

New Goa International Airport
Projected Income Statement

USD	2019	2020	2021	2022	2023	2024	2025	2026	2027	2028	2029	2030	2031	2032	2033	2034
Revenues	25,953,861	27,092,521	28,267,161	29,503,698	30,750,653	32,078,030	34,504,820	36,015,515	38,011,234	39,881,877	41,906,217	43,773,469	46,256,140	48,326,411	51,075,837	53,394,410
Aeronautical revenues	13,805,652	14,445,455	15,106,220	15,806,328	16,505,553	17,236,370	18,025,268	18,861,871	19,716,236	20,618,841	21,572,369	22,568,540	23,622,529	24,713,749	25,868,799	27,073,076
Route Navigation Facilities Charges RNFC	2,156,773	2,266,695	2,376,192	2,472,711	2,566,443	2,663,830	2,776,960	2,895,463	3,018,684	3,147,008	3,282,773	3,423,883	3,572,174	3,724,100	3,884,983	4,052,312
Landing fees TMLC	1,547,098	1,610,266	1,672,980	1,740,692	1,806,378	1,871,605	1,953,512	2,036,148	2,122,157	2,211,428	2,306,007	2,404,263	2,507,421	2,612,963	2,724,756	2,840,950
Housing Charges - P&H	1,242,458	1,292,678	1,341,773	1,395,172	1,446,701	1,500,153	1,560,651	1,623,943	1,689,657	1,757,641	1,829,773	1,904,476	1,982,539	2,061,857	2,145,977	2,233,117
lighting	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
boarding bridge	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Fees on passengers	8,820,324	9,255,796	9,715,274	10,197,752	10,686,030	11,197,782	11,734,144	12,296,318	12,885,559	13,502,743	14,153,815	14,835,918	15,560,394	16,314,829	17,111,083	17,946,688
Aeronautical related revenues	5,783,782	6,010,788	6,248,551	6,499,077	6,747,712	7,007,443	7,270,525	7,538,133	7,803,552	8,073,552	8,348,059	8,622,176	8,905,920	9,189,342	9,472,552	9,755,666
ground handling	934,204	942,518	962,800	1,025,145	1,066,984	1,110,648	1,161,871	1,221,845	1,281,599	1,344,246	1,410,316	1,479,619	1,553,414	1,630,465	1,711,765	1,797,131
catering	451,953	474,267	497,611	522,533	547,552	573,774	601,258	630,063	660,256	691,881	725,241	760,192	797,315	835,972	876,772	919,589
cargo handling	95,884	101,894	108,280	115,068	122,282	129,949	138,097	146,757	155,961	165,743	176,140	187,190	198,934	211,416	224,682	238,782
aircraft fuelling	2,193,065	2,187,965	2,275,000	2,373,020	2,469,870	2,570,945	2,686,460	2,828,345	2,966,665	3,111,680	3,264,525	3,425,045	3,595,865	3,774,225	3,952,465	4,160,026
VIP lounges	5,023	5,237	5,460	5,695	5,928	6,170	6,422	6,708	7,023	7,368	7,743	8,148	8,583	9,058	9,510	9,984
counters	1,674,452	1,745,588	1,820,000	1,896,416	1,975,886	2,056,756	2,157,168	2,262,676	2,373,332	2,489,344	2,611,700	2,740,036	2,876,692	3,019,360	3,169,972	3,328,021
airline offices	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200	559,200
hangars	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Commercial revenues	6,368,427	6,636,278	6,912,390	7,200,294	7,527,389	7,834,218	8,172,028	8,544,102	8,924,663	9,301,343	9,684,759	10,075,522	10,474,285	10,881,596	11,297,000	11,722,160
duty free shop	3,537,639	3,682,951	3,830,434	3,983,477	4,139,797	4,301,877	4,469,909	4,644,102	4,824,663	5,011,343	5,209,152	5,413,798	5,625,559	5,839,342	6,055,696	6,300,824
food & beverage	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712	248,712
car parking	1,391,800	1,464,592	1,542,073	1,623,959	1,706,496	1,793,243	1,884,419	1,980,250	2,080,975	2,186,816	2,298,346	2,415,552	2,540,803	2,672,196	2,810,758	2,956,506
shops	1,063,826	1,128,869	1,175,073	1,223,144	1,306,259	1,358,923	1,416,960	1,483,110	1,558,923	1,636,864	1,718,684	1,806,864	1,899,758	1,997,500	2,095,500	2,198,489
ground transportation	57,316	59,983	62,764	65,675	68,628	71,714	74,938	78,306	81,825	85,498	89,327	93,426	97,897	102,105	106,763	111,637
car rental	49,134	51,152	53,200	55,326	57,497	59,748	62,082	64,501	67,009	69,602	72,349	75,192	78,134	81,102	84,246	87,511
bank	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
cellular providers	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating costs	6,710,809	6,852,095	6,993,004	7,159,087	7,324,847	7,478,305	7,693,880	7,971,068	8,260,633	8,563,151	8,873,309	9,196,874	9,515,741	9,859,920	10,215,150	10,584,444
Payroll	2,943,653	3,055,007	3,166,361	3,332,313	3,478,266	3,699,620	3,873,416	3,927,604	4,011,400	4,280,186	4,353,982	4,668,847	4,767,242	5,082,106	5,180,501	5,531,444
Maintenance	1,711,401	1,726,466	1,741,103	1,755,342	1,769,208	1,796,240	1,934,655	1,947,221	1,959,550	1,971,586	1,983,393	1,999,576	2,015,320	2,030,655	2,046,605	2,060,193
General expenses	2,045,755	2,050,622	2,055,540	2,061,431	2,067,373	2,072,445	2,075,808	2,086,221	2,089,680	2,101,365	2,104,929	2,118,446	2,123,172	2,137,151	2,142,035	2,158,069
Professional services & administration	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000	10,000
Payments to Government	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Operating margin	19,248,053	20,240,426	21,274,157	22,346,611	23,455,806	24,599,725	26,810,940	28,044,447	29,950,601	31,313,726	33,453,907	34,976,595	37,340,399	39,066,490	41,697,687	43,634,895
Marketing	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500	40,500
Corporate	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000	2,000
EBITD	13,205,553	13,197,926	13,231,657	13,304,111	13,413,306	13,557,225	13,768,439	14,001,945	14,290,098	14,631,402	15,023,907	15,468,882	15,968,937	16,519,982	17,128,037	17,794,691
Depreciation	10,678,708	12,160,695	12,861,754	13,162,832	13,572,361	13,432,650	13,885,547	13,837,376	13,872,057	11,108,410	8,811,152	6,098,144	7,215,389	7,882,757	8,550,126	9,217,494
EBIT	8,526,845	8,037,231	8,569,894	9,141,278	9,840,945	11,124,575	12,882,892	14,164,569	16,036,041	20,167,812	24,600,251	28,635,944	30,082,503	31,141,225	33,105,052	34,374,691
Financing expenses	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Pre-tax income	8,526,845	8,037,231	8,569,894	9,141,278	9,840,945	11,124,575	12,882,892	14,164,569	16,036,041	20,167,812	24,600,251	28,635,944	30,082,503	31,141,225	33,105,052	34,374,691
Income tax	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net income	8,526,845	8,037,231	8,569,894	9,141,278	9,840,945	11,124,575	12,882,892	14,164,569	16,036,041	20,167,812	24,600,251	28,635,944	30,082,503	31,141,225	33,105,052	34,374,691

It can be seen in the following Projected Income Statement, that the airport is set to start operating by 2010. Until then, revenues and expenses are calculated just for projection purposes.

While revenues are expected to grow significantly in relation to the current situation, the level of depreciation derived from the capital expenditure program is going to have strong impact on the results.

Only in the fourth year the company will be able to generate the revenues to cover the significant depreciation costs associated with the capital expenses program.

Net profits are expected to escalate to substantial figures by mid of the following decade, giving the volume of traffic build up and the economies of scale achieved in running the facility.

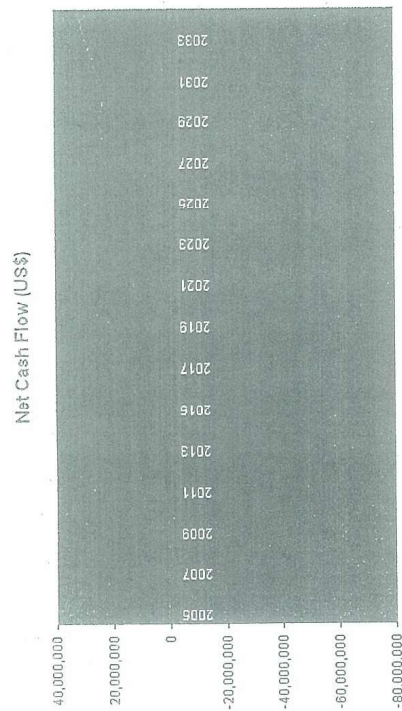
Based on the projected Income Statement, the following Cash Flow was projected, as follows:

New Goa International Airport		2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Projected Cash Flow																
USD																
Net Income		0	0	0	0	0	-2,823,330	-1,893,508	-852,573	1,509,523	2,700,270	3,632,279	4,442,355	5,576,465	6,908,822	8,526,815
Adjustment to Net Income		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Depreciation		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Change in working capital		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Flow from Operations		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Flow from Investment activities		0	10,243,158	71,702,104	61,458,946	61,458,946	0	0	0	0	0	0	0	0	0	0
Infrastructure equipment		0	9,327,758	65,294,304	55,866,546	55,965,546	0	0	0	0	0	0	0	0	0	0
Infrastructure equipment		0	915,400	6,407,800	5,492,400	5,492,400	0	0	0	0	0	0	0	0	0	0
Cash Flow from Financing activities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans received		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans repayments		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow		0	-10,243,158	-71,702,104	-61,458,946	-61,458,946	8,335,228	9,265,049	10,305,034	12,688,067	13,665,927	11,123,567	12,134,080	13,427,068	14,270,072	15,539,283
NPV 20%																
IRR																
New Goa International Airport																
Projected Cash Flow																
USD																
Net Income		6,037,231	8,559,894	9,141,278	9,840,945	11,124,575	12,880,892	14,164,569	16,036,041	20,167,812	24,800,251	28,835,944	30,062,503	31,141,225	33,105,052	34,374,691
Adjustment to Net Income		12,160,895	12,651,764	13,162,832	13,572,361	13,432,650	13,685,547	13,837,276	13,872,057	11,108,410	9,811,152	6,098,144	7,216,388	7,882,757	8,550,126	9,217,494
Depreciation		20,197,826	21,231,857	22,304,111	23,413,306	24,557,225	25,768,439	26,001,945	29,903,066	31,276,222	33,411,402	34,934,069	37,297,892	38,023,882	41,655,178	43,592,185
Change in working capital		9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174	9,168,174
Cash Flow from Operations		6,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974	8,314,974
Cash Flow from Investment activities		853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200	853,200
Infrastructure equipment		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Cash Flow from Financing activities		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans received		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Loans repayments		0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Net Cash Flow		11,028,752	12,063,483	13,135,937	14,245,132	15,292,174	16,296,265	17,265,171	18,333,771	20,759,924	22,108,048	24,243,228	25,068,615	26,188,559	28,819,734	30,755,741
NPV 20%																
IRR																

It can be seen how the generated cash flow is not sufficient to cover the capital expenditure of the project.

The following graph depicts the cash flow position of the project:

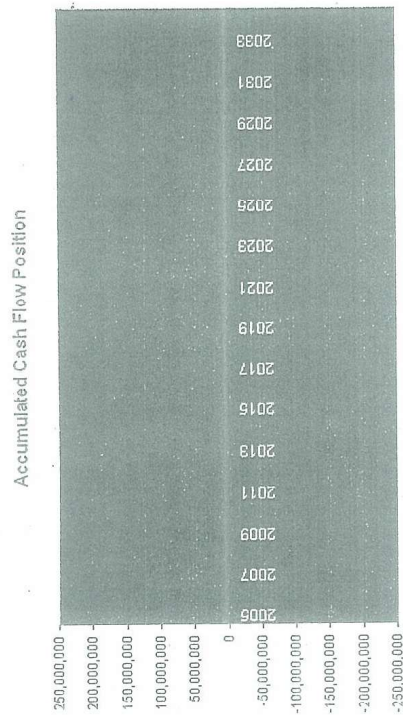
New Goa International Airport – Free Cash Flow per year



The significant expense on investments is far more dramatic than the potential cash that can be generated in the following years.

The accumulated cash flow position is only positive after the year 2026, as can be seen in the following graph.

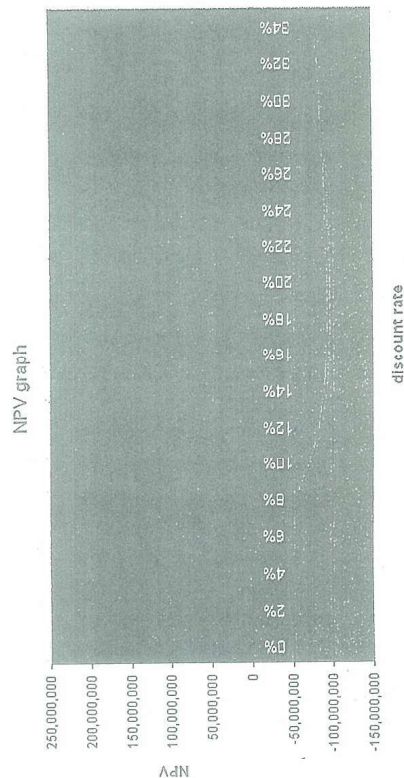
New Goa International Airport – Accumulated Cash Flow Position



This assumes that the project should be dependent on external sources until the year 2025, when the accumulated cash turns positive.

These findings are consistent with a negative Net Present Value, since the Internal Rate of Return is significantly low, well below any reasonable discount rate.

The following graph represents the NPV function for this project:



New Goa International Airport – NPV as a function of the discount rate

The graphs shows that the root of the function (the IRR) is as low as 4.7% and the project would not have a positive IRR for any discount rate above that value (by definition).

10.2.3. Next Steps: Options assessment

The calibration of the model using best practices benchmarks for other international airports demonstrated that the projected revenues and costs are consistent. In parallel, the capital expenditure for such a project is a conservative number for a facility of the intended characteristics. However, the volume of traffic, even on the most optimistic scenario, cannot generate sufficient cash to cover the capital expenditures required.

It then becomes crucial the simulation of different options of structuring the transaction, in order to carry out the project with the least possible intervention from the public sector.

The assessment of the options is part of a stand alone component of this study.

For international traffic, the number of tourists per additional job of 1.2:1, outlined in the Master Plan, was deemed too optimistic and was adjusted to 2 to 1, declining to 1.25 by 2034. This modification was applied because the number of employees derived with the initial ratio produced excessively high numbers of direct jobs per million passengers per annum (MPPA). These numbers were crosschecked with similar MPPA numbers from a survey of 25 European airports of all sizes and were found to be well in excess of 5 times the highest figure in this survey. Even accounting for the different mix of traffic and substantially higher staffing levels in Goa businesses generally compared to Europe, these results seem untenable. One explanation could be that the sample of tourists, analysed in the aforementioned study, ranked at the higher end of tourist scale where services require more staff, whereas Goa caters to a broader spectrum of the tourist industry. The ratio adjustment used in this analysis produces MPPAs that are more in line with expected staffing levels, i.e., almost 3 times Europe's highest rate for Dabolim and a little over twice for Mopa by 2014.

As indicated in the assumptions table above, these ratios were applied in an identical manner to both the Dabolim and the Mopa analysis, so that only the differences in passenger growth account for the differences in total benefits.

11.2.2. Indirect and induced employment -

Obtaining detailed information on this category of employment has proved especially difficult without a detailed survey and input/output analysis to disaggregate the two levels of employment. Therefore, estimates of current employment in firms providing goods and services to those listed under direct employment are based largely on the multiplier (1.358) used in the Tourism Master Plan. Although the multiplier may reflect a somewhat unrepresentative sample of the tourist industry, no adjustment was applied to it for two reasons. First, while it may be somewhat high at the beginning of the forecast period, as the spending patterns of domestic tourists begin to converge with those of international tourists, employment generation should accelerate, bringing the multiplier results in line with actual job growth. Secondly, no alternative multiplier to crosscheck it was available, unlike the varying ratios discussed in section 11.2.1 above.

Establishing indirect employment for Mopa resulted in the added complication that it will provide services that are not now available at Dabolim, such as freighter operations beginning 2012. Another factor for consideration is the location of the new airport which could produce catchment areas overlapping into Maharashtra and Karnataka states. How far into these states the boundaries of these catchment areas would extend depends on a number of factors, such as competition from other airports for passengers, road accessibility for cargo, etc., all of which would require extensive examination since the cargo traffic catchment area likely differs from that for passenger services. While the consultants noted this issue, no provisions are made in the calculations for benefits resulting from Mopa's operations outside Goa proper.

11.3. Wages

One of the factors to keep in mind when considering the economic effects of wages, is the Gross Domestic Consumption as a percent of GDP. India has a Savings Ratio of 25%, meaning that the average wage earner spends 75% of his pay and saves the remaining 25%. If Goa airport employees are typical Indian wage earners, 75% of their wages go directly into the local economy via purchases of food, lodging, etc. The sellers of these goods and services in turn do likewise with the wages they have earned through these transactions, and so on through the succeeding layers of the economy. The overall effect is that for every 100 rupees earned, the succeeding 75% spent at all levels of the economy produce a multiplier of 4. Hence, another 400 rupees have been added to the economy from the initial 100 rupees earned. However, because this repeated spending also appears in indirect receipts described below, the multiplier effects of wages are not evaluated separately.

Table 11.2 - Forecast of Direct and Indirect Employment - Dabolim and Mopa Airports

Year	DABOLIM			MOPA		
	Annual Traveler increase(1)	Direct	Employment Indirect	Annual Traveler increase(1)	Direct	Employment Indirect
2005	56 778	8 987	12 205	56 773	8 987	12 205
2006	56 142	9 256	12 570	56 142	9 256	12 570
2007	59 410	9 618	13 062	59 410	9 618	13 062
2008	59 646	9 774	13 273	59 646	9 774	13 273
2009	64 272	10 470	14 219	64 272	10 470	14 219
2010	71 620	11 059	15 019	71 620	12 865	17 470
2011	47 361	11 785	16 003	79 967	14 674	19 927
2012	49 729	12 867	17 473	89 411	17 303	23 498
2013	52 215	14 751	20 032	91 079	17 085	23 201
2014	32 835	10 086	13 711	94 411	18 785	25 510
2015	33 682	10 045	13 641	71 114	14 552	19 762
2016	34 689	9 869	13 402	70 820	13 252	17 936
2017	35 946	9 276	13 597	74 034	13 676	18 570
2018	37 024	8 799	11 949	75 526	13 864	18 827
2019	31 779	8 167	11 093	78 820	14 273	19 383
2020	32 574	7 372	10 011	84 404	15 263	20 727
2021	33 388	6 410	8 704	89 421	15 804	21 462
2022	34 223	4 975	6 755	94 013	15 635	22 965
2023	35 078	4 895	6 648	95 053	16 911	22 965
2024	28 764	3 910	5 309	99 732	19 846	26 951
2025	29 339	2 809	3 815	104 643	20 790	28 233
2026	29 326	1 803	2 177	109 799	21 900	29 740
2027	30 525	1 479	2 009	115 212	22 941	31 154
2028	31 135	1 485	2 017	120 829	24 032	32 635
2029	23 818	1 491	2 025	127 408	25 588	34 749
2030	24 176	1 497	2 033	133 342	26 822	36 424
2031	24 538	1 503	2 041	142 288	28 257	38 372
2032	24 906	1 509	2 050	148 607	29 149	39 584
2033	25 280	1 516	2 059	156 900	31 026	42 133
2034	17 106	1 516	2 059	164 654	37 272	50 615
TOTAL	1 148 374	209 767	285 867	2 879 634	530 568	747 671

Beginning 2005, wages are based on a median monthly basic pay of 6000 Rupees, plus 30% for social charges, as indicated in the 2002 Census of Government Employees, on the assumption that the Government salary ranges reflect those of the Goan economy in general. Due to the lack of employment benefits data relevant to each type of job, no account was taken of the many other allowances paid to employees as part of their total remuneration. The wages figures included in this analysis of benefits are therefore very conservative. Also, an inflation rate of 4% per annum was included in the calculations to cover growth in consumer prices. All rupee summary figures were converted to U.S. dollar amounts at the rate of 42.7 rupees to \$1.00, to conform to the financial data appearing in the previous section of this report.

11.4. Revenues

11.4.1. Direct Revenues

Aside from airport operating revenues, direct revenues derived from airport-related activities for this study are generated by traveller expenditures for lodgings, food, local transport and other such goods and services. The direct revenue generated by cargo operations will represent a higher proportion of total revenues as these services develop at the new airport. However, these revenues could not be quantified without information on the types of cargo likely to be handled or their origin. The issue of the catchment area extending into adjoining states will have an important influence on volume growth, attendant revenues and benefits to the local economy.

As reported in the Inception Report, tourism represents 10.2% of the World's GDP and 4.8% of India's. For Goa, tourist expenditures alone were estimated to represent 2.5% of the state's GDP. The Tourism Master Plan also indicated that foreign tourists arriving by air spend as much as 5 times the average amount compared to domestic tourists, partly the result of longer average stays (12 vs 5 days). With the limits on the growth of the number of tourist lodgings and the likely move to upgrade existing tourist facilities, as also discussed in the Inception Report, average tourist expenditures are likely to rise faster than average prices. The Master Plan forecast the increase in average tourist expenditures at 6% per annum when inflation rates were higher than at present. Also, this rate did not take into account the potential effects of an upgrade of tourist facilities or the effects of a new airport now expected for Goa. Nonetheless, the 6% growth rate in expenditures is probably conservative when considering air travelers' spending patterns.

For these reasons, it is estimated that, beginning 2014, expenditures of foreign arrivals will rise to 6.5% and to 7% by 2024 as hotels and other tourist facilities refurbish to attract a more well-off class of travellers. Reinforcing these trends is the statement in the Inception Report that the largest share of the constraint on air passenger arrivals will occur in the domestic market. Moreover, an emphasis on international tourists and the rising affluence of the Indian middle-class should promote more demand for better accommodations and services. The overall outcome of these trends affecting tourism in Goa is that this industrial sector should account for a growing share of GDP by the time Mopa has been in operations for some years.

The breakdowns incorporated in the passenger forecasts have allowed a more detailed analysis of air travellers expenditures. The following assumptions were used to produce weighted average costs per trip:

Assumptions re. Air Traveller Expenditures

DABOLIM/MOPA		
Traveller type	Days (no)	Rs/day
Domestic - Business	2	1,575
Domestic - Leisure	5	1,125
International - Business	4	5,625
International - Leisure	12	3,600

It should be noted that these figures exclude connecting traffic. For this particular segment of air passengers, small purchases at concessionaires in the terminal would normally be included in airport revenues, part of total direct receipts.

11.4.2. Indirect/Induced Revenues

Again, for lack of detailed input/output data, the multipliers mentioned in the Tourism Master Plan were used to develop total indirect and induced revenues. For Dabolim, assuming that it remains the only Goa airport, an output multiplier of 1.058 was used to calculate the indirect revenue stream to 2034. However, given the capital expenditures to be allocated to the Mopa project, a weighted multiplier of 1.494, combining both output and value added derived from these capital funds, was used to determine indirect/induced revenues. No adjustments were made to either multiplier.

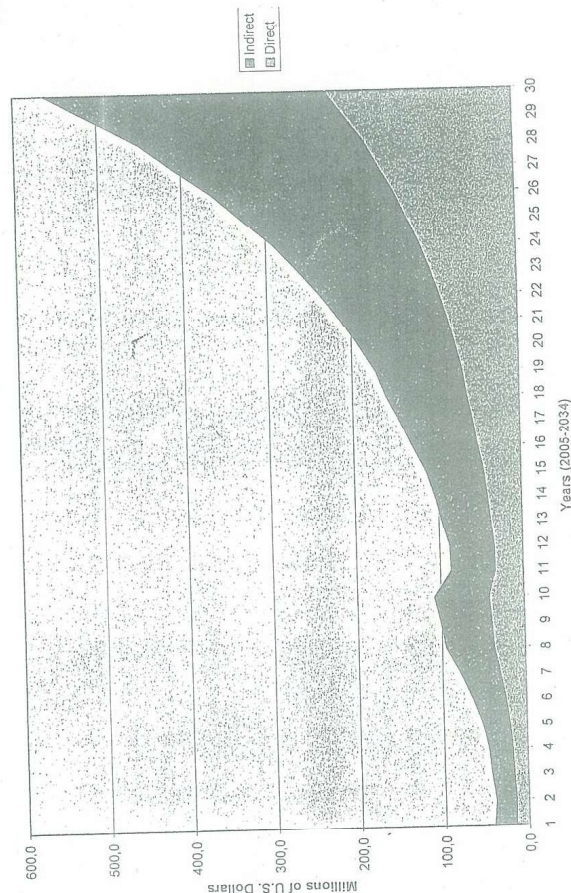


Chart 11.3 - Forecast - Direct & Indirect Revenues from Mopa Project (2005-2034)

Impact (by measure & type)	2005	2006	2007	2008	2009	2010	2011	2012	2013	2014	2021	2022	2023
DABOLIM													
Direct	8897	9256	9518	9774	10470	11039	11765	12494	12667	14751	14751	14935	1516
Indirect & induced	12005	12570	13052	13273	14219	15019	16003	16857	17473	20332	20332	20516	2059
Total	21192	21826	22580	23047	24689	26058	27768	29351	30140	35083	35083	35451	3575
Direct	1918	204	212	215	221	224	226	227	228	229	230	231	232
Indirect & induced	2059	2177	2295	2413	2531	2649	2767	2885	2999	3117	3235	3353	3471
Total	3977	421	427	436	446	454	456	457	459	460	461	462	463
Direct	1615	1516	1574	1636	1712	1757	1815	1885	1921	2231	1950	221	234
Indirect	1715	1615	1676	1737	1824	1872	1916	2024	2141	2159	2234	2234	2416
Total	3330	3131	3250	3373	3536	3629	3731	3901	4066	4089	4184	4184	4760
MOPA													
Direct	0	0	0	0	0	12665	14674	17303	17085	16785	19845	37272	
Indirect & induced	0	0	0	0	0	17470	19927	23439	23201	26510	26951	50615	
Total	0	0	0	0	0	30135	34601	40742	40286	43295	46797	87887	
Direct	0	0	0	0	0	334.5	340.9	350.1	351.5	356.9	392.1	3256.0	
Indirect	0	0	0	0	0	326.8	325.5	366.1	369.9	350.0	3125.1	3347.6	
Total	0	0	0	0	0	661.3	666.4	716.2	721.4	706.9	7046.2	6603.6	
Direct	0	0	0	0	0	334.0	340.6	348.4	353.0	355.9	391.0	3259.0	
Indirect	0	0	0	0	0	350.8	350.7	372.3	379.2	365.0	3150.9	3401.9	
Total	0	0	0	0	0	684.8	691.3	720.7	732.2	720.9	7041.9	6660.9	

Table 11.4 - Summary of Comparative Employment Effects - (Incremental increase over 2004 base year)

11.5 Capital expenditures and rates of return

11.5.1 Capital Expenditures

The outlay of capital expenditures is taken directly from the financial analysis, with no adjustments or reallocations. In the event the Mopa project does not materialize, no capital funds were assigned in this study to Dabolim for the possible upgrade of its facilities. Therefore, an Economic Rate of Return (EIRR) could not be determined for this scenario. The EIRR calculations refer to Mopa only.

11.5.2 Economic Internal Rate of Return -

The cost/benefit analysis of the proposed new airport indicates that, when the total incremental revenue stream for the projected 30 years to 2034 are weighed against the total estimated investment of \$ 388.2 million USD, the EIRR is 19%.

	Direct 1	Indirect 2 (col.1x1.1494)	Total 3	Investments 4	Net Incremental Benefits (col.3 - 4)
2005	21.4	32.0	53.4	0.0	53.4
2006	21.6	32.3	53.9	10.2	43.7
2007	23.4	35.0	58.4	71.2	-12.8
2008	25.2	37.6	62.8	61.5	1.3
2009	28.4	42.4	70.8	61.5	9.3
2010	34.0	50.8	84.8	0.0	84.8
2011	40.6	60.7	101.3	0.0	101.3
2012	48.4	72.3	120.7	0.0	120.7
2013	53.0	79.2	132.2	0.0	132.2
2014	56.9	85.0	141.9	0.0	141.9
2015	49.6	74.1	123.7	37	120.0
2016	50.9	76.0	126.9	37	123.2
2017	55.7	83.2	138.9	37	135.2
2018	59.5	88.9	148.4	37	144.7
2019	64.8	96.8	161.6	37	157.9
2020	72.0	107.6	179.6	92	170.4
2021	78.7	117.6	196.3	92	187.1
2022	86.2	128.8	215.0	92	205.8
2023	92.1	137.6	229.7	92	220.5
2024	101.0	150.9	251.9	183	233.6
2025	111.9	167.2	279.1	92	269.9
2026	122.6	183.2	305.8	92	296.6
2027	135.2	202.0	337.2	92	328.0
2028	148.1	221.3	369.4	92	360.2
2029	164.8	246.2	411.0	92	401.8
2030	180.8	270.1	450.9	12.8	438.1
2031	201.1	300.4	501.5	12.8	488.7
2032	219.3	327.6	546.9	12.8	534.1
2033	244.5	365.3	609.8	12.8	597.0
2034	259.0	401.9	670.9	12.8	658.1
Total	2 839.3	4 241.9	7 081.2	388.0	6 693.2

Table 11.5 - Cost/Benefit Analysis - Mopa Airport Project (USD Millions)¹⁸

A hurdle rate of 16% was considered necessary to cover an investment that could, as an alternative, bring in 6% risk free from long-term government bonds. The additional 10% covers both systemic and political risks. This hurdle rate of 16% is reached by the year 2021, little more than half way through the term of the project. The overall EIRR of 19% therefore shows that this project is viable from an economic point of view, especially as some of the assumptions described above are considered conservative.

¹⁸ 1 USD = 42.7 Rps

12. Environmental & Social Effect

12.1. Introduction

12.1.1. Preamble:

Goa is considered as one of India's premier tourist destination with a large component of International as well as Domestic tourist visits. Initially, the demand on the infrastructure for tourism had a strong seasonal bias. However, with successful marketing efforts on the part of many public and private sector stake holders in tourism, presently, there is hardly any season (including monsoon) that does not attract tourists. Goa is characterised by its moderate weather round the year with the only exception of rather heavy monsoons. However, efforts to make the heavy rains themselves as a tourist attraction are successful. Blessed with the moderate climate, Goa also offers a relaxed atmosphere, combined with a large variety of traditional food and drink to make it just about a perfect tourist destination for tourists from all over the world including India.

12.1.2. Project Background:

Goa is well served by land transport facilities which include National Highway-17 and a broad gauge railway back from Mumbai. However, these routes attract and convey tourists from relatively small Catchment i.e. the neighbouring State of Maharashtra.

The growth of tourism is hampered by the present lack of facilities for servicing heavy air traffic. At present there is only one airport in Goa at Dabolim. This airport belongs to the Ministry of Defence and is controlled by the Indian Navy. The use of airport for the international and domestic traffic is restricted to certain fixed hours decided upon by the Indian Navy and the movement of Military aircraft is always given the top priority. At the present time there are no scheduled flights by International airlines except for the domestic carriers operating flights to Mumbai for international connections and to some neighbouring Countries directly.

The present site for which this report is being prepared has been chosen as the more feasible one from a preliminary study conducted on two sites. The present site is at Mopa at about 30 kms from Panjim near the border between Goa and Maharashtra. The other site was located about 50 kms South of Panjim. The advantages and limitations of the present site are:

Advantages:

- 1) The site is fairly level gradually rising from East to West on a plateau varying from 140 m to 160 m above MSL.
- 2) The lay of the plateau march as quite well with the proposed orientation of the runways confirming to wind directions and intensity etc.

- 3) The site is comparatively close to Panjim.

- 4) The National Highway-17 leading to Panjim is adequate for traffic during construction and the initial stages of operation. There are no severe constraints on widening NH-17 at a later stage when the intensity of traffic demands it.

Limitations:

- 1) An acute water shortage is anticipated.
- 2) Some peaks of the Western ghats are more than 30 km away from the Mopa site.

12.1.3. Need and objective of Environmental and Social Assessment

The need for the environmental and social assessment arises from the following factors.

- A Greenfield project costing over Rs.50 Crores eq 12 Millions US \$ (both qualifications are met by the present project) requires a clearance from the Ministry of Environment and Forests. To obtain this clearance, a full fledged Environmental Impact Assessment study, an Environmental Mitigation Plan and a Disaster Management Plan is required. These reports then undergo a series of approval stages at state level and finally a presentation to the Ministry of Environment and forests.
- The site is surrounded by dense forests and a variety of wild life is anticipated. The construction procedures and Environmental Mitigation Plan must adequately mitigate any likely adverse impacts.

The objectives of the study are:

- To conduct literature review and to collect data relevant to the project area.
- To identify various pollution loads particularly during the construction stage of the project. The pollution loads during the operating stage are also a part of this study.
- To predict and assess the impacts on environmental attributes due to the construction and operation at the proposed airport including the impact of material sourcing activities such as quarrying on the existing environmental status of the area.
- To evaluate the predicted impacts on the various environmental attributes by using well accepted environmental impact assessment methodologies.
- To prepare an Environmental Management Plan (EMP) outlining the measures for mitigating the impacts on environmental quality.
- To identify critical environmental attributes required to be monitored subsequent to the construction of the airport.

12.1.4. Scope of the study:

A reconnaissance survey was conducted by the Consultants to identify the major environmental issues. The following aspects are covered in the study.

- Predominant wind direction in the area.
- Existing topography including perennial or intermittent surface water bodies.
- Locations of human and animal habitats.
- Accessibility, availability of electricity and water.
- Legal and policy framework.

12.1.5. Structure of the report:

This section is divided into six sub-sections:

This sub-section covers the project background, need, objectives and scope of the study, subsequent sections sequentially dealt with the project description, legal and policy frame work, existing scenario, assessment of impacts, and the Preliminary Environmental Management Plan. The detailed Environmental Impact Assessment study, the complete Environmental Management Plan and Disaster Management Plan shall be prepared in the Detailed Project Report, that is not part of this contract.

12.2. *Project description*

12.2.1. General

The project comprises the creation of a new international airport serving exclusively to civilian traffic, making it a Greenfield project. The airport is eventually expected to serve code-F aircraft of A-380 type. Therefore, the layout and clearances of the airside infrastructure of the project will be designed to accommodate code-F aircraft. Since code-F aircraft are not expected to use this airport in the early stages of its operation, the design will be based on code-E i.e. Boeing 747 and Airbus A-340 type of aircraft.

Since the site, at the present time is accessible only by a narrow circuitous road, a permanent all weather road to the nearest trunk route i.e. NH-17, will be an essential component of the airport project. The present access road would be unsuitable even during the construction phase.

12.2.2. Construction Methodology:

During the preparation of detailed project report the detailed methodology of construction for the various components of the airport will be evolved. This construction methodology will eventually be incorporated in the works contract between the Government of Goa and the executing agencies. In this chapter, the guidelines which will be used to evolve the detailed guidelines are presented:

- Use of Ready Mix Concrete will be made mandatory. The site of project is sufficient to justify the installation of a Ready Mix Concrete Plant at site throughout the period when concrete is needed.

- The advantages of Ready Mix Concrete are:

- The preparation of concrete is confined to one location throughout the project. Hence the mitigation measures minimizing the adverse environmental impacts can be designed and enforced more effectively.

- The storage of components of concrete i.e. sand, metal and cement can be kept under controlled conditions and fugitive dust emissions during transport of these materials can be limited by suitable mitigation measures such as periodical spraying. Similarly adequate arrangement for drainage of the storage yard and trapping the fugitive materials from runoff is more effective.

- The power sources for mixing of concrete can be effectively monitored for air pollution and mitigative measures can be taken more effectively and in time.

- A separate self contained Environmental Management Plan can be proposed and enforced effectively for the RMC Plant.

- Use of precasting will be encouraged. This will enable, to a large extent to concentrate casting of concrete in a confined area with minimum resultant pollution of water and obstruction or interference with the natural drainage. Also, trapping of the escaping materials can be carried out more effectively.

- Use of premix bituminous asphalt will be made mandatory. In this case also the site of the project justifies the placement and operation of the premix plant throughout the construction of runways, taxiways, parking lots and roads.

The advantages of construction with premix bituminous asphalt on the same as that of a Ready Mix Concrete Plant.

The other aspects of construction methodology will be finalized when the actual design of the buildings, roads, runways, aprons, taxiways etc. is made.

12.3. *Legal Administrative & Policy framework:*

12.3.1. Introduction

Any new airport construction to be used for commercial purposes must be approved by the following statutory authorities of the Government of India.

- Ministry of Civil Aviation
- Ministry of Defence
- Ministry of Environment and Forest

It does not necessarily mean that other Ministries or departments are not involved. In fact, many other Ministries or departments get involved at various stages for specific aspects. For example, at a later stage when the Detailed Project Report is prepared. The Home Ministry (which is responsible for internal security of India) will be involved in checking up the security aspects of the airport including perimeter security, accommodation and movement of the staff of the ministry which will be permanently posted there during the operation. Ministry of Civil Aviation may require interaction between itself and Ministry of Defence and Ministry of Environment and Forests for ensuring no conflicts between the civilian and military traffic.

The three ministries enlisted above are the ministries with whom the first contact is to be initiated. Other experts may be called in as and when necessary for the specific expertise required to get approval on specific aspects of the airport.

12.3.2. Administrative Procedures

The detailed steps leading to approval vary depending upon the mode of financing. Two possible scenarios exist.

1. The Government of Goa decides to privatize the airport and arranges to create it through the Built Operate Transfer mode or one of the many variants thereof.
2. Alternatively the Government of Goa decides to create it as a state owned airport and raises the resources to construct it through state or institutional finances.

The stepwise procedures are as follows:

12.3.2.1. Use of Private Sector Resources

- The Government of Goa, based on a feasibility report applies to the Ministry of Civil Aviation and Ministry of Defence.
- After the clearance from Ministry of Civil Aviation and Ministry of Defence (or pending a clearance, a document from the two ministries stating that they are evaluating the proposal and have no prima facie objection in principle to the airport); the Government of Goa approaches the private sector investor / operator.
- One consultant appointed by the private sector investor / operator prepares a detailed design report including an Environmental Impact Assessment Report, Environmental Management Plan and Disaster Management Plan.
- The private sector investor / operator & the Government of Goa, submits the Environmental Impact Assessment Report including the Environmental Management Plan and Disaster Management Plan to the Ministry of Environment and Forests.
- The private sector investor / operator, commissions his own technical study through a consultant appointed by him to prepare a detailed design project.

- The detailed design project and cost estimates decide of the Economic Internal Rate of Return / Financial Internal Rate of Return.

- Based on the financial viability of the airport, the consultant makes a financial plan regarding the possible construction and operation of the airport and makes a proposal to the Government of Goa.

- After receiving the clearance from the ministry of Environment and Forests, the investor / operator makes his arrangement with the various contractors, specialist vendors, and other executing agencies and proceeds with the construction and subsequent commissioning of the airport.

- The period of construction and operation prior to handing over the project is incorporated in the agreement between Government of Goa and the Investor / operator, if the handing over the project back to the Government is envisaged.

12.3.2.2. State Owned Project

- The Government of Goa based on a feasibility report applies to the Ministry of Civil Aviation and Ministry of Defence.

- After clearance from the Ministry of Civil Aviation and the Ministry of Defence (or pending a clearance a document from the two ministries stating that they are evaluating the proposal and have no prima facie objection in principle to the airport), the Government of Goa appoints its own consultant for detailed project report.

- The consultant appointed by Government of Goa prepares a detailed design report, including an Environmental Impact Assessment Report, Environmental Management Plan and Disaster Management Plan.

- The Government of Goa, submits the Environmental Impact Assessment Report including the Environmental Management Plan and Disaster Management Plan to the Ministry of Environment and Forests.

- The Government of Goa commissions his own technical study through a consultant appointed by him to prepare a detailed design project.

- Based on the detailed design project and additional tender documents provide by the consultant, the Government of Goa initiates the tendering process through its Public Works Department and / or a specially designated and empowered Project Director and a Steering Committee.

- At the conclusion of the tendering process the work can proceed with periodical intervention or continuous supervision from the consultant.

12.3.3. Presentation of responsibilities

12.3.3.1. Ministry of Civil Aviation

The first proposal to be made is to the Ministry of Civil Aviation. The proposal is to be made to the Ministry by the Government of Goa. This proposal will seek the prima facie approval of the Ministry to locate an airport of a certain size at the specific location. The proposal will be accompanied by the "Feasibility Report". The decision to be expected from the Ministry is a "yes" or "no". It is anticipated that the decision will take the form of a No Objection Certificate and an approval to proceed with the detailed Design of the project.

The preparation of the detailed project report (of which the Environment impact assessment report will be a part) will involve the other investors involved in financing of the airport. The Government of Goa will certainly be one of the equity holders in the airport even if it is financed by the private sector. This is so because the land acquisition is within the jurisdiction of Government of Goa. Having acquired the land, that land itself will be the substantial equity held by the Government of Goa. Also the water, electricity and development of the supporting infrastructure of roads and railway will involve agencies (whether Government or Quasi Government) as partial stake holders.

The next level of approval will be the "Planning Commission" which has the charge of allocating and prioritizing the resources at nation. The planning commission is likely to be involved even if private finance is envisaged due to equity held by the Government of Goa in the form of land and infrastructure. The interaction with the planning commission will be carried on by the Ministry of Civil Aviation.

The first submission to the Ministry of Civil Aviation to be made by the Government of Goa is to be accompanied by the feasibility report. No other documents are required to be submitted at that stage.

12.3.3.2. Ministry of Defence

The submission to the Ministry of Defence is also accompanied by the feasibility report. The Ministry of Defence will issue a No Objection Certificate to proceed with the airport based on the avoidance of conflict between civilian and military aircraft movement. No difficulties are envisaged with the Ministry of Defence since at the present time, the military and civilian aircraft are sharing the same airport at Dabolim and the move to shift civilian traffic to another location will reduce the potential of such conflicts.

12.3.3.3. Ministry of Environment and Forests

The proposed project being a greenfield airport costing well above 50 Crores, can be classified as category A as per categorization of projects developed by the World Bank on the basis of potential environment impacts. Even though the World Bank is not likely to be involved, the guidelines prepared by World Bank are often used by other authorities due to their exhaustive nature.

The principal Environmental Regulatory Agency in India is the Ministry of Environment and Forests (MOEF), New Delhi. MOEF formulates environmental policies and accords environmental clearance for the projects.

MOEF stipulates the procedures and requirements for seeking environmental clearance of projects as "Any person who desires to undertake any new project in any part of India or the expansion or modernization of any existing industry or project listed in Schedule-I shall submit an application to Ministry of Environment and Forests, New Delhi.

The application shall be made in the proforma specified in schedule-II and shall be accompanied by a project report which shall inter alia, include an Environment Impact Assessment Report, Environment Management Plan and details of public hearing as specified in Schedule-IV prepared in accordance with the guidelines issued by the Central Government in the Ministry of Environment and Forests from time to time.

The Environmental Impact Assessment Report required that situation within a 10 km radius of the project site be studied.

- General topography
- Specify general features of land
- Tree cover-prominent species
- Fauna-wildlife/domesticated
- Avifauna
- Soil characteristics
- Natural drainage pattern
- Flood prone areas
- Geological features including seismic zone
- Existing landuse (area & percentages) map (to include agricultural & non-agricultural uses, Commercial, Industrial dense/open forests, fallow land, human settlements.)

Schedule-I includes in the list of projects requiring environmental clearance from the Central Government.

"Ports Harbours and Airports (except minor ports and harbours)"

The following Acts, Rules and notifications regarding water pollution, Air pollution, Environmental protection and Coastal Regulation zones are applicable.

A. Water Pollution:

i) Acts:

1. No.36 of 1977, [7/12/1977] – The Water (Prevention and Control of Pollution) Cess Act, 1977, amended 1992
1. No.19 of 2003, [17/3/2003] – The Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003.

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15. S.O.787(E), [19/11/1991] – Central Pollution Control Board, New Delhi as Central Water Laboratory.

2. No.6 of 1974, [23/3/1974] – The Water (Prevention and Control of Pollution) Act, 1974, amended 1988.

ii) Rules:

1. G.S.R. 378 (E), [24/7/1978] – The Water (Prevention and Control of Pollution) Cess Rules, 1978.

2. G.S.R.58 (E), [27/2/1975] – The Water (Prevention and Control of Pollution) Rules, 1975.

3. Central Board for the Prevention and Control of Water Pollution (Procedure for Transaction of Business) Rules, 1975 amended 1976

iii) Notifications:

1. S.O.498 (E), [6/5/2003] – Date on which the Water (Prevention and Control of Pollution) Cess (Amendment) Act, 2003 (19 of 2003) came into force.

2. S.O.499 (E), [6/5/2003] – Rate of Cess notified under the Water (Prevention and Control of Pollution) Cess (Amendment) Act, 1977 (36 of 1977).

3. S.O.862 (E), [26/11/1992] – Central Pollution Control Board constituted the Pollution Control Committee in the UT of Daman, Diu, Dadra & Nagar Haveli.

4. S.O.284 (E), [19/2/1996] – Amendment to S.O.862 (E) dated 26/11/1991.

5. S.O.698 (E), [3/7/1998] – Amendment to S.O.284(E) dated 19/2/1996.

6. S.O.787(E), [10/3/1992] – Delegation of Powers to the Union Territory of Pondicherry

7. S.O.777(E), [19/7/1995] – Amendment to S.O.787 dated 10/3/1992.

8. S.O.198(E), [15/3/1991] – Delegation of Powers to the Union Territory of Delhi.

9. S.O.199(E), [15/3/1991] – Delegation of Powers to the Union Territory of Chandigarh.

10. S.O.842(E), [31/8/1988] – Delegation of Power to the Union Territory of Lakshwadeep.

11. No.8/1-UTF I(4)-88/4953, [11/4/1988] – Constitution of Appellate Authorities under the Water Act, 1974 FOR Chandigarh

12. G.O. Ms. No. 48/88/F6, [5/4/1988] – Constitution of Appellate Authorities under the Water Act, 1974 for Pondicherry.

13. No.1/2(71)/87. Plg., [7/4/1988] – Standards to prevent & control water pollution for Small-scale industries located in the Union Territories.

14. S.O.247(E), [8/3/1988] – Delhi Zonal Laboratory of NEERI, Nagpur as a Central Water Laboratory.

B Air Pollution:

i) Act:

1. No.14 of 1981, [29/3/1981] – The Air (Prevention and Control of Pollution) Act 1981, amended 1987.

ii) Rules:

1. G.S.R.6(E), [21/12/1983] – The Air (Prevention and Control of Pollution) (Union Territories) Rules, 1983

2. G.S.R.712(E), [18/11/1982] – The Air (Prevention and Control of Pollution) Rules, 1982
iii) Notifications:

1. G.S.R.935(E), [14/10/1998] – Ambient Air Quality Standard for Amonia (NH₃)

2. G.S.R.389(E), [23/9/1994] – CPCB re-established labs in Delhi, Calcutta, Vadodara and Kanpur.

3. G.S.R.384(E), [11/4/1994] – National Ambient Air Quality Standards.

4. S.O.1032(E), [12/12/1989] – Constitution of the Appellate Authority for the Union Territories

5. G.S.R.429(E), [10/2/1989] – Declaring the UT of Dadra and Nagar Haveli as air pollution control area.

6. G.S.R.382(E), [28/3/1988] – The date on which the Air Amendment Act of 1987 came into force.

7. G.S.R.351(E), [15/5/1981] – The date on which the Air Act of 1981 came into force.

C. Environment Protection:

i) Act:

1. No.29 of 1986, [23/5/1986] – The Environment (Protection) Act, 1986, amended 1991.

ii) Rules:

1. S.O.844(E), [19/11/1986] – The Environment (Protection) Rules, 1986.

2. G.S.R.520(E), [12/07/2004] – The Environment (Protection) Second Amendment Rules, 2004.

3. G.S.R.520(E), [1/07/2003] – The Environment (Protection) Amendment Rules, 2003.

4. G.S.R.849 (E), [30/12/2002] – The Environment (Protection) Fourth Amendment Rules, 2002.

5. G.S.R.485(E), [9/7/2002] – The Environment (Protection) Third Amendment Rules, 2002.
 6. G.S.R.371(E), [17/5/2002] – The Environment (Protection) Second Amendment Rules, 2002.
 7. G.S.R.628 (E), [30/08/2001] – The Environment (Protection) Amendment Rules, 2001.
 8. G.S.R.682(E), [5/10/1999] – The Environment (Protection) (Second Amendment) Rules, 1999
 9. G.S.R.7, [22/12/1998] – The Environment (Protection) (Second Amendment) Rules, 1998
 10. S.O.470(E), [21/6/1999] – Environment (Siting for Industrial Projects) Rules, 1999
- iii) Notifications:
- a. S.O.19(E), [14/1/2002] – Goa State Coastal Zone Management Authority.

The MOEF has the overall responsibility to set policy and standards for the protection of environment along with Central Pollution Control Board (CPCB). This includes air, noise, water and hazardous waste standards. The relevant standards which are of significance to the proposed project are given below:

Ambient Air Quality Standards:

National ambient air quality standards for ambient air have been prescribed by Central Pollution Control Board vide Gazette Notification dated 11th April, 1994. The prescribed Indian Standards are given below in Table 12.1

Table 12.1
NATIONAL AMBIENT AIR QUALITY STANDARDS

Pollutant	Time Weighted Average	Concentration of Ambient Air ($\mu\text{g}/\text{m}^3$)		
		Industrial Area	Residential, Rural & Other Areas	Sensitive Areas
Sulphur dioxide (SO_2) ($\mu\text{g}/\text{m}^3$)	Annual Average*	80	60	15
	24 hours**	120	80	30
Oxides of Nitrogen (NO_x) ($\mu\text{g}/\text{m}^3$)	Annual Average*	80	60	15
	24 hours**	120	80	30
Suspended Particulate (SPM) ($\mu\text{g}/\text{m}^3$)	Annual Average*	360	140	70
	24 hours**	500	200	100
Respirable Particulate Matter (Size less than 10 Microns) ($\mu\text{g}/\text{m}^3$)	Annual Average*	120	60	50
	24 hours**	150	100	75
Lead (Pb) ($\mu\text{g}/\text{m}^3$)	Annual Average*	1.0	0.75	0.50
	24 hours**	1.5	1.0	0.75
Carbon monoxide (CO) (mg/m^3)	8 hours	5000	2000	1000
	1 hour**	10000	4000	2000

Note:

* Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.

** 24 hourly/8 hourly values should be met 98% of the time in a year. However, 2% of the time, it may exceed but not in two consecutive days.

Noise Standards:

Ambient Noise Standards:

Ambient standards with respect to noise have been notified by the Ministry of Environment and Forests vide gazette notification dated 26th December 1989. It is based on the A weighted equivalent noise level (L_{eq}). The standards are presented in Table 12.2

Table-12.2
AMBIENT NOISE STANDARDS

Area Code	Category of Area	Noise Levels dB(A) eq	
		Day Time*	Night time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone**	50	40

Note: * Day time is from 6 am to 9 pm.

** Silence zone is defined as area upto 100 meters around premises of hospitals, educational institutions and courts. Use of vehicle horns, loud speakers and bursting of crackers are banned in these zones.

As shown on the Noise Exposure Map, there are no residential areas or Silence zones that will be impacted by Aeronautical noise computed for the term 2034. Any settlements will be under the 55 – 70 Leq levels, which is not permissible in regard with applicable regulation. These families should be removed in a new location.

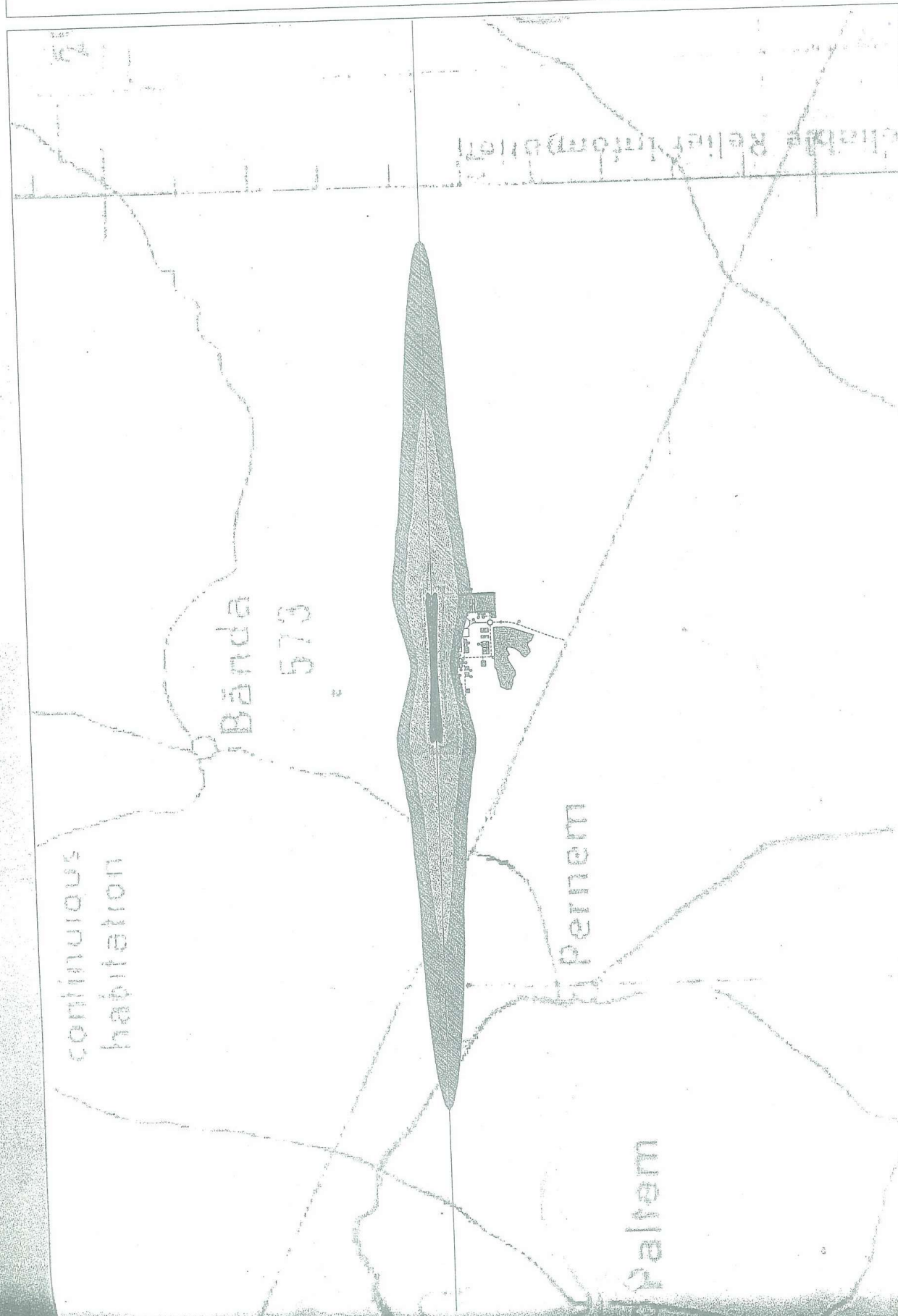
Permissible Noise levels during construction:

Ministry of Environment and Forests have prescribed permissible noise standards for rail/road/highway projects. The noise standards are presented in the table 12.3.

Table-12.3
PERMISSIBLE NOISE STANDARDS

Type of land use	Noise level dB(A)	
	External	Internal
Residential	65	50
Commercial	70	-
Places of Worship, Schools, Hospitals, Auditoriums etc.	65 (if there is activity outside)	50

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Waste water Discharge Standards:

The waste water discharge standards are stipulated under the Environment Protection Rules (1993) for discharge to "Inland Surface Water Bodies" and are given below in Table-12.4

Table-12.4
WATER QUALITY STANDARDS

Sr. no.	List of Parameters	Units	Standard (Inland Surface Water)
1.	Colour and Odor	--	All efforts should be made to remove colour and unpleasant odor as far as practicable.
2.	Suspended Solids, Max	mg/l	100.0
3.	Particle size of suspended solids	--	Shall pass 850 micron IS Sieve
4.	pH value	--	5.5 to 9.0
5.	Temperature	--	Shall not exceed 5°C above the receiving water body temperature.
6.	Oil and grease, Max.	mg/l	10.0
7.	Total residue chlorine, Max.	mg/l	1.0
8.	Ammonical nitrogen (as N), Max.	mg/l	50.0
9.	Total Kjeldahl nitrogen (as N), Max.	mg/l	100.0
10.	Free ammonia (as NH ₃), Max.	mg/l	5.0
11.	Biochemical oxygen demand (3 days at 27°C), Max.	mg/l	30.0
12.	Chemical oxygen demand, Max.	mg/l	250.0
13.	Arsenic (as As), Max.	mg/l	0.2
14.	Mercury (as Hg), Max.	mg/l	0.01
15.	Lead (as Pb), Max.	mg/l	0.1
16.	Cadmium (as Cd), Max.	mg/l	2.0
17.	Hexavalent chromium (as Cr ⁺⁶), Max.	mg/l	0.1
18.	Total Chromium (as Cr), Max.	mg/l	2.0
19.	Copper (as Cu), Max.	mg/l	3.0
20.	Zinc (as Zn), Max.	mg/l	5.0
21.	Selenium (as Se), Max.	mg/l	0.05
22.	Nickel (as Ni), Max.	mg/l	3.0
23.	Cyanide (as C _N), Max.	mg/l	0.2
24.	Fluorides (as F), Max.	mg/l	2.0
25.	Dissolved phosphates (as P), Max.	mg/l	5.0
26.	Sulphides as (S), Max.	mg/l	2.0

Sr. no.	List of Parameters	Units	Standard (Inland Surface Water)
28.	Radioactive materials	mg/l	
a)	Alpha Emitters, Max.	μ C/ml	10 ⁻⁷
b)	Beta Emitters, Max.	μ C/ml	10 ⁻⁶
29.	Bio-assay test	--	90% survival of fish after 96 hours in 100% effluent.
30.	Manganese (as Mn)	mg/l	2.0
31.	Iron as Fe	mg/l	3.0
32.	Vandium (as V)	mg/l	0.2
33.	Nitrate Nitrogen	mg/l	10.0

12.4. Existing Scenario12.4.1. Climate

The climate of Goa is generally pleasant round the year with no more than 15°C variation between the extremes of summer high and winter low. Heavy rains are prevalent from about mid June to mid October with July and August being the months when the heaviest rainfall is experienced.

12.4.2. Topography and Geology

The site has two plateaus running east west. They slope gently upwards from west to east with variation of levels from 140m to 170m above main sea level. The site is located along the boundary between the states of Goa and Maharashtra. The geology of the site consists of a shallow overburden of soil followed by weathered and unweathered basalt rock. No expansive clayey soil, marine clay and other problematic strata are encountered. Strata suitable for founding of structures would be available within 2.0 m from ground at most locations. Apart from the plateaus the site slopes down generally in a southerly direction.

12.4.3. Air Environment

The proximity of site to the sea continued with absence of industry except for mining assures a high baseline quality of air with presence of CO, SO, NOX, SPM and HC well below the acceptable limits. No air quality monitoring stations have been located at any time anywhere near the site. Therefore the generation baseline air quality data will be started by establishing a monitoring station at the site in the earliest stage of starting the detailed environmental study. The air quality will be monitored for one full year covering a complete cycle of seasons.

12.4.4. Ambient Noise Environment

As in case of ambient air quality, in absence of any heavy industry or proximity to major transportation routes, there are no man made noise producing sources within or in near vicinity of the site.

Baseline noise data will be generated by installing noise monitoring equipment in the early stages of detailed project study.

12.4.5. Water Environment

There are no water bodies storing or conveying water round the year. A number of small water courses and two medium size water course convey storm water southwards from the plateaus. Therefore there would be no round the year monitoring to produce the baseline data. Samples will be taken regularly during monsoon when the water courses have some run-off and analyzed for all the parameters stipulated by the Ministry of Environment and Forests.

12.4.6. Land use and Ecology

The present land use of the project area is confined to some seasonal grazing by goats, sheep and some cattle. A few huts of bamboo frame and thatched roof are used by nomads grazing the cattle for temporary shelters. Rest of the site is covered by shrubs, bushes and small trees.

There is no wild life inhabiting the actual airport site except for small animals like lizards, frogs, toads, etc. Common species of birds also inhabit the project area.

None of these are endangered, threatened or protected.

The Sahyadri Ghats starting a few kilometers from the project area have a wide variety of wild life with a possibility of endangered, threatened or protected variety of wild life.

Adequate provisions are made in the Environmental Management Plan (which will be elaborated further in the detailed environmental study) to ensure that the wild life is not adversely affected by the aircraft noise. It is too far away to be affected by the noise of ground vehicles using the airport.

12.4.7. Socio Economical Environment

There are no permanent human habitats in the project area. Only a few temporary huts made of bamboo and thatch are erected by nomads for temporary shelter during the grazing periods. Alternate grazing land will have to be designated. Apart from this there are no issues pertaining to relief and resettlement.

The social impacts during the construction and operation phase are going to be beneficial, in terms of increased employment and the resultant enhanced purchasing power to the local people.

12.5. Impact Assessment

12.5.1. General

The various specific environmental issues which might get impacted due to the implementation of the proposed project during the construction phase and operations phase are identified in this sub section. All the site specific issues, perceivable environmental issues and social issues are listed. The impact identification and assessment is carried on the existing base line environmental status of that particular issue and consultants experience in similar projects.

12.5.2.

Land Use

Impact on land use pattern is expected to be significant more during operations phase than during construction phase. In the pre project scene, the land assigned for this project and presently under study is utilized to a small extent for the purpose of grazing by nomads. Rest of the land is not used for any commercial purpose and is barren or occupied by shrubs and a number of small trees. A school building is located near the south west corner of the project area. This building is at such a location that no construction activity is planned there and this corner of site is not likely to be used at all. Therefore it is not recommended at this time to demolish and relocate the school.

The creation of the airport will have a two fold impact.

- Cattle or sheep/goat grazing cannot be permitted for obvious safety reasons. The nomads who are traditionally using this land will have to be allotted alternative land for the purpose of grazing. A few huts of temporary construction (bamboos and thatch roots) are not a significant issue. They can be easily relocated elsewhere.

- A wild variety of grass grows over most of the site. This variety is prominent all over the west coast of India from Goa northwards. Due to the seasonal nature of rainfall, this grass is green from June to about end of December and turns brown and dry for the remaining part of the year. During the wet season, insects attract birds which are hazardous to the operation of aircraft during takeoff and landings. Due to dry weather there is a fire risk from January to June. To cut and trim the grass and to dispose off the same will have to be a part of regular maintenance. Being inevitable, this is not an environmental issue since the situation will prevail at any site on the western coast from Goa to Gujarat. During the construction period, grazing can be permitted with some restrictions.

12.5.3.

Terrain and Geology

Insignificant adverse impact is anticipated on the geological environment of the project corridor during the construction phase of the project and absolutely no impact is anticipated during the operations phase of the project.

Some adverse impact on the geological environment may be anticipated at the quarry sites and surrounding areas. This can be brought down to insignificant levels by using the locally excavated materials whenever suitable and borrowing the extra fill created by mines in the form of surface spoil, the mines in the vicinity will be glad to get rid of such materials since it is of no use to their operation and creates a nuisance at the mining site.

12.5.4.

Impact on the Drainage pattern

Storm water down take pipes from all the buildings as well as drainage channels, pipes, covered and uncovered gutters will drain the area covered by runways and taxiways, aprons and buildings. Run-off from roads, parking lots for public vehicles and ground vehicles required for operation of aircraft, will be connected to the existing seasonal watercourse in the area at number of locations after suitable treatment for removal of oil and grease.

12.5.6. Impacts on Water Environments

There are no water bodies on the Airport site which store or convey water on a year round basis. There are two water courses which drain storm water during rainy season.

The Ministry of Environment and Forests specifies detailed figures of a number of extraneous chemicals which can be accepted as the discharge in the existing bodies of water. The sewage conveyance system is designed and will be operated to treat the domestic effluents resulting from activities in passenger terminals, restaurants catering areas etc and industrial effluents resulting from maintenance activities and repairs of ground vehicles will be treated to meet these standards. No significant aircraft maintenance activities are planned at the airport in the first phase.

The effects on water environment during the construction of airport are enlisted and addressed in the environmental management plan.

12.5.7. Impact on soil environments

A major impact on the soil environment during the construction of the airport will be due to the quantum of earthwork involved in the construction phase. The subgrade for most of the site is residual soil over laying the weathered basalt rocks of at shallow depths.

The project will involve cutting and replacing about 3,700,000 cum of hard murum and additional 1,300,000 cum of borrow material to be brought either from borrow pits or from the mining spoils which are located at a distance of about 30 kms. This earthwork strengthening activity is likely to have a substantially adverse impact within the project limits and also outside the project area if borrow pits for materials other than mining spoils are used. The adverse environmental impacts on the soil air and water environment during extraction, transport and storage of material have been identified and adequately addressed in the environmental management plan.

Although the project is a net borrower of soil, inevitably some of the material excavated from site will be unsuitable for incorporating into the permanent works. These will have to be disposed of within the project area. Fortunately the project area has two plateaus and rest low lying areas on the south and side. Disposal sites will be identified for minimum impact on the environment as well as economy in handling of the materials. Detailed procedures will be laid out for disposing the materials for minimum impacts on the soil air and water environment.

The erosion of soil occurs normally during the construction phase of the project. Hence, during the construction phase, the road embankment slopes shall be stabilized. This work will be incorporated in the design of the runways taxiways aprons and roads. This work will consist of control of soil erosion, sedimentation, and water pollution during the rainy season and control of fugitive dust emissions during the dry season. The control will be exercised through berms, dykes, sediment basins, mulches, grasses, slope drains and other devices. At locations where the embankment height reaches 3 m vegetable turfing will be used. Oil and fuel spills from construction equipment shall be minimized by good operation and maintenance practice. The measures to be taken are addressed in the environmental management plan.

12.5.8. Impact on Ambient Air quality

Some adverse impacts on ambient air quality are anticipated both during construction and operation phases. The adverse impacts during construction phase will be primarily due to transportation of

Detailed storm water drainage analysis will have to be carried out at further stage to design the drainage of road, parking lots etc on the ground side and runways, taxiways and service roads and aprons on the air approach sides. The values considered for the design of storm water drainage system design area are as follows:

Design rainfall intensity : 10 cms / hr

Coefficient of runoff : 80 % (0.8)

Roughness coefficient: 0.13 for pipe drains and box culverts 0.015 for concrete open drains and 0.30 for open grass covered drains.

Wide, uncovered channels with ground leading to them dressed to a very gentle slope are proposed for all areas where aircraft movements are expected. Concrete gutters with grate covers are proposed for all roads, parking lots and area around buildings. Trunk drains carrying storm water to natural water courses are envisaged as open concrete drains. All concrete surface drain whether covered or uncovered are expected to be rectangular in cross sections.

All Storm water drains including aircraft apron area and areas of ground vehicle movement have to pass through grease and oil trap to the natural water course flowing away from the plateau in a generally south ward direction. This water carriage is seasonal and in the pre project scenario drains only the storm water during the rainy season. It carries no flow during the rest of the year. After the storm water passes through grease and oil traps and the domestic sewage is treated to the level accepted as suitable by the Ministry of Environment and Forests. There will be essentially no interferences with the natural flow of drainage water from the pre-project conditions.

As regards the impact of the quarries and borrow areas on drainage patterns is concerned, the quarries if any are required to be located within the project foundries will be opened up and operated in accordance with IRC 10: 1961 specifications. Top soil of up to 150mm will be preserved and reused as resurfacing material for the berms and slopes where plantations / grasses will be developed. The topographical features of the site are only going to be altered near the runways taxi ways aprons, roads and buildings which are all located on the Plateau any way. Hence as the overall effect of the project no significant alternations in natural drainage patterns are anticipated during the operations phase.

Two minor alternations during the constructions phase due to extraction and storage of construction materials are addressed adequately in the environmental management plan.

12.5.5. Traffic and Transport

The current road connecting the site to the National Highway no 17 is a large and circuitous one and is inadequate to carry the construction traffic much less the ground traffic generated by the airport during its operations. Therefore design of a permanent all weather road connecting the site to the NH 17 will have to be undertaken as a part of the airport project and implemented ahead of the construction of the airport to enable a reliable material flow during the construction. Thereafter, during the first phase of operation of the airport, the existing National Highway No.17 will be adequate to carry the ground traffic generated by the airport. Subsequent widening NH17 to Panjim does not pose any severe constraints, since it does not pass through any heavily built-up inhabited areas.