is sourced from Goa Electricity Department.

REHABILITATION & RESETTLEMENT

7. REHABILITATION & RESETTLEMENT

The area in which the expansion is proposed lies within the airport premises and no additional land is to be acquired for this purpose. Hence this proposal does not involve any rehabilitation & resettlement issues.

PROJECT SCHEDULE & COST ESTIMATE

8. PROJECT SCHEDULE & COST ESTIMATE

The proposed completion schedule for the project is 24 months. The estimated cost of the project is 256.69 crores. The budgetary cost estimates for the project have been prepared as per following details.

Table 8-1: Project Cost Break-up

Sl. No	Description	Amount (Rs.)	
1	**New Domestic Terminal Building**		
a	CIVIL WORKS	1, 12,31,29,025 46	
b	ELECTRICAL WORKS	63,07,71,975.38	
	Sub Total	1,75,39,01,000.84	
	Project Management Consultancy @ 7% (excluding brought out items of electrical)	I0,70.02.762.21	
	Project Management Consultancy @7% on 25% of brought out items of elct.	97,65,614.46	
	Total Cost of Civil & Electrical Works for TB including PMC fee for Civil+Elect+AS+IT Total	**1,87,06,69,377.51**	**A'**
c	Airport System Works	32,27,45,000.00	
	IT System Works	1,00,00,000.00	
	Total Terminal Building (A)	**2,20,34,14,377.51**	**A**
2	**Modification to existing Integrated TB**		
a	Lumpsum provision	3,00,00,000.00	**B**
3	**Pavement work**		
a	CIVIL WORKS	6,07,51,762.33	
b	ELECTRICAL WORKS	1,32,75,648.00	
	Total Apron (B)	**7,40,27,410.33**	**C**
	Total Civil+Elect of Terminal Building (Incld PMC) and Apron (A'+B+C)	**1,97,46,96,787.84**	**X**
	Total Cost of Terminal Building and Apron (A+B+C)	**2,30,74,41,787.84**	**Y**
	Add 5% for operational area hindrance for Apron on C	37,01,370.52	
	Add 1% labour cess on X	1,97,46.967.88	
	Total Cost of TB and Apron	**2,33,05,90,126.24**	
	Add 3% Contingency	6,99,26,703.79	
		2,40,08,16,850.03	
	Add 6.5% cost escalation	15,60,53,093.95	
		2,55,68,69,923.95	
	Say	**255.69 Cr**	

Analysis of Proposal

9. ANALYSIS OF PROPOSAL

Dabolim Airport is an operational airport and is to be upgraded to cater the need of the visitors. The land for the project is already under possession of AAI.

As per current traffic data the Dabolim Airport at Goa handled 8.46 million passengers in 2018-19. The existing integrated terminal building which handles both domestic and international passengers is near saturated, therefore it is proposed to expand the existing integrated terminal building by demolishing the old terminal building to cater to the passengers' convenience in future growth of Goa Airport. The airport is expected to handle as on date, total number of passengers per annum 8.46 million (as of Y-2018-2019). This may increase in the future.

The site in easily accessible and there are no sensitive areas in and around the project location. In summary, the conditions appear to be feasible for expansion of the terminal building of the airport for handling increasing traffic.