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# Development of Greenfield International Airport in Central Travancore, Kerala

# SITE SELECTION REPORT

**November 2016**

**Indo Heritage International Aeropolis Private Limited**

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# TECHNICAL VERIFICATION RECORD

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# 1. INTRODUCTION

## 1.1 Project Background

Indo-Heritage International Aeropolis Pvt. Limited (IHIA) has been incorporated in the year 2015 with a vision to serve the air travel demands of the people of Travancore region. IHIA intends to develop an airport at Pathanamthitta, Kerala for scheduled commercial flight operation to cater to the demand for international air travel. The nearest airports are Trivandrum International Airport towards the south and Cochin International Airport towards the north which is at a distance of approx. 3 hours via road from Pathanamthitta.

## 1.2 Kerala

Kerala historically known as Keralam, is an Indian state in South India on the Malabar coast. It was formed on 1 November 1956 following the States Reorganization Act by combining Malayalam-speaking regions. Spread over 38,863 sq.km, it is bordered by Karnataka to the north and northeast, Tamil Nadu to the east and south, and the Lakshadweep Sea to the west. With 33,387,677 inhabitants as per the 2011 Census, Kerala is the thirteenth largest state by population and is divided into 14 districts with the capital being Thiruvananthapuram. Malayalam is the most widely spoken language and is also the official language of the state.

The region has been a prominent spice exporter since 3000 BCE. The Chera Dynasty was the first prominent kingdom based in Kerala, though it frequently struggled against attacks by the neighbouring Cholas and Pandyas.

In the 15th century, the spice trade attracted Portuguese traders to Kerala, and paved the way for the European colonization of India. After independence, Travancore and Cochin joined the Republic of India and Travancore-Cochin was given the status of a state in 1949. In 1956, Kerala state was formed by merging Malabar district, Travancore-Cochin (excluding four southern taluks), and the taluk of Kasargod.

Kerala has the lowest positive population growth rate in India, 3.44%; highest Human Development Index (HDI), 0.790 in 2011; the highest literacy rate, 93.91% in the 2011 census; the highest life expectancy, 77 years; and the highest sex ratio, 1,084 women per 1000 men. The state has witnessed significant emigration, especially to Arab states of the Persian Gulf during the Gulf Boom of the 1970s and early 1980s, and its economy depends significantly on remittances from a large Malayali expatriate community. Hinduism is practiced by more than half of the population, followed by Islam and Christianity. The culture is a synthesis of Aryan and Dravidian cultures, developed over millennia, under influences from other parts of India and abroad.

The production of pepper and natural rubber contributes significantly to the total national output. In the agricultural sector, coconut, tea, coffee, cashew and spices are important. The state's coastline extends for 595 kilometers, and around 1.1 million people in the state are dependent on the fishery industry which contributes 3% to the state's income. The state has the highest media exposure in India with newspapers publishing in nine languages, mainly English and Malayalam. Kerala is

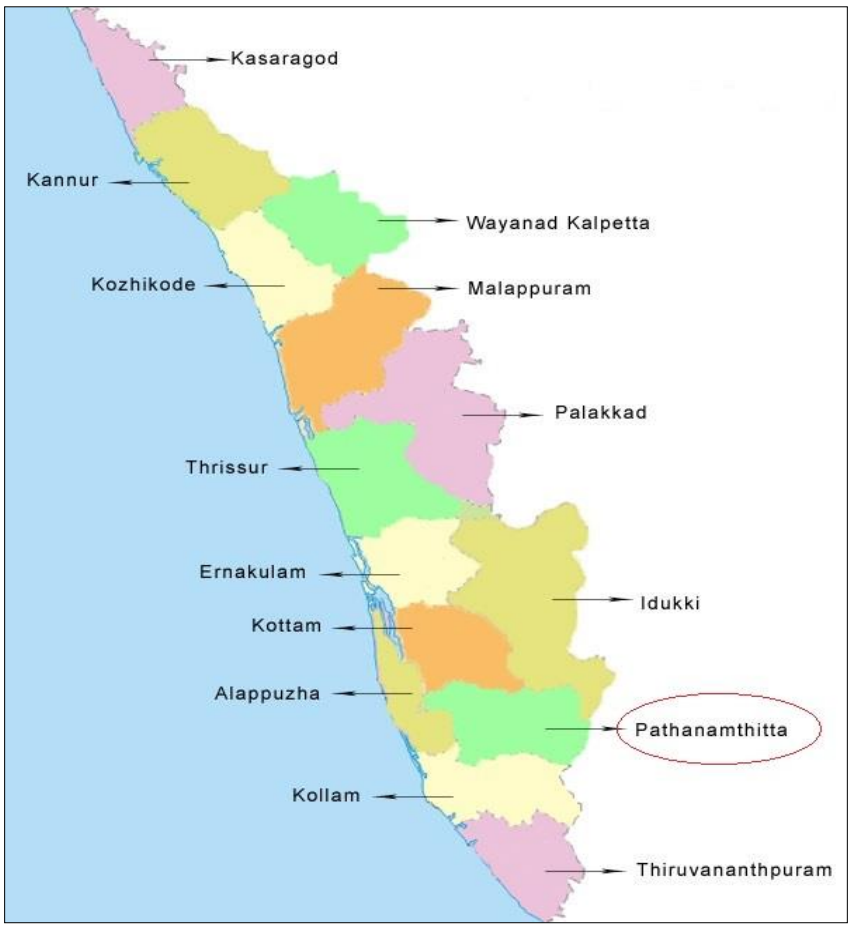
one of the prominent tourist destinations in India, with backwaters, beaches, Ayurvedic tourism and tropical greenery as its major attractions.

### 1.2.1 Pathanamthitta District

Pathanamthitta is situated near the Western Ghats and boarded by the hills, Pathanamthitta district is a treat to eyes with its vast unending stretches of forests, rivers and rural landscapes. Blessed by nature, the district is famous for its scenic beauty and festivals. Pathanamthitta is a true tropical diversity adorned with fertile agricultural land, plantations and forest. Paddy, tapioca, spices like cardamom, pepper and variety of vegetables are extensively cultivated. The district also abounds in extensive rubber plantations.

Pathanamthitta includes portions of the erstwhile Kollam, Alappuzha and Idukki Districts. The total area of the district is 2642 sq. km., of this 1390.73 sq.km come under forest area.

**Fig. 1.1 : Location of Kerala State**



### 1.2.2 History

The district of Pathanamthitta formed with effect from the 1st November, 1982 vide G.O. (M.S) No.1026/82/RD dated 29.10.1982, with headquarters at Pathanamthitta. This district, when carved out of erstwhile Alleppey, Quilon and Idukki districts comprised of a total of 54 villages – 21 villages of Pathanamthitta taluk and 9 villages of Kunnathur taluk of Quilon district and 4 villages of Chengannur taluk, 2 villages of Mavelikkara taluk and 18 villages of Thiruvalla taluk of Alleppey district. Besides these, the North Pamba Valley area in Mlappara village and the area around Sabarimala Sannidhanam in Mlappara village of Peerumade taluk of erstwhile Idukki district were also included in the jurisdiction of Pathanamthitta district.

Pathanamthitta is a combination of two words – Pathanam and Thitta – which mean an array of houses on the river side. The history of the district is sandwiched between the history of erstwhile Quilon and Alleppey districts. The pre-historic period of the district is obscure. But some megalithic monuments such as the dolmens, found in the Ranni reserve forest and Enadimangalam village of present Adoor taluk, date back to the Neolithic period. Yet some old relics, reminiscent of pre-historic period, are found also in some areas of Thiruvalla and Kadapra. During the 1st century A.D almost all the portions of Quilon district formed a part of Ay Kingdom. The southeastern portions upto Thiruvalla of erstwhile Alleppey district were ruled by Ay kingdom with their headquarters at South Travancore. The Kaviyoor Cave Temple of Pallava style of architecture is some of the earliest specimen of stone sculpture supposed to be made in the 7th to the 9th century A.D. The inscriptions engraved on the central shrine of Kaviyoor temple depict details of the area in the Kali era of 4051 and 4052. There are some epigraphical records assigned to post-Portuguese period in the Orthodox Syrian Church at Niranam.

It is worth mentioning that in the 9th century A.D, the district had flourished in the field of culture and literature. The famous Niranam poets who had made great contributions to Malayalam literature belonged to this district.

### 1.2.3 Geography

Pathanamthitta district, the fourteenth and the youngest revenue district of the state of Kerala, nestles its head on the slopes of the Western Ghats and stretches to the low-lying rice fields bordering Alappuzha district. Pathanamthitta has an average elevation of 18 meters (62 ft.) above sea level.[The main trunk road to Sabarimala is from Pathanamthitta. The Main Eastern Highway (Punalur-Muvattupuzha Road/SH-

08) andT.K.Road (Thiruvalla-Kumbazha Road/SH-07) pass through Pathanamthitta. The main Roads passing through Pathanamthitta are T.K Road, Adoor Road, Azhoor Road & Mannarakulanji Road.

### 1.2.4 Climate

The town enjoys a tropical climate with the monsoon starting in June. The months of April–May get very humid. The best weather is from October to February.

Pathanamthitta experiences three distinct seasons: summer, monsoon and winter. Typical summer months are from March to May. The warmest month in Pathanamthitta is April. Although summer doesn't end until May, the city often receives locally developed heavy thunder showers in May (although humidity remains high).

The monsoon lasts from June to August, with moderate rainfall. Most of the heavy rainfall in the city fall between June and July, and June is the wettest month of the year. Last week of June is also days of floods. The three major rivers viz Pampa, Achankovil and Manimala swell with rainwater.

Winter begins in December. The months of December through February are the winter months. The lowest temperatures are experienced during January.

According to the latest World Health Organization (WHO) study on ambient air quality among 123 Indian cities, Pathanamthitta was found to have the cleanest air in India, in terms of least concentration of dust particles in air.

As per the database, in Pathanamthitta, the annual mean of PM10 and PM2.5 is recorded at 23 and 10 respectively, which is closer to the recommended level of concentration of particulate matter. While a number of Indian cities are among the world's most polluted, Pathanamthitta’s air quality is comparable to some of the cleanest cities in North America, Europe and Australia

### 1.2.5 Demographics

As per Census of India 2011 Pathanamthitta had a population of 11, 97,412 (11.97 Lakh) and which was lower than 12.34 lakh of previous Census of 2001. Males constitute 46.9% of the population and females 53.1%. 89% of total population in Pathanamthitta lives in rural area and only 11% lives in urban. Pathanamthitta District

ranks the 12th place in terms of population size in the state. The population density of the District is 452 persons per sq.km which the 12th in States as per 2011 Census. In Sex-ratio, the District is in the 2nd position with 1132 females per 1,000 males. In Child Sex-ratio, the District has the 1st rank with 976 female children per 1000 male children. The District has the second position in total literacy rate (96.55 per cent) and female literacy rate (95.83 per cent). Agricultural labourers constitute 14.1 per cent while cultivators form 10.5 per cent of the total workers in the District. There are five engineering colleges and one medical college in Pathanamthitta District.

### 1.2.6 Transport

#### (a) Railway Connectivity

A Broad Gauge railway line passes through the north –west corner of the district and the total length of railway line through the district is merely 10.00 Km. Eventhough Thiruvalla railway station is located in this district, the people of this district mainly make use of Chengannur railway station in Alappuzha district, which is nearer to most of the areas in this district. Thousands of pilgrims arriving Sabarimala by train from other states and other parts of Kerala also make use of Chengannur Railway station. Certain preliminary surveys were conducted for the

extension of Sabari Railway line to Thiruvananthapuram through the eastern part of the district and another line through the western part of the district, connecting Chengannur and Thiruvanathapuram. But these projects are yet to be sanctioned

#### (b) Road Connectivity

The existing road network of the district consists of State Highways, Major District Road and Minor District Roads under Kerala Public Works Department and other roads maintained by Local Self Governments.

The district is well connected to surrounding districts and neighboring states through a network of various categories of roads. The Main Central Road (MC Road-SH-1) passes through the western part of the district. The other State Highways passing through the district are Kayamkulam -Adoor- Punalur (SH-5), Thiruvalla-Mavelikkara-Kayamkulam Road (SH-6), Thiruvalla-Kumbazha Road (SH-7), Kozhanchery (Pullad)-Kottayam Road (SH-9), Kozhanchery (Thekkemala)-Chengannur-Mavelikkara Road (SH-10), Nedumpuram (Podiyadi)-Edathva-Alappuzha Road (SH-12), Muvattupuzha-Punalur Road (via Manimala-Ranni-Kumbazha-Maroor) (SH-8)) and Adoor-Sasthamkotta Road (SH.37).The famous pilgrim centre, Sabarimala is

connected to other parts of the district and state mainly through Pathanamthitta-Mannarakkulanji- Vadasserikkara Perunad- Laha- Plappally- Nilakkal-Chalakkayam-Pamba Road, Vadasserikkara- Chittar- Angamoozhi-Plappally Road and Erumely-Thulappally-Nilakkal-Pamba Road.

There is a proposal for a National highway (NH 220) from Kollam to Theni via Kottayam. The alignment of this road from Kottayam to Theni has been finalized and now maintained by Public Works Department, National Highway Wing. The alignment of this road from Kottayam to Kollam has to be finalized and this NH is likely to pass through the western part of the district through Thiruvalla Town. Even though there is fairly good network of roads in the midland and lowland regions of the district, most of the roads are either single lane or at the maximum two lanes.

**(c) Water & Air connectivity:**

There is no airport in this district. Even though there are three major rivers, these are not used for water transportation. The District Urbanisation report by the Department of Town & Country Planning, Kerala insists on the need for an airport considering the large number of non-resident Indians in the district and the location of the famous pilgrim centre; Sabarimala in the district.

### 1.2.7 Tourism

**Sabarimala (Ayyappa Temple)**

Sabarimala is one of the most famous pilgrim centers in India. It is 72 km away from Pathanamthitta and is situated between two hills – Karimala and Neelimala which is 191 km from Thiruvananthapuram and 210 km from Kochi. Sabarimala is the holiest and the most famous centre of Hindu pilgrimage. Every year crores of devotees from all over India visit the shrine of Lord Ayyappa for his blessings. The pilgrimage season starts in November (Vrischikam 1st) and ends in mid-January (Makaravilakku). The traditional route is from Erumeli which is about 40 km.

The Sastha temple at Sabarimala attracts people in lakhs for the Mandalapooja and Makaravilakku festivals in December and January every year. On the particular day of Makaravilakku, lakhs devotees throng around the temple for a glimpse of Makarajyothi. The temple is closed for during the rest of the year except for the first five days of every Malayalam month and during Vishu. This temple is situated 914

meters above sea level amidst forest in the rugged terrains of the Western Ghats. The nearest railway station is at Thiruvalla (102 km.)

**Sreevallabha temple at Thiruvalla**

Sreevallabha temple at Thiruvalla is one of the important pilgrim centers of Vaishnavites all over India. The town had been named after the magnificent temple of Thiruvallabhan (Sree Vallabha or Vishnu) which is said to have been founded as early as 84 BC. A natural big pool within the temple is considered to be a rare phenomenon. Besides the image of Vishnu there are 5 images all made of metals called Pancha Loha (gold, silver, tin, lead and copper). A granite pillar cared out of single piece with an image of Garuda on its top stands in front of the temple. The pillar, which serves as a flag staff, is 50 feet high and 2 feet in diameter.

**Bhagavathi temple of Malayalappuzha**

The Bhagavathi temple is believed to have been built more than 1000 years ago. The temple with artistic wall paintings and stone work has been an attraction to many foreigners. It is believed to help people to realize their dreams. The temple is situated 7km from the district headquarters.

**Maramon**

Situated near Kozhenchery (15km from the district headquarters), Maramon is the venue of a mammoth religious convention of Christians from all over the world. It is attended by people from all communities. It is held at Maramon, every year on the vast sandy beds of the river Pamba. The convention takes place in February in an atmosphere of devotion and lasts for a period of seven days. Addressed by speakers of international repute and attended by devotees innumerable, this is perhaps the largest Christian convention in Asia. The centenary celebration of the convention was held in February 1995.

**Peruthenaruvi**

Peruthenaruvi, the famous waterfall, is situated 36 km away from Pathanamthitta. The waterfalls in the Pamba river at Perumthenaruvi attract thousands of people from inside and outside the district. The water flows down a rocky bed into a ravine sixty to one hundred feet deep. This is a beautiful natural waterfall and an ideal place of tourist attraction. It is only 10 km from Erumeli and accessible by trekking or by jeep.

**Charalkunnu**

It is a small beautiful and picturesque hill station located at Thottapuzhassery village with an area 14.46 sq.km and at a distance of 18 km from the district headquarters. This hill station developed in to a major centre of Social, Cultural and religious activities of Marthoma Church in Kerala offers a panoramic view of the nearby valleys including that of the river Pamba. This beautiful centre in central Travancore is gaining a lot of tourist attention because of its location and scenic aspects.

**Kakki Reservoir**

Kakki reservoir, set in sylvan background is a tourist delight. The splendid artificial lake offers exhilarating boating experience. The surrounding forest abounds with tigers, elephants, deer and monkey. The reservoir is located 70km from the district headquarters.

## 1.3 Consultancy Appointment

Agreement was signed on 29th July in between Indo Heritage International Aeropolis Private Limited and AECOM India Private Limited to carry out Technical Pre-feasibility Study, project preparation, obtaining necessary clearances required for airport operations, preparation of Master Plan, detailed design, cost estimation and bidding documents for selection of contractor as well as Project Management during execution stage for the development of the New Greenfield Airport at Pathanamthitta.

## 1.4 Objectives

The objective of this Report is to study the possible locations for siting the airport, based on high level data obtained from Client and provide recommends regarding possible alternative sites.

This report has been divided in various chapters namely:

1. Introduction
2. Meteorological Study
3. Traffic Forecasting
4. Site Assessment Study
5. Environmental and Social Issue

# 2. METEOROLOGICAL STUDY

There is no Observatory in Pathanamthitta, Meteorological Data for Punalur have been considered for analyzing the wind rose diagrams to check the possible Runway direction.

i) Wind data for Punalur observatory enclosed at Annexure **2.1A**

ii) Temperature- mean maximum and minimum temperature in °C for period 1961– 1990 and Rainfall data enclosed at Annexure **2.1B**

iii) Wind Rose for Punalur enclosed at **Annexure 2.2**

**2.1** Above mentioned data have been studied and analyzed and details of analysis in given below:

### 2.1.1 Wind

***a) Direction:*** The predominant wind directions are from Northwest, as visible from the Punalur climatological table

***Speed:*** The wind, as analyzed from the climatological table shows that

- Wind speed > 19 Kmph – NIL
- Wind speed > 1 & < 19 Kmph – The speed ranges between 1 & 19 Kmph in the evening throughout the year

- Calm – occurs mostly during the morning hours throughout the year.

### *2.1.2 Temperature*

Mean maximum temperature ranges between 32°C and 38°C

Mean minimum temperature ranges between 17°C and 22°C.

## 2.2 Conclusion

Since most prominent wind is from North west, most suitable orientation for runway will be North west-South east.

Winds are generally light to moderate during the year.

Weather generally is hot with mean maximum temperature remaining between 32°C to 38°C, during the year.

**Annexure 2.1A**

## WIND DATA

# जलवायवी सारणी
# CLIMATOLOGICAL TABLE

स्टेशन : पुनालूर
STATION : Punalur

| MONTH | | WEATHER PHENOMENA: No. OF DAYS WITH — PPT 2.5 mm or more | HAIL | THUNDER | FOG | DUST STORM | SQUALL | WIND: No. OF DAYS WITH WIND SPEED (Km. p. h.) 62 or more | 20-61 | 1-19 | 0 | PERCENTAGE No. OF DAYS WIND FROM N | NE | E | SE | S | SW | W | NW | CALM | CLOUD: No. OF DAYS WITH CLOUD AMOUNT (ALL CLOUDS) OKTAS 0 | 1-2 | 3-5 | 6-7 | 8 | No. OF DAYS WITH LOW CLOUD AMOUNT OKTAS 0 | 1-2 | 3-5 | 6-7 | 8 | Fog | VISIBILITY: No. OF DAYS WITH VISIBILITY Up to 1 Km. | 1-4 Kms. | 4-10 Kms. | 10-20 Kms. | 20 Kms. or more |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| जनवरी JAN | I | 1.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 5 | 26 | 0 | 5 | 3 | 2 | 1 | 3 | 0 | 3 | 83 | 1 | 5 | 19 | 5 | 1 | 11 | 9 | 11 | 0 | 0 | 0.0 | 0.0 | 0.4 | 14.0 | 16.6 |
| | II | | | | | | | 0 | 0 | 23 | 8 | 0 | 8 | 8 | 9 | 4 | 13 | 4 | 27 | 27 | 0 | 1 | 19 | 9 | 2 | 3 | 12 | 15 | 1 | 0 | 0.0 | 0.0 | 2.8 | 8.7 | 19.5 |
| फरवरी FEB | I | 2.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 3 | 25 | 0 | 2 | 2 | 2 | 0 | 2 | 0 | 1 | 91 | 0 | 4 | 18 | 6 | 0 | 9 | 9 | 10 | 0 | 0 | 0.0 | 0.0 | 0.2 | 12.4 | 15.4 |
| | II | | | | | | | 0 | 0 | 22 | 6 | 1 | 7 | 8 | 10 | 5 | 13 | 7 | 30 | 19 | 0 | 1 | 17 | 9 | 1 | 2 | 10 | 16 | 0 | 0 | 0.0 | 0.0 | 2.5 | 7.6 | 17.9 |
| मार्च MAR | I | 5.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 2 | 29 | 0 | 1 | 1 | 1 | 0 | 1 | 1 | 1 | 94 | 0 | 4 | 20 | 7 | 0 | 10 | 10 | 11 | 0 | 0 | 0.0 | 0.0 | 0.3 | 14.7 | 16.0 |
| | II | | | | | | | 0 | 0 | 22 | 9 | 0 | 5 | 4 | 6 | 4 | 17 | 7 | 28 | 29 | 0 | 0 | 17 | 10 | 4 | 1 | 10 | 18 | 2 | 0 | 0.0 | 0.0 | 3.3 | 11.0 | 16.7 |
| अप्रैल APR | I | 12.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0 | 0 | 1 | 29 | 0 | 1 | 0 | 0 | 0 | 1 | 0 | 0 | 98 | 1 | 2 | 17 | 9 | 1 | 7 | 8 | 14 | 1 | 0 | 0.0 | 0.0 | 0.5 | 15.9 | 13.6 |
| | II | | | | | | | 0 | 0 | 21 | 9 | 1 | 3 | 2 | 2 | 3 | 15 | 9 | 33 | 32 | 0 | 0 | 12 | 11 | 7 | 0 | 7 | 19 | 4 | 0 | 0.0 | 0.0 | 4.5 | 14.4 | 11.1 |
| मई MAY | I | 12.5 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0 | 0 | 2 | 29 | 0 | 2 | 0 | 0 | 0 | 1 | 0 | 1 | 96 | 0 | 1 | 16 | 10 | 4 | 3 | 8 | 18 | 2 | 0 | 0.0 | 0.0 | 1.5 | 18.1 | 11.4 |
| | II | | | | | | | 0 | 0 | 21 | 10 | 1 | 2 | 1 | 1 | 1 | 14 | 11 | 34 | 35 | 0 | 0 | 13 | 11 | 7 | 0 | 7 | 20 | 4 | 0 | 0.0 | 0.0 | 4.9 | 15.0 | 11.1 |
| जून JUN | I | 21.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 2 | 28 | 0 | 1 | 0 | 0 | 0 | 2 | 1 | 1 | 95 | 0 | 0 | 15 | 9 | 6 | 2 | 7 | 17 | 4 | 0 | 0.0 | 0.0 | 4.3 | 18.1 | 7.6 |
| | II | | | | | | | 0 | 0 | 20 | 10 | 1 | 3 | 0 | 0 | 1 | 18 | 11 | 31 | 35 | 0 | 0 | 13 | 10 | 7 | 0 | 7 | 19 | 4 | 0 | 0.0 | 0.0 | 6.0 | 15.0 | 9.0 |
| जुलाई JUL | I | 21.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 2 | 29 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 1 | 95 | 1 | 0 | 14 | 9 | 7 | 2 | 7 | 17 | 5 | 0 | 0.0 | 0.0 | 4.9 | 19.6 | 6.5 |
| | II | | | | | | | 0 | 0 | 21 | 10 | 2 | 4 | 1 | 0 | 1 | 15 | 11 | 32 | 34 | 0 | 0 | 13 | 10 | 8 | 0 | 7 | 19 | 5 | 0 | 0.0 | 0.0 | 7.0 | 15.9 | 8.1 |
| अगस्त AUG | I | 18.4 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 3 | 28 | 1 | 2 | 0 | 0 | 0 | 2 | 2 | 2 | 91 | 0 | 0 | 16 | 9 | 8 | 2 | 7 | 18 | 4 | 0 | 0.0 | 0.0 | 3.6 | 19.1 | 8.3 |
| | II | | | | | | | 0 | 0 | 23 | 8 | 2 | 5 | 1 | 0 | 1 | 15 | 12 | 37 | 27 | 0 | 0 | 13 | 10 | 8 | 0 | 6 | 20 | 5 | 0 | 0.0 | 0.0 | 5.1 | 14.1 | 11.8 |
| सितम्बर SEP | I | 13.8 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 2 | 28 | 0 | 2 | 0 | 0 | 0 | 1 | 1 | 2 | 94 | 1 | 1 | 16 | 9 | 3 | 5 | 7 | 16 | 2 | 0 | 0.0 | 0.1 | 1.3 | 19.5 | 10.1 |
| | II | | | | | | | 0 | 0 | 23 | 7 | 1 | 3 | 0 | 0 | 1 | 15 | 14 | 42 | 24 | 0 | 0 | 14 | 10 | 6 | 0 | 7 | 19 | 4 | 0 | 0.0 | 0.0 | 4.0 | 12.3 | 13.7 |
| अक्तूबर OCT | I | 17.1 | 0.0 | 0.1 | 0.0 | 0.0 | 0.0 | 0 | 0 | 1 | 30 | 0 | 1 | 0 | 0 | 0 | 1 | 1 | 1 | 96 | 0 | 0 | 17 | 11 | 3 | 3 | 7 | 19 | 2 | 0 | 0 | 1.2 | 0.0 | 1.6 | 18.8 | 9.4 |
| | II | | | | | | | 0 | 0 | 21 | 10 | 1 | 4 | 1 | 1 | 2 | 15 | 10 | 33 | 33 | 0 | 0 | 11 | 12 | 8 | 0 | 5 | 21 | 5 | 0 | 0 | 0.0 | 0.0 | 6.1 | 16.1 | 8.8 |
| नवम्बर NOV | I | 10.2 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 2 | 28 | 0 | 1 | 1 | 1 | 0 | 2 | 0 | 1 | 94 | 0 | 2 | 17 | 9 | 2 | 5 | 6 | 18 | 1 | 0 | 0 | 0.0 | 0.0 | 1.0 | 16.8 | 12.2 |
| | II | | | | | | | 0 | 0 | 20 | 10 | 0 | 5 | 6 | 7 | 2 | 15 | 7 | 23 | 35 | 0 | 0 | 13 | 12 | 5 | 0 | 7 | 20 | 3 | 0 | 0 | 0.0 | 0.0 | 4.5 | 14.1 | 11.4 |
| दिसम्बर DEC | I | 2.9 | 0.0 | 0.0 | 0.0 | 0.0 | 0.0 | 0 | 0 | 4 | 27 | 0 | 3 | 1 | 1 | 0 | 2 | 0 | 4 | 89 | 1 | 3 | 20 | 6 | 1 | 8 | 9 | 13 | 1 | 0 | 0 | 0.0 | 0.0 | 0.7 | 18.1 | 12.2 |
| | II | | | | | | | 0 | 0 | 22 | 9 | 0 | 8 | 8 | 9 | 2 | 17 | 3 | 25 | 28 | 0 | 1 | 17 | 10 | 3 | 2 | 12 | 16 | 1 | 0 | 0 | 0.0 | 0.0 | 3.2 | 11.2 | 16.6 |
| वार्षिक योग का माध्य ANNUAL TOTAL OR MEAN | I | 140.1 | 0.0 | 0.3 | 0.0 | 0.0 | 0.0 | 0 | 0 | 29 | 336 | 0 | 2 | 1 | 1 | 0 | 2 | 1 | 2 | 93 | 5 | 22 | 205 | 99 | 34 | 67 | 94 | 182 | 22 | 0 | 0 | 1.2 | 0.1 | 20.3 | 204.1 | 139.3 |
| | II | | | | | | | 0 | 0 | 259 | 106 | 1 | 5 | 3 | 4 | 2 | 15 | 9 | 31 | 30 | 0 | 3 | 172 | 124 | 66 | 8 | 97 | 222 | 38 | 0 | 0 | 0.0 | 0.0 | 53.9 | 155.4 | 155.7 |
| वर्षों की संख्या NUMBER OF YEARS | I | | | 30 | | | | | | 25 | | | | | | 25 | | | | | | | 25 | | | | | | 27 | | | | | 26 | |
| | II | | | | | | | | | 28 | | | | | | 28 | | | | | | | 26 | | | | | | 27 | | | | | 29 | |

**Annexure 2.1B**

## TEMPERATURE AND RAINFALL DATA

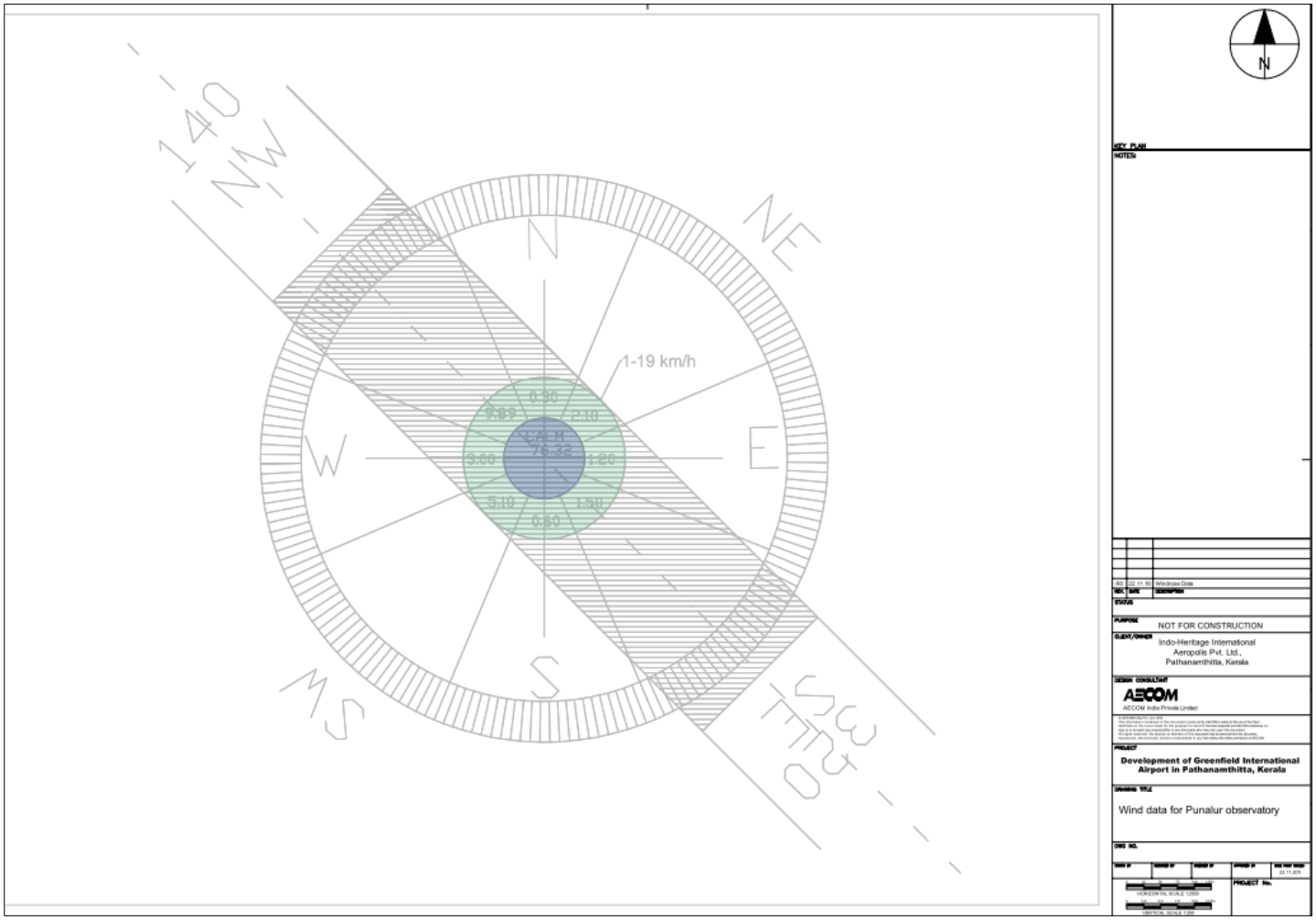
### जलवायवी सारणी
### CLIMATOLOGICAL TABLE

STATION : Punalur — LAT 09° 00' N — LONG 76° 55' E — HEIGHT ABOVE M.S.L. 34 METRES — BASED ON OBSERVATIONS 1961-1990

| MONTH | | STATION LEVEL PRESSURE | MEAN DRY BULB °C | MEAN WET BULB °C | MEAN DAILY MAX °C | MEAN DAILY MIN °C | MEAN HIGHEST IN THE MONTH °C | MEAN LOWEST IN THE MONTH °C | EXTREMES HIGHEST °C | EXTREMES DATE AND YEAR | EXTREMES LOWEST °C | EXTREMES DATE AND YEAR | HUMIDITY RELATIVE HUMIDITY % | HUMIDITY VAPOUR PRESSURE hPa | CLOUD AMOUNTS ALL CLOUDS Oktas of sky | CLOUD AMOUNTS LOW CLOUDS Oktas of sky | RAINFALL MONTHLY TOTAL mm | RAINFALL NO OF RAINY DAYS | RAINFALL TOTAL IN WETTEST MONTH WITH YEAR mm | RAINFALL TOTAL IN DRIEST MONTH WITH YEAR mm | RAINFALL HEAVIEST FALL IN 24 HOURS mm | RAINFALL DATE AND YEAR | MEAN WIND SPEED Kmph |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | | hPa | °C | °C | °C | °C | °C | °C | °C | | °C | | % | hPa | Oktas of sky | | mm | | mm | mm | mm | | Kmph |
| JAN | I | 1009.1 | 23.7 | 21.0 | 33.7 | 20.4 | 35.7 | 17.5 | 38.8 | 30 1987 | 12.9 | 08 1968 | 77 | 22.6 | 4.0 | 1.7 | 14.3 | 1.0 | 109.2 1971 | 0.0 | 45.8 | 27 1971 | 3.7 |
| | II | 1004.9 | 31.3 | 23.1 | | | | | | | | | 48 | 21.8 | 4.9 | 2.5 | | | | | | | |
| FEB | I | 1008.6 | 24.4 | 21.6 | 35.3 | 21.1 | 37.4 | 18.0 | 40.1 | 08 1975 | 14.7 | 15 1982 | 77 | 23.6 | 4.1 | 1.7 | 43.7 | 2.2 | 151.7 1971 | 0.0 | 66.6 | 15 1966 | 4.2 |
| | II | 1004.2 | 32.7 | 23.8 | | | | | | | | | 46 | 22.3 | 5.0 | 2.5 | | | | | | | |
| MAR | I | 1007.9 | 26.1 | 23.5 | 36.3 | 22.7 | 38.2 | 19.9 | 40.6 | 31 1983 | 17.4@ | 21 1970 | 80 | 27.1 | 4.2 | 1.7 | 73.9 | 4.9 | 174.7 1958 | 0.0 | 75.6 | 22 1964 | 3.8 |
| | II | 1003.6 | 32.8 | 25.2 | | | | | | | | | 53 | 26.0 | 5.5 | 3.1 | | | | | | | |
| APR | I | 1006.4 | 27.2 | 25.1 | 35.6 | 23.8 | 37.9 | 21.7 | 40.6 | 15 1983 | 18.1 | 02 1976 | 84 | 30.3 | 4.5 | 2.1 | 215.7 | 10.9 | 432.5 1959 | 44.8 1983 | 83.4 | 11 1969 | 3.3 |
| | II | 1002.7 | 31.0 | 26.0 | | | | | | | | | 67 | 29.6 | 6.0 | 3.6 | | | | | | | |
| MAY | I | 1005.2 | 27.0 | 25.4 | 33.8 | 23.9 | 36.5 | 21.8 | 39.2 | 06 1982 | 19.4@ | 31 1970 | 87 | 31.1 | 5.2 | 2.9 | 236.5 | 11.0 | 637.1 1960 | 50.8 1968 | 299.6 | 14 1972 | 3.9 |
| | II | 1002.3 | 30.5 | 26.1 | | | | | | | | | 70 | 30.2 | 6.0 | 3.5 | | | | | | | |
| JUN | I | 1005.7 | 25.4 | 24.4 | 30.8 | 23.0 | 34.0 | 21.4 | 36.6 | 06 1983 | 18.9 | 23 1970 | 92 | 29.8 | 5.5 | 3.2 | 446.8 | 20.2 | 928.4 1961 | 108.4 1962 | 165.0 | 07 1961 | 3.9 |
| | II | 1003.4 | 28.2 | 25.2 | | | | | | | | | 78 | 29.6 | 6.0 | 3.6 | | | | | | | |
| JUL | I | 1005.9 | 24.8 | 23.9 | 30.0 | 22.6 | 32.8 | 21.2 | 36.6 | 05 1982 | 18.9 | 10 1970 | 92 | 28.9 | 5.6 | 3.4 | 424.3 | 20.2 | 925.4 1968 | 107.8 1987 | 108.4 | 05 1964 | 3.3 |
| | II | 1003.6 | 27.8 | 24.8 | | | | | | | | | 78 | 29.0 | 6.0 | 3.6 | | | | | | | |
| AUG | I | 1006.3 | 24.9 | 23.9 | 30.3 | 22.6 | 32.8 | 21.3 | 34.2@ | 31 1979 | 18.6 | 02 1970 | 92 | 28.9 | 5.5 | 3.2 | 289.9 | 16.4 | 498.8 1958 | 129.6 1985 | 102.6 | 19 1971 | 3.5 |
| | II | 1003.6 | 28.0 | 24.8 | | | | | | | | | 76 | 28.7 | 6.1 | 3.6 | | | | | | | |
| SEP | I | 1006.9 | 25.2 | 24.0 | 31.5 | 22.6 | 33.9 | 21.0 | 35.2 | 20 1982 | 17.4 | 26 1970 | 90 | 28.9 | 5.0 | 2.7 | 243.3 | 12.4 | 490.2 1975 | 31.8 1982 | 141.8 | 18 1975 | 3.3 |
| | II | 1003.7 | 28.6 | 24.9 | | | | | | | | | 74 | 28.5 | 5.9 | 3.4 | | | | | | | |
| OCT | I | 1007.4 | 25.0 | 23.9 | 31.6 | 22.4 | 34.2 | 20.6 | 35.7 | 28 1976 | 16.4 | 19 1984 | 91 | 28.9 | 5.2 | 2.8 | 365.6 | 15.5 | 573.6 1970 | 102.6 1983 | 164.8 | 26 1960 | 3.3 |
| | II | 1004.1 | 28.1 | 24.9 | | | | | | | | | 77 | 29.0 | 6.1 | 3.7 | | | | | | | |
| NOV | I | 1007.8 | 24.7 | 23.3 | 31.8 | 21.8 | 34.3 | 19.2 | 36.3 | 30 1973 | 15.3 | 19 1967 | 88 | 27.5 | 4.9 | 2.5 | 195.4 | 9.1 | 701.5 1960 | 16.6 1961 | 154.8 | 10 1979 | 3.1 |
| | II | 1004.4 | 28.7 | 24.8 | | | | | | | | | 72 | 28.2 | 5.8 | 3.3 | | | | | | | |
| DEC | I | 1008.5 | 24.2 | 22.0 | 32.7 | 21.0 | 34.6 | 17.9 | 36.2 | 28 1989 | 15.0@ | 11 1956 | 82 | 24.7 | 4.4 | 2.1 | 40.7 | 2.4 | 221.8 1987 | 0.0 | 76.6 | 07 1987 | 3.2 |
| | II | 1004.8 | 29.9 | 24.1 | | | | | | | | | 59 | 25.3 | 5.2 | 2.7 | | | | | | | |
| ANNUAL TOTAL OR MEAN | I | 1007.1 | 25.2 | 23.5 | 32.8 | 22.3 | 38.5 | 16.6 | 40.6 | | 12.9 | | 86 | 27.7 | 4.8 | 2.5 | 2590.1 | 126.2 | 3599.2 | 2018.0 | 299.6 | | 3.4 |
| | II | 1003.8 | 29.8 | 24.8 | | | | | | | | | 67 | 27.4 | 5.7 | 3.3 | | | 1960 | 1986 | | | |
| NUMBER OF YEARS | I | 28 | 28 | 28 | 30 | 29 | 30 | 30 | 35 | | 35 | | 28 | 28 | 26 | 28 | 30 | 30 | 35 | 35 | 35 | | 23 |
| | II | 30 | 30 | 30 | | | | | | | | | 30 | 30 | 29 | 28 | | | | | | | |

**Annexure 2.2**

## WIND ROSE DIAGRAM



# 3. TRAFFIC FORECASTING

## 3.1 Background

India's civil aviation industry is on a high-growth trajectory. India aims to become the third-largest aviation market by 2020 and the largest by 2030.

The Civil Aviation industry has ushered in a new era of expansion, driven by factors such as low-cost carriers (LCCs), modern airports, Foreign Direct Investment (FDI) in domestic airlines, advanced information technology (IT) interventions and growing emphasis on regional connectivity. India is the ninth-largest civil aviation market in the world, with a market size of around US$ 16 billion. India is expected to become the third largest aviation market by 2020#.

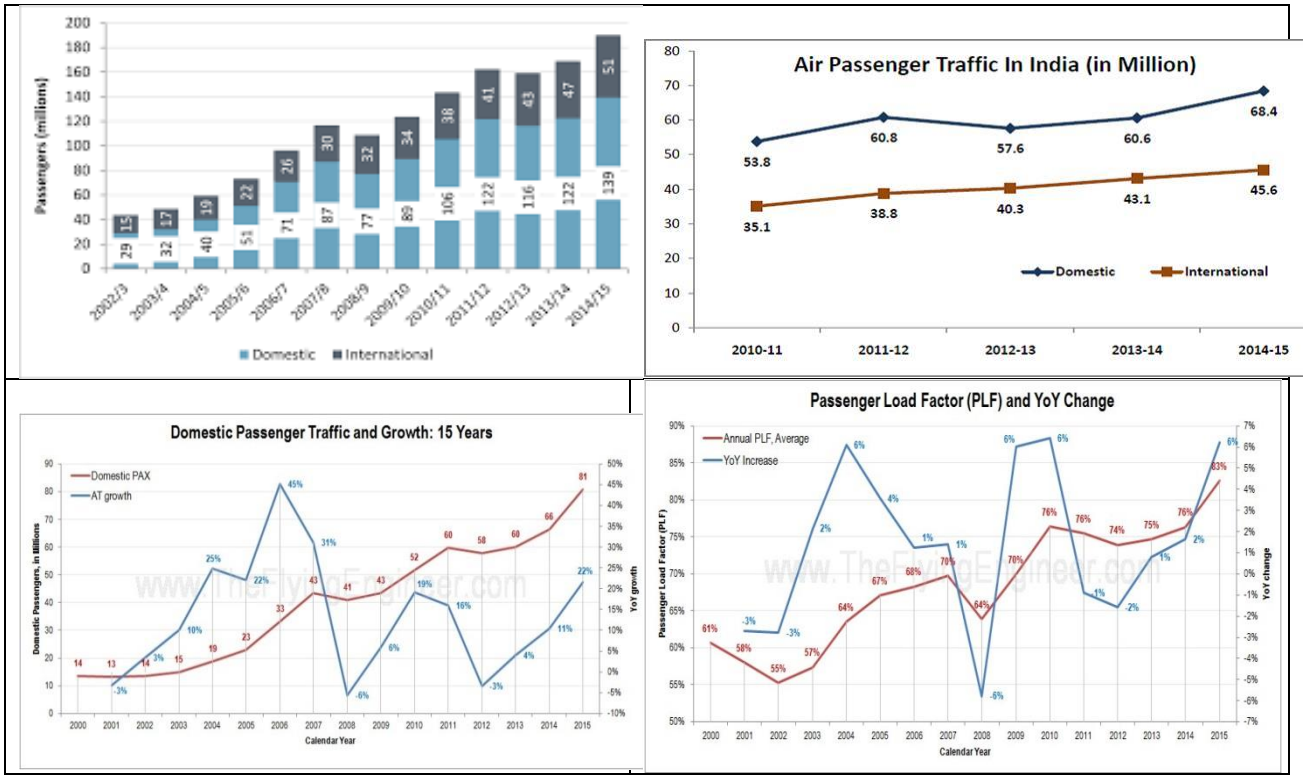
### 3.1.1 Market Size

During January-August 2016, domestic air passenger traffic rose 23.14 per cent to 64.47 million from 52.36 million during the same period in 2015. Passenger traffic during FY 2015-16 increased at a rate of 21.3 per cent to 85.57 million from 70.54 million in the FY 2014-15.

In July 2016, total aircraft movements at all Indian airports stood at 168,400, which was 14.3 per cent higher than July 2015. International aircraft movements increased by 8.2 per cent to 32,830 in July 2016 from 30,330 in July 2015. Domestic aircraft movements increased by 15.8 per cent to 135,570 in July 2016 from 117,050 in July 2015.

Indian domestic air traffic is expected to cross 100 million passengers by FY2017, compared to 81 million passengers in 2015, as per Centre for Asia Pacific Aviation (CAPA).

India is among the five fastest-growing aviation markets globally with 275 million new passengers. The airlines operating in India are projected to record a collective operating profit of Rs 8,100 crore (US$ 1.29 billion) in fiscal year 2016, according to Crisil Ltd.




### 3.1.2 Aircraft Traffic Movement (ATM)

Aircraft Movements In the month of March 2015, total aircraft movements at all Indian airports were 140.07 thousand. This shows growth of 3.9% over the corresponding month of previous year. Overall aircraft movements up to March in the current financial year also indicate growth of 4.3%. Growth in International aircraft movements, for the month of March 2015, was 2.8% and same percentage growth has been observed for the period April to March, 2014-15. Growth in Domestic aircraft movements, for the month of March 2015, was 4.2% and 4.7% growth has been observed for the period April to March, 2014-15.

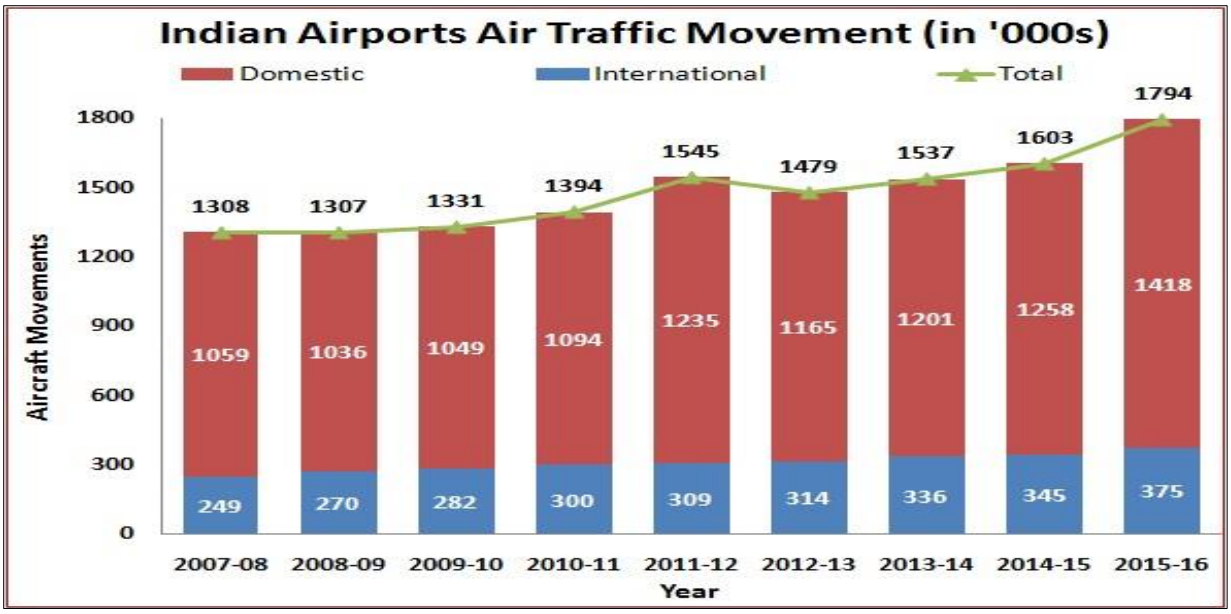
Freight During the month of March 2015, total freight at all Indian airports was 220.47 thousand MT. This shows growth of 3.9% over the corresponding month of previous year. Overall freight up to March, in the current financial year, also indicates growth of 11.0%. Growth in International freight for the month of March was 2.0% and 6.9% growth for the period April to March 2014-15. Growth in Domestic freight for the month of March was 7.3% whereas 18.0% growth for the period April to March 2014-15.

Average PLF for international operations is generally higher around 120 due to deployment of bigger aircrafts with more seating capacity over long-haul

operations. For domestic operations, average PLF has traditionally been in the range of 70-80. However, due to capacity optimization and deployment of more seating capacity per aircraft (reduction of business class seats per aircraft, conversion of business class to economy class, etc.), the average PLF has been high during the last 4 years touching a high of 132 in international segment and 106 in domestic segment.

As per the ICAO estimates9, world passenger load factor also witnessed increasing trend during the last decade from around 69% in 2001 to around 75% in 2005 which further increased to around 77% in 2011. Thus Indian airlines followed global trend of maximizing utilization of the existing fleet by enhancing passenger load factor in order to optimize costs and enhance sustainability. The trend is expected to continue in future leading to further increase in passenger load factor.

| Year | Aircraft Movement (in '000s) | | | Aircraft Movement Growth Y-o-Y in % | | |
|---|---|---|---|---|---|---|
| | International | Domestic | Total | International | Domestic | Total |
| **2007-08** | 249 | 1059 | **1308** | 15.3 | 22.9 | **21.3** |
| **2008-09** | 270 | 1036 | **1307** | 8.8 | -2.2 | **-0.1** |
| **2009-10** | 282 | 1049 | **1331** | 4.4 | 1.2 | **1.9** |
| **2010-11** | 300 | 1094 | **1394** | 6.4 | 4.3 | **4.7** |
| **2011-12** | 309 | 1235 | **1545** | 3.0 | 13.0 | **10.8** |
| **2012-13** | 314 | 1165 | **1479** | 1.5 | -5.7 | **-4.3** |
| **2013-14** | 336 | 1201 | **1537** | 7.0 | 3.1 | **3.9** |
| **2014-15** | 345 | 1258 | **1603** | 2.8 | 4.7 | **4.3** |
| **2015-16** | 375 | 1418 | **1794** | 8.7 | 12.8 | **11.9** |




*Source: Association of Private Airport Operators*

### 3.1.3 Air Cargo

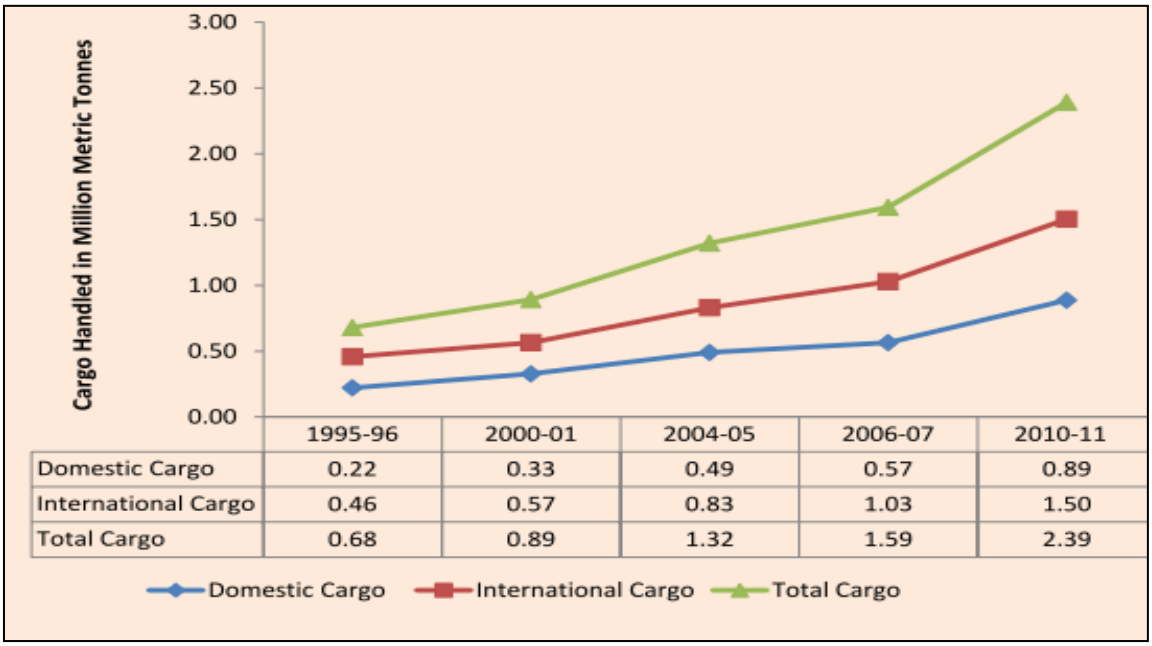
Indian Economy is on the higher trajectory of growth. Forecasts suggest that the growth prospects are likely to continue for more than two decades. That means, requirements for augmentation of infrastructure facilities in the logistics space to cater to the growing needs of the trade and industry will be immense.

Air cargo represents about 10% of the airline industry's revenues. As 35% of the value of goods traded internationally is transported by air, air cargo is a barometer of global economic health .The fortunes of the transport and logistics industry are closely connected to the economic cycle. When economic activity is buoyant, demand for transport and logistics services is equally strong. Consumer and business demand for goods and services inevitably translates into higher demand for transport and logistics services.

India's impressive growth in international and domestic trade over past few years has augured well for the air-cargo industry in India. Air Cargo in India received its initial impetus from the 1986 permission, wherein air taxi operators were allowed to provide on-demand services primarily to boost tourism on major routes. Subsequently, the 'Air Cargo Open Sky Policy' was adopted in 1990 initially for 3 years and further extended in 1992 on a permanent basis, where any airline whether Domestic or Foreign carriers which met specified operational and safety requirements, were allowed to operate scheduled and non-scheduled cargo services to/from any airports in India wherever customs facilities are available. In addition, regulatory regime over

cargo rates for major export commodities was abolished so that carriers are free to set their own rates

**Trend in growth for of Air Freight traffic throughout at Indian Airport**

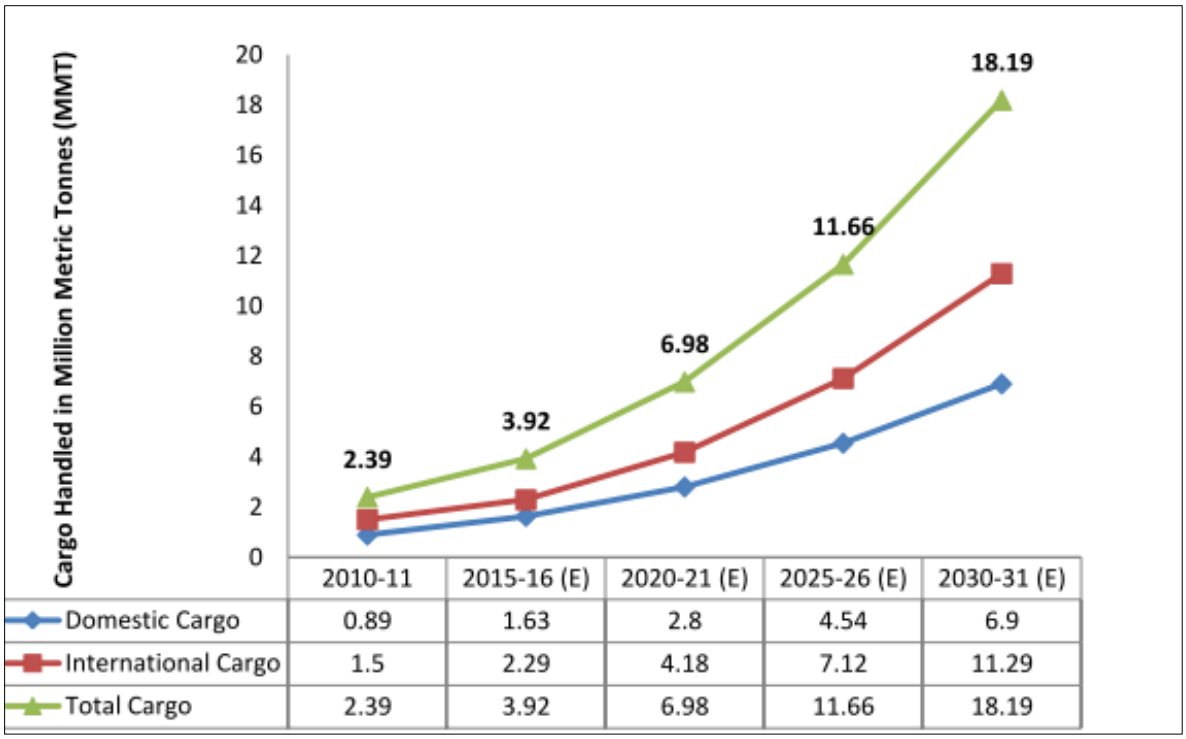



| | 1995-96 | 2000-01 | 2004-05 | 2006-07 | 2010-11 |
|---|---|---|---|---|---|
| Domestic Cargo | 0.22 | 0.33 | 0.49 | 0.57 | 0.89 |
| International Cargo | 0.46 | 0.57 | 0.83 | 1.03 | 1.50 |
| Total Cargo | 0.68 | 0.89 | 1.32 | 1.59 | 2.39 |

*Source: AAI Analysis; MOCA*

### 3.1.4 Forecast of Air Freight Traffic

MoCA carried out forecasting exercise using econometric models to estimate the most likely growth scenarios of air freight traffic in India for the next 20 years. While domestic GDP is the explanatory variable for forecasting domestic Cargo growth, world GDP is the explanatory variable used to forecast international freight traffic to and from India. The data points used are 1990-91 to 2010-11. Log-linear model was used, for the purpose of forecast, the Indian GDP growth rate is assumed to range from 8.5% in the near term to 6 % in the long term on an average as the expected scenario in the period 2011-12 to 2030-31. The International GDP growth rate assumption has been taken to be 3.25% in the near term and 3% in the long term as the likely scenario keeping in line with the IMF expected GDP growth rates

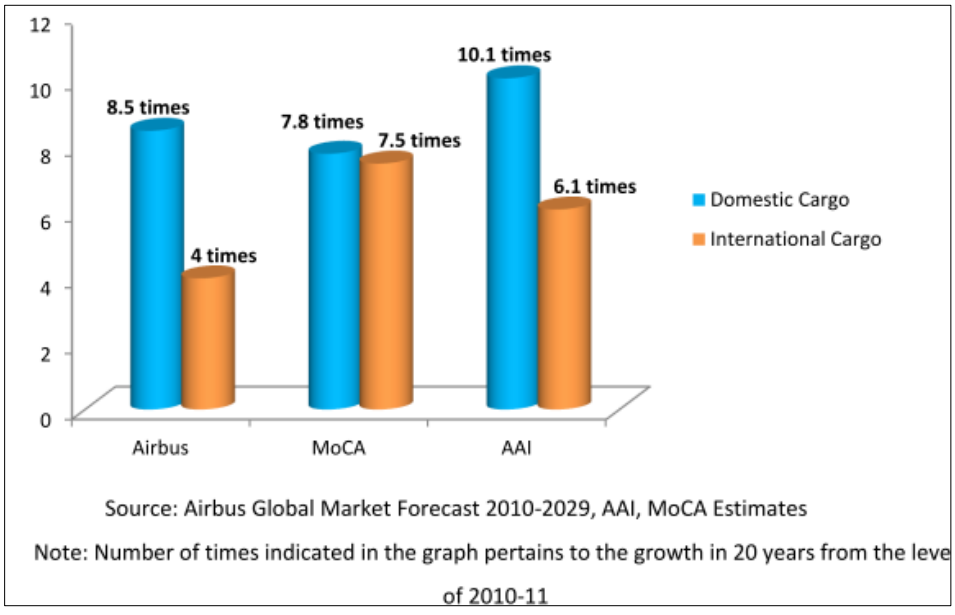



| | 2010-11 | 2015-16 (E) | 2020-21 (E) | 2025-26 (E) | 2030-31 (E) |
|---|---|---|---|---|---|
| Domestic Cargo | 0.89 | 1.63 | 2.8 | 4.54 | 6.9 |
| International Cargo | 1.5 | 2.29 | 4.18 | 7.12 | 11.29 |
| Total Cargo | 2.39 | 3.92 | 6.98 | 11.66 | 18.19 |

*Source: MOCA*

MoCA forecasts that the Total Cargo throughput at Indian airports is expected to grow 7.6 times in the next 20 years (CAGR of 11.2). Domestic Cargo throughput is expected to grow 7.8 times in the next 20 years (CAGR of 10.4%). International Cargo throughput is expected to grow 7.5 times in the next 20 years (CAGR of 11.7%). Transshipment segment has significant market potential. It is assumed to be 5% by 2015-16, 10% by 2020-21, 15% by 2025-26 and 20% of International cargo by 2030-31.

**Cargo Forecast for next 20 years**




Source: Airbus Global Market Forecast 2010-2029, AAI, MoCA Estimates

Note: Number of times indicated in the graph pertains to the growth in 20 years from the leve of 2010-11

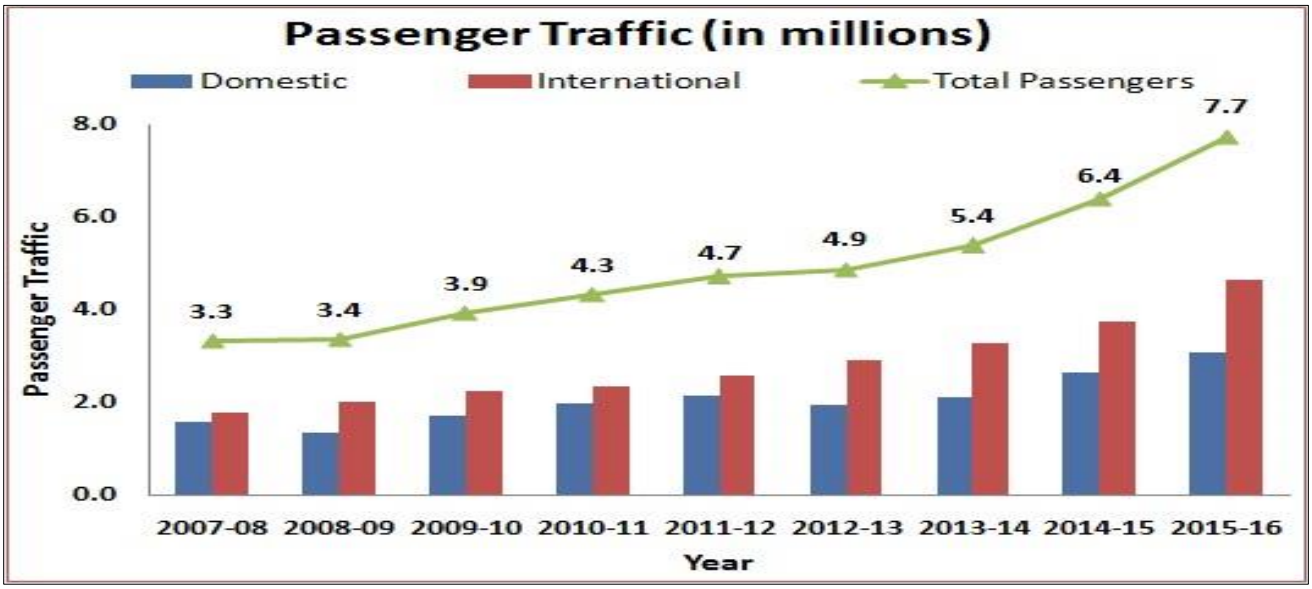
### 3.1.5 Kerala Aviation Industry

Kerala is the southern-most state of India along western coast. The State is famously known and marketed as 'God's Own Country' and is famous for its beaches, backwaters, national park, heritage spots and high immigrant base mainly in mid-east countries – United Arad Emirates, Saudi Arabia, Oman, Kuwait, etc.

The State is 12th largest in terms of population 3.3 million as per Census 2011) and ranked 21st in terms of area. The State has highest Human Development Index in the county, highest literacy rate and life expectancy rate in India.

Though small in size, Kerala is the only state in India which has three international airports. These airports cater to the travel requirements of the people of Kerala and inbound travel requirements of tourists, business and other passengers from India and abroad. Trivandrum International Airport has historically been the major airport in Kerala. However, Cochin International Airport is the busiest airport in Kerala since 2003-04 and managed 4.72 million passengers and 40,181 aircraft movement in 2011-12.

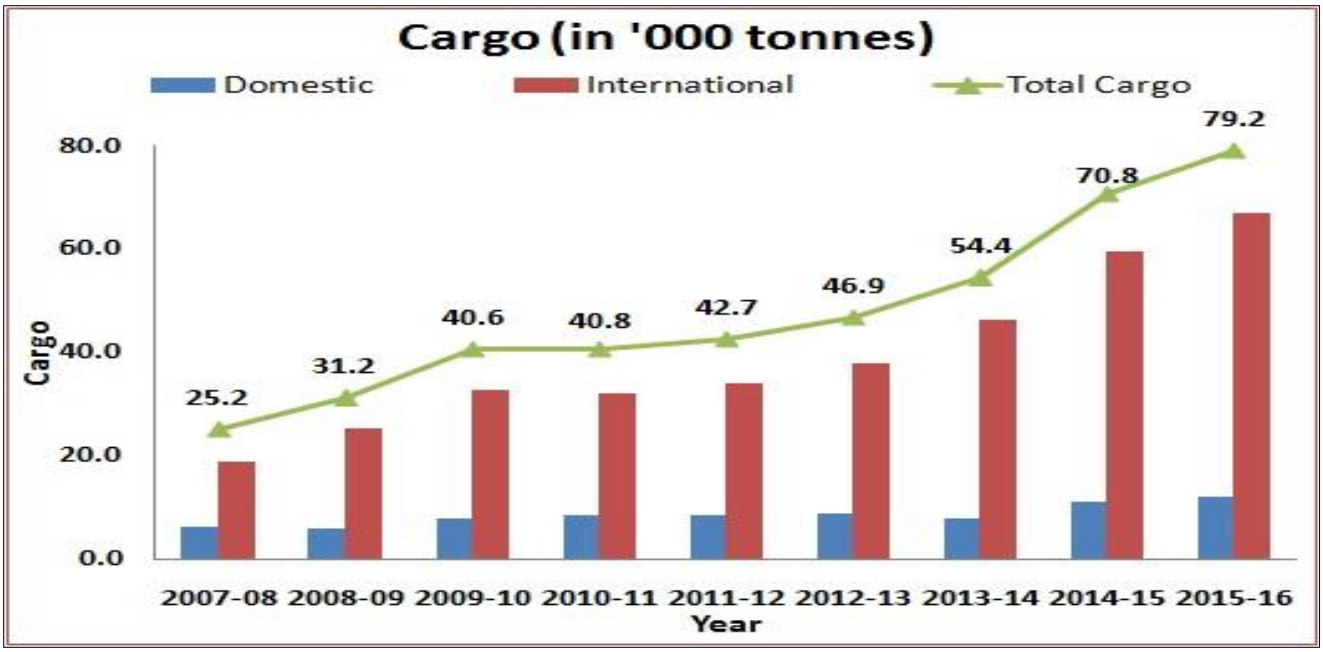
| **Passenger Traffic - Annual Passenger Handling Capacity** | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| (in Millions) | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 |
| **Domestic** | 1.6 | 1.4 | 1.7 | 2.0 | 2.1 | 2.0 | 2.1 | 2.7 | 3.1 |
| **International** | 1.8 | 2.0 | 2.2 | 2.4 | 2.6 | 2.9 | 3.3 | 3.7 | 4.7 |
| **Total Passengers** | 3.3 | 3.4 | 3.9 | 4.3 | 4.7 | 4.9 | 5.4 | 6.4 | 7.7 |
| **Growth Y-o-Y (%)** | 30.3 | 0.7 | 17.3 | 10.1 | 8.7 | 3.3 | 10.4 | 19.0 | 21.0 |
| **Passenger Traffic Share in %** | | | | | | | | | |
| **Domestic** | 47.0 | 40.2 | 43.4 | 45.7 | 45.2 | 40.2 | 39.3 | 41.6 | 39.9 |
| **International** | 53.0 | 59.8 | 56.6 | 54.3 | 54.8 | 59.8 | 60.7 | 58.4 | 60.1 |
| **% of Passenger Traffic handled by CIAL in comparison with all Airports** | | | | | | | | | |
| **Domestic** | 1.8 | 1.7 | 1.9 | 1.9 | 1.8 | 1.7 | 1.7 | 1.9 | 1.8 |
| **International** | 5.9 | 6.4 | 6.5 | 6.2 | 6.3 | 6.8 | 7.0 | 7.4 | 8.5 |
| **Total** | **2.9** | **3.1** | **3.2** | **3.0** | **2.9** | **3.1** | **3.2** | **3.4** | **3.5** |

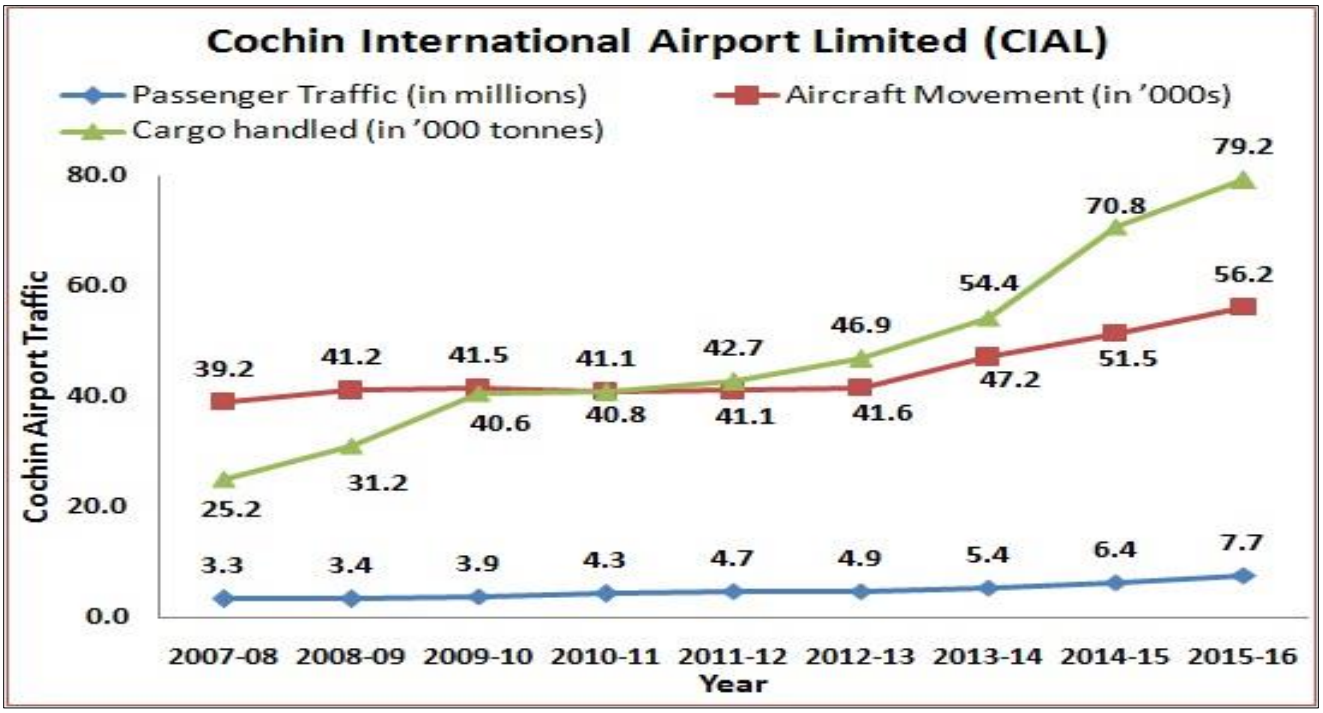



**Air Traffic Movement (ATM)**

| (in '000s) | 2007-08 | 2008-09 | 2009-10 | 2010-11 | 2011-12 | 2012-13 | 2013-14 | 2014-15 | 2015-16 |
|---|---|---|---|---|---|---|---|---|---|
| **Domestic** | 22.8 | 22.1 | 23.5 | 22.6 | 22.8 | 21.3 | 24.1 | 25.9 | 26.1 |
| **International** | 16.3 | 19.0 | 18.1 | 18.5 | 18.3 | 20.3 | 23.1 | 25.6 | 30.1 |
| **Total ATM's** | **39.2** | **41.2** | **41.5** | **41.1** | **41.1** | **41.6** | **47.2** | **51.5** | **56.2** |
| **Growth Y-o-Y (%)** | | 5.1 | 0.9 | -1.1 | 0.1 | 1.1 | 13.5 | 9.1 | 9.1 |
| **% of Air Traffic Movement handled by CIAL in comparison with all Airports** | | | | | | | | | |
| **Domestic** | 2.2 | 2.1 | 2.2 | 2.1 | 1.8 | 1.8 | 2.0 | 2.1 | 1.8 |
| **International** | 6.6 | 7.0 | 6.4 | 6.2 | 5.9 | 6.5 | 6.9 | 7.4 | 8.0 |
| **Total** | **3.0** | **3.2** | **3.1** | **2.9** | **2.7** | **2.8** | **3.1** | **3.2** | **3.1** |


| Cargo Traffic - Annual Handling Capacity | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|
| (in '000 tons) | **2007-08** | **2008-09** | **2009-10** | **2010-11** | **2011-12** | **2012-13** | **2013-14** | **2014-15** | **2015-16** |
| **Domestic** | 6.2 | 5.9 | 7.9 | 8.6 | 8.5 | 8.9 | 8.0 | 11.1 | 12.1 |
| **International** | 19.0 | 25.2 | 32.8 | 32.2 | 34.2 | 38.0 | 46.5 | 59.7 | 67.1 |
| **Total Cargo** | **25.2** | **31.2** | **40.6** | **40.8** | **42.7** | **46.9** | **54.4** | **70.8** | **79.2** |
| **Growth Y-o-Y (%)** | | 23.8 | 30.4 | 0.4 | 4.7 | 9.8 | 16.1 | 30.0 | 11.9 |
| **% of Cargo handled by CIAL in comparison with all Airports** | | | | | | | | | |
| **Domestic** | 1.1 | 1.1 | 1.1 | 1.0 | 1.1 | 1.1 | 1.0 | 1.1 | 1.2 |
| **International** | 1.7 | 2.2 | 2.6 | 2.2 | 2.3 | 2.7 | 3.2 | 3.9 | 4.0 |
| **Total** | **1.5** | **1.8** | **2.1** | **1.7** | **1.9** | **2.1** | **2.4** | **2.8** | **2.9** |




### 3.1.6 Kerala Tourism Industry:

Tourism industry is an important sector of the Indian economy and contributes significantly in the country's GDP as well as foreign exchange earnings. With its backward and forward linkages with other sectors of the economy, like transport,

construction, handicrafts, manufacturing, horticulture, agriculture, etc., tourism has the potential to not only be the economy driver, but also become an effective tool for poverty alleviation and ensuring growth with equity. The Indian tourism economy has been deemed as the second-most rapidly increasing (8.8%) tourism economy in the world, by World Travel and Tourism120. In India, the travel and tourism sector is estimated to create around 78 jobs per million rupees of investment compared to 45 jobs in the manufacturing sector for similar investment. Along with construction, it is one of the largest sectors of service industry in India.

The state of Kerala is one of the most popular tourism destinations in India. The state, promoted as “God’s Own Country”, has various tourism assets such as beaches, hill stations, backwaters, national parks and wildlife sanctuaries. However, the key to tourism success has been its sustained marketing efforts and creation of new tourism products. As a result, Kerala has become a model for planned tourism development to other Indian states. For example National Geographic Traveller selected Kerala as one of the 50 must see destinations of a lifetime21. The success of tourism marketing in Kerala can be attributed to a combination of factors:

Clear identification and positioning of the tourism product & differentiating from other Indian states

- Developing a basket of tourism activities
- Close coordination between state agencies and private sector for tourism marketing
- Aggressive promotion & brand building to the target audience
- Development of best practices and models for tourism

Major tourism destinations in Kerala include:

**Beaches-** Kovalam, Varkala, Marari, Bekal, Kannur

**Backwaters-** Kumarakom, Alappuzha, Kollam, Kochi, Kozhikode

**Hill stations-** Munnar, Wayanad, Vagamon, Ponmudi, Thattekad, Parambikulam

**Wildlife reserves** – Periyar, Eravikulam

Kerala state is also famous for offering ayurveda as tourism product. While, ayurvedic practices are followed elsewhere in India also, Kerala has distinct advantages that make it one of the sought after destinations for ayurveda services. The 'Kerala Vision 2025' envisages ayurveda as a thrust area to concentrate upon

and develop to the fullest possible extent. As per Department of Tourism, Government of Kerala, Thiruvananthapuram, Ernakulam and Malapuram districts are the main destinations[23] for ayurvedic services for both foreign and domestic tourists.

**Tourism Statistics of Kerala:** Tourism and related industries are important contributors to the economy of Kerala. The statistics related to tourist visits for Kerala and India over the last 10 years are as below:

**Number of Foreign/Domestic Tourists for All Indian and Kerala (in Million)**

| Year | Foreign Tourist Visit (FTV) | | | Domestic Tourist Visit (DTV) | | |
|---|---|---|---|---|---|---|
| | India | Kerala | % share | India | Kerala | % share |
| 2001 | 2.54 | 0.21 | 8.3% | 236.47 | 5.24 | 2.2% |
| 2002 | 2.38 | 0.23 | 9.7% | 269.60 | 5.57 | 2.1% |
| 2003 | 2.73 | 0.29 | 10.6% | 309.04 | 5.87 | 1.9% |
| 2004 | 3.46 | 0.34 | 9.8% | 366.27 | 5.97 | 1.6% |
| 2005 | 3.92 | 0.34 | 8.7% | 392.01 | 5.95 | 1.5% |
| 2006 | 4.45 | 0.43 | 9.7% | 462.32 | 6.27 | 1.4% |
| 2007 | 5.08 | 0.51 | 10.0% | 526.56 | 6.64 | 1.3% |
| 2008 | 5.28 | 0.59 | 11.2% | 563.03 | 7.59 | 1.3% |
| 2009 | 5.17 | 0.55 | 10.6% | 668.80 | 7.91 | 1.2% |
| 2010 | 5.78 | 0.65 | 11.2% | 747.70 | 8.59 | 1.1% |
| 2011 | 6.29 | 0.73 | 11.6% | 850.86 | 9.38 | 1.1% |
| CAGR | 9.5% | 13.3% | | 13.7% | 6.0% | |

*Source: All India data from India Tourism Statistics 2011 at a Glance (Ministry of Tourism, GoI); Kerala data from Department of Tourism, Kerala*

Foreign Tourist Visits ("FTV") to India have seen a turnaround over the last decade. This turnaround was the result of several factors such as Government of India's "Incredible India" campaign, high visibility afforded to India by its economic success, the tourism industry's constant search for new destinations, and improvement in infrastructure.

Total FTVs in India in 2011 were 6.29 million, which increased at a CAGR of 9.5% between 2001 and 2011. Despite burgeoning share of the Asian market, India's total share in world tourist arrival remains a modest 0.64%.

Kerala has been one of the favourite tourist destinations in India for foreign tourists. As is evident from the table above, FTVs during last 10 years in Kerala has increased at a CAGR of 13.3% as compared to India growth rate of 9.5%. In 2011, Kerala FTVs increased by 12.3% y-o-y which was much higher than the UNWTO's projected growth rate of 4% - 5% for the world and around 7% - 9% for Asia-Pacific region25.

Kerala's total revenue (including direct & indirect) from tourism during 2011 is estimated to be around INR 19,037 Cr, estimated to be an increase of around 9.74% over the previous year's figure.

Data published by Department of Tourism, Government of Kerala, with respect to district wise FTVs and DTVs in Kerala, reveal that the tourist inflow to Kerala is highly concentrated for both FTVs and DTVs. Three districts, namely Ernakulum, Thrissur and Trivandrum account for around 59% of DTVs and two districts, namely Ernakulum and Trivandrum account for around 73% of the FTVs.

Kannur district accounted for around 0.8% of FTVs and 5.2% of DTVs in the year 2011.

**Kerala District wise Foreign and Domestic Tourist Visits for the year 2016**

| | | | | | |
|---|---|---|---|---|---|
| 1 | Alappuzha | 46,019 | 6.3% | 199,670 | 2.1% |
| 2 | Ernakulum | 308,674 | 42.1% | 2,169,426 | 23.1% |
| 3 | Idukki | 55,778 | 7.6% | 506,990 | 5.4% |
| 4 | Kannur | 6,038 | 0.8% | 486,769 | 5.2% |
| 5 | Kasargode | 2,040 | 0.3% | 178,683 | 1.9% |
| 6 | Kollam | 9,317 | 1.3% | 210,808 | 2.2% |

| | | | | | |
|---|---|---|---|---|---|
| 7 | Kottayam | 37,573 | 5.1% | 334,747 | 3.6% |
| 8 | Kozhikkode | 9,892 | 1.3% | 650,676 | 6.9% |
| 9 | Malappura | 18,394 | 2.5% | 369,773 | 3.9% |
| 10 | Palakkad | 1,331 | 0.2% | 383,027 | 4.1% |
| **11** | **Pathanamth** | **964** | **0.1%** | **89,115** | **0.9%** |
| 12 | Trivandrum | 224,387 | 30.6% | 1,288,555 | 13.7% |
| 13 | Thrissur | 5,011 | 0.7% | 2,062,032 | 22.0% |
| 14 | Wayanad | 7,567 | 1.0% | 451,184 | 4.8% |
| **Total** | | **732,985** | **100%** | **9,381,455** | **100%** |

*Source: Department of Tourism, Government of Kerala*

### 3.1.7 Kerala Immigrants - Snapshot

Indian immigrants to other countries are a very unique and special characteristic specific to the state of Kerala. This immigrant population base has increased over the years and has become a formidable force in driving the local economy through high foreign remittances back to India for family, investment, etc.

Historically, Kerala was an in-migrating state until around 1960s. The State witnessed high literacy rate and low income growth, which led to migration of Keralites for economic reasons. Since then, Kerala turned to out-migrating state and till date, the State has remained out-migrating.

The number of Kerala immigrants living abroad in 1998 was around 1.36 million which increased to 2.28 million in 2011. The Non Resident Keralites ("NRK") comprising, immigrants and return immigrants increased from 2.10 million in 1998 to 3.43 million in 2011. For comparison, NRK population in 2011 was around 10% of the Kerala state population (as per Census 2011, total population of Kerala was 33.87 million).

District wise analysis of NRK population reveals that Malappuram district accounted for maximum number of NRKs, around 20% in 1998. In 2011 also, Malappuram district has the highest share, however the same has declined to around 16.4%. Thiruvananthapuram had the second highest share of NRKs with 11.9% share and the same has increased marginally to around 12.4% in 2011.

**Kerala District wise Non Resident Keralite Data**

| District | 1998 | 2003 | 2008 | 2011 |
|---|---|---|---|---|
| Thiruvananthapuram | 2,49,583 | 2,71,105 | 5,23,761 | 4,25,833 |
| Kollam | 1,77,083 | 2,17,771 | 3,31,582 | 2,84,373 |
| **Pathanamthitta** | **1,52,042** | **2,17,222** | **1,81,543** | **1,06,678** |
| Alappuzha | 97,442 | 1,18,145 | 1,82,744 | 1,99,074 |
| Kottayam | 53,658 | 1,34,937 | 1,15,799 | 1,29,306 |
| Idukki | 12,407 | 11,646 | 9,005 | 14,428 |
| Ernakulam | 1,48,778 | 1,95,672 | 1,89,839 | 1,98,425 |
| Thrissur | 2,77,890 | 2,64,896 | 4,58,723 | 3,47,500 |
| Palakkad | 1,55,264 | 2,32,884 | 2,75,133 | 2,25,408 |
| Malappuram | 4,20,460 | 4,13,324 | 5,54,308 | 5,63,006 |
| Kozhikode | 1,76,936 | 2,76,537 | 2,71,568 | 3,21,143 |
| Wayanad | 7,879 | 11,556 | 15,926 | 41,363 |
| Kannur | 1,16,328 | 2,47,808 | 1,45,535 | 4,08,348 |
| Kasaragod | 55,414 | 1,18,917 | 95,073 | 1,66,005 |
| **Total Kerala** | **21,01,164** | **27,32,420** | **33,50,539** | **34,30,890** |

## 3.2 Traffic Forecast

### 3.2.1 Investment in Aviation Sector

According to data released by the Department of Industrial Policy and Promotion (DIPP), FDI inflows in air transport (including air freight) between April 2000 and March 2016 stood at US$ 931.05 million.

Key investments and developments in India's aviation industry include:

- Airbus SAS has signed an agreement with Karnataka-based Aequs Aerospace, an aircraft component maker, for the supply of over 100,000 titanium machined parts for its A320 new engine option (NEO) aircraft.

- Boeing Company, an American plane maker, and Tata Advanced Systems Ltd (TASL), a fully owned subsidiary of Tata Sons, have entered into a joint venture to set up a new facility in Hyderabad to manufacture Boeing AH-64 Apache helicopter fuselages.
- GoAir, India's fifth-biggest carrier by passengers travelled, has signed a memorandum of understanding (MoU) with Airbus to buy 72 A320neo aircrafts, valued at US$ 7.7 billion, as part of an expansion drive.
- Lockheed Martin Corporation plans to make India a manufacturing base for its F-16V fighter jets, C-130J Super Hercules military transport planes and helicopters.
- Auto components maker Bharat Forge Ltd (BFL), the flagship company of the US$ 3 billion Kalyani Group, has formalised agreement with Rolls-Royce Plc, under which BFL will supply critical and high integrity forged and machined components for a range of aero engines.
- The Ministry of Civil Aviation has signed Memorandum of Understanding (MoU) with Finland, Kazakhstan, Kenya, Sweden, Norway, Denmark, Oman and Ethiopia for increased co-operation between the countries in terms of additional seats, sharing of airlines codes, increased frequencies and additional points of call, during the International Civil Aviation Negotiations (ICAN),2015 held in Antalya, Turkey.
- Tata Advanced Systems (TASL) has signed a joint venture with American aircraft manufacturing major, Boeing, to establish a centre of excellence for manufacturing aero structures for Apache helicopter initially and collaborate on integrated systems development opportunities in India in the long term.
- US-based aircraft manufacturer Boeing plans to assemble one of its two helicopters namely, Chinook (heavy-lift) or Apache (attack type) in India, thus becoming yet another global company to invest in India encouraged by the ‘Make in India’ campaign.
- Airbus, leading European aircraft manufacturer, plans to invest US$ 40 million to set up a pilot and maintenance training center in New Delhi, which will be operational by the end of 2017.
- Airbus also expects India’s aviation industry to grow at over 10 per cent annually in the next decade, almost double the average growth rate of the global aviation industry.

## Draft Traffic Forecasting (Domestic and International)

| Year | Projected Domestic Traffic | | Projected International Traffic | |
|---|---|---|---|---|
| | PAX (Mn) | CAGR | PAX (Mn) | CAGR |
| 2015-16 | 0.14 | 12% | 9.81 | 11% |
| 2016-17 | 0.16 | | 11.03 | |
| 2017-18 | 0.18 | | 12.31 | |
| 2018-19 | 0.2 | | 13.72 | |
| 2019-20 | 0.22 | | 15.26 | |
| 2020-21 | 0.26 | | 16.91 | |
| 2021-22 | 0.29 | | 18.72 | |
| 2022-23 | 0.32 | | 20.59 | |
| 2023-24 | 0.35 | | 22.62 | |
| 2024-25 | 0.39 | | 24.71 | |
| 2025-26 | 0.42 | 8.40% | 26.97 | 8% |
| 2026-27 | 0.46 | | 29.42 | |
| 2027-28 | 0.5 | | 31.92 | |
| 2028-29 | 0.55 | | 34.61 | |
| 2029-30 | 0.6 | | 37.51 | |
| 2030-31 | 0.64 | | 40.43 | |
| 2031-32 | 0.7 | | 43.57 | |
| 2032-33 | 0.75 | | 46.93 | |
| 2033-34 | 0.81 | | 50.29 | |
| 2034-35 | 0.87 | | 53.88 | |
| 2035-36 | 0.93 | 6.10% | 57.72 | 6% |
| 2036-37 | 0.99 | | 61.5 | |
| 2037-38 | 1.06 | | 65.52 | |
| 2038-39 | 1.13 | | 69.8 | |
| 2039-40 | 1.2 | | 73.96 | |
| 2040-41 | 1.27 | | 78.37 | |
| 2041-42 | 1.35 | | 83.04 | |
| 2042-43 | 1.42 | | 87.53 | |
| 2043-44 | 1.5 | | 92.25 | |
| 2044-45 | 1.58 | | 97.23 | |
| 2045-46 | 1.66 | | 102.47 | |

*Note: The projected traffic based on the high level information at this stage and may change/ vary during detailed study*

# 4. SITE ASSESSMENT STUDY

Site Investigation was carried out for the 5 locations at the district to understand the best possible solution for the proposed Airport. The comparative analysis on the various factors has been carried out to derive the location wise result in terms of suitability for the Airport. But it is to mention that no detailed Engineering studies have been carried out at any of the locations. Without having the detailed topographical survey, the consultants used the Google Image to generate the contours to understand the overall topography of these areas.

## 4.1 Methodology for Ranking of the Sites

***Techno-Economic Parameters***

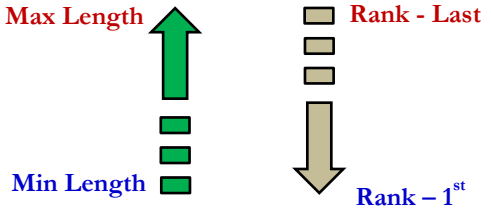
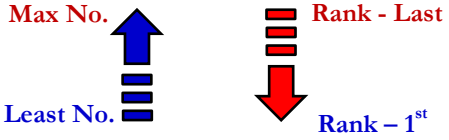
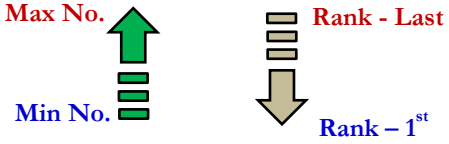
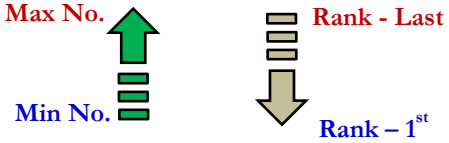
After the options are prepared, following salient techno-economic parameters were evaluated and the Options were compared against each individual parameter:

- Length of New Alignment (km)
- Horizontal Geometry
- Difference in Elevation
- No of structures
- Social Effect (Length of Built up sections affected)

Based on the comparisons of the above parameters by subjective analysis, a ranking and a weightage system is adopted to evaluate each option quantitatively.

***Ranking System***

Ranking system adopted for each techno-economic parameter is described in the table below:

| Sl. No. | Parameter | Ranking System | |
|---|---|---|---|
| 1 | Topography | Option with the minimum undulation will have Rank -1 while the one with the maximum undulation will rank last |   |
| 2 | Connectivity | Option with better Connectivity will Rank-1 and one with lesser one will rank last |   |
| 3 | Social Effect | Lesser the no. of structures affected, better is the rank |   |
| 4 | Obstacles | Lesser the no. of structures affected, better is the rank |   |

***Weightage System***

As it is difficult to judiciously weigh separately each of the above parameters, hence for evaluation purpose all were given equal weightage with individual score of 10. Hence each alignment option is evaluated on a scale of 100 (10nos. of parameters x 10 points). The weight of each parameter for each option is evaluated by the following formula presented in **Equation 1**:

**Equation 1:**

$$\text{Score of Parameter}_i\text{for Option: X} = 100\text{x}\left(1 - \frac{\text{Rank of Parameter}_i\text{for Option: X} - 1}{\text{Last Rank} - 1}\right)$$

Hence from the above it is evident that for an individual parameter the option having Rank-1st will score 10, while the option with last rank will score 0. Other intermediate options will have intermediate score calculated using Eq. (1).

**Equation 2:**

$$\text{Total Score of Option: X} = \sum_{i=1}^{i=100} \text{Score of Parameter}_i \text{ for Option: X}$$

The total score of each option is then estimated by summation of score of all the parameters following Eq. (2) above. The option having maximum score will Rank-1st and is recommended to be adopted for further study.

## 4.2 Site Options

### a) Site 1 - Koottickal

It is a small village, about 10 kilometers away from Konni (India) in Pathanamthitta district, Kerala, India. It is situated on the banks of river Achankovil

The site is 106 km away from Thiruvanthapuram International Airport. The site is observed to have undulating topographical features. The vegetation at this site consists of rubber. No manmade obstacles were observed at the visible part of the site or in its vicinity.

### b) Site 2 – Cheruvally Estate

Erumeli is a village in Kottayam district of Kerala, India. It is situated on the way to Sabarimala and also an important halting place (Idathavalam) for the Sabarimala devotees. Erumely is famed for its religious harmony and prosperity. The site is c. 136km away from Thiruvanthapuram International Airport. It is roughly 2.5 km away from Theni- Kotarakara Highway. This site is the closest to Erumeli Town where GOK has recently announced having identified land parcel. The site consists of about 2,268 acres of vast stretches of plain land. The vegetation at the site comprises of large number of rubber plants. No manmade obstacles were observed at the site or in its vicinity.

### c) Site 3 – Laha Estate

The site is 136km away from Thiruvanthapuram International Airport and lies on the national highway (NH 183). The site is observed to have severe undulating topographical features.

### d) Site 4 – Malayalapuzha - Kumbzha Estate

Kumbazha is a main junction in Pathanamthitta City Suburbs, located in Kerala state, India. The Achenkovil river flows through Kumbazha. Kumbazha Jn. is 3 km away from Pathanamthitta Central Jn.It is the meeting point of two

major State Highways T.K.Road (SH - 07) and Main Eastern Highway ( Punalur-Pathanamthitta-Muvattupuzha Road / SH - 08 ).

The site is 97km away from Thiruvanthapuram International Airport. The site is observed to have undulating topographical features with vast stretches of rubber plantation. No manmade obstacles were observed at the visible part of the site or in its vicinity.

**e) Site 5 – Kalleli**

The site is 161 km away from Thiruvanthapuram International Airport and 7km away from the nearest national highway (NH 183). No manmade obstacles were observed at the site or in its vicinity.

The topographical details analysed from Contour and the features that may be the detrimental to the proposed airport are given below:

| S. No | Site-No | Site Name | Highest Elevation in (m) | Lowest Elevation in (m) | Remark |
|---|---|---|---|---|---|
| 1 | Site No-01 | Koottickal | 650 | 150 | |
| 2 | Site No-02 | Cheruvally Estate | 220 | 60 | |
| 3 | Site No-03 | Laha Estate | 500 | 80 | |
| 4 | Site No-04 | Malayalapuzha – Kumbzha Estate | 220 | 60 | River/ Nala inside the Proposed area |
| 5 | Site No-05 | Kalleli Estate | 200 | 60 | River/ Nala inside the Proposed area |

Based on all the details the decision matrix has been generated and the relative rankings are given for each of proposed locations which in turn will give the preference Index of the site.

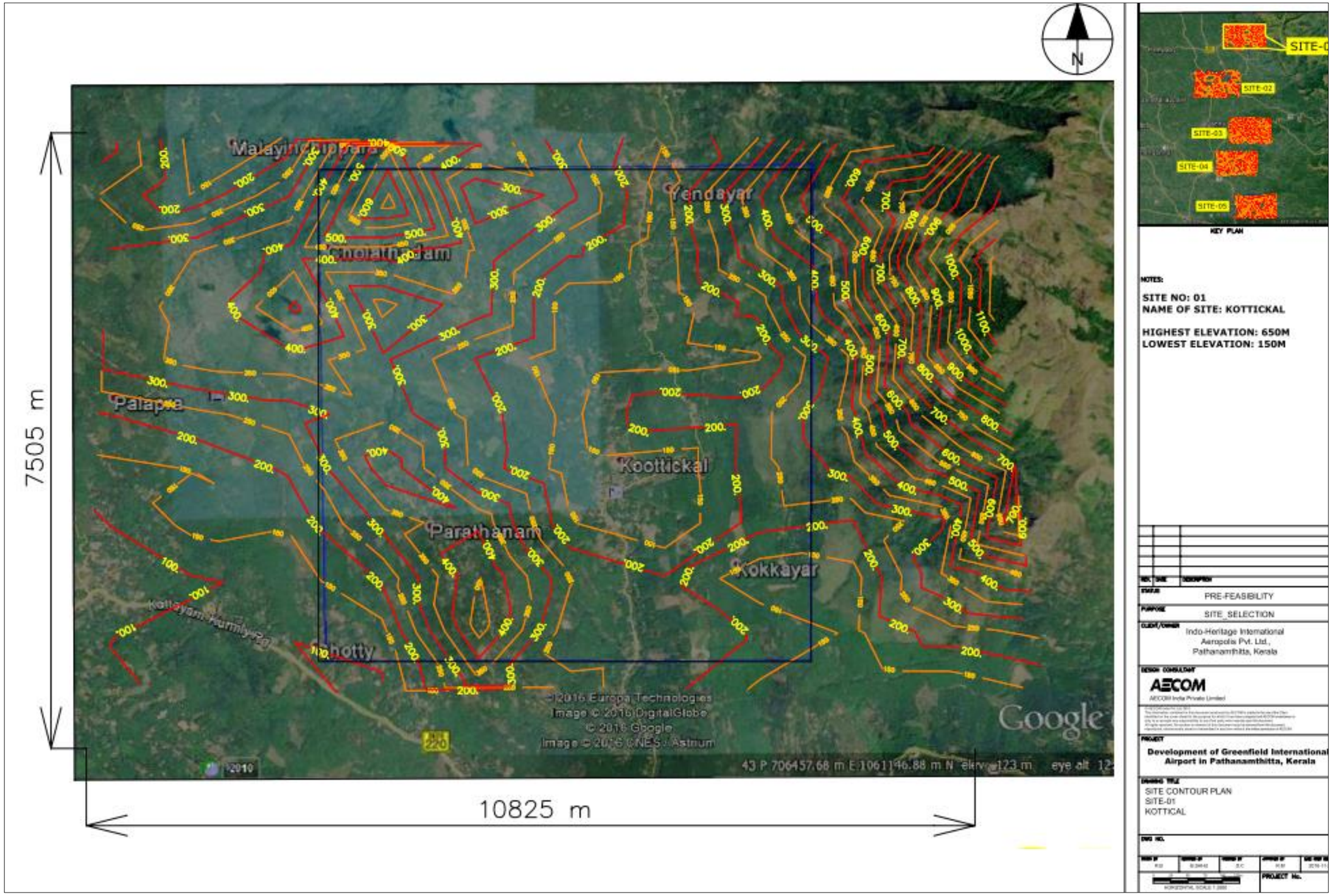
The contour plans of Site 1, Site 2, Site 3, Site 4 & Site 5 are shown in **Annexure 4.1** to **Annexure 4.5**

| Site Selection Study - Decision Matrix | | | | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **Engineering Aspects** | | | | | | | | | | | | | |
| Site Detail | Name of Site | Connectivity Issue from Trivandrum (km) | Relative Marking | Topography (Average Elevation) | Relative Marking | Obstacle | Relative Marking | Env and Social issue | Relative Marking | Land Cost | Relative Marking | **Total Markings** | **Rank** |
| Site 1 | Koottickal | 120 | 81 | 150 | 93 | 10 | 100 | 20 | 60 | 25 | 80 | 414 | IV |
| Site 2 | Cheruvally Estate | 136 | 71 | 140 | 100 | 10 | 100 | 12 | 100 | 22 | 91 | 462 | **I** |
| Site 3 | Laha Estate | 136 | 71 | 290 | 48 | 10 | 100 | 12 | 100 | 17 | 118 | 437 | **II** |
| Site 4 | Malayalapuzha – Kumbzha Estate | 97 | 100 | 220 | 64 | 10 | 100 | 22 | 55 | 20 | 100 | 418 | III |
| Site 5 | Kalleli | 161 | 60 | 400 | 35 | 10 | 100 | 22 | 100 | 20 | 100 | 395 | V |

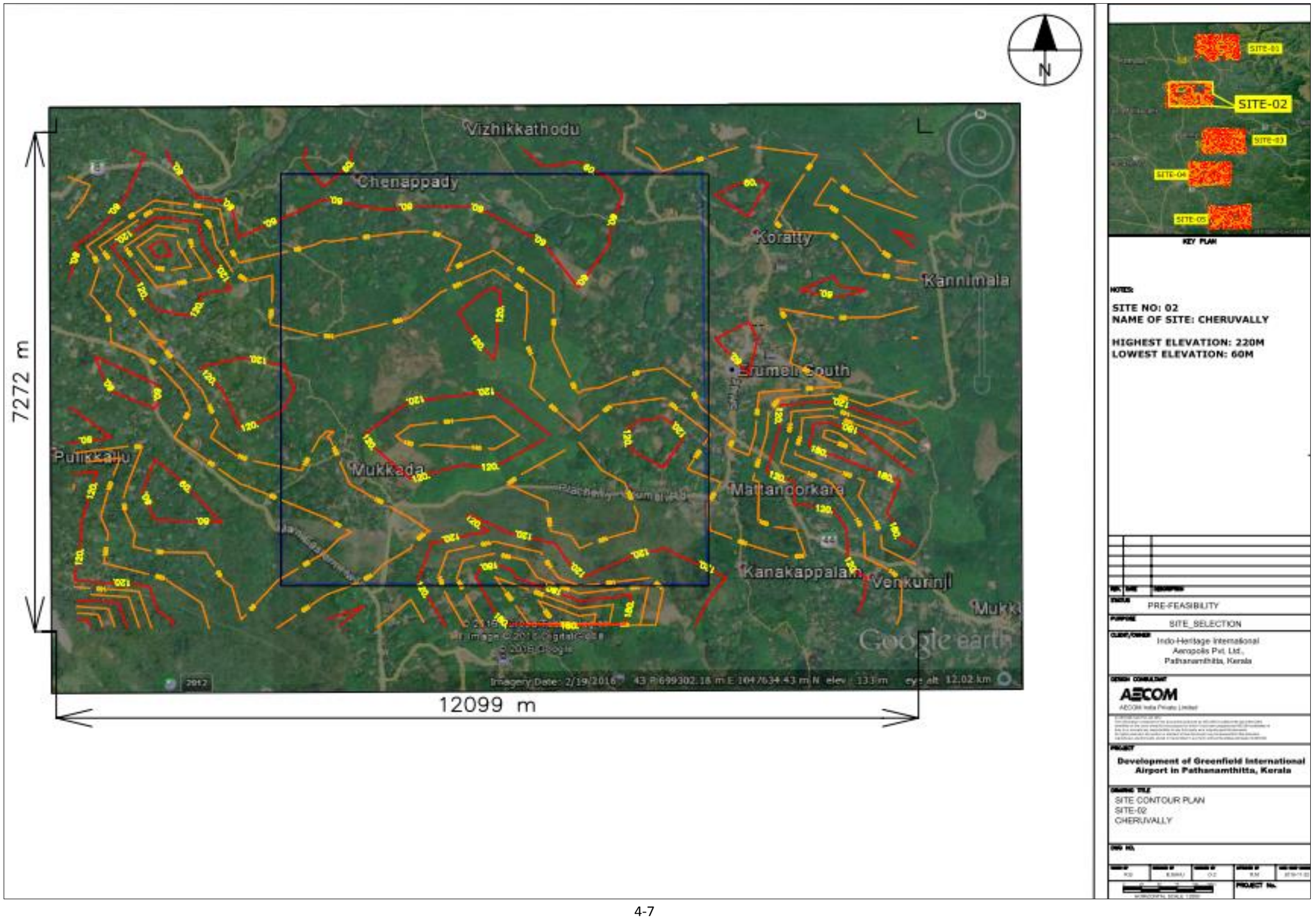
**From the above we can conclude that based on this high level initial study it is found that Site 2 i.e. Cheruvelly Estate is the most preferred location while Site 3 i.e. Laha Estate comes next to that. However, on receipt of detailed land maps and topographic details, the above assessment is subject to change. Final recommendation on the Site selection can be concluded after the detailed Study and Investigation**

*******

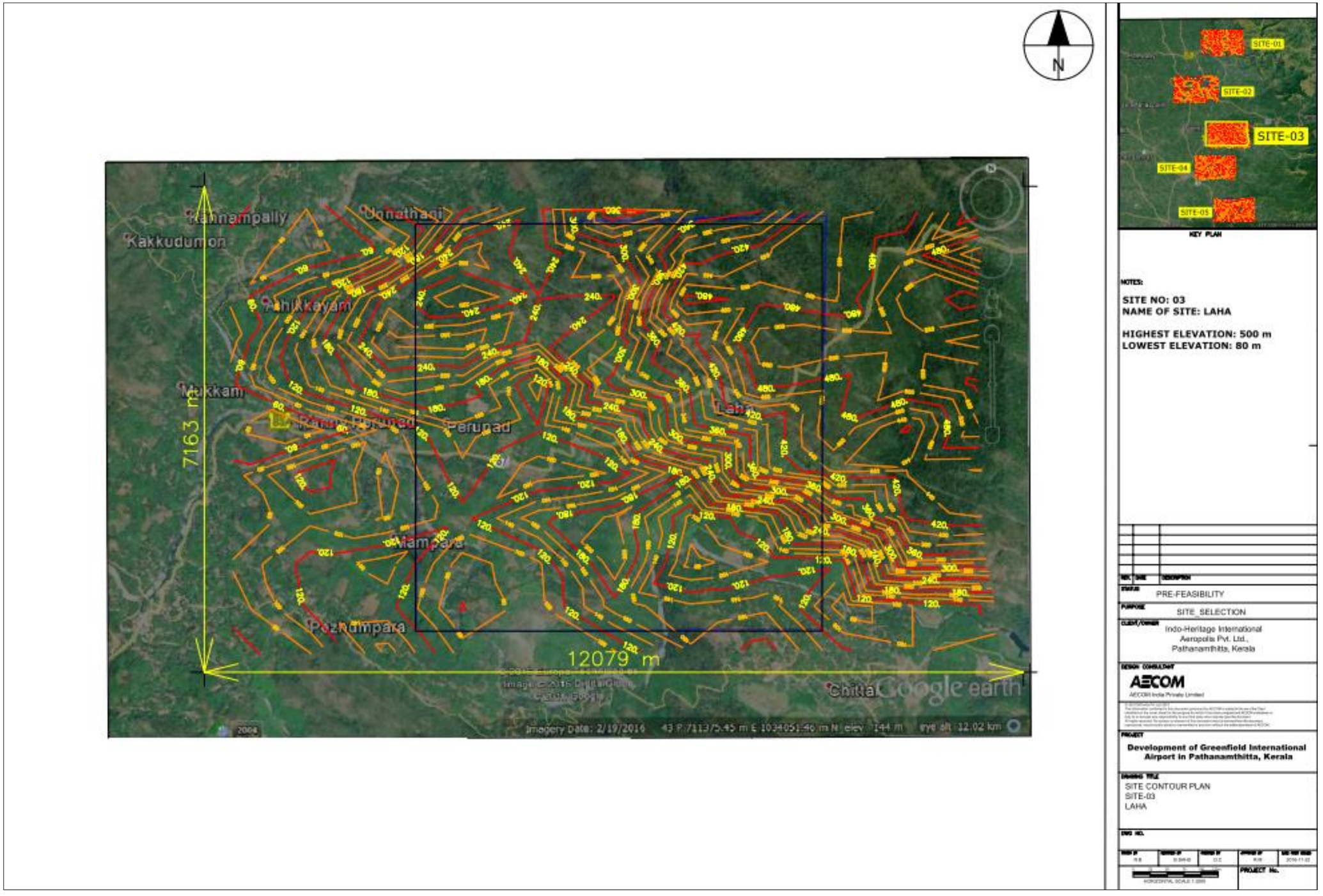
## Site Contour Plan - Site-01 Kottickal



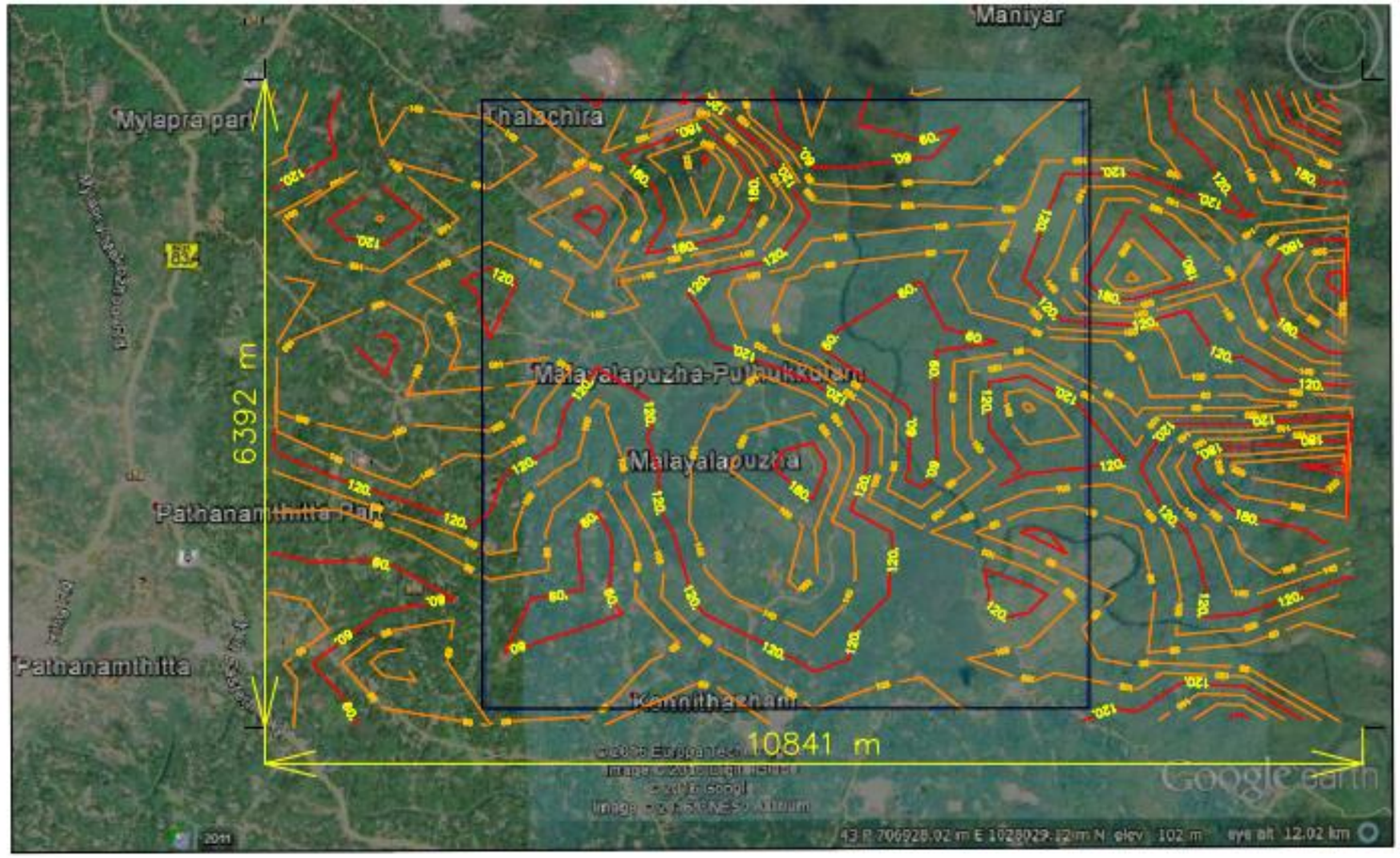
## Site Contour Plan - Site-02 Cheruvally

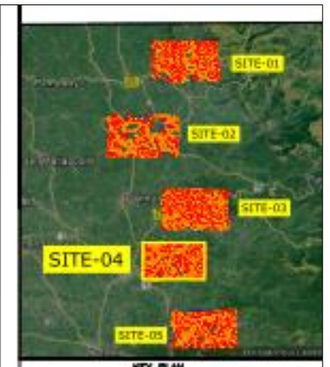


## Site Contour Plan - Site-03 Laha



## Site Contour Plan - Site-04 Malayalapuzha




KEY PLAN

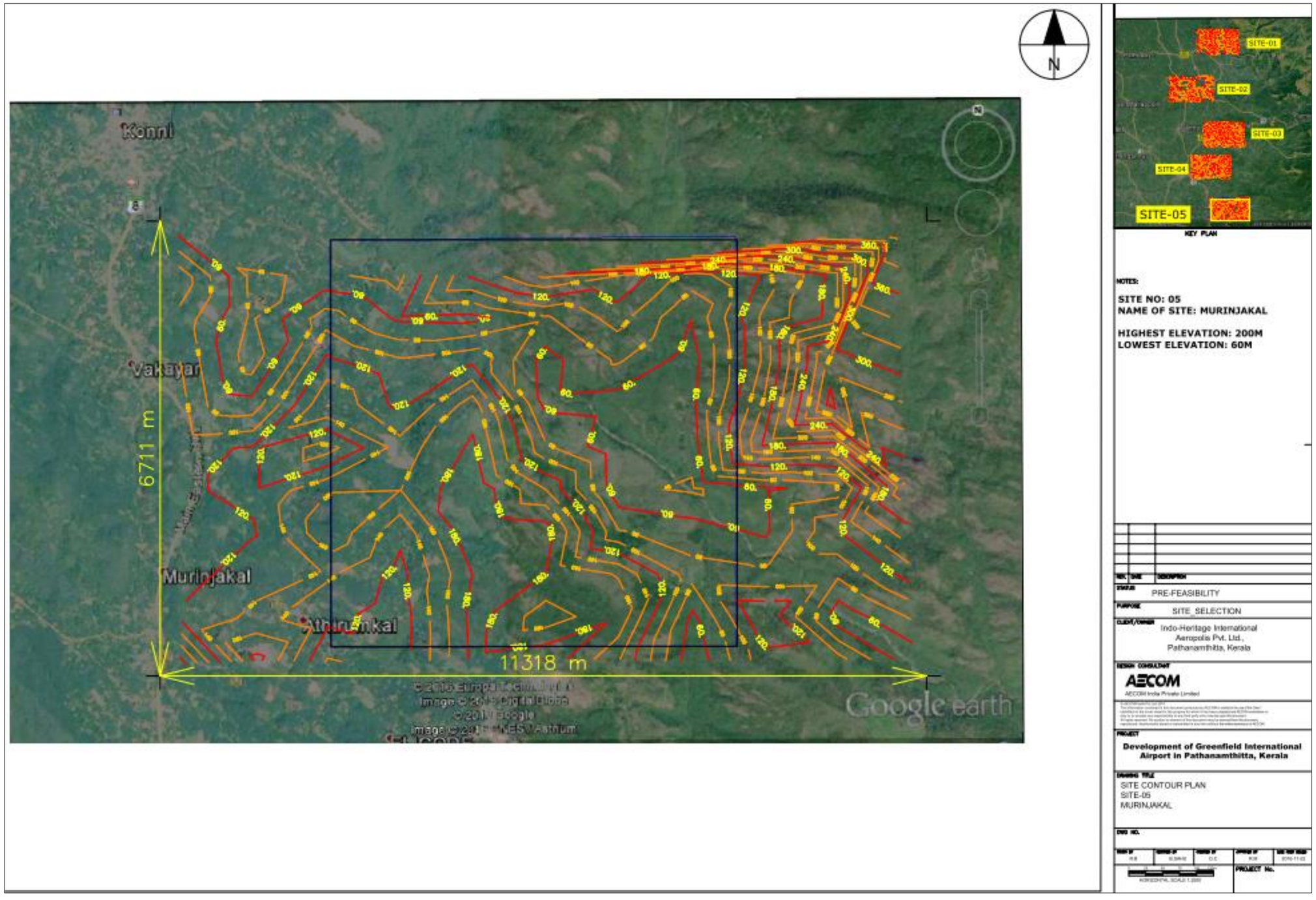
NOTES:

SITE NO: 04
NAME OF SITE: MALAYALAPUZHA

HIGHEST ELEVATION: 220M
LOWEST ELEVATION: 60M

| | |
|---|---|
| STATUS | PRE-FEASIBILITY |
| PURPOSE | SITE_SELECTION |
| CLIENT/OWNER | Indo-Heritage International Aeropolis Pvt. Ltd., Pathanamthitta, Kerala |
| DESIGN CONSULTANT | AECOM India Private Limited |
| PROJECT | Development of Greenfield International Airport in Pathanamthitta, Kerala |
| DRAWING TITLE | SITE CONTOUR PLAN<br>SITE-04<br>MALAYALAPUZHA |
| DWG NO. | |

## Site Contour Plan - Site-05 Murinjakal



# 5. ENVIRONMENTAL AND SOCIAL ISSUES

## 5.1 Background

Environment plays a vital role in overall development of the country. Recognizing the importance of environmental protection and sustainable development, the Ministry of Environment and Forest, Government of India had formulated policies and procedures governing the industrial and other developmental activities to prevent indiscriminate exploitation of natural resources and to promote integration of environmental concern in developmental projects. Environmental Impact Assessment is a planning tool now generally accepted as an integral component of sound decision-making. The purpose of EIA is to give the environment its due place in the decision-making process by clearly evaluating the environmental consequences of the proposed activity before action is taken. Early identification and characterization of critical environmental impact allows the public and the government to form a view about the environmental acceptability of a proposed developmental project and what conditions should apply to mitigate or reduce those risks and impact. The Ministry of Environment & Forest has made environmental clearance (EC) for certain developmental projects mandatory through its notification issued on 27.01.1994 under the provisions of Environment (Protection) Act, 1986. The process of conducting public hearing has also been made mandatory for certain developmental projects through its notification issued on 10.04.1997. EIA notification 2006, as amended Dec 2009 was issued by the Ministry of Environment and Forests and is in vogue now. The categorization of the developmental projects / activities is specified in this notification

## 5.2 General Information on Airport Sector

The aviation sector has been relatively free of major environmentally driven regulations in past, because the sector is considered a key contributor to driving the global economy and the only mode of rapid trans-national travel on offer to customers. However airport development has not kept pace with significant increases in aviation activity in India. While funding is one problem; rapid pace of change in aviation technologies is the other. While joint ventures in airport development have solved the first problem, innovative planning approaches are

needed to solve the second. Central actions in connection with proposed airport development often require pursuant to the implementing guidelines of the Ministry of Environment and Forests (MoEF) under Government of India (GOI), which is in the process of formulating EIA manual for airport sector according to EIA notification dated 14th September 2006, as amended 2009 Major sources of the adverse effects on account of development of airport projects are due to the following:

a) Location of airport;

b) Construction activities;

c) Airport operation, including air traffic and associated noise & emissions, and

d) Cargo handling & storage, and land transport

## 5.3 Environmental Clearances Process

The following process (Fig. 5.1) is required to be carried out for Project categorized A and outlined in EIA GUIDANCE MANUAL - AIRPORTS, MOEF, government of India February, 2010.

**Fig. 5.1 : Prior Environmental Clearance Process for Category A Projects**