MASTER PLAN FOR SABARIMALA INFRASTRUCTURE MODULE

Traffic and Transportation

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1. BACKGROUND

1.1 Introduction and Relevance

The most important infrastructure, essential to sustain and augment any pilgrimage is the facility for transportation of both men and goods; as pilgrimage itself is 'travel to a holy destination'. This is especially so, for the Sabarimala pilgrimage which draws pilgrims mainly from across the borders of Kerala especially during the peak pilgrim season which lasts for two months from November to January annually. In addition, as the pilgrimage approaches its destination, transportation requirements in the Sabarimala enclave of the Periyar Tiger Reserve (PTR) itself are colossal as required to sustain the movement of men and materials for administrative purposes, goods to meet the needs of the pilgrims and for religious purposes including the preparation of the much sought out 'prasadam'; the Appam and Aravana. Hence planning for facilities to sustain and improve the regional linkages and the movements within the Sabarimala micro region form essential part of Sabarimala Master Plan.

The concept of *tirtha yatra* offers the basis of a spatialized model of the pilgrimage, which consists of a network of places nurtured by the choice of the itinerary. The place of pilgrimage draws its pilgrims beyond their daily perimeters of circulation. In addition the norms and mores as per tradition underline the modal and route choices, movement pattern and behaviour.

The traffic and transportation sub module takes into perspective specific movement pattern of pilgrims and goods in and around Sabarimala in addition to the regional linkages to the holy precinct. Surveys had been conducted to understand the traffic characteristics and the condition of existing facilities such as roads, terminals, public transport system etc and their usage. Issues and deficiencies of the existing system in terms of extent and condition of the ways and facilities at transit points, have been identified and interventions have been suggested to mitigate the issues, to improve the existing system, to provide infrastructure and facilities for the increasing transportation demands, and to look into the need for alternate transportation systems at Sabarimala area as well as in the region. Review of existing *major and much discussed* proposals by various agencies has also been undertaken as part of this study so as to render this report comprehensive.

1.2 Aims and Objectives

The study is aimed at devising strategies for effectively supporting the pilgrimage by providing movement facilities for the pilgrims in the region and at Sabarimala *per se*, with adequate care on conserving the environment and mitigating the existing environmental issues associated with such movement.

Objectives are:

a) To study the extent and character of the religious travel and goods movement in the region as well as at the base camps and the holy destination of Sabarimala
b) To understand the existing traffic and transportation facilities, the issues and deficiencies
c) To understand the demands and needs of the pilgrims and other stakeholders

d) To suggest strategies to ensure efficient transportation of pilgrims, supporting staff and goods to and from the holy destination and the base camps; in tune with the traditional values and beliefs and environmental conservation requirements

1.3 Methodology

The methodology followed for the traffic and transportation study is as depicted in the chart below:

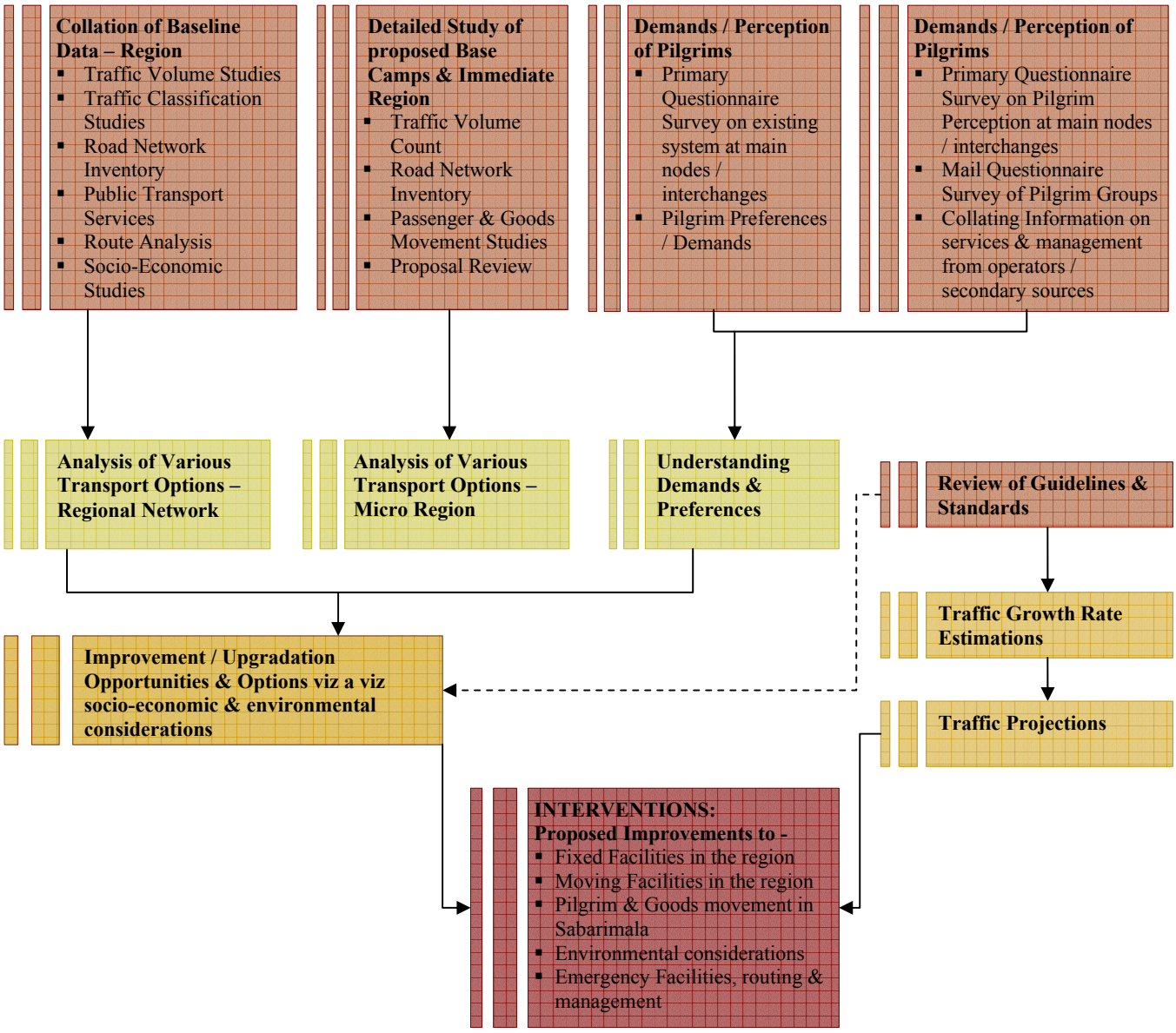

Figure 1: Methodology Adopted for Traffic and Transportation Study

1.4 Scope of the Study

The study covers the implications of the pilgrimage in the traffic and transportation sub sector, primarily covering the requirements at Sabarimala and the region of influence. It discusses the intensity of traffic across the region during the peak pilgrim season and plans the facilities required to contain the additional requirements. It discusses the various

transportation options and choices at Sabarimala and outlines the improvements / upgradations which form part of this Master Plan. It discusses the existing proposals strongly advocated by various stakeholder groups and suggests the way forward in terms of additional studies and scrutiny required while realising them. It also discusses the broad resource outlay required in terms of capital cost and land requirement for such interventions mainly at Sabarimala as it is required to initiate the procedures to transfer the land for the said use from the forest surrounds. However, detailed design of each intervention suggested does not fall under the purview of the Master Plan. It is suggested that required disussions with various agencies be carried out by respective implemnting agencies to adopt suitable designs and formats as required prior to implementation and additional studies be conducted as warranted and permissions and / or modifications be obtained as per prevailing laws / rules from various statal and central agencies during the further stages of development, and this do not form part of this consultancy service.

1.5 Structure of the Report

While this chapter namely, Chapter 1 of the report gives a brief overview of the need for a sub-module on Traffic and Transportation, aims and objectives, methodology and scope of the study undertaken to prepare the module. Thefollowing chapters throw light on the actual study undertaken, results of the study and the formulated strategies to achieve the set aim and objectives by year 2015 and policies / guidelines for the year 2050.

Chapter 2 discusses the existing scenario of traffic and transportation in the immediate region of influence converging at Sabarimala and the movement patterns at Sabarimala *per se*.

Chapter 3 discusses in detail the **regional** traffic characteristics, their issues and deficiencies.

Chapter 4 presents an analysis of traffic and transportation characteristics, their issues and deficiencies at **Sabarimala**.

Chapter 5 presents a discussion on the existing projects of vital importance with respect to Sabarimala pilgrimage in the region.

Chapter 6 discusses the proposed interventions and strategies to ensure provision of efficient transportation facilities and essential services for the pilgrims in such a way as to ensure minimisation of negative impacts on the environment due to the pilgrimage. This chapter is divided into two sections; former section focuses on the proposed **regional interventions** while the later focuses on the **specific interventions** in the **Sabarimala Micro Region.**

2. BASELINE TRANSPORTATION SCENARIO

2.1 Introduction

The Sabarimala temple is situated in the midst of dense forests in the Periyar Tiger Reserve (PTR) in Ranni Taluk of Pathanamthitta district of Kerala. Sabarimala is located deep in the western ghat hill ranges about 70 km east of Pathanamthitta, the district head quarters and 185 km north of Thiruvananthapuram, the State capital. From Sabarimala, Madurai in Tamilnadu across the border is at a distance of 195 km via Vandiperiyar, Kumily and Uttamapalayam.

This most famous temple of Lord Ayyappa is thronged by multitudes of people from all over the country and abroad, however, mostly from the four southern States of India. The temple used to attract few thousands of pilgrims even during the 18th century. The number of pilgrims has increased tremendously over the last several years, especially after the sixties when road heads were opened in connection with the Moozhiar Power Project in the neighbouring Ranni Forest Division. An area of 60 acres (50 acres at Sannidhanam and 10 acres at Pampa) from the forests was leased to the Travancore Devaswom Board (TDB) to provide pilgrim facilities. Large-scale constructions in the leased area took place during 1980's and 90's. Pilgrims visit the temple especially during the *Mandalapooja* and *Makaravilakku* festival season from mid November to mid January; the Vishu festival period during the middle of April; and Onam in August / September. The temple also remains open during the first five days of every month of the Malayalam calendar; and some selected auspicious days of the year. The temple is thus open for a total of 133 days in a year, of which the peak pilgrim season lasts for about 64 days from mid-November through mid-January annually. The flow of traffic through the region and its accumulation at the main Base and Transit camps during the peak pilgrim season is enormous and generally beyond the traffic carrying capacity of the major roads and parking areas.

Review of the traffic and transportation scenario is undertaken for the Sabarimala micro Planning region and the outlined Planning Region 1, comprising of Kottayam, Pathanamthitta and Idukki and spilling over into the Chengannur Taluk of Alappuzha District and Pathanapuram Taluk of Kollam District.

2.2 Accessibility to the Holy Destination

The temple attracts pilgrims mainly from various parts of Kerala and neighbouring States of Tamil Nadu, Andhra Pradesh and Karnataka, from other parts of the country and the world as well.

2.2.1 Railways

At present there is no direct railway line to Sabarimala. The nearest railway stations are Chengannur, Thiruvalla, Kottayam and Punalur. Punalur railway station is on the Kollam – Chennai metre gauge line. Chengannur, Thiruvalla and Kottayam are the railway stations on the Thiruvananthapuram-Chennai broad gauge line. Punalur is 102 Km, Kottayam 122 Km, Chengannur 93 Km and Thiruvalla 97 Km from Pampa at the foothill of Sannidhanam. Ministry of Railways had initiated a proposal to connect Pampa to Kottayam by a rail link for which field investigations had been completed. However, this has now been shelved mainly due to resistance from locals on land aquisition. Currently there is a proposal to connect

Erumely, the most prominent base of the pilgrimage with Angamali on Thrissur – Ernakulam Broad Gauge line through Kanjirappally, which has been planned to be extended to Punalur in the longrun.

2.2.2 Airways

Coimbatore on the north, Madurai on the east, Thiruvananthapuram on the south, and Nedumbassery (Ernakulam) on the west are the nearest terminals available for pilgrims travelling by air.

2.2.3 Roadways

Sabarimala region has an intricate road network. Nearest road head to Sabarimala is Pampa, which is connected to Pathanamthitta, Chengannur, Ernakulam and Erumely by a network of well-laid out roads. Similarly, the Northern approach to Sabarimala is through Vandiperiyar, which lies on the Kottayam – Kumily National Highway (erstwhile Kottayam – Kumily Road: newly declared NH 220).

2.2.3.1 Road Transport services

Public transport services are provided by Kerala State Road Transport Corporation (K.S.R.T.C) which has constructed a bus station at Chakkupalam, about half a kilometre from Pampa. From this station, bus communication is available to many stations in Kerala namely Pathanamthitta, Kottayam, Chengannur, Punalur, Thiruvalla, Kottarakkara, Thiruvananthapuram, Ernakulam, Guruvayoor, Palakkad, Ochira, Kayamkulam, Mavelikkara, Kollam, Thrissur, Kumily, Ponkunnam, Erumely, Attingal and Alappuzha. Besides, State transport buses from Tamil Nadu and Karnataka are also operating their services to Pampa during the pilgrim season.

The main means of conveyance are the buses run by K.S.R.T.C. Apart from the K.S.R.T.C, many private firms and individuals are also engaged in transporting the devotees to Pampa, Uppupara, Erumely etc, from where pilgrims trek to Sannidhanam. The TDB, which administers the religious activities at Sabarimala also, arranges for transportation in a small way.

Geographic disposition of Kerala and the transportation networks in the region and primary road network in Sabarimala Region is presented in Map 1.

2.3 Movement Pattern

Located within the tiger reserve, the Shrine necessitates long distance trekking by the pilgrims through the forest areas to reach Sannidhanam. Main access to Sannidhanam uphill, where the Srikovil (*Sanctum Sanctorum)* is located is reached by trekking from Pampa, which lies at the foot of the hills at the end of the vehicular road from Mannarakulanji and the trek path from Erumeli. Sannidhanam can also be reached by trekking from Uppupara in the north (through the PTR). However, a majority of pilgrims access Sannidhanam through Pampa, due to the religious significance attached to a number of ritual observances that are performed at Pampa. Significant among these is the *Pampa Snanam* (the holy bath at Pampa), which pilgrims undertake before beginning the trek uphill to Sannidhanam. Similar to Pampa, Erumely, a town located approximately 42 kms from Pampa, holds great significance for the Sabarimala

pilgrims. Traditionally, the most devout pilgrims and the first time pilgrims (known as '*Kanni Ayyappans')* halt at Erumely to pay their respects at the Ayyappa Temples and the Vavar Mosque here and perform the ritual dance *'Petta thullal'* before proceeding to Sabarimala. From Erumely, several pilgrims also trek through the forests to Pampa, commemorating Lord Ayyappa's trek to Sabarimala from Erumely after defeating the demoness *Mahishi*. This is the traditional pilgrim route and was the only route until mid 19th century when the pilgrims started movement through Sathram to Sannidhanam. However, the religious importance over time has given in to ease of *vehiclular* accessibility and the most preffered routes as of date, are the road head from Mannarkulanji to Pampa and the route from Vallakkadavu (near Vandiperiyar) to Uppupara which were opened recently.

Pilgrims travel by private, semi private modes or by KSRTC shuttle bus services from railway stations and bus stations mainly at Kottayam and Chengannur to Pampa or Erumely. Most of the public buses are dedicated services, which also stop enroute in case of demand.

Pilgrims who reach Erumely either travel by road (private / state owned buses, hired / private cars, hired / private jeeps) to Pampa or resort to trekking, along the forest route (*'Kanana Paatha'*). Pilgrims arriving from Vandiperiyar travel by KSRTC bus / private or semi private jeeps to Uppupara via Vallakkadavu through the forest Koop road. From Uppupara, pilgrims trek down to reach Sannidhanam. Few pilgrims also trek or travel by bus / jeep from Vandiperiyar to Sathram and from there to Sannidhanam.

The major routes traversed by the pilgrims are as follows:

- Kottayam – Kanjirapally – Erumely – Mukkuttuthara – Thulappally – Plappally – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Kottayam – Kanjirapally – Erumely – Kanakapalam – Athikkayam – Perinad – Laha – Plappally – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Kottayam – Ponkunnam – Pondanpuzha – Athikkayam – Perinad – Laha – Plappally – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Thiruvalla – Kozhenchery – Ranni – Perinad – Plappally – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Thiruvalla – Vennikkulam – Ranni – Perinad – Plappally – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Pandalam – Pathanamthitta – Vadasserikkara – Perinad – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Chengannur – Kozhenchery – Ranni – Perinad – Plappally Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Chengannur – Kozhenchery – Pathanamthitta – Vadasserikkara – Perinad – Plappally – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Punalur – Pathanapuram – Pathanamthitta – Vadasserikkara – Perinad – Plappally – Chalakkayam – Pampa (and trek from Pampa to Sannidhanam)
- Kumily – Vandiperiyar (Kakki Kavala) – Vallakkadavu – 4th Mile – Uppupara (and trek from Uppupara to Sannidhanam)
- Kumily – Vandiperiyar (Spencer Junction) – Sathram or Vallakkadavu – Sathram (and trek from Sathram to Uppupara – Sannidhanam or other routes to Sannidhanam)

The existing network of roads in the Sabarimala region indicated above is inadequate to meet the needs of the ever-increasing number of pilgrims, especially during the peak pilgrim season. Traffic from many road sections leading to Pampa from major towns and interchange

points passes through Perinad, on the Mannarakulanji – Chalakkayam – Pampa road. Road from Erumely passes through Thulappally and joins the main road from Mannarakulanji to Pampa at Plappally. These roads lack adequate width to cater to the demand, which is over two times its current carrying capacity during the peak pilgrim season. Severe traffic congestion and hold-ups are common in the sections between Perinad to Plappally and Plappally to Pampa. The congestion between Chalakkayam and Pampa is most severe due to the terrain conditions of the section and due to lack of adequate traffic holding / dispersal facilities at Pampa. A new road is being formed under Central Road Fund (CRF) scheme between Thulappally and Elavumkal, which is expected to shorten the route between Erumely and Pampa.

Currently, all vehicular traffic, including autos, cars, jeeps, vans, buses, tempos and trucks terminate mostly at Pampa. The KSRTC buses terminate at the bus terminal, about 500 meters (m) outside Pampa, and return from here. During peak pilgrim season, due to the lack of sufficient parking space, the private buses drop the pilgrims at Pampa and return to Nilakkal for parking. The pilgrims who have been dropped by these private buses at Pampa, on their return journey, board the buses run by the KSRTC at Pampa to reach Nilakkal and embark on their respective vehicles parked there. While private buses return empty from Pampa, the KSRTC service is practically empty from Nilakkal to Pampa. However, during return journey KSRTC buses are severely strained to cater to the pilgrims who travel to Nilakkal and beyond from Pampa.

At Pampa, private vehicles are parked at the Chakkupalam parking grounds, hilltop parking lot in three levels (light vehicles), and the parking area at Thriveni.

Pilgrims travelling from Vandiperiyar, travel to Sathram from where they trek to Uppupara or travel by jeep directly to Uppupara via Vallakkadavu and fourth mile along the Vallakkadavu – Angamuzhi forest road. Pilgrims prefer parking their buses / cars / jeeps at Vandiperiyar or Kumily, from where they may hire a separate jeep or travel by bus (run by KSRTC) for onward journey to Sathram or Uppupara. Jeeps are temporarily parked at Uppupara or Sathram. The road from Vandiperiyar (Spencer Junction) to Sathram runs along the undulating terrain through the tea estates. This road is badly damaged at many stretches and has inappropriate geometry. The link from Vallakkadavu to Sathram, which meets the Vandiperiyar – Sathram route midway, at Mount Estate is also in similar condition. As the estate roads were not paved and maintained following the near stoppage of estate activities, the road was rendered unusable and the pilgrims demanded the opening of forest koop road to Uppupara. As a result, this forest koop road from Vallakadavu to Uppupara is opened on demand mainly during peak pilgrim season. Initial stretches of the Vandiperiyar – Uppupara road (between Vandiperiyar (Kakki Kavala) to Vallakkadavu) is well paved and is of fairly good condition, while the remaining stretch which falls in the forest area is poor in geometry and pavement condition. Though the traffic intensity along these stretches is meagre; undulating terrain, unprotected valleys, poor geometry and poor pavement conditions result in higher travel time and accident risk.

On reaching Uppupara, pilgrims walk along the grasslands downhill to reach Sannidhanam. These pilgrims either return via Pampa or trek back to Uppupara and proceed to Vallakkadavu, enroute to Vandiperiyar.

Pilgrims trekking from Erumely reach Pampa (near the Ganapathy temple premises) after crossing a foot over bridge (at Njunangar) near Cheriyanavattom.

Pilgrims reaching Pampa via road (after parking their vehicles at Nilakkal or at parking lots at Pampa), have to cross the Pampa River to reach the Pampa Ganapathy Temple premises from where the trek route to Sannidhanam originates. There are two bridges across Pampa, one is a motorable bridge at Thriveni (which is mainly closed for general vehicular traffic during peak pilgrim season except for vehicles used for temple administration and management related purposes) while the other is a foot over bridge.

On reaching the Ganapathy Temple premises at Pampa, pilgrims have to climb up the steep hill of Neelimala enroute to Sannidhanam. There are two routes to trek up the Neelimala; one is the old conventional / traditional route which is paved and very steep, via Appachimedu and Sabaripeedom and the other is a pathway through the slopes of Neelimala with lesser gradient but with an additional trek distance of 1 km, known as Swamy Ayyappan Road constructed by Sri Subramaniam Trust. Both these roads meet at Marakkootam (beyond Sabaripeedom in the former route). Thereafter, the road again bifurcates: one through the religiously important Sharamkuthi and the other road through the lower slopes of Sharamkuthi hills, called Chandranandan Road. Both these roads again meet close to the Nadapandal near Sannidhanam. In order to manage the pilgrim movement during the peak pilgrim season one-way movement is enforced after the pilgrims reach Marakkoottam. Pilgrims, who are on their onward journey to Sannidhanam, use the path along Sharamkuthi and returns through Chandranandan Road.

Goods are mainly transported to Pampa from nearby towns and are off-loaded at the warehouse near Pampa Ganapathy temple. From here, these goods are transported either on tractors or as head load. Based on the information provided by the TDB officials, a total of 17 tractors (making an average of 3 trips per day) operate between Pampa and Sannidhanam through Swami Ayyappan Road during non-peak pilgrim season. Materials transported thus include construction materials like cement, bricks, sand, stones and materials for preparation of *Prasadam* such as ghee, rice, jaggery etc and other provisions. Each tractor carries around 2 tonnes per trip. The tractor movement is confined to around 25 days during the month before the commencement of the Sabarimala season. Due to the sharp curves and less manoeuvrability of these roads, there have been accidents to tractors with resultant casualties. Donkeys are used for carrying goods between Pampa and Sannidhanam during the pilgrim seasons. About 450 donkeys are pressed into service and they make an average of 3 return trips every day. Between Ganapathy Temple at Pampa and for nearly 500 m beyond Marakkoottam, the donkeys trek along the same route as pilgrims, beyond which they have a separate designated route to Sannidhanam. Porters are also engaged to carry goods from Pampa to Sannidhanam.

Old and/or invalid pilgrims and others who cannot undertake trekking can make the use of the '*doli*' service to reach Sannidhanam or return to Pampa. Four *doli* carriers / *doli* men shoulder each '*doli*' and usually prefer the Swami Ayyappan route as it has smoother gradient. After Marakkoottam, they go through the traditional route along Sharamkuthi or through Chandranandan road during off-season while preference is for Chandranandan road, which is of smoother gradient.

3. REGIONAL TRAFFIC ANALYSIS

3.1 Introduction to Studies and Analysis

Traffic and transportation studies for the region were conducted in two phases: preliminary study was conducted during the initial phase (2004-05) to understand the movement pattern and to assess the need for further studies; detailed study was conducted during the 2005-06 peak, off peak and lean pilgrim seasons.

In order to identify the deficiencies in the existing road and transportation system and to establish the need for a more detailed study, a preliminary reconnaissance study of the roads leading to Sabarimala was undertaken during the pilgrim season 2004-05. The available carriageway width, road and shoulder condition, adequacy of protective works and traffic facilities were assessed and a network inventory was prepared.

The feasibility for developing Base Camps and Transit Camps and their possible locations were considered and analysed during the preliminary studies. A tentative assessment of the broad facilities required for safe and efficient movement of pilgrims along the trekking routes between Pampa and Sannidhanam as also a broad assessment of the quantum and pattern of goods movement from Pampa to Sannidhanam was made during the preliminary study.

Detailed studies were undertaken during the pilgrim season between November 2005 and January 2006. These studies include the collection of traffic volume and classification data at selected locations in the road network in Sabarimala region, collection of parking accumulation data at critical locations including Nilakkal, Pampa hill top and Pampa Thriveni and collection of data on pilgrim activity at critical locations such as major railway stations and major bus stations which have significant pilgrim activity. A pilgrim movement validation survey to establish and validate the results of the primary survey on pilgrim population organised by Government of Kerala and various departments during the 2005-06 pilgrim season was conducted at Pampa to assess the pattern and quantum of trekking pilgrims. A goods movement survey was conducted at Pampa and Sannidhanam to assess the pattern and quantum of trekking pilgrims as well as goods movement. The locations of continuous traffic count station; 24-hour traffic count stations and parking survey locations are indicated in Map 2. Details of these traffic studies including their observations and findings are detailed below.

3.2 Traffic Volume and Classification Analysis for Regional Roads

Surveys conducted capture the general traffic movement through various regional roads which comprises both general traffic, increased tourist traffic as the period corresponds to the tourist season as well as Sabarimala pilgrim traffic. Comparison with the general daily traffic pattern and sample counts indicates that contribution of Sabarimala Pilgrim traffic to overall traffic is around 15 percent to 25percent for roads in the wider region (Planning region 3and2), 20percent to 60percent (for the roads in the outer loops of Planning region 1 and around 50percent to 99.5 percent (for the roads which leads to Pampa and nearby locations) of the traffic during this period is contributed by Sabarimala pilgrimage related traffic. However, for the purpose of this study, overall traffic pattern is more important as the aim is to decide the improvement requirements of the fixed facilities to cater for the *overall traffic* during the Sabarimala pilgrim season.

i) Kottayam - Kumily Road

(a) Kottayam –Kanjirappally section

Traffic volume and classification count was conducted at Ponkunnam on Kottayam-Kumily road for 24 hours during Mandalapooja period and for another 24 hours during the Makaravilakku season. The observed traffic intensity was 16,637 Passenger Car Units (PCUs) per day during Mandalapooja season and 21,260 PCUs per day during Makaravilakku season.

(b) Vandiperiyar-Kumily section

Traffic volume and classification count was conducted between Vandiperiyar and Kumily for 24 hours during Mandalapooja period and for another 24 hours during Makaravilakku period. The observed traffic intensity was 7010 PCUs per day during Mandalapooja season and 7759 PCUs per day during Makaravilakku period. Thus, it is seen that there is no major change in the traffic intensity during Mandalapooja and Makaravilakku seasons.

The details of traffic volume by category of vehicles at both these locations during the representative day during Mandalapooja and Makaravilakku seasons are given in Table 1.

Table 1: Kottayam – Kumily Road

(a) Kottayam – Kanjirappally Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*								*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos.)*	*Total (PCUs)*
23-12-05	Friday	Kanjirappally	138	319	371	175	311	437	2927	1141	1710	5	7	9	7	3	7560	9102.5
		Ponkunnam	107	81	292	154	333	216	2526	1309	1833	5	15	28	3	1	6903	7534.5
		TOTAL	**245**	**400**	**663**	**329**	**644**	**653**	**5453**	**2450**	**3543**	**10**	**22**	**37**	**10**	**4**	**14463**	**16637.0**
12-1-05	Thursday	Kanjirappally	288	140	672	271	233	871	3703	1523	2143	13	14	17	5	1	9894	12122.0
		Ponkunnam	400	77	551	236	149	537	1849	1410	1981	7	18	19	7	2	7243	9138.0
		TOTAL	**688**	**217**	**1223**	**507**	**382**	**1408**	**5552**	**2933**	**4124**	**20**	**32**	**36**	**12**	**3**	**17137**	**21260.0**

(b) Vandiperiyar – Kumily Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*								*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
17-12-05	Saturday	Kumily	86	22	86	108	199	216	968	878	268	67	2	5	2	3	2910	3564.0
		Vandiperiyar	95	16	115	70	156	282	934	789	269	51	2	4	2	2	2787	3446.0
		TOTAL	**181**	**38**	**201**	**178**	**355**	**498**	**1902**	**1667**	**537**	**118**	**4**	**9**	**4**	**5**	**5697**	**7010.0**
12-01-05	Thursday	Kumily	149	29	113	187	211	123	758	807	332	48	7	10	7	48	2829	3872
		Vandiperiyar	117	16	109	149	180	236	908	786	315	50	9	6	5	61	2947	3886.5
		TOTAL	**266**	**45**	**222**	**336**	**391**	**359**	**1666**	**1593**	**647**	**98**	**16**	**16**	**12**	**109**	**5776**	**7758.5**

ii) Pathanamthitta – Pampa Road

(a) Pathanamthitta – Vadasserikkara section

Traffic volume and classification count was conducted between Pathanamthitta and Vadasserikkara for 24 hours during Mandalapooja period and for another 24 hours during Makaravilakku period. The observed traffic intensity was 10608 PCUs per day during Mandalapooja period and 8284 PCUs per day during Makaravilakku period. Thus it is observed that there is a marginal fall in traffic during Makaravilakku period at this location as compared to Mandalapooja period.

(b) Vadasserikkara – Perinad section

Traffic volume and classification count was conducted for 24 hours between Vadasserikkara and Perinad during Sabarimala pilgrim season. The observed traffic intensity at this location during the Sabarimala season was 12,633 PCUs.

(c) Perinad-Plappally section

Traffic volume and classification count was conducted for 24 hours between Perinad and Plappally during Sabarimala pilgrim season. The observed traffic intensity at this location during the Sabarimala season was 10,660 PCUs.

The details of traffic volume by category of vehicles at the above locations during the Sabarimala season 2005-2006 are indicated in Table 2**.**

iii) Ponkunnam-Pondanpuzha-Athikkayam Road

(a) Ponkunnam-Vizhikkithodu Section

Traffic volume and classification count was conducted for 24 hours between Ponkunnam and Vizhikkithodu during Sabarimala pilgrim season. The observed traffic intensity at this location during Sabarimala season was 3253 PCUs.

(b) Vizhikkithodu-Pondanpuzha Section

Traffic volume and classification count was conducted for 24 hours between Vizhikkithodu and Pondanpuzha during Sabarimala pilgrim season. The observed traffic intensity at this location during Sabarimala season was 4018 PCUs.

The details of traffic volume by category of vehicles at the above locations during the Sabarimala season 2005-2006 are indicated in Table 3.

iv) Kanjirappally – Erumely Road

Traffic volume and classification count was conducted for 24 hours between Kanjirappally and Erumely during Sabarimala pilgrim season. The observed traffic intensity at this location during Sabarimala season was 8,903 PCUs.

The details of traffic volume by category of vehicles at the above locations during the Sabarimala season 2005-2006 are indicated in Table 4.

Table 2: Pathanamthitta – Pampa Road

(a) Pathanamthitta – Vadasserikkara Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*								*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
20-12-05	Tuesday	Vadasserikkara	118	5	154	27	274	96	1039	605	964	43	6	5	12	4	3352	3673.5
		Pathanamthitta	183	24	459	61	259	1091	1652	393	1158	101	19	5	10	0	5415	6934.5
		TOTAL	**301**	**29**	**613**	**88**	**533**	**1187**	**2691**	**998**	**2122**	**144**	**25**	**10**	**22**	**4**	**8767**	**10608.0**
13-01-06	Friday	Pathanamthitta	180	11	244	169	224	154	992	463	920	33	18	13	8	0	3429	4365.5
		Vadasserikkara	218	4	172	128	172	106	904	442	1006	34	27	21	6	1	3241	3918
		TOTAL	**398**	**15**	**416**	**297**	**396**	**260**	**1896**	**905**	**1926**	**67**	**45**	**34**	**14**	**1**	**6670**	**8283.5**

(b) Vadasserikkara – Perinad Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*								*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
20-12-05	Tuesday	Vadasserikkara	347	47	1141	21	236	930	1751	360	627	35	16	2	8	0	5521	8901.0
		Sabarimala	145	15	336	39	165	269	884	249	643	37	3	0	0	0	2785	3732.0
		TOTAL	**492**	**62**	**1477**	**60**	**401**	**1199**	**2635**	**609**	**1270**	**72**	**19**	**2**	**8**	**0**	**8306**	**12633.0**

(c) Perinad – Plappally Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*							*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
18-12-05	Sunday	Nilakkal	193	39	460	33	15	811	944	124	205	13	11	3	4	0	2855	4617.0
		Pathanamthitta	268	40	541	43	50	681	1843	238	293	16	12	5	6	0	4036	6043.0
		TOTAL	**461**	**79**	**1001**	**76**	**65**	**1492**	**2787**	**362**	**498**	**29**	**23**	**8**	**10**	**0**	**6891**	**10660.0**

Table 3: Ponkunnam – Pondanpuzha – Athikkayam Road

(a) Ponkunnam – Pondanpuzha - Athikkayam Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (N:s)*	*Total (PCUs)*
17-12-05	Saturday	Manimala	19	3	46	40	46	48	476	563	714	6	1	0	0	1	1963	1868.0
		Ponkunnam	12	1	39	27	5	39	339	511	450	5	0	1	1	0	1430	1384.5
		TOTAL	**31**	**4**	**85**	**67**	**51**	**87**	**815**	**1074**	**1164**	**11**	**1**	**1**	**1**	**1**	**3393**	**3252.5**

(b) Vizhikkithodu - Pondanpuzha Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
13-01-06	Friday	Manimala	8	3	109	122	87	171	485	335	498	39	2	1	0	2	1862	2210.5
		Pondanpuzha	4	4	94	61	94	96	471	313	437	34	4	7	0	1	1620	1807.5
		TOTAL	**12**	**7**	**203**	**183**	**181**	**267**	**956**	**648**	**935**	**73**	**6**	**8**	**0**	**3**	**3482**	**4018**

Table 4: Kanjirappally – Erumely Road

(a) Kanjirappally – Erumely Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
17-12-05	Saturday	Kanjirappally	38	24	162	48	148	370	1132	658	814	30	2	4	3	3	3436	3829.0
		Erumely	73	102	311	52	184	734	1074	591	771	22	2	10	2	1	3929	5073.5
		TOTAL	**111**	**126**	**473**	**100**	**332**	**1104**	**2206**	**1249**	**1585**	**52**	**4**	**14**	**5**	**4**	**7365**	**8902.5**

v) Kanakapalam-Mukkuthuthara – Tulappali – Plappalli Road

(a) Kanakapalam – Mukkuttuthara section

Volume and classification count was conducted for 24 hours between Kanakapalam and Mukkuttuthara during Sabarimala pilgrim season. The observed traffic intensity at this location during Sabarimala season was 3,816 PCUs.

(b) Thulappally – Plappally section

Traffic volume and classification count was conducted for 24 hours between Thulappally and Plappally during Sabarimala pilgrim season. The observed traffic intensity at this location during Sabarimala season was 6395 PCUs.

The details of traffic volume by category of vehicles at the above locations during the Sabarimala season 2005-2006 are indicated in Table 5.

vi) Kanakapalam – Vechuchira – Athikkayam Road

Traffic volume and classification studies were conducted for 24 hours near Vechuchira during Sabarimala pilgrim season. The observed traffic intensity at this location was 3250 PCUs. The details of traffic volume by category of vehicles at the above location during the Sabarimala season 2005-2006 are indicated in Table 6.

vii) Pandalam – Pathanamthitta Road

Traffic volume and classification count was conducted for 24 hours between Pandalam and Omallur on Pandalam – Pathanamthitta road during Sabarimala pilgrim season. The observed traffic intensity at this location during Sabarimala season was 2590 PCUs. The details of traffic volume by category of vehicles at the above location during the Sabarimala season 2005-2006 are indicated in Table 27.

viii) Adoor-Pathanamthitta Road

Traffic volume and classification count was conducted for 24 hours between Adoor and Omallur on Adoor-Pathanamthitta road during Sabarimala pilgrim season. The observed traffic intensity at this location during Sabarimala season was 13,718 PCUs. The details of traffic volume by category of vehicles at the above location during the Sabarimala season 2005-2006 are indicated in Table 8.

ix) Vadasserikkara – Chittar – Angamuzhi – Plappally Road

(a) Vadasserikkara-Chittar section

Traffic volume and classification count was conducted for 24 hours during Mandalapooja season and another 24 hours during Makaravilakku season between Vadasserikkara and Chittar on Vadasserikkara – Chittar – Angamuzhi – Plappally road. The observed traffic intensity at this location was 1923 PCUs per day during Mandalapooja season and 2779 PCUs per day during Makaravilakku season as indicated in Table 9 (a).

(b) Plappally-Angamuzhi section

Traffic volume and classification count was conducted for 24 hours during Sabarimala pilgrim season between Plappally and Angamuzhi on Vadasserikkara – Angamuzhi – Plappally road. The observed traffic intensity at this location was 1782 PCUs during Sabarimala pilgrim season. The details of traffic volume by category of vehicles at the above locations during the Sabarimala season 2005-2006 are indicated in Table 9 (b).

Table 5: Kanakappalam – Mukkuttuthara – Thulappally – Plappally Road

(a) Kanakappalam – Mukkuttuthara Section

Date & Location	*Day*	*Direction*	*Buses*		*Vehicles*							*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (Nos)*	*Total (PCUs)*
17-12-05	Saturday	Mukkuttuthara	24	0	18	6	74	558	545	127	274	2	3	1	2	2	1636	1918.0
		Erumely	29	0	7	0	86	431	689	131	341	18	0	3	2	2	1739	1898.0
		TOTAL	**53**	**0**	**25**	**6**	**160**	**989**	**1234**	**258**	**615**	**20**	**3**	**4**	**4**	**4**	**3375**	**3816.0**

(b) Thulappally - Plappally Section

Date & Location	*Day*	*Direction*	*Buses*		*Vehicles*							*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (No:s)*	*Total (PCUs)*
18-12-05	Sunday	Plappally	44	0	45	11	33	678	2311	182	92	1	7	0	2	0	3406	3919.0
		Thulappally	36	0	10	2	43	344	1548	144	67	11	12	2	2	0	2221	2475.5
		TOTAL	**80**	**0**	**55**	**13**	**76**	**1022**	**3859**	**326**	**159**	**12**	**19**	**2**	**4**	**0**	**5627**	**6394.5**

Table 6: Kanakappalam – Vechuchira – Athikkayam Road

Date & Location	*Day*	*Direction*	*Buses*		*Vehicles*							*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
12-01-06	Thursday	Kanakappalam	26	41	168	45	90	63	284	160	241	18	2	1	1	-	1140	1619
		Athikkayam	32	55	147	39	81	58	296	152	229	14	-	4	-	-	1107	1631
		TOTAL	**58**	**96**	**315**	**84**	**171**	**121**	**580**	**312**	**470**	**32**	**2**	**5**	**1**	**-**	**2247**	**3250**

Table 7: Pandalam – Pathanamthitta Road

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*							*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
13-01-05	Friday	Pathanamthitta	1	0	146	24	86	78	239	185	357	12	6	3	1	0	1138	1379.5
		Pandalam	0	0	109	8	119	84	205	154	368	3	5	2	1	0	1058	1210
		TOTAL	**1**	**0**	**255**	**32**	**205**	**162**	**444**	**339**	**725**	**15**	**11**	**5**	**2**	**0**	**2196**	**2589.5**

Table 8: Adoor-Pathanamthitta Road

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*							*Service Vehicles*				*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
13-01-06	Friday	Pathanamthitta	176	0	374	216	243	113	1465	715	2308	79	25	8	4	1	5727	6235.5
		Adoor	129	19	425	188	215	431	2049	893	2426	72	14	10	5	0	6876	7482
		TOTAL	**305**	**19**	**799**	**404**	**458**	**544**	**3514**	**1608**	**4734**	**151**	**39**	**18**	**9**	**1**	**12603**	**13717.5**

Table 9: Vadasserikkara-Chittar-Plappally Road

(a) Vadasserikkara-Chittar Section

Date & Location	*Day*	*Direction*	*Buses*		*Vehicles*								*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
20-12-05	Tuesday	Vadasserikkara	0	1	40	2	52	6	398	142	355	4	5	1	0	0	1006	941.5
		Chittar	1	4	49	1	57	8	389	154	339	5	4	0	0	0	1011	981.5
		TOTAL	**1**	**5**	**89**	**3**	**109**	**14**	**787**	**296**	**694**	**9**	**9**	**1**	**0**	**0**	**2017**	**1923.0**
13-12-06	Friday	Pathanamthitta	0	2	74	25	26	57	520	181	327	23	14	0	0	5	1254	1332.5
		Chittar	4	1	117	19	34	113	446	192	257	48	12	0	0	0	1243	1446
		TOTAL	**4**	**3**	**191**	**44**	**60**	**170**	**966**	**373**	**584**	**71**	**26**	**0**	**0**	**5**	**2497**	**2778.5**

(b) Plappally-Angamuzhi Section

Date & Location	*Day*	*Direction*	*Buses*		*Vehicles*								*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*	*Total (PCUs)*
12-01-06	Thursday	Angamuzhi	3	18	33	10	11	53	447	153	66	6	20	6	1	0	827	953
		Plappally	1	8	14	6	18	28	405	204	74	2	21	5	0	0	786	829
		TOTAL	**4**	**26**	**47**	**16**	**29**	**81**	**852**	**357**	**140**	**8**	**41**	**11**	**1**	**0**	**1613**	**1782**

x) Vennikulam – Ranni – Vadasserikkara Road

(a) Vennikulam – Ranni section

Traffic volume and classification count was conducted for 24 hours during Sabarimala pilgrim season between Vennikulam and Ranni on Thiruvalla - Vennikulam - Ranni road. The observed traffic intensity at this location was 5755 PCUs.

(b) Ranni – Vadasserikkara section

Traffic volume and classification count was conducted for 24 hours during Mandalapooja season and another 24 hours during Makaravilakku season between Ranni and Vadasserikkara on Kozhenchery – Ranni – Vadasserikkara road. The observed traffic intensity at this location was 4133 PCUs during Mandalapooja season and 4568 PCUs during Makaravilakku season. The details of traffic volume by category of vehicles at the above locations during the Sabarimala season 2005-2006 are indicated in Table 10.

xi) Chengannur – Kozhenchery – Ranni Road

Traffic volume and classification count was conducted for 24 hours during Sabarimala pilgrim season between Kozhenchery and Ranni on Chengannur – Kozhenchery – Ranni road. The observed traffic intensity at this location was 3752 PCUs during Sabarimala pilgrim season. The details of traffic volume by category of vehicles at the above location during the Sabarimala season 2005-2006 are indicated in Table 11

xii) Vandiperiyar – Vallakkadavu road

Traffic volume and classification count was conducted for 24 hours during Sabarimala pilgrim season between Kakkikavala and Vallakkadavu on Vandiperiyar – Vallakkadavu road. The observed traffic intensity at this section was 993 PCUs per day during Sabarimala pilgrim season. The details of traffic volume by category of vehicles at the above location during the Sabarimala season 2005-2006 are indicated in Table 12

xiii) Pondanpuzha – Chunkappara – Athikkayam – Perinad Road

(a) Pondanpuzha – Chunkappara section

Traffic volume and classification count was conducted for 24 hours between Pondanpuzha and Chunkappara during Sabarimala pilgrim season. The observed traffic intensity at this location was 5085 PCUs per day during Sabarimala pilgrim season as shown in Table 13 (a).

(b) Athikkayam – Perinad section

Traffic volume and classification count was conducted for 24 hours between Athikkayam and Perinad during Sabarimala pilgrim season. The observed traffic intensity at this location was 3224 PCUs per day during Sabarimala pilgrim season. The details of traffic volume by category of vehicles at the above location during the Sabarimala season 2005-2006 are indicated in Table 13 (b).

xiv) Punalur – Pathanamthitta Road

Traffic volume and classification count was conducted for 24 hours between Pathanamthitta and Konni on Punalur – Pathanamthitta road during Sabarimala pilgrim season. The observed traffic intensity at this location was 23,339 PCUs per day during Sabarimala pilgrim season.

The details of traffic volume by category of vehicles at the above location during the Sabarimala season 2005-2006 are indicated in Table 14.

Table 10: Vennikulam – Ranni – Vadasserikkara Road

(a) Vennikulam – Ranni Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*					*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos.)*	*Total (PCUs)*
13-01-06	Friday	Vennikulam	19	0	136	16	93	22	742	653	1313	11	3	3	4	0	3015	2760.5
		Ranni	23	1	134	23	151	25	809	733	1241	11	2	5	3	1	3162	2994
		TOTAL	**42**	**1**	**270**	**39**	**244**	**47**	**1551**	**1386**	**2554**	**22**	**5**	**8**	**7**	**1**	**6177**	**5754.5**

(b) Ranni – Vadasserikkara Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*					*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos.)*	*Total (PCUs)*
20-12-05	Tuesday	Pathanamthitta	0	15	193	35	103	206	417	152	333	12	3	4	0	2	1475	1947.0
		Ranni	13	29	183	30	132	220	496	182	384	14	6	4	1	1	1695	2186.0
		TOTAL	**13**	**44**	**376**	**65**	**235**	**426**	**913**	**334**	**717**	**26**	**9**	**8**	**1**	**3**	**3170**	**4133.0**
13-01-06		Pathanamthitta	19	6	98	93	174	53	759	335	575	17	0	2	2	0	2133	2386.5
	Friday	Ranni	26	12	127	101	105	137	545	189	487	50	1	2	5	0	1787	2181.5
		TOTAL	**45**	**18**	**225**	**194**	**279**	**190**	**1304**	**524**	**1062**	**67**	**1**	**4**	**7**	**0**	**3920**	**4568**

Table 11: Chengannur – Kozhenchery – Ranni Road

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*		*Service Vehicles*								*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (Nos.)*	*Total (PCUs)*
13-01-05	Friday	Kozhenchery	11	1	89	79	111	53	544	190	715	37	2	2	4	3	1841	1921
		Ranni	7	4	87	68	120	63	560	129	647	24	3	4	3	6	1725	1831
		TOTAL	**18**	**5**	**176**	**147**	**231**	**116**	**1104**	**319**	**1362**	**61**	**5**	**6**	**7**	**9**	**3566**	**3752**

Table 12: Vandiperiyar – Vallakkadavu Road

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*		*Service Vehicles*								*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (Nos.)*	*Total (PCUs)*
17-12-05	Saturday	Vallakkadavu	5	0	2	0	16	52	72	214	124	11	1	4	2	1	504	490.5
		Vandiperiyar	7	0	0	2	13	58	142	166	74	18	1	5	2	1	489	502.5
		TOTAL	**12**	**0**	**2**	**2**	**29**	**110**	**214**	**380**	**198**	**29**	**2**	**9**	**4**	**2**	**993**	**993.0**

Table 13: Pondanpuzha – Chunkappara – Athikkayam – Perinad Road

(a) Pondanpuzha – Chunkappara Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*					*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (Nos.)*	*Total (PCUs)*
13-01-07	Friday	Pondanpuzha	15	19	175	94	141	119	547	204	432	5	2	6	1	2	1762	2285.5
		Ittiyappara	20	30	318	125	130	108	565	175	425	5	2	3	1	0	1907	2799
		TOTAL	**35**	**49**	**493**	**219**	**271**	**227**	**1112**	**379**	**857**	**10**	**4**	**9**	**2**	**2**	**3669**	**5084.5**

(b) Athikkayam – Perinad Section

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*						
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (Nos.)*	*Total (PCUs)*
13-01-06	Friday	Perinad	84	24	216	37	28	225	370	167	251	10	10	0	0	4	1426	2152
		Athikkayam	25	5	19	40	22	62	354	171	269	18	9	1	0	0	995	1071.5
		TOTAL	**109**	**29**	**235**	**77**	**50**	**287**	**724**	**338**	**520**	**28**	**19**	**1**	**0**	**4**	**2421**	**3223.5**

Table 14: Punalur – Pathanamthitta Road

Date & Location	*Day*	*Direction*	*Buses*			*Vehicles*						*Service Vehicles*					*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (Nos.)*	*Total (PCUs)*
13-01-06	Friday	Punalur	95	72	698	235	235	1135	4027	1332	1251	46	3	1	6	0	9136	11384.5
		Pathanamthitta	204	56	449	360	573	1558	2525	1862	2163	100	13	2	5	0	9870	11952
		TOTAL	**299**	**128**	**1147**	**595**	**808**	**2693**	**6552**	**3194**	**3414**	**146**	**16**	**3**	**11**	**0**	**19006**	**23336.5**

3.3 Parking Studies at the Base Camps

Parking accumulation studies were conducted at critical locations for 24 hours both during Mandalapooja season 2005 and during the Makaravilakku season 2006. The locations were parking surveys were conducted include Nilakkal plantation area, Erumely, Pampa (Hill top), Pampa (Thriveni), Pampa (Chakkupalam), Vandiperiyar and Uppupara. Parking studies were also conducted at major transit stations such as Chengannur, Kottayam and Ernakulam. Details of the study observations at different locations are discussed below.

3.3.1 Nilakkal Plantation Area

Parking study conducted at Nilakkal as part of the Master Plan preparation on a representative peak day during Mandalapooja season indicate a peak accumulation of 14,105 vehicles at a time on the date of survey. This consists of 6541 buses, 6654 passenger vans, 325 cars including taxis, 55 trucks and 92 light commercial vehicles besides a number of two wheelers and service vehicles including Police, PWD, Fire service and TDB. The details of parking survey at Nilakkal during Mandalapooja period is given in Table 15. The parking surveys were repeated on a representative day during Makaravilakku season also. The peak accumulation observed during this period was 13,703 vehicles. This includes 3487 buses, 4928 passenger vans, 5067 passenger cars, 78 trucks and 76 light commercial vehicles besides a few service vehicles and two wheelers. Details of parking survey at Nilakkal on a presentative day during Makaravilakku period is given in Table 16.

It was estimated that the area occupied by the parked vehicles (including access roads and driveways) was around 40 to 45 hectares. The duration of parking ranged between 3 to 6 hours for government buses and 12 to 48 hours for private buses. With respect to cars and passenger vans, the duration of parking ranged between 16 hours and 48 hours.

It could be inferred that pilgrims concentrate at Sabarimala and Pampa for minimum 12 hours and maximum of 48 hours (average being 24 hours or a day), while vehicles wait at Nilakkal during this time. Vehicles run between Nilakkal and Pampa twice (to and fro) with one empty trip, and additional traffic is generated by KSRTC chain services which brings people back to Nilakkal.

Analysis of the above figures brings it to the fore that during the peak day, the possible average concentration at Nilakkal is of a maximum of around 1 lakh people in an hour during a 24 hour period, including staff and service personnel. In addition, this peak population is contributed by vehicles with an average halt of 24 hours a day, while the darshan time for a maximum sized group is an extended maximum of 50 seconds to an hour, travel time to and from Pampa to Nilakkal is minimum 45 minutes to 2 hours each during rush time and waiting time for reaching Sannidhanam (in the queue) ranges from 2 to 8 hours, thus totalling the process time from and back to Nilakkal as 12 hours. Additional halt is contributed by the absence of facility for Neyyabhshekam, which extends only for around 6 hours everyday.

3.3.2 Erumely Town

Parking of vehicles is observed at a number of locations in Erumely. These include the front area of Valiambalam, terrace parking besides TDB school, hilltop parking adjacent to the police station and stadium adjacent to Vavar mosque. The combined peak accumulation of

parking on a representative day during Mandalapooja is observed to be 331 vehicles comprising of 47 buses, 142 passenger vans and 142 cars including taxis. The details of parking survey at Erumely on a representative day during Mandalapooja season are given in Table 17.

The survey was repeated on another representative day during Makaravilakku season. The peak accumulation during this period was observed to be 215 vehicles comprising of 28 buses, 45 passenger vans, 80 passenger cars and 13 light commercial vehicles besides certain number of auto-rickshaws and two wheelers. Details of parking survey data at Erumely on a representative day during Makaravilakku season is indicated in Table 18.

The combined available parking space at these locations approximates about 8 acres, besides another 10 acres of private open area available behind KSRTC bus station and along Mukkada road which are used for parking during the peak season. The available area will be adequate to accommodate about 2000 cars at a time, besides area required for provision of access roads and pilgrim amenities. The average duration of parking of cars and vans ranged between 12 hours and 72 hours while that of private buses ranged between 12 and 48 hours. In addition to the people reaching Nilakkal in vehicles, large numbers of people also trek and reach here and further proceed to Pampa by foot.

Analysis of the above figures brings it to the fore that during peak, around 16,500 to max. 60,000 people accumulate at Erumely in an hour, the average accumulation being around 30,000 in an average halt period of 42 hours.

Table 15: Nilakkal - Parking Accumulation on 19-12-2005

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*				*Total*
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Van's*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
8.00	578	167	5796	55	92	6654	325	69	94	82	76	53	64	0	14105
10.00	359	73	4264	59	61	5594	230	67	74	44	100	58	57	0	11040
12.00	237	41	2606	42	51	3813	225	39	51	72	79	57	23	0	7336
14.00	122	33	2731	6	7	4300	162	0	4	0	26	4	8	0	7403
16.00	81	12	3154	9	0	3587	7	2	0	0	17	4	6	0	6879
18.00	32	8	2587	6	4	3645	13	6	0	0	16	4	5	0	6326
20.00	117	11	3936	5	2	3792	14	3	0	0	24	5	7	0	7916
22.00	73	11	2765	6	0	4030	14	1	0	0	17	4	5	0	6926
0.00	123	29	2750	6	3	4278	19	2	1	0	24	4	12	0	7251
2.00	90	18	3539	5	6	3904	16	2	2	0	19	3	9	0	7613
4.00	79	13	2789	7	3	3681	33	8	2	0	15	2	8	0	6640
6.00	79	15	1672	7	3	2873	65	9	2	0	15	2	9	0	4751

Table 16 : Nilakkal - Parking Accumulation on 12-1-2006

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
10.00	5	76	658	23	33	2335	2988	4	9	0	19	2	4	0	6156
12.00	8	79	904	19	32	2472	3023	6	12	0	19	4	3	0	6581
14.00	12	147	950	24	39	2667	3297	6	13	0	22	3	3	1	7184
16.00	18	155	942	38	62	2782	2936	9	13	0	20	3	3	1	6982
18.00	16	223	1025	48	81	2695	3133	12	12	0	15	2	3	0	7265
20.00	21	206	1239	63	71	3770	3481	18	16	0	13	3	2	1	8904
22.00	24	284	1253	82	106	3402	3566	24	30	0	13	2	2	1	8789
0.00	41	298	1145	81	73	3694	3884	23	31	0	12	3	2	1	9288
2.00	37	311	3139	78	76	4928	5067	23	27	0	12	2	2	1	13703
4.00	21	317	1311	105	50	5385	4949	27	27	0	12	2	2	1	12209
6.00	19	343	1632	98	66	4633	4459	30	27	0	13	4	2	1	11327
8.00	22	477	1777	143	126	5506	5015	30	28	0	12	2	2	1	13141

Table 17: Erumely - Parking Accumulation on 18-12-2005

Time Interval	*Buses*		*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
10.00-11.00	0	0	33	0	0	137	133	0	0	0	0	0	2	0	305
12.00-13.00	0	1	23	0	0	129	92	6	0	0	1	0	0	0	252
14.00-15.00	0	0	24	0	0	140	135	2	0	0	0	0	0	0	301
16.00-17.00	0	2	36	0	0	127	107	0	0	0	0	0	3	0	275
18.00-19.00	0	2	34	0	1	113	90	2	0	0	0	0	1	0	243
20.00-21.00	0	0	25	0	0	127	100	2	0	0	0	0	0	0	254
22.00-23.00	0	0	19	0	0	112	88	1	0	0	2	0	0	0	222
0.00 -1.00	0	2	20	0	0	109	101	2	0	0	0	0	0	0	234
2.00 -3.00	0	4	43	0	0	124	87	1	0	0	0	0	0	0	259
4.00 -5.00	0	5	29	1	0	142	115	1	0	0	0	0	0	0	293
6.00 -7.00	0	7	40	0	0	142	142	0	0	0	0	0	0	0	331
8.00 -9.00	0	0	16	0	0	148	150	2	0	0	0	0	0	0	316

Table 18: Erumely - Parking Accumulation on 13-01-2006

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
9.00	0	4	23	7	12	60	63	11	15	0	0	0	0	0	195
11.00	0	1	27	0	13	45	80	15	34	0	0	0	0	0	215
13.00	0	2	35	0	3	65	74	3	1	0	0	0	0	0	183
15.00	0	2	26	0	0	66	77	0	0	0	0	0	0	0	171
17.00	0	4	35	0	2	50	58	2	1	0	0	0	0	0	152
19.00	0	4	23	0	0	59	74	1	0	0	0	0	0	0	161
21.00	0	2	22	0	0	52	61	1	0	0	0	0	0	0	138
23.00	0	1	30	0	0	59	56	0	0	0	0	0	0	0	146
1.00	0	2	28	0	1	52	56	1	0	0	0	0	0	0	140
3.00	0	3	33	0	0	54	63	0	0	0	0	0	0	0	153
5.00	0	2	21	0	0	48	58	1	0	0	0	0	0	0	130
7.00	0	1	27	0	0	47	59	0	0	0	0	0	0	0	134

3.3.3 Vandiperiyar

Pilgrims visiting the Sannidhanam through the Uppupara route come to Vandiperiyar on the Kumily – Kottayam road by own vehicles, park their vehicles mainly at Vandiperiyar Stadium and proceed to Uppupara by jeep or by KSRTC buses. Hence a parking accumulation survey was conducted on a representative day at Vandiperiyar stadium both during the Mandalapooja and the Makaravilakku seasons.

The parking study conducted at Vandiperiyar on a representative day during the Mandalapooja season indicated the highest accumulation of 86 vehicles comprising of 32 buses, 16 cars (including taxies), 14 passenger vans, 12 autos, four commercial vehicles, five two wheelers, two bicycles and one service vehicle of Kerala Government. The details of parking accumulation survey conducted at Vandiperiyar during the Mandalapooja period are indicated in Table 19.

The survey was repeated on another representative day during the Makaravilakku period. The highest parking accumulation observed during this period was 120 vehicles comprising of 60 passenger vans, 39 cars (including taxis), four buses, five commercial vehicles, 8 autos, three two wheelers and one bicycle. The details of parking accumulation at this location on a representative day during the Makaravilakku season are indicated in Table 20.

The parking activity is now confined to the stadium having an area of about 6 acres. The duration of parking ranges between 18 hours and 48 hours for cars and vans.

3.3.4 Uppupara Transit Area

Apart from pilgrims who come to Uppupara from Vandiperiyar by KSRTC bus or jeep, some pilgrims also reach Uppupara in their own vehicles / semi public vehicles, park them and then proceed to Sannidhanam by foot. A parking accumulation survey was conducted at Uppupara on a representative day, both during Mandalapooja and during the Makaravilakku season.

The peak parking accumulation during Mandalapooja season was 41 vehicles comprising of 40 cars (including taxis) and one passenger van. Similarly, the parking accumulation survey conducted during Makaravilakku season reveals a peak accumulation of 156 vehicles comprising of 91 passenger cars (including taxis), 61 passenger vans, two light commercial vehicles and two utility vehicles belonging to police department. The peak parking accumulation at this location both during Mandalapooja season as well as Makaravilakku are presented in Table 21 and Table 22

The parking activity extends over a wide area of the open grasslands. The duration of parking varies between 24 hours and 72 hours for cars and vans.

It is noted that maximum concentration here occurs during Makaravilakku as the Makarajyothi is visible from this locale. During other periods, the pilgrims prefer returning via Pampa as the dip in the holy River is a *sine qua non* of the pilgrimage as also considering the climb upwards towards Uppupara on returning after darshan. However it is noted that around 50000 to 80000 pilgrims congregate here to watch Makarajyothi and the halt for the same starts a day or two prior to the Makaravilakku day.

Table 19: Vandiperiyar - Parking Accumulation on 20-12-2005

Time Interval	*Buses*		*Vehicles*								*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt /TDB*	*Fire Service/ Ambulance*	*Others*	*Total (Nos)*
8.00 -9.00	10	0	8	3	2	10	8	13	5	3	0	0	0	0	62
9.00 -10.00	8	0	10	0	3	12	11	14	12	2	1	0	0	0	73
10.00-11.00	10	3	13	2	2	8	8	6	6	2	0	3	0	0	63
11.00-12.00	9	0	15	1	1	19	4	8	8	3	0	3	0	0	71
12.00-13.00	13	0	16	0	0	17	9	9	9	2	0	3	0	0	78
13.00-14.00	9	0	13	2	1	11	7	14	11	1	0	2	1	0	72
14.00-15.00	4	0	9	1	1	7	8	4	14	1	2	1	0	1	53
15.00-16.00	14	0	18	1	3	14	16	12	5	2	0	1	0	0	86
16.00-17.00	9	0	7	0	0	7	3	3	2	0	1	1	0	0	33
17.00-18.00	9	0	9	1	0	15	14	12	19	2	0	0	0	0	81
18.00-19.00	5	0	11	1	2	6	9	2	5	0	0	0	0	0	41
19.00-20.00	4	0	6	0	0	1	9	2	5	0	0	0	0	0	27
20.00-21.00	9	0	7	0	1	1	8	4	5	0	0	1	0	0	36
21.00-22.00	7	0	7	0	1	1	10	13	11	0	1	2	0	0	53
22.00-23.00	3	0	2	0	0	0	2	4	3	0	0	0	0	0	14
23.00-0.00	0	0	1	0	0	0	4	5	2	0	0	0	0	0	12
0.00 -1.00	0	0	0	0	0	1	2	3	1	0	1	0	0	0	8
1.00 -2.00	0	0	0	0	0	0	1	4	3	0	0	0	0	0	8
2.00 -3.00	0	0	0	0	0	0	2	3	2	0	0	0	0	0	7
3.00 -4.00	0	0	0	0	0	0	0	4	2	0	0	0	0	0	6
4.00 -5.00	1	0	2	0	0	2	0	4	4	0	0	0	0	0	13
5.00 -6.00	4	0	5	0	0	0	1	5	4	0	0	0	0	0	19
6.00 -7.00	4	0	5	1	0	2	4	3	5	0	0	0	0	0	24
7.00 -8.00	5	0	6	0	1	5	2	3	1	0	0	0	0	0	23

Table 20: Vandiperiyar - Parking Accumulation on 12-01-2006

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
8.00 -9.00	0	0	2	0	0	44	40	3	2	0	0	0	0	0	91
10.00-11.00	0	0	2	0	1	50	38	2	2	0	0	0	0	0	95
12.00-13.00	0	0	2	0	4	49	35	6	3	0	0	0	0	0	99
14.00-15.00	0	0	2	0	1	51	30	2	0	0	0	0	0	0	86
16.00-17.00	0	0	2	0	1	53	33	0	0	0	0	0	0	0	89
18.00-19.00	0	0	3	0	1	57	32	0	0	0	0	0	0	0	93
20.00-21.00	0	0	4	0	1	58	37	0	0	0	0	0	0	0	100
22.00-23.00	0	0	4	0	1	58	36	0	0	0	0	0	0	0	99
0.00 -1.00	0	0	4	0	1	62	39	1	2	0	0	0	0	0	109
2.00 -3.00	0	1	4	2	1	60	37	0	0	0	0	0	0	0	105
4.00 -5.00	0	0	4	1	4	60	39	8	3	1	0	0	0	0	120
6.00 -7.00	0	0	4	1	1	61	39	0	0	3	3	0	0	0	112

Table 21: Uppupara - Parking Accumulation on 20-12-2005

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
10.00-11.00	0	0	0	0	0	1	36	0	0	0	0	1	0	0	38
12.00-13.00	2	0	0	0	0	1	40	0	0	0	0	0	0	0	43
14.00-15.00	0	0	0	0	1	1	22	0	0	0	0	0	0	0	24
16.00-17.00	1	0	0	0	0	1	13	0	0	0	0	1	0	0	16
18.00-19.00	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13
20.00-21.00	0	0	0	0	0	0	13	0	0	0	0	0	0	0	13
22.00-23.00	0	0	0	0	0	1	0	1	0	0	0	0	0	0	2
0.00 -1.00	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2.00 -3.00	0	0	1	0	0	1	4	1	0	0	0	0	0	0	7
4.00 -5.00	0	0	0	0	0	0	6	2	0	0	0	0	0	0	8
6.00 -7.00	0	0	0	0	0	2	1	0	0	0	0	0	0	0	3
8.00 -9.00	0	0	0	0	0	4	2	1	0	0	0	0	0	0	7

Table 22: Uppupara - Parking Accumulation on 12-01-2006

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
8.00 -9.00	1	0	0	0	3	17	42	0	0	0	0	1	0	0	64
10.00-11.00	1	0	0	0	4	13	60	0	0	0	0	0	0	0	78
12.00-13.00	1	0	0	0	1	10	58	0	0	0	0	0	0	0	70
14.00-15.00	1	0	0	0	2	27	55	0	0	0	0	1	0	0	86
16.00-17.00	1	0	0	0	2	22	45	0	0	0	1	0	0	0	71
18.00-19.00	0	0	0	0	3	40	21	0	0	0	2	0	0	0	66
20.00-21.00	0	0	0	0	2	45	25	0	0	0	2	0	0	0	74
22.00-23.00	0	0	0	0	2	45	24	0	0	0	2	0	0	0	73
0.00 -1.00	0	0	0	0	2	45	27	0	0	0	2	0	0	0	76
2.00 -3.00	0	0	0	0	2	45	27	0	0	0	2	0	0	0	76
4.00 -5.00	0	0	0	0	2	47	32	0	0	0	2	0	0	0	83
6.00 -7.00	0	0	0	0	2	50	40	0	0	0	2	0	0	0	94
8.00-9.00	3	0	0	0	2	61	91	0	0	0	2	0	0	0	159

Desire Line diagram of traffic in the region with indicated maximum parking accumulation at main points is presented in Map 3.

4. TRAFFIC STUDIES AND ANALYSIS AT SABARIMALA

Traffic volume and classification studies and parking studies conducted at Sabarimala during the last two peak pilgrim seasons gives an idea about the nature of traffic, parking requirements and need for exploring the possibility of introducing other transport options here.

4.1 Traffic Volume and Classification at Chalakkayam Toll Station

Traffic volume and classification studies were conducted continuously for 11 days (in two spells) during Mandalapooja period and for 7 days during Makaravilakku period. Surveys were conducted for 24 hours during each survey day. The days of survey were so arranged as to capture the pattern of traffic movement both during weekdays and during the weekend in each spell.

In the first spell, the traffic surveys were conducted for 5 days between 15th and 19th December 2005. During this period, the highest intensity of traffic at Chalakkayam on one of the days' was 19,657 PCUs while the average was 17,172 PCUs per day. It is observed that the volume of traffic is evenly distributed in both directions on all the days of survey. Details of number of different categories of vehicles in either direction during these 5 days of survey are presented in Table 23.

In the second spell, the surveys were conducted for 6 days between 23rd and 28th December 2005. The highest traffic intensity of 28,057 PCUs was observed on 24th December 2005 which was a Saturday. After 25th December 2005, the traffic intensity tapered off sharply towards close of the Mandalapooja season, the intensity of traffic on the last day of the Mandalapooja season on 28th December 2005 being 1,228 PCUs. While the intensity of traffic was evenly distributed in either direction on 23rd and 24th December 2005, tidal flow was observed on the other days between 25th December 2005 and 28th December 2005. Details of number of different categories of vehicles in either direction during this 6 day period are indicated in Table 24.

In the third spell, continuous traffic volume and classification count was conducted for 7 days between 9th January 2006 and 15th January 2006. While the intensity of traffic volume was around 11,000 to 14,000 on 9th to 13th January 2006, it was highest at nearly 31,000 PCUs on the day of Makara Jyothi on 14th January 2006. The intensity of traffic volume was more towards Pampa on 9th, 10th and 11th January 2006 while it is more or less evenly distributed in both directions on 12th and 13th January 2006. The flow pattern was reversed with higher traffic intensity towards Pathanamthitta on 14th and 15th January 2006. The details of number of different categories of vehicles in either direction during the 7-day period during Makaravilakku season is indicated in Table 25.

It is observed that for around 4 to 5 days preceeding the peak Makaravilakku day, around 50,000 to 75,000 pilgrims (also taking into account that the trip towards Pampa is empty for 80percent KSRTC buses and trip to Nilakkal is empty for around 80percent of other buses) travelled towards Pampa on a single day, and around 40,000 to 70,000 returned to Pathanamthitta / Nilakkal / Plapally and the remaining were parked at Pampa and along road side. While on the day of Makaravilakku, around 80,000 to 1,00,000 pilgrims travelled to Pampa and around 2 lakh people moved towards Pathanamthitta.

Table 23: Traffic Volume Survey – Chalakkayam (15-12-05 to 19-12-05)

DATE	*DAY*	*DIRECTION*	*Buses*			*Vehicles*								*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger vans*	*Car/ Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (No.s.)*	*Total (PCUs)*
15-12-05	Thursday	Pathanamthitta	474	60	226	29	30	864	1590	142	161	4	23	26	7	0	3636	5592.5
		Pampa	478	62	208	34	25	967	2088	154	212	0	24	21	7	0	4280	6248.0
		TOTAL	**952**	**122**	**434**	**63**	**55**	**1831**	**3678**	**296**	**373**	**4**	**47**	**47**	**14**	**0**	**7916**	**11840.5**
16-12-05	Friday	Pathanamthitta	644	79	252	30	28	1032	2238	149	180	6	21	30	5	1	4695	7154.0
		Pampa	699	92	267	29	39	1033	2889	215	184	9	19	20	5	1	5501	8126.5
		TOTAL	**1343**	**171**	**519**	**59**	**67**	**2065**	**5127**	**364**	**364**	**15**	**40**	**50**	**10**	**2**	**10196**	**15280.5**
17-12-05	Saturday	Pathanamthitta	773	92	302	24	29	1301	3729	281	221	4	29	17	4	0	6806	9748.5
		Pampa	789	90	333	24	35	1241	3705	367	309	15	23	17	4	0	6952	9908.0
		TOTAL	**1562**	**182**	**635**	**48**	**64**	**2542**	**7434**	**648**	**530**	**19**	**52**	**34**	**8**	**0**	**13758**	**19656.5**
18-12-05	Sunday	Pathanamthitta	980	100	299	28	27	1401	2994	310	285	13	14	19	6	2	6478	9873.0
		Pampa	957	101	342	28	23	1490	2900	168	213	10	15	16	3	1	6267	9776.0
		TOTAL	**1937**	**201**	**641**	**56**	**50**	**2891**	**5894**	**478**	**498**	**23**	**29**	**35**	**9**	**3**	**12745**	**19649.0**
19-12-05	Monday	Pathanamthitta	926	110	419	29	37	1639	2680	167	167	27	20	17	3	0	6241	9956.0
		Pampa	889	131	385	22	39	1644	2420	119	153	14	19	20	3	0	5858	9476.0
		TOTAL	**1815**	**241**	**804**	**51**	**76**	**3283**	**5100**	**286**	**320**	**41**	**39**	**37**	**6**	**0**	**12099**	**19432.0**
TOTAL(Nos.)			**7609**	**917**	**3033**	**277**	**312**	**12612**	**27233**	**2008**	**2085**	**102**	**207**	**203**	**47**	**5**	**56714**	**85858.5**
ADT			**1521.8**	**183.4**	**606.6**	**55.4**	**62.4**	**2522.4**	**5446.6**	**401.6**	**417**	**20.4**	**41.4**	**40.6**	**9.4**	**1.0**	**11342.8**	**17171.8**

Table 24: Traffic Volume Survey – Chalakkayam (23-12-05 to 28-12-05)

DATE	*DAY*	*DIRECTION*	*Buses*											*Service Vehicles*			*Total*	
			Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/ Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos.)*	*Total (PCUs)*
23-12-05	Friday	Pathanamthitta	854	109	322	20	26	1681	3815	235	186	0	34	18	5	0	7305	10706.5
		Pampa	842	106	336	14	31	1738	3956	304	204	16	38	14	2	0	7601	10972.5
		TOTAL	**1696**	**215**	**658**	**34**	**57**	**3419**	**7771**	**539**	**390**	**16**	**72**	**32**	**7**	**0**	**14906**	**21679.0**
24-12-05	Saturday	Pathanamthitta	1268	156	497	15	21	2192	4273	308	227	16	28	18	6	1	9026	13897.0
		Pampa	1313	178	469	20	19	2714	3775	182	221	2	24	18	4	2	8941	14160.0
		TOTAL	**2581**	**334**	**966**	**35**	**40**	**4906**	**8048**	**490**	**448**	**18**	**52**	**36**	**10**	**3**	**17967**	**28057.0**
25-12-05	Sunday	Pathanamthitta	1184	109	312	9	11	1423	3447	158	167	9	19	12	3	0	6863	10726.0
		Pampa	1043	54	336	12	17	1145	1741	118	115	5	23	12	2	0	4623	8038.0
		TOTAL	**2227**	**163**	**648**	**21**	**28**	**2568**	**5188**	**276**	**282**	**14**	**42**	**24**	**5**	**0**	**11486**	**18764.0**
26-12-05	Monday	Pathanamthitta	834	4	25	19	23	309	1765	118	151	0	100	31	3	1	3383	5245.5
		Pampa	758	2	66	43	25	189	465	65	91	0	72	13	2	0	1791	3589.0
		TOTAL	**1592**	**6**	**91**	**62**	**48**	**498**	**2230**	**183**	**242**	**0**	**172**	**44**	**5**	**1**	**5174**	**8834.5**
27-12-05	Tuesday	Pathanamthitta	32	4	2	40	34	18	96	16	18	0	28	8	0	0	296	466.0
		Pampa	62	8	19	47	31	58	231	53	26	1	51	13	7	1	608	891.5
		TOTAL	**94**	**12**	**21**	**87**	**65**	**76**	**327**	**69**	**44**	**1**	**79**	**21**	**7**	**1**	**904**	**1357.5**
28-12-05	Wednesday	Pathanamthitta	4	1	0	89	82	0	82	54	18	0	72	2	0	0	404	627.0
		Pampa	6	0	0	49	45	36	208	68	16	0	28	3	0	0	459	600.5
		TOTAL	**10**	**1**	**0**	**138**	**127**	**36**	**290**	**122**	**34**	**0**	**100**	**5**	**0**	**0**	**863**	**1227.5**
TOTAL(Nos.) (6 days)			**8200**	**731**	**2384**	**377**	**365**	**11503**	**23854**	**1679**	**1440**	**49**	**517**	**162**	**34**	**5**	**51300**	**79919.5**
ADT			**1367**	**122**	**397**	**62.8**	**61**	**1917.2**	**3976**	**280**	**240**	**8.2**	**86.2**	**27**	**5.667**	**0.8**	**8550**	**13320**

Table 25: Traffic Volume Survey – Chalakkayam (09-1-06 to 15-01-06)

			Buses			*Vehicles*								*Service Vehicles*			*Total*	
DATE	*DAY*	*DIRECTION*	*Kerala Govt.*	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (No)*	*Total (PCUs)*
9/1/2006	Monday	Pathanamthitta	937	37	282	18	49	527	1468	93	124	12	35	12	4	0	3598	6374.0
		Pampa	1051	21	465	23	54	597	1977	62	102	11	49	20	11	0	4443	7854.0
		TOTAL	**1988**	**58**	**747**	**41**	**103**	**1124**	**3445**	**155**	**226**	**23**	**84**	**32**	**15**	**0**	**8041**	**14228.0**
10/1/2006	Tuesday	Pathanamthitta	663	23	122	15	59	403	1199	64	69	1	23	8	0	4	2653	4503.0
		Pampa	1146	16	218	20	99	790	2422	47	61	14	19	19	1	0	4872	8081.0
		TOTAL	**1809**	**39**	**340**	**35**	**158**	**1193**	**3621**	**111**	**130**	**15**	**42**	**27**	**1**	**4**	**7525**	**12584.0**
11/1/2006	Wednesday	Pathanamthitta	522	35	174	18	61	363	2188	66	84	0	34	12	2	4	3563	5243.0
		Pampa	798	29	226	8	63	541	2487	47	55	1	31	10	4	11	4311	6737.0
		TOTAL	**1320**	**64**	**400**	**26**	**124**	**904**	**4675**	**113**	**139**	**1**	**65**	**22**	**6**	**15**	**7874**	**11980.0**
12/1/2006	Thursday	Pathanamthitta	617	80	324	20	67	387	2309	67	79	3	36	2	5	13	4009	6313.0
		Pampa	591	68	301	30	74	426	2333	80	115	4	38	4	7	14	4085	6297.5
		TOTAL	**1208**	**148**	**625**	**50**	**141**	**813**	**4642**	**147**	**194**	**7**	**74**	**6**	**12**	**27**	**8094**	**12610.5**
13/1/2006	Friday	Pathanamthitta	725	60	474	23	57	344	1360	92	81	1	36	1	6	7	3267	6016.5
		Pampa	789	53	378	16	48	413	1456	84	151	5	37	3	2	28	3463	6147.5
		TOTAL	**1514**	**113**	**852**	**39**	**105**	**757**	**2816**	**176**	**232**	**6**	**73**	**4**	**8**	**35**	**6730**	**12164.0**
14/1/2006	Saturday	Pathanamthitta	3689	65	34	19	17	761	5999	65	240	1	92	2	19	17	11020	18974.5
		Pampa	3290	41	42	11	10	367	988	54	147	2	104	3	7	14	5080	12004.0
		TOTAL	**6979**	**106**	**76**	**30**	**27**	**1128**	**6987**	**119**	**387**	**3**	**196**	**5**	**26**	**31**	**16100**	**30978.5**
15/1/2006	Sunday	Pathanamthitta	1991	48	154	37	110	369	1466	73	195	11	112	4	17	25	4612	9292.5
		Pampa	1476	18	230	14	74	416	1480	48	127	6	127	2	16	19	4053	7777.5
		TOTAL	**3467**	**66**	**384**	**51**	**184**	**785**	**2946**	**121**	**322**	**17**	**239**	**6**	**33**	**44**	**8665**	**17070.0**
TOTAL(Nos)			**18285**	**594**	**3424**	**272**	**842**	**6704**	**29132**	**942**	**1639**	**72**	**773**	**102**	**101**	**156**	**63029**	**111615.0**
ADT			**2612**	**84.9**	**489**	**38.9**	**120**	**957.7**	**4162**	**135**	**234.1**	**10**	**110**	**15**	**14.4**	**22.3**	**9004**	**15945**

4.2 Volume and Capacity of Pampa – Sannidhanam route

The traditional trek route from Ganapathy Temple to Marakkoottam is about 1800 meters in length. Concrete steps and railings are provided for the first 1500 meters. The remaining length up to Marakkoottam is mud road on nearly level ground. The width of the concreted initial portion ranges between 3.95 meters and 7.40 meters. The trek path from Marakkoottam to Sabarimala via Sharamkuthi is 1100 meters in length and has width ranging between 2.90 m and 10.00 m. This trek path is unpaved, but is provided with railing almost over its entire length.

Swamy Ayyappan road is the newly laid (1970's) route between Ganapathy Temple and Marakkoottam. This road runs on the steep gradient without steps and is used both for passage of pilgrims and also for tractor movement during non peak days. This road is generally unpaved, but some stretches are paved with pebbles. This road has a length of about 2300 meters and has width ranging between 1.90 meters and 6.00 meters. The path between Marakkoottam and Sannidhanam along Chandranandan road is about 1300 meters in length. This road is generally unpaved mud road with small sections having concrete paving. This road has width ranging between 2.25 m and 5.80 meters. The orientation of the routes between Pampa and Sannidhanam is illustrated in Map 4.

4.2.1 Pilgrim Movement from Pampa to Sannidhanam

As indicated earlier in this report, pilgrims move from Pampa to Sannidhanam mainly through the traditional trek path, Swamy Ayyappan Road and Chandanandan Road. One-way movement is enforced usually during pilgrim season, with pilgrims climbing up through traditional path.

Currently flow of pilgrims through the two trek routes from Pamba to Sannidhanam are managed by the police. Practical capacity of the trek path with two-way movement is 4800 persons/hour and with one-way movement is 6000 persons/hour. Practical capacity of the Swami Ayyappan Road is 2400 persons/hour with one-way movement and 3750 persons/hour with two-way movementThe practical capacity of Chandranandan Road with with two-way movement is around 3200 persons/hour.

Old and invalid pilgrims who cannot undertake the trekking are being carried in doli; a type of bamboo couch / chair with extensions on the seat shouldered by four doli carriers. These doli carriers usually prefer the Swami Ayyappan route since this is not very steep. Administrative and service personnel also share the same paths. In case of emergency, same pathways are used by all to move up and down.

4.2.2 Goods Transport

Goods are transported from Pampa to Sannidhanam on donkeys, on tractors (except during peak season) and as head load. Study of the goods movement during the Sabarimala season reveals that nearly 145 tonnes of material were transported to Sannidhanam from Pampa. Of this, nearly 45 tonnes were carried by head load operators, and another 45 tonnes were transported by donkeys while nearly 55 tonnes were transported by tractors. Evidently, the movement of tractors, donkeys and the head load carriers on the trekking path impede the free flow of pilgrims.

a) Tractor Movement

A total of 17 tractors are operating between Pampa and Sannidhanam and they traverse through the Swami Ayyappan route and Chandranandan Road, which have flatter gradients. Each tractor makes an average of 3 trips taking materials from the warehouse near Ganapathy temple at Pampa to Sannidhanam. These include construction material like cement, sand, stones and materials for preparation of Prasadam such as sugar, rice, jaggery etc. Each tractor carries about 2 tonnes in each trip. The tractor movement is confined to one month before the commencement of the Sabarimala season, during which they are operational for about 25 days. Assuming the total number of tractors operating on any day as 15, the total quantity transported during the one-month period amounts to 2,250 tonnes.

b) Donkey Movement

Services of donkeys are utilised by TDB, shopkeepers and others for carrying their belongings / goods up and down between Pampa and Sabarimala during the peak pilgrim season. About 450 donkeys are pressed into service and they make an average of 3 return trips every day. During each trip, each donkey carries about 50 kg of materials. Between Ganapathy Temple at Pampa and for nearly 0.5 km beyond Marakkoottam, the donkeys travel along with pilgrims in the trekking pathway, beyond which they have a separate designated route to Sannidhanam. These donkeys are kept in subhuman conditions near Ganapathy Temple area (godowns) at Pampa and near Appam Aravana Complex / Godowns at Sannidhanam and cause severe pollution which has been reported to be spreading infectious diseases among wildlife. Donkeys also tread on walking pilgrims and cases have been reported regarding the infants and adult pilgrims being kicked and run down by donkeys. It has been proposed by all stakeholders that the donkeys should be phased out gradually. The donkeys are given prophylactic vaccination arranged by the Department of Forests at the check posts to diminish the spread of communicable diseases through them.

c) Head load by Porters

In addition to donkeys, porters are also being engaged for carrying goods between Pampa and Sannidhanam. Each porter carriers about 35 kg of head load. The porters mainly carry consumer items which are required by the various commercial establishments at the Sannidhanam. Lack of access to basic amenities while pilgrims queue up for nearly 2 to 8 hours during peaks, right from below Marakoottam to Nadapanthal at entry to Sannidhanam, difficulty to climb up and move down due to poor and irregularly laid pavement along trek path, multiple directional movements and multiple usages, lack of railings and canopy over the path, activities such as shops and beggars spilling into the ways, lack of demarcated ingress and egress during emergencies, unplanned services and utility lines are the main issues faced along the trek path.

4.3 Trekking Volume and Capacity of Uppupara – Sannidhanam route

The trekking path from Sathram to Sannidhanam involves a steep climb between Sathram and Seethakulam over a distance of 1.5 km, level track between Seethakulam and Uppupara for a length of 4.5 km and a gentle downward slope to Sannidhanam over a distance of about 6 kms. Maximum movement observed along the route is around 500 people per hour (single directional movement), during Mandalapooja day. During Makaravilakku, maximum movement velocity observed was 400 persons per hour (including bi-directional movement).

4.4 Trekking Volume and Capacity of Erumely – Pampa route

The trek route between Erumely and Pampa along Kalaketti and Valiyanavattom is about 50 km in length. This route passes through thick forests mostly of the PTR and involves steep climb at more than one location. Most dreaded climb is the Karimala reach. The passage is narrow and winding and varies between 3.5 m to 6.0 m in width. Kalaketti and Azhutha are main intermediate locations where basic pilgrim amenities like viri, water supply and sanitation, bathing and toilet facilities and provision of selected food and drink items are available. These facilities are available on a larger scale at Valiyanavattom and Cheriyanavattom on the banks of Njunangar very close to Pampa Ganapathy Temple.

According to latest pilgrim count, the highest number of pilgrim on any day on this trekking route during Mandalapooja season was around 12,000 whereas it was nearly 65,000 on the peak day during Makaravilakku season. Average movement density is 25,000 to 40,000. Maximum observed movement was during the three days preceeding the Makaravilakku with average movement velocity of 5,000 persons per hour.

4.5 Parking Studies

4.5.1 Pampa

Parking of vehicles is observed at three distinct locations at Pampa. These locations are Chakkupalam near KSRTC bus station, hill top parking and Thriveni parking on the riverside. The parking characteristics at each of these locations are observed to be distinctly different. Hence the parking data for these three locations are presented separately.

a. Chakkupalam

The peak parking accumulation at Chakkupalam area on a representative day during Mandalapooja season was observed to be 559 vehicles comprising of 489 passenger cars (including taxis), 56 passenger vans besides a few autos and light commercial vehicles. The details of parking survey at Chakkupalam on a representative day during Mandalapooja season is indicated in Table 26.

The survey was repeated on another representative day during the Makaravilakku season. The peak accumulation during this period was observed to be 1,669 vehicles. This comprises of 1,539 passenger cars (including Taxis) besides 95 passenger vans, 11 buses, 6 light commercial vehicles, 7 auto rickshaws, 5 two wheelers an 6 Government service vehicles. The details of parking accumulation at Chakkupalam area on a representative day during Makaravilakku season are indicated in Table 27.

The approximate area available for parking at Chakkupalam is about 6 acres. The duration of parking at this location ranges between 16 hours and 48 hours for cars and 24 hours to 60 hours for vans.

b. Hill Top Parking Area

The peak accumulation at hill top parking area at Pampa on a representative day during Mandalapooja period was observed to be 1308 vehicles comprising of 1168 passenger cars (including taxis), 39 passenger vans, 54 autos, 41 two wheelers, besides a few light commercial vehicles and service vehicles of the State Government. The details of parking

accumulation at the hilltop parking area on a representative day during the Mandalapooja season are indicated in Table 28.

The survey was repeated on another representative day during the Makaravilakku season. The peak accumulation during this period was observed to be 1693 vehicles comprising of 1638 cars (including taxis), 3 passenger vans, 3 autos, 12 service vehicles of police department and a few two wheelers. The details of parking accumulation on a representative day at Hilltop parking area during Makaravilakku season are indicated in Table 29. The extent of hill top parking area is about 2.2 hectares. The duration of parking at this location ranges between 8 to 36 hours for cars and vans.

c. Thriveni Parking Area

The peak accumulation of parked vehicles at Thriveni parking area on a representative day during Mandalapooja season was observed to be 660 vehicles comprising of 631 passenger cars (including taxis), 27 two wheelers besides two each of passenger van and auto rickshaw. The details of parking accumulation here are as indicated in Table 30.

The parking accumulation study was repeated on another day during the Makaravilakku season. The peak accumulation during this period at this location was observed to be 1597 vehicles comprising of 1500 passenger cars (including taxis), 14 passenger vans, 41 autos and 42 two wheelers. The details of parking accumulation at Thriveni parking area during Makaravilakku season are indicated in Table 31.

The extent of area now utilised for parking is about 3.2 hectares. The duration of parking ranges between 12 hours and 48 hours for cars and vans.

4.5.2 Roadside Parking between Nilakkal and Pampa

Apart from the off-street parking at Nilakkal and Pampa discussed earlier, isolated on-street parking activity is observed all along the road between Nilakkal and Pampa. Details of such on-street parking of different categories of vehicles are indicated in Table 32. The duration of parking ranges between 16 hours and 48 hours. This parking reduces the practical capacity of the way and results in bottlenecks and queuing up for hours together to reach the holy destination. Now the vehicles move around the entire pampa area to off load pilgrims, to fill fuel and to find a place to park at these scattered locales. Vehiclular cross movements to and from these parking locations creates points of vehicular – vehicular, vehicular – pedestrian conflicts at Pampa and makes the location pedestrian unfriendly. It could be inferred that around 4,500 vehicles are parked for a minimum of 8 hours to maximum of around 60 hours in and around Pampa waiting for the pilgrims to return, indicating the current pattern of around 30,000 persons getting off loaded near Pampa on an indicative peak day in addition to those offloaded by the private and KSRTC buses and around 4,000 drivers and other support personnel just waiting around for the above mentioned duration without adequate access to facilities and services.

Table 26: Pampa - Chakkupalam - Parking Accumulation - 19-12-2005

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
10.00	0	0	2	0	2	56	489	10	0	0	0	0	0	0	559
12.00	0	0	2	0	1	58	469	13	0	0	0	0	0	0	543
14.00	0	0	1	0	0	65	420	8	0	0	0	0	0	0	494
16.00	0	0	1	0	0	64	337	2	0	0	0	0	0	0	404
18.00	0	0	1	0	0	58	256	1	0	0	1	0	0	0	317
20.00	0	0	1	0	0	64	265	1	0	0	0	0	0	0	331
22.00	0	0	1	0	0	76	254	1	0	0	0	0	0	0	332
0.00	0	0	1	0	0	82	260	1	0	0	0	0	0	0	344
2.00	0	0	1	0	0	89	277	1	0	0	0	0	0	0	368
4.00	0	0	1	0	0	92	305	1	0	0	0	0	0	0	399
6.00	0	0	1	0	0	89	326	1	0	0	0	0	0	0	417
8.00	0	0	0	0	0	101	351	2	0	0	0	0	0	0	454

Table 27: Pampa - Chakkupalam - Parking Accumulation - 14-01-2006

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
10.00	0	0	7	0	10	74	1468	4	0	0	0	2	0	0	1565
12.00	0	0	8	0	8	67	1498	4	0	0	0	5	0	0	1590
14.00	0	0	8	0	9	78	1488	5	0	0	0	6	0	0	1594
16.00	0	0	6	0	2	81	1502	5	5	0	0	5	0	0	1606
18.00	0	1	10	0	6	95	1539	7	5	0	0	6	0	0	1669
20.00	0	1	10	0	3	88	1284	7	5	0	0	6	0	0	1404
22.00	0	1	8	0	1	55	834	3	5	0	0	4	0	0	911
0.00	0	0	3	0	1	23	690	2	1	0	0	4	0	0	724
2.00	0	0	3	0	1	16	585	1	0	0	0	2	0	0	608
4.00	0	0	3	0	0	16	572	1	0	0	0	2	0	0	594
6.00	0	0	3	0	1	14	490	0	0	0	0	2	0	0	510
8.00	0	0	2	0	1	10	357	0	0	0	0	2	0	0	372

Table 28: Pampa - Hill Top - Parking Accumulation - 19-12-2005

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
9.00	0	0	0	0	0	28	1045	60	30	0	0	0	0	0	1163
11.00	0	0	0	0	0	18	727	53	22	0	0	0	0	0	820
13.00	0	0	0	0	0	29	678	35	20	0	0	0	0	0	762
15.00	0	0	0	0	1	29	547	27	22	0	0	0	0	0	626
17.00	0	0	0	0	3	29	786	36	36	0	0	4	0	0	894
19.00	0	0	0	0	2	37	729	42	33	0	0	4	0	0	847
21.00	0	0	0	0	3	39	848	43	34	0	0	2	0	0	969
23.00	0	0	0	0	3	39	730	40	35	0	0	2	0	0	849
1.00	0	0	0	0	2	42	796	44	34	0	0	2	0	0	920
3.00	0	0	0	0	0	30	814	45	40	0	0	2	0	0	931
5.00	0	0	0	0	3	25	1012	39	41	0	0	3	0	0	1123
7.00	0	0	0	0	2	39	1168	54	41	0	0	4	0	0	1308

Table 29: Pampa - Hilltop - Parking Accumulation - 14-01-2006

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./ TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (No:s)*
10.00	0	0	0	0	0	6	1324	4	56	0	29	0	0	0	1419
12.00	0	0	0	0	0	3	1638	3	37	0	12	0	0	0	1693
14.00	0	0	0	0	0	0	1418	3	42	0	16	0	0	0	1479
16.00	0	0	0	0	0	0	1418	3	42	0	16	0	0	0	1479
18.00	0	0	0	0	0	0	1213	2	31	0	16	0	0	0	1262
20.00	0	0	0	0	0	0	983	1	26	0	12	0	0	0	1022
22.00	0	0	0	0	0	0	739	1	19	0	11	0	0	0	770
0.00	0	0	0	0	0	0	701	0	16	0	11	0	0	0	728
2.00	0	0	0	0	0	0	627	0	9	0	9	0	0	0	645
4.00	0	0	0	0	0	0	413	0	8	0	8	0	0	0	429
6.00	0	0	0	0	0	0	403	0	8	0	8	0	0	0	419
8.00	0	0	0	0	0	1	376	0	10	0	9	0	0	0	396

Table 30: Pampa - Thriveni - Parking Accumulation - 19-12-2005

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos.)*
10.00	0	0	0	0	0	10	1825	49	64	0	0	0	0	0	1948
12.00	0	0	0	0	0	10	1882	40	55	0	0	0	0	0	1987
14.00	0	0	0	0	0	9	1949	42	56	0	0	0	0	0	2056
16.00	0	0	0	0	0	12	1981	40	60	3	0	0	0	0	2096
18.00	0	0	0	0	0	15	2072	41	67	0	0	0	0	0	2195
20.00	0	0	0	0	0	13	1723	37	59	0	0	0	0	0	1832
22.00	0	0	0	0	0	10	1503	25	42	0	0	0	0	0	1580
0.00	0	0	0	0	0	8	1429	18	32	0	0	0	0	0	1487
2.00	0	0	0	0	0	8	1198	11	27	0	0	0	0	0	1244
4.00	0	0	0	0	0	7	1169	10	37	0	0	0	0	0	1223
6.00	0	0	0	0	0	6	1133	12	39	0	0	0	0	0	1190
8.00	0	0	0	0	0	10	1073	11	33	0	0	0	0	0	1127

Table 31: Pampa - Thriveni - Parking Accumulation - 14-01-2006

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi /Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt./TDB*	*Fire service/ Ambulance*	*Others*	*TOTAL (No:s)*
10.00	0	0	0	0	0	6	1324	4	56	0	29	0	0	0	1419
12.00	0	0	0	0	0	3	1638	3	37	0	12	0	0	0	1693
14.00	0	0	0	0	0	0	1418	3	42	0	16	0	0	0	1479
16.00	0	0	0	0	0	0	1418	3	42	0	16	0	0	0	1479
18.00	0	0	0	0	0	0	1213	2	31	0	16	0	0	0	1262
20.00	0	0	0	0	0	0	983	1	26	0	12	0	0	0	1022
22.00	0	0	0	0	0	0	739	1	19	0	11	0	0	0	770
0.00	0	0	0	0	0	0	701	0	16	0	11	0	0	0	728
2.00	0	0	0	0	0	0	627	0	9	0	9	0	0	0	645
4.00	0	0	0	0	0	0	413	0	8	0	8	0	0	0	429
6.00	0	0	0	0	0	0	403	0	8	0	8	0	0	0	419
8.00	0	0	0	0	0	1	376	0	10	0	9	0	0	0	396

Table 32: Nilakkal to Pampa - Roadside Parking Accumulation - 19-12-2005

Time Interval	*Buses*			*Vehicles*							*Service Vehicles*			*Total*	
	Kerala Govt.	*Other Govt.*	*Others*	*Trucks*	*LCVs*	*Passenger Vans*	*Car/Taxi/ Jeep*	*Auto*	*Two Wheeler*	*Cycle*	*Police*	*Govt. / TDB*	*Fire service/ Ambulance*	*Others*	*Total (Nos)*
8.00	1	4	2	1	1	8	11	2	1	0	3	0	0	3	37
10.00	0	0	3	2	1	12	25	2	4	2	3	0	0	3	57
12.00	0	2	1	1	0	16	16	2	3	2	3	0	0	2	48
14.00	0	3	0	1	2	10	21	3	3	1	3	0	0	2	49
16.00	0	2	1	1	2	12	12	2	2	0	2	0	0	2	38
18.00	0	2	1	2	0	15	16	1	0	2	3	0	0	2	44
20.00	0	0	3	1	0	8	11	1	0	0	3	0	0	2	29
22.00	0	0	1	0	0	11	7	1	0	0	3	0	0	2	25
0.00	0	0	3	0	0	6	3	1	0	0	3	0	0	2	18
2.00	1	0	3	0	0	8	5	1	0	0	3	0	0	2	23
4.00	1	0	2	0	0	7	12	1	0	0	3	0	0	2	28
6.00	1	0	7	0	1	3	4	3	0	0	3	0	0	2	24

5. REVIEW OF EXISTING MAJOR PROPOSALS

Reviews of main proposals which are in advanced stages of conception and / or implementation by various agencies have been carried out as a part of this module to examine their suitability in the current context.

1. Development of Railway Networks
2. Widening of Pampa – Plappally Road
3. Ropeway from Pampa to Sannidhanam
4. Road from Erumely to Pampa through Kissimum and Attathodu

5.1 Development of Railway Network

a) Angamaly – Azhutha Railway Line

General Description and Progress Status

Proposals for forming a direct railway linkage between Angamali on Thrissur Ernakulam broad Gauge Line to Erumely through Perumbavur, Muvattupuzha, Thodupuzha, Pala and Kanjirapally have been initiated by the Ministry of Railways, Government of India (Map 5). Initial proposal is for extending this line to Punalur. The preliminary surveys have been completed and the land acquisition is in progress along the initial stretches starting from Angamali. Total length of this rail would be 147 km with 17 stations, 27 tunnels, 20 underpasses, 14 over passes and many railway crossings on MC road, KK road, Muvattpuzha – Punalur Road, Ettumanoor – Poonjar Road and Ernakulam – Erumeli road. The stations proposed by the Railways in the immediate region of influence of Sabarimala pilgrimage which have been included in the first phase of the project are Erumely and Azhutha. This would be used mainly by the Sabarimala pilgrims and other inter state travelers would not be using this network. It is expected that the initial stretch to Azhutha would get completed by year 2030 if the pace is further unhindered by local oppositions against acquisition, as faced by the earlier proposed (but now abandoned) project on linking Kottayam to Erumely.

Cost Estimation

The project of forming the rail link between Angamali and Erumely for about 135 kms was estimated to cost Rs.550 cores as per the prevailing rates during 1997-98. This could well exceed Rs. 800 cores considering the inflation and resultant cost escalation.

Importance with respect to Sabarimala

Once this is completed, most of the pilgrims arriving to Sabarimala from the North including Andhra and Karnataka States would prefer to come by train as against the road travel from Ernakulam, Kottayam or Chengannur as at present. This would reduce the congestion on regional roads and decrease the travel, accident and other social costs associated with road development and traffic through thickly populated areas of Kerala.

Issues

- The pattern of pilgrimage would drastically undergo a change once this gets completed. The impact would be greater than that catapulted by the road connection from Mannarakulanji to Pampa (in 1970's) which completely changed the pattern of pilgrimage from the traditionally followed patterns.

- The infrastructure requirements at Erumely would increase manifold, not only to cater to the requirement of the pilgrims, but also to serve as a regional market hub, being the nearest rail link to the high ranges, the spice fields of Kerala.
- The project would involve large scale displacement of habitations and agricultural fields.
- Azhutha, at the edge of the PTR would become a nodal transit point for pilgrims. Large scale developments which would be required here may affect the forest edge. This place is also a main pilgrim transit point in the traditional pilgrim route to Sabarimala. Further urbanization here would add to reducing the traditionally followed path which is already far away from restoration starting from Erumely to Peruthodu. This impact would add to commercialization, growing demand for creating facilities along the forest edge and in turn diminishing the importance of traditional route to Sabarimala through the Forests.
- Proposed alignment would require large scale land acquisitions.

Suggestions

- Initial development of the proposed rail link should be restricted till Erumely Town.
- Further development of the rail from Erumely should follow systematic review after a detailed Social and Environmental Impact Assessment to analyze the impacts of such rail development on the PTR and the traditional pilgrimage pattern.

b) Railway Gauge Conversion: Thenkasi – Kollam

General Description and Progress Status

Presently, the railway line up to Thenkasi on Virudunagar – Thenkasi – Kollam section is Board Gauge and the section between Thenkasi to Kollam is in Meter Gauge operation. The Railway Administration has taken up conversion of the 8 km Thenkasi – Shenkottai section and the work is expected to be completed shortly. Similarly, the 45 km stretch between Punalur and Kollam is also expected to be completed by the end of this year. After this, the 49 km section between Shenkottai and Punalur is expected to be taken up for conversion. Once this work is completed, pilgrims can conveniently come to Punalur and proceed to Sabarimala by bus. This will increase the patronage and consequently, the pilgrim movement along Punalur – Pathanamthitta – Pampa road will also increase significantly.

Importance with respect to Sabarimala

The meter gauge railway line between Kollam and Thenkasi has been taken up for conversion to broad gauge in phases. Because of the existing multi-gauge operation, the pilgrims from southern Tamil Nadu do not prefer to come to Sabarimala by train up to Punalur due to the delays even though this provides a shorter link. Once the guage conversion is completed, trans-shipment at Thenkasi will be eliminated and more number of direct broad gauge trains could be operated from Tamil Nadu. Therefore, the pilgrim arrival at Punalur is bound to increase and the required transfer and travel facilities should be contemplated at this stage.

Suggestions

- Development of Punalur and Aryankavu Temple as important transit nodes with sufficient pilgrim facilities

- Development of temple tourism circuits from Punalur and Aryankavu connecting various Sastha temples of importance enroute Sabarimala

5.2 Widening of Mannarakulanji Pampa Road and Karingallumuzhi Elavumkal Road

General Description and Progress Status

Government of Kerala had proposed the widening of Mannarakulanji – Plappally and Karingallumuzhi – Elavumkal sections to standard four lanes and Plappally – Pampa section to a four lane corridor, based on a Detailed Project Report prepared for the same. Out of this, the Karingallumuzhi - Elavumkal section is under completion and would soon be open to pilgrim traffic. However, the widening of remaining stretches has not been initiated. In 2005, the government had submitted a memorandum to the Hon'ble Prime Minister of India to request co-operation to take this proposal forward considering the demands of the pilgrims.

Importance with respect to Sabarimala

Mannarakulanji – Pampa road is the most widely used road stretch by more than 80percent of the pilgrims visiting the shrine as it is the only road connectivity to Pampa at the foot hill of Sabarimala. The two roads viz., Mannarakulanji - Plappally (from south) and Karingallumuzhi - Elavumkal (from north) together has been suggested for upgradation / development to four lanes. It has been estimated that 26.0 km stretch passes through Reserve Forests and requires around 22.20 ha of land for widening. It is expected that the stretch Mannarakulanji – Plapally – Elavumkal – Karingallumoozhi would serve easy pilgrim movement to and from northern and southern parts of Kerala.

Cost Estimation

The proposal in brief with estimated cost as per project report is as given below:

Two standard two-lane corridors listed below	**Length (in Kms)**	**Cost (Rs. in Crores)**
Mannarakulanji – Plappally	32.0	20.72
Karingallumuzhi – Elavumkal	22.3	60.42
Total	54.3	81.14
One Standard four-lane corridors listed below		
Plappally – Pampa	26.0	95.74
Total	**83.0**	**176.88**

Issues

Plappally - Pampa section passes through reserve forests and wildlife reserves and involves extensive and unavoidable rock cutting which would need to be carried out under controlled conditions, so as to not to disturb the wild life. In addition, resettlement and rehabilitation issues and other disturbances to the indigenous people need closer scrutiny.

Suggestions

This corridor would need detailed environment impact assessment (EIA) study and clearance from the Ministry of Environment and Forests as per prevailing laws and rules.

A detailed study on this road has been undertaken as part of the Master Plan. The proposal for widening is elaborated in *Section 6.4.1* of this report.

5.3 Ropeway from Pampa to Sannidhanam

General Description and Progress Status:
One of the main recommendations of the stakeholders including Travancore Devaswom Board and the earlier Master Plans for Sabarimala is the construction of a Ropeway from Pampa to Sannidhanam. During several high level meetings on Sabarimala Master Plan, stakeholders have highlighted the need for introducing a ropeway here. This has been proposed to ease out the transportation of men and materials from Pampa to Sannidhanam. TDB had earlier facilitated a survey to ascertain the feasibility of introducing such a ropeway.

Importance with respect to Sabarimala
The voiced objective of the stakeholders to set up the ropeway is to avoid the deployment of donkeys for carrying goods/materials to the Sannidhanam in addition to controlling the movement of tractors from Pampa to Sannidhanam during off seasons, which cause uncontrollable soil erosion along the Swamy Ayyappan and Chandranandan Road.

The donkeys which move along with the pilgrims through the trek paths hinder with the movement of pilgrims. It is reported that there have been many incidences when they have stepped over and kicked the pilgrims. In addition, incidences of carcasses of diseased donkeys left in the nearby forest areas and chances of spreading of communicable diseases among wild life through the donkeys, which are in constant contact with humans are important to be considered from the ecological point of view. This exposes the need to phase out the donkeys from service. It is desirable to opt for better alternatives to transport goods from Pampa to Sannidhanam.

Provision of ropeway between Pampa and Sannidhanam will be helpful in conveying goods and materials intended for pooja (for Appam Aravana Preparation) and for pilgrim facilities at Sannidhanam and also construction materials needed uphill from time to time. It could be made use of in transporting sick and invalid persons and also in shifting people during emergencies. Goods are required for minimal sustenance of few thousands of people at Sannidhanam including staff and officials and for food facilities (*annadanam) for atleast* around *10,000* pilgrims a day, construction and demolition activities in around 60 acres of Sannidhanam area and for Appam Aravana preparation.

Cost Estimation
TDB sources reports that around Rs. 80 crores would be required to set up a ropeway as per current value of money.

Issues
Provision of ropeway between Pampa and Sannidhanam will be helpful in conveying goods and materials intended for pooja and for pilgrim facilities at Sannidhanam and also construction materials needed uphill from time to time. It must be remembered that ropeway is not a viable proposition for transporting pilgrims on a large scale. However, it may be made use of in transporting sick and invalid persons and also in shifting people during emergencies. In addition, authorities should take care to see that this is not misused and hamper the traditionally followed customs or beliefs associated with the traditional “trekking nature” of the pilgrimage.

Main issues are:

- Large extend of land (around 9 acres) is required for installation though the ropeway runs aerially considering the safety aspects and installation requirements.
- Trees present at the points of ingress and egresses well as to the sides all along the ropeway may need to be cut for installation and safety.
- Need to consider possible short-circuiting and other disasters[1] though safety aspects are usually considered by operators
- Ropeway may act as a line of fire or disaster right from Pampa to Sannidhanam in case of any emergencies in addition to possibility of being a subject / means for a sabotage

Suggestions

Development of such large scale infrastructure which requires land modifications and / or tree cutting or massive construction requirements in the fragile ecosystem of the PTR need to carried out after conducting **proper Environmental Impact Assessment Studies.** Suitable **social (including aspects related to tradition and beliefs) consideration** also needs to be built in into the detailed study.

While planning for the ropeway between Pampa and Sannidhanam, the following need to be considered:

1. Topography and pristine nature of the place
2. Location in the unique tiger reserve
3. Safety and security aspects
4. Traditional customs and beliefs

Hence it is required to understand the best possible option for goods transport which would

- Require least area for setting up
- Require less time to set it up
- Require minimal cutting of trees
- Require only minimal land modifications
- Pose no hindrance to moving wildlife
- Ensure safety of goods, structures, and the living environment including the operators, other users of right of way including the wildlife
- Require minimal maintenance
- Ensure emergency evacuation of pilgrims (only) in case of disasters
- Pose minimal risk in case of disasters, like fire
- Ensure sufficient environmental conservation and upgradation efforts during the construction phase and post construction phase

5.4 Attathodu Road

General Description and Progress Status

To solve the issue of single road access to Pampa, studies conducted by National Transportation Planning and Research Centre (NATPAC) have identified a possible road alignment between Thulappally and Pampa along Kissimum and Attathodu. This road alignment runs along Pampa River on its south bank. This proposal was not carried forward for implementation due to the extent of possible environmental issues related to the development of such a road.

[1] as has happened during the past with some ropeways in the country and abroad

Importance with respect to Sabarimala

The alternate route proposed between Thulappally and Pampa along Kissimum and Attathodu was expected to serve as an alternative access to Pampa and also as an emergency escape route in case of any blockage of the Plappally – Chalakkayam – Pampa route.

Issues and Suggestions

It is necessary to consider the environmental impact of the proposed formation of Thulappally – Pampa road along Kissimum and Attathodu since the proposed alignment runs closely along the river Pampa. This alignment passes through thick Reserve Forest Area and any construction activity here will result in severe damage to environment and affect the flora and fauna during the construction and operation stage on the fragile environment. The movement of vehicles on this road during Sabarimala season will also result in similar environmental degradation. This has been highlighted by the NATPAC who has carried out the study and it is not considered desirable to embark on this proposal.

Development of such a road would not cater for the pilgrims from the Pathanamthitta side, as they would still consider movement through the Mannarakulanji – Chalakkayam - Pampa route. In order to reduce the pollution of River Pampa at Pampa and considering the need to minimise the congruence of pilgrims at the seam of the PTR at Pampa, Nilakkal has been proposed to be developed as the main base camp for Sabarimala. Hence, additional facilities to aid movement of pilgrims to Pampa may not be critical.

Possible alternate construction pointed out by certain quarters, by raising the two-lane road above ground level over pillars at critical sections so as to avoid cutting of thick jungle and to avoid conflict with wild life, may not be feasible as the construction of such a raised road would anyway require tree cutting all along during the construction phase, even if the alignment is proposed much higher than the tree canopies. Construction of a raised road would also require much time and resources to be spend and the impacts related to such construction on the social and environmental scenario would be crucial. Such a raised road would negate the possibility to escape through side routes in case of an emergency or traffic congestion. In addition this would require large-scale investment which would necessitate collection of a part of the cost incurred from the pilgrims during the two-month period.

Such huge investment in terms of land and resources may not be justifiable considering the fact that the road would be used only during Sabarimala pilgrim seasons. If it is a raised road, no other settlement enroute would have accessibility to the said road and creation of such accesses would demand further resources and depletion of environmental resources.

Even if this road is developed, widening of existing Pampa – Chalakkayam road would become a necessity considering the pilgrim traffic flow patterns and the on-going developmental works. Restricting the type of modes and ensuring controlled traffic flow rather than allowing haphazard and uncontrolled movement from Nilakkal to Pampa would help to increase the practical capacity of the road and control of traffic during emergencies. It is advisable commercially and environmentally to widen an existing road than to construct a new highway through this environmentally fragile area.

It cannot be assumed that in case of sabotage along Pampa – Chalakkayam road, this road can positively serve as an alternate route as the possibility of targeting both accesses converging at a particular destination cannot be overruled. Further, escape routes such as Erumely trek

path and Uppupara trek path with enroute transit stations are present in addition to few forest Koop roads for use during such extreme emergencies.

Suggestions

Development of this road may be discussed in the context of analysing the pilgrim growth and traffic pattern after 2030, which may be altered by the construction of rail link to Erumely. In that case also, the construction of additional access to Pampa through forests should be based on suitable Environmental Impact Assessment studies and after considering other eco-friendly alternatives.

5.5 Conclusion

1. Construction of rail link from Angamali to Erumely would be beneficial to Pilgrims. However,
   - Initial development of the proposed rail link should be restricted till Erumely
   - Further development of the rail from Erumely should follow systematic review after a detailed Social and Environmental Impact Assessment to analyze the impacts of such rail development on the PTR and other forests and the traditional pilgrimage pattern.
2. Gauge construction of Thenkasi – Kollam rail link would be beneficial to Pilgrims, Following activities should be undertaken for the benefit of pilgrims:
   - Development of Punalur and Aryankavu Temple as important transit nodes with sufficient pilgrim facilities
   - Development of temple tourism circuits from Punalur and Aryankavu connecting various Sastha temples of importance enroute Sabarimala
3. Pampa – Plappally Road to be developed after EIA studies and applicable Resettlement and Rehabilitation studies for the benefit of the pilgrims. Detailed guidelines for phased development provided in *Section 6.4.1* of this report
4. Ropeway from Pampa to Sannidhanam to transport goods may be developed after conducting a detailed environmental and social assessment study through a nationally recognized agency
5. Development of this road may be discussed in the context of analysing the pilgrim growth and traffic pattern after 2030, which may be altered by the construction of rail link to Erumely. In that case also, the construction of additional access to Pampa through forests should be based on suitable Environmental Impact Assessment studies and after considering other eco-friendly alternatives.

6. PRIORITISATION OF REQUIREMENTS AND PROPOSED INTERVENTIONS

6.1 Development Vision

Movement facilities for the pilgrims in the region and at Sabarimala per se, with adequate care on conserving the environment and mitigating the existing environmental issues associated with such movement

6.2 Issue Prioritisation

The following issues are to be addressed to improve the transportation network in the region and pilgrim management at Sabarimala.

- Lack of adequate capacity of sections of the existing network to meet the traffic demand generated by the pilgrimage;
- Poor road conditions in several sections of the road network used for the purposes of the pilgrimage
- Poor road and intersection geometry, pavement and shoulder conditions and parking facilities at major intermediate halt points amidst Sabarimala pilgrimage
- Lack of rapid transportation system and modal integration to ensure efficient connectivity to pilgrims arriving from different locations using diverse modes of transport
- Extremely congested conditions in Pampa and along the stretch of road from Chalakkayam to Pampa due to deficiency in traffic regulation, multiplicity of transport modes; and inadequate facilities for traffic dispersal
- Deficiencies in the system for transporting goods from Pampa to Sannidhanam; which currently consist of tractor movement along unpaved tract during the month before start of the season and donkey movement along the pilgrim routes during season; and
- Severe traffic congestion between Chalakkayam and Pampa and also in the Erumely-Nilakkal segment leading to very low speeds, longer waiting time and increased pollution
- Severe crowding at Pampa and at Sannidhanam
- Lack of basic facilities along the trekking routes
- Emergency Evacuation and Disaster Management

Based on the detailed studies conducted, specific development interventions have been formulated. These include the following:

i. Development of existing road network in the region.
ii. Formation of new link roads
iii. Development of major bus stations
iv. Development of base and transit stations
v. Development of railway network
vi. Development of pilgrim facilities at Pampa.
vii. Improvements to pilgrim trek routes
viii. Development of queue complex
ix. Development of alternate transport options

Specific observations and detailed interventions on each of the above are detailed in the succeeding sections.

6.3 Suggested Interventions for Regional Transportation

Based on the findings of these studies, specific improvement proposals, both for short term as well as long term, have been formulated. The implementation of these development proposals will go a long way in improving the conditions of the pilgrims, at the same time ensuring optimization of available resources and improving upon them wherever essential.

6.3.1 Improvements to Existing Road Network

As detailed earlier, the primary routes of pilgrims arriving for Sabarimala are as follows:

- Kottayam – Kanjirapally – Erumely – Mukkuttuthara – Thulappally – Plappally – Chalakkayam – Pampa.
- Kottayam – Kanjirappally – Erumely – Kanakappalam – Athikkayam – Perinad – Laha – Plappally – Chalakkayam – Pampa.
- Kottayam – Ponkunnam – Pondanpuzha – Athikkayam – Perinad – Laha – Plappally – Chalakkayam – Pampa.
- Thiruvalla – Kozhenchery – Ranni – Perinad – Plappally – Chalakkayam – Pampa.
- Thiruvalla – Vennikulam – Ranni – Perinad – Plappally – Chalakkayam – Pampa.
- Pantalam – Pathanamthitta – Vadaseriakkara – Perinad – Chalakkayam – Pampa.
- Chengannur – Kozhenchery – Ranni – Perinad – Plappally Chalakkayam – Pampa.
- Chengannur – Kozhenchery – Pathanamthitta – Vadasserikkara – Perinad – Plappally – Chalakkayam – Pampa.
- Punalur – Pathanapuram – Pathanamthitta – Vadasserikkara – Perinad – Plappally – Chalakkayam – Pampa.
- Kumily – Vandiperiyar (Kakki Kavala) – Vallakkadavu – 4th Mile – Uppupara.

As discussed earlier in this report, traffic volume studies were conducted in all these segments during the Sabarimala pilgrim season during 2005 – 06. Except for the route Kumily – Vandiperiyar – Vallakkadavu which caters to pilgrims arriving from the North East, all other routes converge at Plappally and the highest intensity of pilgrim traffic occurs in Plappally – Chalakkayam – Pampa segment. Considering its proximity to the destination, interventions suggested for Plappally – Chalakkayam – Pampa segment has been presented in the section dealing with specific interventions for Sabarimala. Proposals for improving other road links have been presented here.

a) Punalur – Pathanapuram – Konni – Pathanamthitta Section

The traffic intensity observed on Punalur – Pathanapuram – Konni – Pathanamthitta section during Sabarimala pilgrim season 2005 – 06 was 23,337 PCUs.

Considering the general traffic growth and the pilgrim movement and thus adopting a growth factor of 4 percent per annum (for entire traffic) up to year 2015 and 3 percent thereafter, the likely traffic intensity during year 2015 and 2030 will be 34,500 and 54,000 passengers car units respectively. Since this peak intensity occurs only during the limited period of Sabarimala pilgrim season, it is adequate to provide for level of service 'C'. This will however provide for a better level of service approaching level of service 'B' during other periods of the year. (According to Indian Roads congress (IRC) 64-1990, the practical capacity of a two lane road in rolling terrain under level of service B adopting a peak hour factor of 10 percent can be taken as 11,000 PCUs. Here, the peak hour factor during the peak pilgrim season is observed to be of the order of 6 to 6.5

percent. It is also considered that a level of service 'C' which provides a speed of around 50 kph is adequate for design purposes. The practical capacity of a two lane road under the above conditions will be around 25,400 PCUs. Under conditions of level of service 'D' which provides a speed of around 25 – 30 kph, the maximum capacity of a two lane road will be around 30,000 PCUs).

The average carriageway width now available is around 6.70 m. This will accommodate a traffic intensity of around 24,000 PCUs under level of service 'C' at a peak hour factor of 6.5 percent. Hence, the present carriageway width would be able to cater the traffic demand up to year 2015, beyond which further widening to provide for 4 lanes would have to be considered.

b) Pathanamthitta – Vadasserikkara – Perinad – Plappally Section

The observed peak traffic intensity at three locations in Pathanamthitta – Vadasserikkara – Perinad – Plappally section during the peak pilgrim season of 2005- 06 was 10,608, 12,633 and 10,660 PCUs respectively. Adopting the higher volume of 12,633 PCUs for design purposes and adopting a growth rate of 4 percent up to year 2015 and 3 percent thereafter, the design service volume for years 2015 and 2030 will be 18,700 and 29,200 PCUs respectively.

The available carriageway width of this road is around 7.0 meter. The practical capacity of this road at level of service 'C' at a peak hour factor of 6.5 percent will be 25,400 PCUs. This traffic intensity will be reached during year 2025. In order to accommodate the increasing traffic volume in this section during the peak pilgrim season, it is recommended that one way operation be introduced in the section Vadasserikkara to Plappally and the traffic in the return direction could be routed through Plappally – Angamuzhi – Chittar – Vadasserikkara road. Hence, only the section between Pathanamthitta to Vadasserikkara needs to be widened to 7.0m by the year 2015 to accommodate future growth in traffic.

Suitable traffic management facilities be created / maintained and managed at intersections.

c) Kottayam – Kanjirapally Section

According to the traffic studies conducted during the 2005-06 Sabarimala pilgrim season, the peak traffic intensity on Kottayam – Kanjirapally section was 16,637 PCUs during the Mandalapooja period and 21,260 PCUs during the Makaravilakku season. This road is National Highway No. 220 and has a uniform carriageway width of 7.0 meters. Adopting a peak hour factor of 6.5 percent, the practical capacity of the existing road under level of service 'C' will be 34,600 PCUs. Adopting an average annual growth of 5 percent in traffic volume up to year 2015 and 3 percent thereafter, the estimated traffic volume in this section will be 34,600 and 53,900 PCUs during 2015 and 2030 respectively. Hence, the existing carriageway width would be adequate to cater to the traffic demand up to year 2015 beyond which the road needs to be widened to 4 lanes.

d) Vandiperiyar – Kumily Section

According to traffic studies conducted during the 2005 –06 Sabarimala pilgrim season, the peak traffic intensity on Vandiperiyar – Kumily section of NH220 was 7,010 PCUs during Mandalapooja season and 7,759 PCUs during Makaravilakku season. Adopting a

peak hour factor of 6.5 percent, the practical capacity of the existing road under level of service 'C' will be 25,400 PCUs per day. Adopting an average annual overall traffic growth rate of 5 percent up to year 2015 and 3 percent thereafter, the estimated traffic volume in this section will be 12,600 and 19,650 PCUs during years 2015 and 2030 respectively. Since the practical capacity of this road section is 25,400 PCUs as discussed earlier, no further widening is called for to cater to future traffic demand.

e) Kanjirapally – Erumely Section

The traffic intensity observed on Kanjirapally – Erumely section during Sabarimala pilgrim season of 2005 – 06 was 8,903 PCUs per day. Adopting an annual growth rate of 4 percent up to year 2015 and 3 percent thereafter, the expected traffic intensity on this section will be 13,200 and 20,500 PCUs during years 2015 and 2030 respectively. This road has an average carriageway width of about 6.50 meters. The practical capacity of this road at level of service 'C' adopting a peak hour factor of 6.5 percent is 23,600 PCUs. Hence the existing road width would be adequate to cater the anticipated traffic demand in year 2030. However this road could be widened to provide a standard width of 7.0 meters over the entire stretch to facilitate smooth and efficient traffic movement.

f) Erumely – Mukkuttuthara – Thulappally – Plappally Section

The road to Pampa from Erumely branches off at Karimgallumuzhi on Erumely – Pondanpuzha – Ranni road, passes through Mukkuttuthara and Thulappally and joins Pathanamthitta – Pampa road at Plappally.

According to data collected during peak pilgrim season of 2005 – 2006, the daily traffic intensity on Karimgallumuzhy – Thulappally section is 3,816 PCUs and on Plappally – Thulappally section is 6395 PCUs. The later consists of 3,919 PCUs towards Plappally and 2,476 PCUs towards Thulappally. Hence the notional pilgrim season traffic intensity on Thulappally – Plappally segment may be taken as 3,919 PCUs for design purposes. Adopting a normal annual growth rate of 4 percent up to year 2015, the expected traffic intensity in Karingallumuzhi – Thulappally and Thulappally – Plappally sections during year 2015 will be 5,650 PCUs and 5,800 PCUs respectively. The corresponding traffic intensity during year 2030 adopting an annual growth rate of 3 percent will be 8,800 and 9,050 PCUs respectively. The Karingallumuzhi – Thulappally road section has an average carriageway width of 5.60 meters while the Thulappally – Plappally section has an average carriageway width of 4.60 meters. Hence it would be necessary to widen Thulappally – Plappally section to provide 5.5 m carriageway width. However, the new road connecting Thulappally and Elavumkal has just been formed. This provides for a carriageway width of 7.0 m and is having fairly gentle gradient. On the other hand, the existing Thulappally – Plappally road is having very steep gradients at certain locations and any geometric improvement will be very difficult to achieve. Hence a major proportion of the traffic in this section, especially heavy vehicles are to be diverted along the new road which has significantly higher capacity. However, it would be difficult to insist on a one way movement along this road considering the traffic requirements of the settlements along the stretch. Suitable traffic intersection management facilities (manned islands and solar power based signal controls) should be developed at Elavumkal and Plapally.

g) Erumely – Kanakappalam – Vechuchira – Athikkayam Section

The traffic intensity observed during Sabarimala pilgrim season 2005-06 near Vechuchira is 3,250 PCUs adopting an annual growth rate of 4 percent up to 2015 and 3 percent beyond the estimated traffic intensity on this road will be 4,810 and 7,500 PCUs during year 2015 and 2030 respectively.

The average available carriageway width in Kankappalam – Vechuchira section is 3.8 m and in Vechuchira – Athikkayam section is 3.0 m. The practical capacity of the road sections, adopting a land of service 'C' and a peak from factor of 6.5 percent will be 4200 and 3400 PCUs respectively. It is therefore necessary to widen the entire road section between Kanakappalam and Athikayam to 5.5 m to provide for future traffic.

h) Ponkunnam – Vizhikkithodu – Pondanpuzha – Athikkayam – Perinad Section

The traffic intensity observed during Sabarimala Pilgrim season 2005 – 06 in Ponkunnam – Vizhikkithodu section was 3,253 PCUs, in Vizhikkithodu – Pondanpuzha section was 3,253 PCUs, in Pondanpuzha – Athikkayam section was 5085 PCUs and in Athikkayam – Perinad section was 3,224 PCUs. Considering the general traffic growth and the pilgrim traffic and adopting an annual growth rate of 4 percent up to 2015 the estimated traffic intensity is the above sections by year 2015 will be 4800, 5950, 7550 and 4800 PCUs respectively. Similarly, adopting a conservative annual growth rate of 3 percent beyond year 2015, the estimated traffic intensities in the above sections by year 2030 will be around 7500, 9300, 11800 and 7500 PCUs per day respectively.

The average available carriageway width in Ponkunnam – Vizhikkithodu section is 3.80 m, in Vizhikkithodu – Pondampuzha section is 3.80 m, in Pondanpuzha – Athikkayam section is 4.60 m and in Athikkayam Perinad section is 5.0 meters. The practical capacity of these road sections, adopting a level of service 'C' and a peak hour factor of 6.5 percent, will be 4200 PCUs per day for single lane, 13,200 PCUs per day for 5.5m wide intermediate width and 25,400 PCUs per day for two lane road sections.

It is therefore necessary to widen these road sections between Ponkunnam and Perinad along Vizhikkithodu – Pondanpuzha and Athikkayam to 5.5 m immediately to cater to the existing and future traffic.

i) Chengannur – Kozhenchery – Ranni – Athikkayam Section

The traffic intensity observed in Kozhenchery – Ranni – Athikkayam section during the peak Sabarimala pilgrim season 2005-06, was 3,752 PCUs. Adopting an annual growth rate of 4 percent up to year 2015 and 3.0 percent beyond, the anticipated traffic intensity in this section will be 5,560 PCUs in the year 2015 and 8,700 PCUs the year 2030.

The average available carriageway width of this road section is around 5.4metres. The practical capacity of a road 5.4 meter wide, adopting a level / service 'C' and a peak hour factor of 6.5 percent will be around 12,000 PCVs. Hence the available carriageway width is adequate to cater the anticipated future traffic demand.

j) Pandalam – Pathanamthitta Section

The traffic intensity observed in Pandalam – Pathanamthitta road during 2005-06 Sabarimala pilgrim season was 2,590 PCUs. Adopting an average annual growth rate of 4 percent up to the year 2015 and 3 percent beyond, the estimated traffic intensity on this

road section during year 2015 and 2030 will be 3,850 and 6,000 PCUs respectively. The average available carriageway width of this road is around 4.60 meters. This road is to be widened to provide 5.50 meter wide carriageway. The practical capacity of this road section, adopting a level of service 'C' and a peak hour factor of 6.5 percent is around 11,600 PCUs. Hence, this road segment when widened to 5.5 m carriageway will be able to cater to the future traffic up to year 2030.

k) Adoor – Pathanamthitta Section

The traffic intensity observed in Adoor – Pathanamthitta road during Sabarimala pilgrim season 2005 – 06 was 13,718 PCUs. Adopting a growth factor of 4 percent per annum up to 2015 and 3 percent thereafter, the estimated traffic intensity in this road section in 2015 and 2030 will be 20,300 and 31,700 PCUs respectively.

The average carriageway width now available in different segments of Adoor – Pathanamthitta road ranges between 4.5m to 5.1m. This will accommodate a traffic intensity of around 10600 to 12200 PCUs per day, under level of service 'C' and 6.5 percent peak hour factor. Since this is not adequate even to meet the present volume, it is essential that this road be widened to provide two lane carriageway of 7.0m width. Even with this width, only a capacity of around 25,000 PCUs will be possible and hence, by year 2022 additional capacity will have to be provided or otherwise the level of service will fall to 'D'.

l) Thiruvalla – Vennikulam – Ranni Section

The traffic intensity observed in Thiruvalla – Vennikulam – Ranni road during Sabarimala pilgrim season of 2005-06 was 5755 PCUs. Adopting a growth rate of 4 percent per annum up to year 2015 and 3 percent thereafter, the estimated traffic intensity in this road section in 2015 and 2030 will be 8,500 and 13,250 PCUs respectively.

The average carriageway width is around 5.10 meters. The practical capacity of this road under level of service 'C' with a peak hour factor of 6.5 percent will be 12,200 PCUs. Hence, the available carriageway width would be adequate up to year 2027. However, this road may be widened to provide a uniform width of 5.5 meters immediately to provide for better and safer passing and overtaking maneuvers.

m) Plappally – Angamuzhi – Vadasserikkara Section

The traffic intensity observed in Plappally – Angamuzhi and Chittar – Vadasserikkara sections during 2005 – 06 pilgrim season were 1,782 and 2,779 PCUs respectively. Adopting a growth rate of 4 percent per annum up to year 2015 and 3 percent beyond, and assuming that the traffic from Pampa towards Vadasserikkara will be routed along this road, the estimated traffic intensity will be 9,300 PCUs during year 2015 and 15,000 PCUs during year 2030. The carriageway width of this road is around 3.80 meters between Plappally and Chittar and 5.80 meters between Chittar and Vadasserikkara. The practical capacity of this road under level of service 'C' and a peak hour factor of 6.5 percent will be around 4,500 PCUs between Plappally and Chittar and 13,400 PCUs between Chittar and Vadasserikkara. Hence the section between Plappally and Chittar is to be widened to 5.5 m immediately and the entire road segment between Plappally to Vadasserikkara through Angamuzhi be widened to 7.0 metres to cater to projected traffic in the period 2015 – 2030.

n) Vandiperiyar – Sathram – Vallakkadavu Section

The traditional trekking route of pilgrims was from Vandiperiyar (Spencer junction) to Sathram via Mount Estate untill the forest Koop road to Uppupara was opened some 6 to 8 years back. Since the road to Sathram road is under the control of private Tea Estates, it has no proper maintenance ever since the regular operation of these estates has been discontinued by the owners.

Sathram has even derived its name from the erstwhile government dormitory provided here for the benefit of pilgrims. TDB has constructed a Subramanya Swamy temple here and owns around 20 acres of land around the temple, where some facilities are provided to pilgrims during season. Few pilgrims move from Vandiperiyar to Sathram by jeeps or some distance by bus and thereafter on foot. Even now, very few pilgrims trek to Sathram and beyond as it is the traditional route from this side.

Owing to the opening of the Vallakkadavu – 4th mile – Uppupara route through the reserve forest for pilgrim traffic during the Sabarimala season the Vandiperiyar – Sathram route is not favored by pilgrims, as vehicles can ply upto Uppupara from where trek down to Sannidhanam is less tedious. However bus service is presently available from Vandiperiyar up to Mount Estate, a distance of 7.0km from Sathram.

It is learnt that the passage of pilgrims through the forest creates environmental problems and severely affects the ecological balance of the flora and fauna in the PTR. In addition due to the poor maneuverability, width and surface conditions, accidents are common in this route. It is therefore recommended that the Forest road to Uppupara be closed and the traditional route to Sathram from Vandiperiyar be revived and movement of pilgrim traffic through the reserve forest be stopped. The Panchayat has taken up special maintenance of the Sathram road and has carried out major repairs. Spencer-Mount Estate road and Mount-Estate-Vallakkadavu road may be widened to provide 3.70 m carriageway with 1.5 m earthen shoulder or either side with adequate segregated bays at frequent intervals to facilitate passing, overtaking and occasional parking of vehicles.

This will help to provide one-way operation from Spencer junction to Mount Estate for pilgrims arriving to have darshan at Sannidhanam and from Mount Estate to Vallakkadavu for pilgrims returning after darshan. Mount Estate-Sathram link will however have to accommodate two way traffic movements. Hence, this link is to be widened to provide 5.5 m wide carriageway with adequate passing bays at frequent intervals (Map 6).

o) Summary

The details of traffic volume, capacity and suggested interventions for medium term (Year 2006-2015) and long term (Year 2015-2030) are given in Table 33.

The location maps of roads proposed for improvement during the period 2006-2015 and after 2015 are indicated in Maps 7 and 8.

Table 33: Summary of Traffic Interventions for Roads in Sabarimala Region

Sl. No.	*Road Section*	*Length (km)*	*Average c/w width (m)*	*Road condition*		*Practical Capacity (PCU)* (L.O.S-C P.H.F. - 6.5%)*	*Peak Traffic (2005-06)*	*Projected Traffic (Notional)*		*Interventions (Widening)*		*Remarks*
				Terrain	*Curvature*			*2015*	*2030*	*2015*	*2030*	
1	Plappally - Chalakkayam - Pampa (a) Plappally - Chalakkayam (b) Chalakkayam – Pampa	15.0 9.0	7.0 7.9	Rolling Rolling	High High	23,100 26,100	30,979	18,800 (4% annual growth)	29,300 (3% annual growth)	No widening	Widening to 10.00m by year 2025	All light and medium vehicles including cars, passenger vans, autos and two wheelers to be stopped at Nilakkal and pilgrims transported to Pampa by KSRTC chain service buses.
2	Punalur - Pathanapuram - Konni - Pathanamthitta (a) Punalur - Pathanapuram (b) Pathanapuram-Konni (c) Konni - Pathanamthitta	12.0 17.0 8.5	6.7 6.6 6.7	Plain	Low	34,500	23,337	34,500 (4% annual growth)	54,000 (3% annual growth)	No further widening (standard width 7.0m to be provided)	Widening to 4 lanes	To be brought to standard width of 7.0m immediately. Since widening to 4 lanes will become necessary beyond year 2015 advance action is to be taken by year 2010 in this direction

Sl. No.	*Road Section*	*Length (km)*	*Average c/w width (m)*	*Road condition*		*Practical Capacity (PCU)* (L.O.S-C P.H.F. - 6.5%)*	*Peak Traffic (2005-06)*	*Projected Traffic (Notional)*		*Interventions (Widening)*		*Remarks*
				Terrain	*Curvature*			*2015*	*2030*	*2015*	*2030*	
3	Pathanamthitta - Vadasserikkara - Perinad - Plappally	8.5	6.6			24,000	10,608	15,700	15,000 (3% annual growth)	No widening (standard width of 7.0m to be provided)	To be widened to 10.0m	One way operation is to be enforced in Plappally - Vadasserikkara section with Plappally - Angamoozhi - Chittar - Vadasserikkara as the alternate route for light and medium vehicles during peak pilgrim season
	(a) Pathanamthitta-Vadasserikkara (Mylapra)	6.5	7.0	Rolling	Low	25,400	12,633	18,700			No Widening	
	(b)Vadasserikkara-Perinad	20.0	7.0			25,400	12,633	15,800 (4% annual growth)			No Widening	
	(c) Perinad-Plappally											
4	Kottayam - Kanjirapally	42	7.0	Plain	Low	34,600	21,260	34,600 (5% annual growth)	53,900 (3% annual growth)	No widening	To be widened to 4 lanes	Since the projected traffic will exceed capacity of existing road by year 2015, advance action must be initiated by year 2015 to widen this road to 4 lanes.
5	Vandiperiyar - Kumily	15	7.0	Rolling	Low	25,400	7,759	12,600 (5% annual growth)	19,650 (3% annual growth)	No widening	No widening	

Sl. No.	*Road Section*	*Length (km)*	*Average c/w width (m)*	*Road condition*		*Practical Capacity (PCU)* (L.O.S-C P.H.F. - 6.5%)*	*Peak Traffic (2005-06)*	*Projected Traffic (Notional)*		*Interventions (Widening)*		*Remarks*
				Terrain	*Curvature*			*2015*	*2030*	*2015*	*2030*	
6	Kanjirapally - Erumely	12	6.5	Rolling	Low	23,600	8,903	13,200 (4% annual growth)	20,600 (3% annual growth)	No widening (standard width of 7.0m to be provided)	No further widening	Though the width is adequate to meet the traffic demand, the road has to be widened to provide standard lane width of 7.0m to ensure safe passing and over taking operations.
7	Erumely - Mukkuttuthara - Pampa Valley - Thulappally - Plappally (a) Erumely - Pampa Valley (b)Pampa Valley - Plappally	14.4 6.0	5.6 4.6	Rolling Hilly	Low High	13,200 8,700	3,816 6,395	5,650 2,900* (4% annual growth)	8800 3025** (3% annual growth)	a) No widening b) To be widened to 5.5 m.	No further widening	A new road between Thulappally and Elavumkal has been formed under CRF scheme. This road is almost parallel to Thulappally - Plappally road and joins Pathanamthitta - Pampa road very close to Plappally. This road is having a carriageway width of 7.0m of capacity 25,400 PCUs This road could be used to divert part of the traffic on Thulappally - Plappally road during peak season. *Assuming 50 percent of traffic (Heavy vehicles) between Thulappally and Plappally is diverted along

Sl. No.	*Road Section*	*Length (km)*	*Average c/w width (m)*	*Road condition*		*Practical Capacity (PCU)* (L.O.S-C P.H.F. - 6.5%)*	*Peak Traffic (2005-06)*	*Projected Traffic (Notional)*		*Interventions (Widening)*		*Remarks*
				Terrain	*Curvature*			*2015*	*2030*	*2015*	*2030*	
												the new Thulappally - Elavumkal road. **Assuming 67 percent traffic between Thulappally and Plappally is diverted along Thulappally - Elavumkal road.
8	Kanakappalam - Athikkayam (a) Kanakappalam – Vechuchira (b) Vechuchira - Athikkayam	5.0 5.7	3.8 3.0	Rolling Rolling	Low Low	4,200 3,400	3,350	4,810	7,500	To be widened to 5.5m	No further widening	
9	Ponkunnam - Pondanpuzha - Athikkayam - Perinad (a)Ponkunnam - Vizhikkithodu (b)Vizhikkithodu - Pondanpuzha (c)Pondanpuzha - Athikkayam (d)Athikkayam - Perinad	4.7 11.2 18.0 5.0	3.8 3.8 4.6 5.0	Rolling Rolling Rolling Rolling	Low Low Low Low	4,200 4,200 5,200 5,600	3,253 4,018 5,085 3,224	4,800 5,950 7,550 4,800 (4% annual growth)	7,500 9,300 11,800 7,500 (3% annual growth)	To be widened to 5.5 m	5.5m wide carriageway will be adequate	Widening the entire section to 5.5m carriageway is to be taken up immediately.
10	Kozhenchery - Ranni - Chunkapara (a)Kozhenchery - Ranni	10.0 3.5	5.4 6.5	Rolling Rolling	Low Low	12,000 12,000	3,752	5,560 (4% annual growth)	8,700 (3% annual	No widening (To be	No further widening	However, the road should be widened to provide a uniform width of 5.5m riding surface to facilitate easy and safe

Sl. No.	*Road Section*	*Length (km)*	*Average c/w width (m)*	*Road condition*		*Practical Capacity (PCU)* (L.O.S-C P.H.F. - 6.5%)*	*Peak Traffic (2005-06)*	*Projected Traffic (Notional)*		*Interventions (Widening)*		*Remarks*
				Terrain	*Curvature*			*2015*	*2030*	*2015*	*2030*	
	(b)Ranni - Chunkapara								growth)	brought to standard width 5.5m)		passing and overtaking activity
11	Pandalam - Pathanamthitta (up to Omallur)	11.8	4.60	Plain	Low	11,600	2,590	3,850 (4% annual growth)	6,000 (3% annual growth)	No widening (To be brought to standard width 5.5m)	No further widening	However, the road should be widened to provide a uniform width of 5.5m riding surface to facilitate easy and safe passing and overtaking activity
12	Adoor - Pathanamthitta (a)Adoor - Anandapally (b)Anandapally - Kaipatur (c)Kaipattur - Pathanamthitta	2.5 6.3 6.6	5.10 4.50 4.60	Rolling	Low	12,200 10,800 11,000	13718	20,300 (4% annual growth)	31,700 (3% annual growth)	Widening to two lane	Two lane road adequate up to year 2022 widening to 10m to be undertaken by year 2022	Widening beyond two lanes will be difficult without resorting to acquisition. Hence, advance action to be taken by 2015 to provide for 10m wide carriageway.
13	Vennikulam - Ranni	16	5.10	Rolling	High	12,200	5,755	8,500 (4% annual growth)	13,250 (3% annual growth)	No widening (To be brought to standard width 5.5m)	No further widening	However, the road may be widened to a uniform width of 5.5 metres immediately to facilitate easy and safe passing and overtaking activity

Sl. No.	*Road Section*	*Length (km)*	*Average c/w width (m)*	*Road condition*		*Practical Capacity (PCU)* (L.O.S-C P.H.F. - 6.5%)*	*Peak Traffic (2005-06)*	*Projected Traffic (Notional)*		*Interventions (Widening)*		*Remarks*
				Terrain	*Curvature*			*2015*	*2030*	*2015*	*2030*	
14	Plappally - Angamuzhy - Vadasserikkara	6.0		Rolling						To be widened to 5.5m	To be widened to 7.0m	
	(a)Plappally - Angamuzhy	11.5	3.80	Plain	Low	4,500	1,782	9,300 (4% annual growth)	15,000 (3% annual growth)	No Widening		
	(b)Anganmuzhy - Chittar	18.0	3.90	Plain	High	4,600						
	(c)Chittar - Vadasserikkara		5.80	Plain	High	13,400	2,779					
15	Vandiperiyar - Sathram	8.0	3.50	Rolling	High	3,900		1,600	2,500	No widening (To be brought to standard width 3.7m)	No further widening	To be brought to standard width of 3.70m with 3.50m wide 50m long parking bays at each km staggered on either side
	(a)Vandiperiyar (Spencer) - Mount	5.0	3.00	Rolling	High	3,300		1,600	2,500			
	(b)Mount – Sathram											
16	Vallakkadavu - Sathram	5.0	2.60	Rolling	Low	3,100		1,600	2,500	To be widened to 3.70m	No further widening	To be provided width 3.5m wide bays 50m long in each km staggered on either side
17	Vandiperiyar (Kakkikavala) – Vallakkadavu	7.5	3.80	Rolling	Low	4,200	993	1,500	2400	No widening	No further widening	To be provided width 3.5m wide 50m long bays in each km staggered on either side

*Practical capacity adopted from IRC 64-1990 - Guidelines for Capacity of Roads in rural areas.

6.3.2 Formation of New Road Links in the Region

a) Ring road to Erumely town

The Vavar mosque at Erumely is the traditional starting point of Sabarimala trek from Erumely. A great majority of Sri Swami Ayyappa devotees, particularly those who come with the sacred 'Irumudi' visit the Kochambalam Sastha temple located on Kanjirapally leg of Erumely junction, cross the road and offer prayers at the Vavar Mosque situated on the opposite side of the road. Thereafter they proceed to Valiyambalam along the main highway through Erumely town performing the traditional Petta Thullal. During this period, not only is the traffic movement along the highway severely affected, but the safety of the pilgrims is also in jeopardy. Since the KSRTC bus station as also the private bus station are close to this location, the traffic situation is further aggravated.

At present a small diversion named TB road is provided from KSRTC bus station on Erumely – Mukkada road to a point close to Erumely junction on Erumely-Kanjirapally road. During Sabarimala pilgrim season, traffic from Mukkada side towards Kanjirapally is diverted by this road. Though this provides some relief at Erumely junction, the traffic situation is still critical since the Valiyambalam to which the pilgrims proceed from Vavar mosque is not bypassed and also the existing bypass does not facilitate traffic between Karingallumuzhi side and Mundakkayam side. Considering the urgent need for provision of bypass to Erumely, the Public Works Department (Roads and Bridges), Government of Kerala has initiated noteworthy action in this direction.

A number of new roads are under construction. These include

(a) Road connecting Koratty on Kanjirapally road and Kannimala on Mundakkayam road having an average carriageway width of 4 to 5 meters for a length about 3.0 km.
(b) Road connecting Koratty on Kanjirapally road and Karimpinthodu on Mukkada road through Ourunkal having a carriageway width of 5.0m for a length of 6.8km.
(c) Road connecting MES College on Mukkuttuthara road and Peruthodu on Mundakkayam road having a carriageway width of 4.0m for a length of 2.6km.
(d) Peruthodu – Irumpoonnikkara road connecting Mundakkayam road and Mukkuttuthara road having a carriageway width of 5.0m for a length of 4.4km.

In addition, proposals are being formulated for formation of new links as detailed below.

(a) Extension of T.B road upto Koratty on Kanjirapally road for a length of 1.1km.
(b) Link road between Ourunkal – Karimpinthodu road to connect Mukkada road at Karimgallumoozhy for a length of 750m.
(c) Chenbagathingal Bridge to Chavala road to connect Kanjirapally road and Mundakkayam road for a length of 1.5km.
(d) Koratty Bridge to Oringalkadavu on Koratty – Ourunkal road along Manimala river bank for a length of 2.5km.
(e) Improvements to Panchayat road from Chavala to Erumely in front of Panchayat office for a length of 2.0km.

These roads, when completed, will provide the much needed relief to Erumely town and all through-traffic can be diverted along the circular roads during the peak Sabarimala pilgrim season. The existing roads around Erumely, the roads under construction and the road proposed for construction are indicated in Map 9.

b) Erumely – Chalakkayam Road from Kanamala Causeway to Elavumkal

National highway wing of Kerala PWD has taken up construction of a link road between Kanamala causeway in river Pampa and Elavumkal which is 3 km ahead of Nilakkal on Mannarakulanji-Chalakkayam State Highway. This link has a length of 9.910 km.

The above work executed by NH wing is split up into three phases. Phase I from Kanamala causeway to Thulappally (Ch: 0/000 to 3/200) has been completed during 1994 and handed over to the state PWD. Phase II from Thulappally to Naranamthodu (Ch:3 / 200 to 6/678) has been completed during 2000 and the same has been handed over to State PWD.

The phase III from Naranamthodu to Elavumkal (Ch : 6.878 to 9/910) passes completely through forest land. The execution of the phase III is in good progress and is expected to the opened to traffic shortly. (During the time of finalization of this report, it has been completed and opened). This road link is expected to result in a saving of about 40 km and considerable savings in time to reach Sabarimala as compared to Erumely - Athikkayam – Perinad – Nilakkal – Pampa route. (Map 10) and is almost parallel in alignment to the existing Thulapally – Plapally Route.

Once the road is opened to pilgrims, the main problem which could be expected to cause hindrance to traffic flow is the narrow causeway at Kanamala. A new bridge is essential in this stretch of river where the width of the river is 110m. The NH department has prepared a rough cost estimate amounting to Rs.450 lakhs for the bridge and approach road and the proposal is getting ready for submission to the Central Ministry for sanction under CRF Scheme.

c) Road connecting Ernakulam South and North Stations

The Corporation of Cochin has plans to develop a new road link adjacent to the existing railway line between Ernakulam North and South stations. This road alignment passes behind Ernakulam KSRTC bus station. The formation of this link will greatly enable KSRTC to pick up pilgrims bound for Sabarimala alighting at these stations.

6.3.3 Development of Major Bus Stations

The major KSRTC bus stations which serve transport of Sabarimala pilgrims are Pathanamthitta, Erumely, Pampa, Kottayam, Ernakulam and Chengannur. The infrastructural facilities at these places need to be augmented to cater to the present and future pilgrim population using the stations.

Data collected from KSRTC indicate that several additional trips had been generated from different bus stations to Erumely and Pampa during the peak season. It is observed that KSRTC has operated 31,136 special trips during Mandalapooja season in December 2005 ad 19909 special trips during Makaravilakku season in January 2006. Of the 31,136 trips operated during December 2005, 18214 trips were operated from Pampa, 2293 trips from Kottayam, 1712 trips from Kottarakkara, 1579 trips from Chengannur, 1070 trips from Pathanamthitta and 1030 trips from Ernakulam, besides others. Similarly of the around 19000 special trips operated during the Makaravilakku season during January 2006, 9840 trips were operated from Pampa, 1704 trips from Kottayam, 1158 trips from Chengannur besides others.

The number of additional services operated on different days during the last pilgrim season from different locations is given in **Table 34**.

Table 34: Details of Sabarimala Special Trips from different locations during 2004-2005 and 2005-2006 pilgrim seasons

Name of Depot	*Mandalapooja-2005*				*Makaravilakku-2006*			
	Pampa	*Erumely*	*Others*	*Total*	*Pampa*	*Erumely*	*Others*	*Total*
Adoor	561	156	-	717	165	-	176	341
Chengannur	1579	-	-	1579	1158	-	-	1158
Ernakulam	1030	-	-	1030	638	168	-	806
Erumely	626	52	-	678	2309	-	-	2309
Kottarakkara	794	918	-	1712	543	-	-	543
Kottayam	2263	22	8	2293	889	815	-	1704
Kumily	319	49	150	518	505	-	487	992
Pampa	18214	-	-	18214	9840	-	-	9840
Pathanamthitta	1006	64	-	1070	413	30	1	444
Thiruvananthapuram	718	86	-	804	256	266	-	522
Others	2504	9	8	2521	1179	23	48	1250

In order to meet this extra demand during the pilgrim season, it is necessary to augment the basic facilities at these bus stations. These will include provision of additional parking bays, additional repair and service facilities, provision of necessary facilities for the pilgrims such as cloak room, dormitory, water supply and sanitation, bath and toilet facilities and subsidized food and snacks. This will necessitate development of additional operational and service area within the bus station.

a) Pathanamthitta Bus Station

Pathanamthitta is the gateway of Sabarimala. Sufficient transportation facilities exist between Pathanamthitta and Erumely and also between Pathanamthitta and Pampa. As per data available, a maximum of 1070 trips were operated from Pathanamthitta during the last Mandalapooja season. This amounts to an average of 24 trips per day. The highest number for anyone day was recorded as 43 trips. Assuming a turn around time of 6 hours, each bus will make four return trips. Thus the number of buses in operation amounts to 11 and the frequency of operation will be 25 minutes. Adopting 100 percent increase in the number of trips, the frequency will become to 12.5 minutes. Assuming a halting time of 30 minutes at each end, the number of buses stationed at Pathanamthitta at any point in time will be 3. Allowing for exigencies, four parking bays will be sufficient to handle the Sabarimala special buses. Adopting a maintenance cycle of one week, the number of buses to be maintained each day will be around four. Hence four maintenance bays could be provided for maintaining the Sabarimala special buses at Pathanamthitta. Enough open space is available in this bus station. Four to five additional bays could be constructed in the workshop area to facilitate maintenance of additional buses used during the Sabarimala season. KSRTC has proposals to construct a shopping complex in this bus station. Sufficient pilgrim amenities like dormitory, toilet, bathroom and other needed facilities could be provided in the proposed complex.

Pathanamthitta bus station has adequate space for development of these additional facilities. Additional parking bays could be provided in the parking area in the front portion of the bus station while 4 or 5 additional maintenance bays could be developed in the open area at the rear portion. Additional pilgrim facilities could be incorporated in the new complex proposed for development in this bus station.

b) Kottayam Bus Station

Kottayam is a major transit station for pilgrims arriving by train and proceeding to Erumely. The present KSRTC bus station at Kottayam is located far away from the railway station. Though arrangements have been made by KSRTC to pick up pilgrims arriving at Kottayam Railway Station, this practice is not very effective due to inadequate parking space in the railway station and aggressive competition by private vehicle operators. Moreover, the available operating space at Kottayam KSRTC bus station is inadequate to meet the extra demand during the Sabarimala pilgrim season.

For this purpose, two specific proposals are being considered. In the first place, it is suggested that the vacant railway land available on the goods shed side of Kottayam railway station may be utilized for parking of KSRTC buses for picking up pilgrims during the Sabarimala season. Pilgrims arriving by train could be picked up by KSRTC shuttle service buses and brought to Kottayam bus station where they will be transferred to regular buses. The railway track available in the goods yard may be utilized as a siding for stationing pilgrim specials if warranted. Also, extension of the foot over bridge to the goods shed side may be considered to facilitate pilgrims arriving by regular trains.

In the second place, the low lying land measuring about 3500sqm belonging to KSRTC adjacent to the present bus station may be filled and brought to use and the additional area thus reclaimed may be utilized for creating better infrastructural facilities for the pilgrims (Map 11).

It is observed that about 70 special trips were operated between Kottayam and Pampa / Erumely daily during Makaravilakku season last year. Adopting an average of two return trips per bus, number of buses needed would be 35. Considering the pilgrim demand, provision has to be made for around 50 buses. Assuming a halting time of 60 minutes for a bus between two successive trips, number of parking bays needed would be four. Assuming a maintenance cycle of 7 days, number of additional maintenance bays to be provided will be 7. While the additional parking bays and the needed pilgrim amenities could be incorporated in the additional area developed by reclaiming the low lying land, the additional maintenance bays could be accommodated in the available open space in the present garage.

c) Bus Station at Ernakulam

A piece of vacant land measuring 1.55 hectares lies adjacent to the present workshop complex of Ernakulam bus station. This has access through Chevara Road which is planned to become part of the proposed link road connecting Ernakulam North and South stations (Map 12). Around (average) 34 special trips were operated during the last Makaravilakku season from Ernakulam to Pampa / Erumely. Considering the pilgrim demand, the number of daily special trips could be taken as 50. Adopting a turn around time of 12 hours, the number of special buses required would be 25.

Assuming a halting time of 60 minutes between two successive trips for a bus, number of parking bays required will be three. Also, assuming a maintenance cycle of 7 days, number of maintenance bays required will be four. The additional parking bays and infrastructure needed for providing pilgrim amenities could be provided in the additional area indicated above. This land could be developed to be used for providing operational space for special buses during Sabarimala season and provided with needed pilgrim facilities like dormitory, cloak room, toilets and bathing complex, cafeteria and other needed essential items. The additional maintenance bays required could be accommodated in the existing garage itself for administrative convenience.

Further, a second entry to Ernakulam South Station has recently been provided on the eastern side of the present station. This is provided with a modern complex comprising of ticket booking counter, passenger waiting hall etc. There is a railway siding with passenger platform at this side. Wide vehicle parking area is available in front of the eastern entrance. This facility could be utilized for parking of dedicated pilgrim specials of KSRTC and pilgrim special trains could be stationed in the yard to facilitate pick up by the KSRTC buses.

d) Bus Station at Erumely

The existing bus station at Erumely is functioning from a small extend of land. There is no scope for expansion of this depot and it is very difficult to operate the required buses from this station during Sabarimala pilgrim season. It has been suggested that the piece of land about 3000 sqm between TB road and the drainage channel close to the existing bus station be acquired. This could be developed to provide all needed infrastructural facilities and pilgrim amenities (Map 13)

A total of 2309 trips were operated from Erumely during the last Makaravilakku season. This amount to an average of 100 trips per day and the highest number of trips on any one day could be taken as 120. Adopting a turn around time of 8 hours and three return trips per bus, the number of buses that will be needed is 40 and the frequency of operation will be 9 minutes. To provide for maximum accumulation of 35000, considering the possible increase in pilgrim arrivals by bus in case of increase in service and facilities, the time gap between services will get reduced to 6 minutes. Assuming a halting time of 300 minutes at each end for each bus, number of bus parked at Erumely at any one time will be five. Hence six parking bays may be provided at Erumely to take care of exigencies. Adopting a maintenance cycle of 7 days, number of buses to be serviced each day will be nine. However, 10 maintenance bays may be provided to take care of emergencies.

e) Bus Station at Chengannur

Even though Chengannur KSRTC bus station is located away from the railway station, there is adequate space within the railway station compound for stationing 3 to 4 buses simultaneously. An average of about 48 special trips was operated by KSRTC during Makaravilakku season last year. Assuming a turn around time of 12 hours, number of additional buses needed for providing these special trips will be 24. To provide for maximum arrivals, considering the possible increase in pilgrim arrivals by bus and improvement of service and facilities; number of additional buses to be provided will be 36. Assuming a halting time of 60 minutes for a bus between successive trips, number of parking bays required will be three. Also, adopting a maintenance cycle of 7 days,

number of additional maintenance bays required will be three. While the existing parking space available in Chengannur railway station is thus adequate, the additional maintenance bays could be provided in Chengannur KSRTC bus station. There exists good working arrangement at the railway station and additional buses required are provided at short notice on demand. This arrangement could continue with additional pilgrim facilities like information centre, medical facilities and other needed essential services in the open area in front of Chengannur railway station. It may be mentioned here that dormitory accommodation and toilet facilities are already available at this location for Sabarimala pilgrims. These could be augmented as warranted annually to meet the demand as may be evident after each season.

6.3.4 Development of Base and Transit Stations

a) Need for Base Stations

Pilgrims coming to Sabarimala arrive from three major routes viz: along Pathanamthitta – Vadasserikkara – Pampa route, from Erumely side and from Vandiperiyar side. Among these three, the Pathanamthitta - Vadasserikkara – Pampa route is used by a significant majority of pilgrims. This route is generally used by pilgrims arriving by train to Chengannur, Thiruvalla or Alappuzha and also pilgrims who travel by private vehicles. These vehicles are normally taken up to Pampa. These vehicles are parked at Pampa hill top parking site, Chakkupalam area or at Thriveni to the extent parking facilities are available. Other vehicles proceed back to Nilakkal for parking after dropping the pilgrims at Pampa. The pilgrims who had arrived by these vehicles proceed to Nilakkal back from Pampa by KSRTC chain service on their return trip after worship at Sannidhanam. These KSRTC buses generally return empty from Nilakkal to Pampa since there is no demand as pilgrims own vehicles are allowed to proceed to Pampa to drop them. Thus, unnecessary traffic is generated in the section between Nilakkal and Pampa, caused by empty private vehicles from Pampa to Nilakkal and empty KSRTC buses in the opposite direction. This not only causes *disguised* traffic congestion in this stretch by unnecessary traffic, but also leads to waste of fuel, air pollution, other environmental impacts and loss of revenue. It is therefore suggested that a base camp be developed at Nilakkal where all private vehicles should be terminated and it is made mandatory for all pilgrims to travel by KSRTC chain service between Nilakkal and Pampa in both directions.

Pilgrims arriving from Erumely side generally arrive by train at Kottayam or Ernakulam and proceed towards Erumely by KSRTC buses or private vehicles. Many of these pilgrims park their vehicles at Erumely and proceed to Sabarimala by foot after offering worship at Vavar Mosque and performing the traditional 'Petta Thullal'. A sizable section of the pilgrims also travel by private vehicles to Pampa along Athikkayam – Perinad route or along Mukkuttuthara-Thulappally route which joins Pathanamthitta – Vadasserikkara – Pampa route at Perinad and Plappally respectively.

Pilgrims arriving from Vandiperiyar side generally arrive by road from Kumily either by KSRTC buses or by private vehicles. Some buses operated by KSRTC proceed to Pulmedu (Uppupara) along Vallakkadavu. But majority of pilgrims travel by jeep or private vehicles from Vandiperiyar to Uppupara from where they trek to Sannidhanam.

Thus, it is evident that there is need for setting up base camps at Erumely, Vandiperiyar and Nilakkal. This would tap and hold pilgrims from various directions approaching

through all main routes. These base camps should be provided with all needed infrastructural facilities like parking bays, dormitory and restaurant for pilgrims and crew of private / KSRTC vehicles, fueling and repair facilities, communication facilities, medical and health facilities, bathing facilities, toilet facilities and the like.

b) Base Camp at Nilakkal

Traffic studies indicate that the intensity of traffic between Plappally and Chalakkayam gradually increases during the Mandalapooja season from 11,840 PCUs on 15th December 2005 and has reached a peak value around 28,000 PCUs on the last day of this season. On the other hand, the daily traffic intensity during Makaravilakku season varied between 12,000 and 15,000 PCUs per day up to 13th December 2006 while it suddenly increased to nearly 31,000 PCUs on Makara Jyothi day.

A study of the pattern of traffic movement indicates that heavy congestion occurs on the road section between Plappally and Chalakkayam and also between Chalakkayam and Pampa mainly because of three major reasons. They are:

i. Inadequate road capacity to meet the sudden increase in traffic flow.
ii. Inadequate parking spaces at Pampa and consequent empty trips made by vehicles in search of parking accommodation.
iii. Empty trips being made by KSRTC chain service buses from Nilakkal to Pampa.

In order to improve the movement of pilgrims on the road and to reduce congestion, it is proposed to restrict movement of private vehicles beyond Nilakkal. All private vehicles will be terminated at Nilakkal and the pilgrims transported by KSRTC chain service vehicles between Nilakkal and Pampa. This will ensure reduction in traffic congestion and consequently reduced travel time between Nilakkal and Pampa. Such a modal restriction between Pampa and Nilakkal would also increase the traffic carrying capacity, route performance and efficient control and management during emergencies (as public vehicles, here, buses) with only similar speed and similar carrying capacities are allowed).

Studies conducted at Nilakkal parking area during 2005 – 2006 Sabarimala pilgrim season indicate that the highest parking intensity for any period during Mandalapooja season was 14105 vehicles which occurred around 08.00 hrs while the highest accumulation during Makaravilakku season was 13141 vehicles which occurred around 02.00 hours.

The peak accumulation during the Mandalapooja period included 6654 passenger vans and 5796 private buses besides 578 KSRTC buses, 325 passenger cars and 167 other State Government buses. Similarly, the peak accumulation during Makaravilakku season was 13141 vehicles which occurred around 08.00 hours. The peak accumulation included 5506 passenger vans, 5015 passenger cars and 1777 private buses, besides 437 other State Government buses. The accumulation of KSRTC buses is surprisingly low at 22 vehicles.

Hence, reasonable base camp facilities for at least 100000 pilgrims are proposed here. In addition to providing temporary accommodation and transit facilities for around 70000 pilgrims, around 30000 pilgrims to be provided permanent accommodation and facilities here.

In order to improve the operational efficiency of the transport facilities in this section, the 110 hectares of forest land originally leased to Kerala State Farming Corporation is being transferred to Travancore Devaswom Board for developing a base station at Nilakkal, following the suggestion in the 'Outline of the Master Plan for Sabarimala'[2]. The area is being developed and additional facilities are being created here since the last pilgrim season. The area presently occupied for parking is about 45 hectares in between the trees. Parking area is required to be developed here with least cutting of trees to meet the future demand. The remaining area could be utilized for provision of pilgrim amenities and crew rest areas by appropriate structural design. TDB had cut around 4000 trees here last season to clear the area for arranging the parking before the land transfer ceremony much before the detailed plan preparation. However, it is to be noted that such clearing would not only destabilize the sloping profile, but also would render the area without shade to the parked vehicles or ground cover to prevent erosion. Hence it is suggested in the Master Plan that further provision of parking here should be with minimal tree cutting just to facilitate movement of vehicles in between trees. Vehicles should be parked between the trees and no ground clearing is warranted. If required, TDB and Police Department can jointly demarcate each parking bay using 'string / ropes tied along trees at least 2 weeks prior to the start of the pilgrim season. Such an environmentally sensitive provision of parking if resorted to would be applauded greatly by future generations. No cutting of trees to leave the ground barren for arranging parking facilities

Following are the guidelines to providing additional parking at Nilakkal

- Parking to be provided in between rubber trees as was done earlier in the plantation. This would provide the much-needed shade in the parking area

- May provide gravel tucking or suitable ground covering which would not disrupt water percolation in the ground prone to getting muddy during rains

- As the distance between two rubber trees is approximately 3 to 4 m, it is suggested that if necessary for parking of heavy vehicles, a row of trees be cut to leave the space for entry exit of vehicles to the space between trees. Such lanes be created at an interval of 20m, (space to accommodate 2 heavy vehicles from each lane).

Certain basic pilgrim amenities like toilet facilities and refreshment stalls already exist in Nilakkal parking area. However, the infrastructure facilities presently available in this parking area are not adequate and up to the standards demanded by an international pilgrim centre. Apart from improving on the availability of food and refreshments at this location, other needed facilities such as fueling, minor repair facilities, dormitory facilities for the drivers, water supply and sanitation facilities along with an integrated communication system should be put in place. Watch towers and accommodation for police and stay facilities for other department staff would also be required.

Presently, the space allotted for parking KSRTC buses is not adequate to meet the demand that will be created by the above arrangement. Moreover, this space is at the far end of the parking area. This will entail disruption of KSRTC services in the event of any traffic congestion within the parking area. A separate parking area should be developed preferably closer to the entry to accommodate KSRTC chain service vehicles so that any

[2] IL&FS Ecosmart Ltd (2004), **Outline of the Master Plan for Sabarimala**, Kerala State Road Fund Board, Government of Kerala.

disruption in the movement of vehicles in the other areas will not affect the schedule of operation of KSRTC chain service buses. This KSRTC parking area should have access and exit ways (which are as segregated from other vehicles as possible) and contain necessary passenger facilities such as queue barriers, waiting shed, water supply and sanitary facilities to ensure effective utilization of KSRTC chain service buses, apart from basic needs of crew as also of vehicles maintenance (Map 14).

Existing road at Nilakkal be widened to 9 m carriage way with 1.2 m earthern shoulders on both sides to facilitate movement. In addition, a separate road to take the vehicles to the parking lots and a separate exit leading the vehicles to the fuelling station (and finally exit the base camp) which is to be located towards the Pathanamthitta side edge of the Nilakkal area nearly abutting the road is required.

Parking arrangement of allocating specified areas for different groups of vehicles (coming from different States) is valid and suitable to the devotees. TDB desires to shift toll station currently functioning at Plappally to Nilakkal so as to tap the vehicles coming through the newly formed Elavumkal road. Such toll station is to be provided at a location which renders clear vision of the inbound and outbound traffic. In addition, TDB should built in place suitable management measures such as passes, photo identity cards (with support of local self government) to see that non-temple bound local traffic is allowed to pass freely without toll collection.

Traffic bottleneck at the ornamented entry gate to Nilakkal need to be eased. This may be done by straightening the entry around the gate, but however retaining the gate. At the island created between the newly proposed straightened entry leg of existing road and the new road to parking lots, traffic control signals or manned traffic island may be provided to control and regulate traffic flow.

Essential details for implementing these suggestions have been submitted to the GoK and TDB in the reports on Proposed Works for 2004-05 and 2005-06 pilgrim seasons[3].

c) Base Station at Erumely

Erumely is the gateway to Sabarimala for pilgrims coming from Kottayam or Ernakulam side. Besides, it is a traditional belief that the Sabarimala pilgrimage commences only after worship at the Vavar mosque at Erumely. Hence, Erumely occupies a very important place in the schedule of Sabarimala pilgrims.

As already indicated a sizable proportion of pilgrims who arrive at Erumely, park vehicles at different available parking places and trek to Sabarimala along the traditional trek route. Certain proportion of pilgrims proceeds to Pampa by public or private vehicles along Athikkayam or Thulappally and join Pathanamthitta, Vadasserikkara – Pampa highway. These vehicles are proposed to be stopped at Nilakkal and the pilgrims will be transported to Pampa by KSRTC chain service vehicles.

[3] IL&FS Ecosmart Ltd (September 2005) **Work Status Report: Stage2, Preparation of Master Plan for Sabarimala**, *Submitted to* Government of Kerala (unpublished)
IL&FS Ecosmart Ltd (September 2006) **Details for Implementing Proposed works at Sabarimala and Nilakkal 2006-07**, Master Plan for Sabarimala, *Submitted to* Government of Kerala (unpublished)

Private Vehicles either owned or hired by the pilgrims are parked at Erumely for long durations for obvious religious observances. The average duration of parking of cars and vans ranged between 12 hours and 72 hours while that of private buses ranged between 12 hours and 48 hours. There are four major parking areas in Erumely where these vehicles are parked. These are

i. Open area in front of Valiambalam measuring about 5000 sqm.
ii. Terrace parking adjacent to TDB School measuring about 9000 sqm.
iii. Chembakathumkal stadium parking ground measuring about 12,500 sq.m.
iv. Stadium near Vavar Mosque measuring about 1000 sqm.

These areas as also certain private open areas along Mukkada road, TB road and road leading to Oringalkadavu from KSRTC bus station could accommodate about 1800 to 2000 vehicles. Since the present peak accumulation on the date of survey is only less than 400 vehicles, the available parking space will be adequate till year 2030.

Since a sizable proportion of pilgrims who arrive at Erumely stay here for sufficiently long durations (at least two days) before proceeding to Sabarimala either by foot or by other vehicles, it is necessary to provide them necessary facilities like bathroom and toilet facilities, restaurants, rest room, cloak rooms, vehicle parking area with fueling and servicing facilities and adequate communication facilities.

However, in the event of formation of Angamali-Erumely rail link, no additional parking space will be required since private vehicles arriving to Erumely will get reduced significantly and pilgrims arriving by train and intending to travel to Pampa are proposed to be transported by KSRTC chain service buses.

All these parking areas have certain amount of basic facilities like water supply, sanitation and refreshment stalls, which however need to be augmented to meet the demand. Further, separate exit has to be created for the parking lot next to TDB School by cutting open the front portion and forming a ramp near the school entrance.

Also, considering the proposal of the Ministry of Railways to from a railway link from Angamali to Erumely, it is imperative that sufficient parking place and pilgrim amenities be created at the proposed Erumely railway station since more number of pilgrims will be attracted to come to Erumely as it will provide direct connection from their place of origin without change of mode. Hence reasonable base camp facilities for at least 35000 pilgrims are proposed here. Minimum and Peak accumulation here may be considered as 24000 and 65000 respectively.

It has been proposed to form bypass roads to Erumely as discussed elsewhere in this report. Considering this, the most ideal location for providing separate parking place with all attendant infrastructural facilities is the existing Kerala Tourism Development Corportion's hotel complex on Kanjirappally road, since there is adequate dormitory, water supply and sanitation facility in addition to vast open land. It is necessary to establish a base camp at Erumely with all the above mentioned infrastructural facilities.

Besides providing parking facilities, the movement of pilgrims within Erumely town also needs to be regulated and facilitated. As already indicated, pilgrims crosses the Kanjirappally road from Kochambalam to the Vavar Mosque to offer prayers. Then they

proceed along Erumely – Mukkada road to Valiambalam performing the traditional 'Petta Thullal'. To facilitate uninterrupted flow of vehicles and to ensure safety of the pilgrims, it is suggested that a foot over bridge be erected across Kanjirappally road to provide direct access between Kochambalam and Vavar Mosque. An underpass is not recommended here considering the land requirements, construction costs and modifications required for that in addition to the possibility of this forming a den for anti-social activities and possible insanitary usages after the pilgrim season. In addition, a foot over bridge may be provided from Devaswom School to Valiyambalam.

Also, the stretch of Erumely-Mukkada road from Erumely junction to police station is to be made 'One-way' and the carriageway width may be reduced to 5.5m. The foot path on the Mosque side be widened by adding the extra width retrieved from the road and provided with continuous railing to prevent pedestrian – vehicle conflict during the season.

The ring roads proposed are expected to be completed before the next pilgrim season. During the pilgrim season, one-way movement can be enforced along the stretches of Mukkada road up to Karingallumuzhi, Mundakkayam road up to Peruthodu and Kanjirapally road up to Koratty Bridge. The shoulder of Mundakkayam road from Erumely junction up to Peruthodu is to be widened and provided with railings and shade with traditional trek ambience to facilitate free movement of pilgrims on the shoulder without conflicting with vehicular traffic.

d) Base Station at Vandiperiyar

As has been indicated earlier, Vandiperiyar is the northern gateway to Sabarimala. Most of the pilgrims who arrive at Vandiperiyar park their vehicles at Vandiperiyar and proceed to Pulmedu by KSRTC buses or by jeep. These vehicles now proceed along 4th mile and Kozhikkanam through thick forests of the Periyar Tiger Reserve. These vehicles have to travel through a narrow road with poor geometry resulting in severe traffic problems while passing or overtaking other vehicles. The noise and air pollution caused by the vehicles and also the waste generated by the pilgrims along the route severely affect the wildlife in this forest area.

In order to reduce the level of pollution within the forest area, it is suggested that the road from Spencer junction to Sathram along Mount Estate which was traditionally used by pilgrims be restored to motorable standard and shuttle services buses / jeeps be operated between Vandiperiyar and Sathram. According to a study conducted recently, the total number of pilgrims visiting Sabarimala through Vandiperiyar route has been observed to be around 32,000 during the Mandalapooja season and around 40,000 during the Makaravilakku season with the maximum pilgrim on any day being around 9300 and 9800 during the Mandalapooja and Makaravilakku seasons respectively. A full fledged base camp need to be developed at Vandiperiyar with all needed infrastructural facilities. Considering the traffic flow, a peak accumulation of 30000 and average accumulation of 7000 pilgrims (Based on the assumption that once Sathram is developed as a base camp, about 30percent of the pilgrim will take Vandiperiyar Sathram route) may be expected and camp facilities be provided for such holding.

KSRTC chain services may be run between Vandiperiyar and Sathram instead of though 4th mile and Kozhikkanam to avoid disruption to the wild life in the forest area. Present

condition of road width and its surface is so poor that accidents and resultant casualties are common. At many stretches it is difficult for buses and even jeeps to maneuver. Further widening of 4th Mile road to Uppupara is not environmentally acceptable due to its disposition in the Tiger Reserve. Further, as more and more pilgrims would prefer traveling through Uppupara road against tradition, widening requirement would be manifold. Hence it is suggested that opening of this road for pilgrims be discontinued.

Even now, buses are being operated between Vandiperiyar and Mount Estate. Even though the road from Vandiperiyar to Sathram is a private road owned by the plantations, the Panchayat has recently undertaken major repairs to vulnerable sections of this road between Vandiperiyar and Mount Estate. The road between Vandiperiyar and Sathram to be developed as detailed in the section on road improvements. All private pilgrim vehicles should be parked at Vandiperiyar and pilgrims transported up to Sathram by KSRTC chain service buses or jeeps. Necessary parking facilities including all attendant infrastructural requirements need to be developed at Vandiperiyar and Sathram.

The peak parking accumulation at Vandiperiyar during pilgrim season was observed to be 120 vehicles and around 160 at Uppupara. The available open space in the Vandiperiyar stadium and vast open space at Sathram will be able to accommodate up to 600 vehicles. Hence, no additional parking area will be needed by year 2050.

e) Transit Camp at Sathram

All pilgrims arriving from Vandiperiyar side will have to be routed to Sathram since the present route to Uppupara through the reserved forest is not satisfactory from the ecological and environmental aspects of air and noise pollution and as also the safety aspects of the pilgrims. A full fledged transit camp with necessary infrastructural facilities will have to be created at Sathram. TDB has over 20 acres of land at Sathram. This land could be utilized for creation of the needed infrastructural facilities like resting place, toilet and bath and refreshment besides requirements needed for the chain service vehicles of KSRTC like vehicle parking area, crew rest room, basic repair facilities, communication (wireless) and the like. Until such time the road improvements between Spencer junction and Sathram are developed, some basic necessities need to be developed at Pulmedu for the benefit of pilgrims who trek from Pulmedu to Sannidhanam. This will consist of basic facilities like dormitories (viri), bath and toilet facilities and restaurants selling food at affordable prices. It is also necessary to provide basic minimum medical facilities at Pulmedu in addition to upgrading the available facilities at Vandiperiyar. However, pilgrims may not prefer trekking through this route as the distance is more when compared to trek from Sathram. Possibility of operating noiseless battery powered vehicles between Vallakkadavu and Uppupara for a limited period during Makaravilakku days, specially managed by the reserve authorities may be explored till such time the road to Sathram is well developed.

f) Infrastructure Development at Transit Stations : Chengannur, Kottayam, Thiruvalla, Ernakulam, Alappuzha, Punalur

As already indicated, dedicated pilgrim facilities such as information centre, medical center, dormitory and bath / latrine complex are available at Chengannur railway station. These should be augmented to meet extra demand during peak pilgrim season. Further, such dedicated facilities should be made available at all transit stations such as Ernakulam South, Ernakulam Town, Kottayam, Thiruvalla, Alappuzha and Punalur.

6.3.5 Traffic Management

The District Police Administration at Pathanamthitta has been commendably managing the traffic during the peak pilgrim season every year. During the period Nov 15th to Jan 21st, which is the peak season for Sabarimala, a special cell headed by Special Superintendent of Police for Pampa sector and Special Superintendent of Police for Sabarimala Sector is operating under the overall control of Special Deputy Inspector General of Police.

Four shifts are in operation at each sector daily during the peak season. The Pampa sector is in charge of traffic regulation and control between Vadasserikkara and Appachimedu, while the Sabarimala sector is in charge of the section between Appachimedu to Sannidhanam including Sannidhanam complex.

In addition to this, to control the heavy rush of pilgrims during the Mandalapooja performed on 27th December and Makaravilakku on 14th January, additional police personnel are deployed both at Pampa sector and at Sabarimala sector.

Because of the efficient traffic control undertaken by Pathanamthitta District Police, there has been no perceptible increase in traffic accidents during the pilgrim season. There have been a total of 1645 traffic accidents in Pathanamthitta district during year 2005 of which 99 were fatal. Details of month wise traffic accidents in Pathanamthitta District according to their severity are given in Table 35.

Table 35: Details of Month wise Severity of Accidents in Pathanamthitta District during 2005

S. No.	*Severity*	*Jan*	*Feb*	*March*	*Apr*	*May*	*Jun*	*July*	*Aug*	*Sep*	*Oct*	*Nov*	*Dec*	*Total*
1	Fatal	6	4	12	6	8	12	8	8	8	11	6	10	99
2	Serious Injury	101	80	101	70	94	82	72	87	53	81	72	91	984
3	Simple Injury	42	26	37	28	35	33	26	19	21	35	30	38	370
4	Property Damage	13	11	2	4	11	7	9	7	4	7	6	6	87
5	Mech failure	9	6	6	3	5	3	3	3	3	6	3	6	56
6	Not Known	4	3	1	6	3	6	2	8	4	8	2	4	51
	Total	**175**	**130**	**159**	**117**	**156**	**141**	**120**	**132**	**93**	**148**	**119**	**155**	**1645**

It is seen that the total accidents during the three month period from Nov. '05 to January '06 aggregates to nearly 27 percent of the total yearly traffic accidents in the district. Also, the percentage of fatal incidents during the three month period accounts for 22 percent of the total fatal accidents in the year. Thus, it is evident that there has been no major increase in the occurrence of accidents during the Peak Sabarimala season in spite of the fact that there is a very large influx of pilgrim vehicles in Pathanamthitta and in other major towns in this district.

From a review of the month wise accident occurrence in different police station limits at Pathanamthitta district, it is observed that Pathanamthitta, Adoor, Thiruvalla police stations account for nearly 47 percent of the total accidents recorded in 20 police stations in this district (Table 36).

Table 36: Details of Month wise Traffic Accidents in Different Police Station Limits in Pathanamthitta District (2005)

S. No	*Name of Police Station*	*Jan*	*Feb*	*Mar*	*Apr*	*May*	*June*	*July*	*Aug*	*Sept*	*Oct*	*Nov*	*Dec*	*Total*
1	Kodumon	2	2	1	1	-	2	-	1	2	1	-	3	14
2	Konni	14	6	11	8	13	9	9	5	5	8	4	9	95
3	Koodal	3	3	1	2	2	2	1	-	-	4	2	6	26
4	Vechuchira	3	1	1	-	1	3	2	-	-	-	-	1	12
5	Adoor	21	11	31	28	34	19	15	23	21	16	19	17	255
6	Pandalam	11	10	17	6	11	8	12	7	6	9	6	16	119
7	Thiruvalla	31	15	26	24	26	19	21	17	12	19	19	16	242
8	Pulikuzhi	6	8	8	6	6	6	3	6	5	10	7	5	76
9	Keezhvaipur	9	10	9	4	9	4	5	4	1	7	4	6	72
10	Perumpathy	1	4	1	2	2	2	1	7	-	2	-	1	23
11	Ranni	12	5	8	5	6	10	12	17	7	18	9	10	119
12	Perinad	4	10	4	3	5	6	2	2	3	6	2	-	47
13	Pathanamthitta	25	23	25	17	21	26	18	24	15	26	25	27	272
14	Pampa	3	1	-	-	3	-	-	-	2	-	4	10	23
15	Chittar	3	-	2	-	1	-	1	-	1	1	-	2	11
16	Moozhiyar	1	-	1	-	1	-	-	-	-	-	-	-	3
17	Aranmula	13	8	5	8	7	16	8	12	7	12	9	11	116
18	Koipuram	10	13	7	2	8	9	10	7	6	9	5	7	93
19	Thannithodu	1	-	1	1	-	-	-	-	-	-	-	1	4
20	Vadasserikkara	2	-	-	-	-	-	-	-	-	-	4	7	13
	Total	**175**	**130**	**159**	**117**	**156**	**141**	**120**	**132**	**93**	**148**	**119**	**155**	**1645**
	Percentage to Total	**10.7**	**8.0**	**9.7**	**7.2**	**9.5**	**8.6**	**7.3**	**8.1**	**5.7**	**9.1**	**7.3**	**9.5**	**100.0**

While adequate police force is available at Pathanamthitta and Thiruvalla, no such system has been in place in Adoor. This deficiency has to be rectified in the interest of the overall transport scenario in the district.

It would be advantageous if police outputs are established at every 10 km on Pathanamthitta – Pampa route and also on Erumely – Pampa route. These could be provided with wireless communication system and an ambulance with necessary paramedics so that in case of any medical emergency or accident, and the nearest police force and hospital facility could be moblised at short notice to help in traffic management possibly by utilizing citizen groups.

6.4 Suggested Interventions for improved transportation and support facilities in Sabarimala Micro Region

6.4.1 Plappally - Chalakkayam - Pampa Section of Pathanamthitta – Pampa Road

As discussed earlier, traffic volume count in this segment was conducted for 5 days during the initial period of Mandalapooja, 6 days towards the end of Mandalapooja and for 7 days towards the end of Makaravilakku season. The intensity of traffic in this segment during the initial period of Mandalapooja ranged between 11,841 PCUs and 19,657 PCUs. The traffic intensity was in excess of 15,000 PCUs on 4 of the five days studied.

During the 6 days survey towards the end of Mandalapooja season, the daily traffic volume in this segment ranged between 1228 PCUs and 28,057 PCUs. The traffic intensity has exceeded 10,000 passenger units on three of the six days studied.

During the 7 days survey towards the end of Makaravilakku season, the daily traffic intensity ranged between 11,980 PCUs and 30,979 PCUs, the second highest intensity during this period being 17070 PCUs.

It is observed that the highest intensity of traffic in almost all the roads in the region occurs only on a few days during the pilgrim season of Mandalapooja and Makaravilakku and it is much less on other days of the year. It is also observed that the peak hour factor is only of the order 6 to 6.5 percent. Therefore it is considered not prudent to design the road facility to cater to the peak demand. But, a well considered system of traffic management is to be put in place to cater to the present and future traffic demand. With this view, the future requirements have been worked out to provide a level of service 'C' which will facilitate a traffic speed of around 40 to 50 kmph adopting a peak hour factor of 6.5 percent, suitably modifying the capacity norms recommended for different terrain conditions in IRC64 - 1990.

Structural Conversion

With a view to reducing the traffic congestion and improving the flow of traffic in Plappally – Chalakkayam – Pampa section, it is suggested that all private pilgrim vehicles including cars and vans be stopped at Nilakkal and the pilgrims transported to Pampa by KSRTC buses. Assuming a capacity of 50 per bus, 15 per van and 5 per car, one bus will be able to accommodate passengers of 3.3 vans or of 10 cars. However, the equivalent passenger car unit of one bus is three and one van is 1.50. Thus each van of 1.50 PCU is equivalent to 0.3 bus of 0.9 PCU and each car of 1.00 PCU is equivalent to 0.10 bus of 0.30 PCU. Accordingly, the equivalent peak traffic intensity during Mandalapooja period of 2005 will amount to about 19,000 PCUs and the equivalent peak traffic intensity during the Makaravilakku season of 2006 will amount to about 24,400 PCUs.

According to I RC 64-1990, the practical capacity of a two lane road in rolling terrain under level of service B adopting a peak hour factor of 10 percent can be taken as 11,000 PCUs. It is observed that the peak hour factor during the peak pilgrim season is observed to be of the order of 6 to 6.5 percent. It is also considered that a level of service 'C' which provides a speed of around 50 kph is adequate for design purposes. The practical capacity of a two lane road under the above conditions will be around 25,400 PCUs. Under conditions of level of service 'D' which provides a speed of around 25 – 30 kph, the maximum capacity of a two lane road will be around 30,000 PCUs.

Granting that all vans, cars, autos and two wheelers are stopped at Nilakkal and all pilgrims transported by buses commencing from Mandalapooja season of 2006, and providing a safe factor of 4 percent annual increase (considering the normal vehicle growh factor especially of small vehicles / private ownership etc, observed and its possible excalation over years), a traffic intensity of around 34,800 PCUs per day may be expected to be achieved by year 2015 and may increase to 54,200 PCUs by year 2030 adopting a growth rate of 3 percent. Further widening is necessary to accommodate future growth in traffic. This could be achieved in two stages, considering the difficulties in acquiring the needed land. Carriageway 10.0m wide with adequate shoulders is to be developed by year 2010 which could be further widened to provide for four lanes of traffic by year 2020.

Additional land is required for providing 4lane road of 14.0 m width and 1.5 m wide shoulder on either side.Minimum area required is worked out by the detailed project report prepared for the said road development by the PWD (R&B) of GoK as 22.2 ha from the Forest area.

Nilakkal – Pampa Traffic Management

As it is proposed that all vehicles be stopped at Nilakkal, it is necessary to introduce dedicated chain service preferable by using KSRTC services from Nilakkal to Pampa and back. As around 100000 people would be able to get comfortable darshan in a day, during the 14 hours of temple opening for 16 hours, morning 8hrs being the rush period, considering the movement velocity through holy 18 steps and assuming at least 1.5 seconds *darshan per pilgrim*. No: of pilgrims who would get darshan in an hour is around 5000. For transporting 5000 people from Nilakkal to Pampa in an hour, and vice versa, (one round trip by a bus as it takes half an hour travel time) around 80 buses are required to ply. In addition to this an average of 10 cars per hour may be assumed to transport men and materials required for administrative purposes. By ensuring such dedicated services, it would be possible to control the flow of pilgrims from base camps to Pampa depending on the possibility of *darshan*.

6.4.2 Circulation at Pampa

Currently Pampa is a place of traffic conflicts. Pedestrian – Pedestrian, Pedestrian – Vehicular and Vehicular – vehicular conflicts are quite common owing to unregulated flow of men and materials. All vehicles are allowed currently until Pampa and unload the pilgrims here. Vehicles are parked at Hilltop and Thriveni and flow of vehicles to these lots necessitate vehicle movements conflicting with pedestrian movement. Suggested restriction of private vehicles at Nilakkal would improve the situation. Thriveni would be left open for religious performances. Hence, regulation of parking at Pampa needs to be implemented at the earliest so as to prevent conflicts and to leave more area for pilgrims use / religious use.

Parking at Thriveni would be only for emergency service vehicles such as those for police on duty, ambulances, fire force emergency vehicles etc. A service road is proposed along Pampa from the South bank of River Pampa to Cheriyanavattom area.

a) Bus Station at Pampa (Chakkupalam)

Buses to all directions are being operated by KSRTC from the bus station at Chakkupalam in Pampa. In addition, Government buses from Tamil Nadu are also operating from this bus station. This bus station is heavily congested during peak pilgrim season and as of now requests from other state governments like Andhra Pradesh and Karnataka for operating their buses could not be entertained for want of sufficient space

in the bus station. Further, an average of about 400 trips is operated between Pampa and Nilakkal daily during Mandalapooja and Makaravilakku seasons.
Consequent upon the proposal to terminate all private vehicles at Nilakkal, Chakkupalam parking area will be freed from private vehicle parking and this area could be earmarked exclusively for Pampa-Nilakkal chain service buses. This will also help to decongest the existing bus station at Pampa. The number of KSRTC chain service buses need to be increased to meet the additional demand generated due to stoppage of all private vehicles at Nilakkal.

Total area required for parking required buses here, accommodation facilities for drivers and other facilities for administration is around 3.50 ha. Currently there are 2.50 ha of land available. Hence additional land requirement here would be 1.0 ha.

b) Hill Top Parking Area

As indicated earlier, all private light and medium vehicles such as cars, jeeps, taxis and maxicabs and also all private buses are proposed to be stopped at Nilakkal and the pilgrims traveling by these vehicles are to be transported to Pampa by KSRTC chain service buses. In the immediate future, both KSRTC and other Sate Government buses will however be permitted to proceed to Pampa. Long distance buses, both of Kerala Government as well as other State Governments will be parked at Pampa KSRTC depot. KSRTC could charge appropriate fees from other State Government buses for utilizing the infrastructural facilities available at the KSRTC bus station at Pampa. Only Administrative vehicles and related department vehicles listed, approved and verified by Police Department, will be parked at the first level of hill top parking area till the day before Makaravilakku. The second and third levels of hill top parking area which are at present used for parking of vehicles need to be converted and used for essential facilities for pilgrims to watch Jyothi and for drivers, support staff etc of those vehicles which would be parked here. In addition, area needs to be left for other services proposed by various agencies such as ropeway (in this case parking for emergency service vehicles and goods vehicles would be needed here). During Makara Jyothi day, the hill top would be cleared (except permanent facilities) and all other activities would be stopped and the place would be suitably converted for pilgrims to watch Makara Jyothi. Adequate barricades and other safety measures and temporary facilities are to be provided at this location to ensure safety of pilgrims watching the Makara Jyothi from here.

c) Restoration of Thriveni area for religious performances

The area on the river bank at Thriveni which is now utilized for parking of vehicles will be freed after prohibition of private vehicles beyond Nilakkal. This area will be kept aside for religious performances as was the custom since yore. Only cloak room kiosks to safe-keep pilgrim's belongings and not more than four temporary shops of area not more than 4 sqm each, run by the government / allied agency selling pooja materials for rituals would be permitted here. Parking at Thriveni would be only for emergency service vehicles such as those for police on duty, ambulances, fire force, emergency vehicles etc.

d) Provision of a Service Road for Solid Waste Transportation from Pampa South Bank to Cheriyanavattom Treatment Area

The present access road to Cheriyanavattom area is narrow and being used as a pilgrim pathway. Temporary shops are also being constructed during season. Hence movement of vehicles and pilgrim movement along the stretch are conflicting and both get severely

affected during the season. Hence it is proposed to bifurcate the pilgrim movement and service access by providing an exclusive lane for the service vehicles to the treatment area. In addition to serving daily as a service route for solid waste transportation, this would facilitate movement of emergency vehicles until the Ganapathy Temple premises in case of emergencies, without hindering the normal pilgrim flow along the riverbank.

The land requirement is estimated as 0.15 ha for the provision of access.

6.4.3 Improvements to Trekking Routes

There are three major trekking routes usually used by pilgrims to reach Sannidhanam. They are.

(a) Pampa to Sannidhanam along Marakkoottam.
(b) Erumely to Pampa along Azhutha.
(c) Uppupara to Sannidhanam along Poongavanam.

Detailed discussion on these routes has been provided in sub sections 4.2, 4.3 and 4.4. The requirements for future development are discussed below:

a) Pampa to Sannidhanam

i) Widening of Traditional Route between Pampa to Marakkoottam

As suggested in the Outline of the Master Plan for Sabarimala, The current alignment, width and pavement condition hampers uniform flow of pilgrims especially during peak season. This hinders the easy flow of pilgrims especially during peak days. To address the existing situation, it is recommended to widen the trek routes, ease out the curves and improve the pavement.

As discussed earlier, peak pilgrim trek intensity durig a day is 6000 persons per hour. Assuming a peak intensity of 200 percent of the mean density, the highest of pilgrim intensity which could be expected is 12,000 persons per hour. To provide for the peak-hour rush in case of an uncontrolled situation (like in case of emergencies) the likely peak pilgrim intensity to be considered would be around 40,000 persons per hour. The practical capacity of a paved foot way is around 5000 persons per meter width per hour (1.3 persons per second). This would warrant a width of around 3 to 4 times more than the current width. It is observed that concreted portions of the trek path becomes mossy and slippery after rains and the pilgrims often losses grip. Hence, the width of the pathway shall be at least 8.0m or on an average 12m, and it shall be adequately surfaced with earth binding natural growth and / or non-slippery eco friendly paving and provided with railings on both sides and at the centre to ensure safety of the pilgrims and also to provide support to elderly people. Hence, paving should be suitably selected in consultation with the Forest Department, Government of Kerala, to take care of issues related to the response of wildlife and ecosystem. While improving the existing trek path, While widening the pathway, care should be taken to conserve as much trees as possible as the way would otherwise erode without the root protection offered by the trees. In addition, clearing the trees here would affect the shade otherwise offered by the canopies and would render the path untrekkable. Hence sideward widening should focus on retaining the status of forest as such, but with additional resting bays for pilgrims to take rest. All service and utility lines should be housed in well laid out underground utility cables.

Since the width of the trek route between Pampa and Marakkoottam is not uniform, it is recommended that this stretch of the trek route is uniformly widened to 12 m including the existing right of way, to ease the one-way movement of pilgrims during peak pilgrim season. Land requirement for providing a finished width of 12m from Pampa to Marakkoottam is **2.164 ha.**

All concreted hard pavings on existing trek route to be replaced by suitable non-slippery, resilient to vagaries of climate, hard trek resistant material where ever required. Natural surface of all widened portions to be retained and to provided with suitable earth based / stone paving with loose joints (with natural growth of infilled grass or other suitable varieties as prescribed by the PTR authorities) if required to ensure safety, and minimal stepping wherever as per the guidelines prescribed in Volume 3 of this report. The ambience of traditional trek to be retained.Undergrowth may be cleared but canopy to be retained. Trees could be named and protected as part of nature education.

ii) Need to Phase out Donkeys from carrying goods

The donkeys which move along with the pilgrims through the trek paths hinder with the movement of pilgrims. There have been many incidences when they have stepped over and kicked the pilgrims. In addition incidences of carcasses of diseased donkeys left in the nearby areas and chances of spreading of communicable diseases among wild life through these donkeys exposes the need to phase out the donkeys from service. It is desirable to go in for better alternatives to transport goods from Pampa top Sannidhanam.

iii) Construction of a Ropeway

As explained in Chapter 5 of this report, it is desirable to construct a ropeway top transport goods from Pampa to Sannidhanam, which can be used for emergency evacuation as well. However, the best alignment option which suits the environment by minimal cutting of trees and utilization of minimum land area required need to be selected as the best possible alterative. Selection of best alternative should be carried out following a Social and Environmental Impact Assessment as per the Environmental Legislation of the MoEF.

iv) Provision of Resting Areas along Traditional Route between Pampa and Marakkoottam

Considering the arduous trek from Pampa to Sannidhanam, it is proposed that adequate resting / waiting facilities be provided for the pilgrims from Pampa to Sannidhanam. This would mean providing temporary facilities in the form of sheltered bays from Pampa to Marakkoottam along the traditional route.

The sheltered bays from Pampa to Marakkoottam will be provided at a regular interval and could be accommodated at places where there is adequate land of suitable gradient on both edges of the traditional trek route. Each bay would be

provided with shops selling essential food, water (kiosks for supplying drinking / medicated water) and medicines, toilets and temporary seating.

Each bay would be with pergolas for shelter where shops selling essential food, water (kiosks for supplying drinking / medicated water or water purifiers on technologies such as Reverse Osmosis) and medicines, toilets and temporary seating arrangements are provided.

Land requirement for this would be 0.014ha.

v) Widening of Chandranandan Road and Swamy Ayyappan Road

The Chandranandan road between Marakkoottam and Srikovil runs on a relatively flat terrain (relative to the earlier section through Appachimedu), but is extremely narrow at certain stretches which has resulted in fatal accidents. Moreover, there is no protective railing on the valley side. Thus, it is important to widen Chandranandan road and provided with railings, to allow easier movement. Pilgrims going downhill from Sannidhanam towards Pampa use the Chandranandan road during peak season. It has been proposed to provide a uniform width of 7m (5m cler width plus additional width to construct retaining walls to protect valleys) for Chandranandan road, including the existing right of way. Land requirement for this would be **0.893 ha**

The Swamy Ayyappan road from Ganapathy temple at Pampa to Marakkoottam has an unevenly paved surface, narrow with a number of sharp bends. It is proposed that this route be widened, paved with suitable surfacing and railed. This would help in smoothening the one-way pilgrim movement during the peak pilgrim season and also facilitate solid waste collection from the secondary storage and collection points being proposed on the Swamy Ayyappan Road.

It has been proposed to provide a uniform width of 5m for Swamy Ayyappan road, including the existing right of way. Land requirement for this would be **1.0832 ha**

vi) Construction of a Retaining Wall at Chandranandan Road

The terrain on one side of the Chandranandan road is a deep valley. In view of the pilgrim safety and to protect the pathway from erosion, the proposal recommends providing of barricades along the sides and construction of a retaining wall at Chandranandan Road. Since it is proposed to provide a uniform width of 7m for Chandranandan Road, no separate area is required for constructing the retaining wall.

vii) "Queue" Complex

During the pilgrim season, the pilgrims wait in a queue along the trekking route with ‘irumudi kettu’ for a long time before darshan, without having basic amenities. This undesirable wait after a strenuous trek increases the physical hardship of the pilgrims. In addition to the necessity for immediate amenities and facilities such as toilets and drinking water, it is also required to streamline the movement of the pilgrims towards Sannidhanam. Hence, it is proposed to have a full-fledged “Queue” complex between

Marakkoottam and Nadapanthal for pilgrims trekking the traditional route and a second queue complex for pilgrims trekking through the Uppupara side.

The over night stay at Sannidhanam for performing Neyyabhishekam may be eliminated by the following arrangement.

Twelve numbers waiting sheds each with a seating capacity of 5000 persons are to be constructed between Marakkoottam and Saramkuthi in the queue complex. Each cell of a shed may hold 800 to 1000 pilgrims with all required facilities. The pilgrims carrying 'Irumudi' are regulated through eight of these waiting sheds between 3.00 AM and 10.00 AM such that the last person to leave for Sannidhanam from the queue complex will have a very good chance of having darshan, perform Neyyabhishekam and return to Pampa the same day. Pilgrims who do not carry the traditional Irumudi are to be regulated through the other four waiting halls which will be opened at selected intervals between 11.00 AM and 9.00 PM since these pilgrims are assumed not to be performing the Neyyabhishekam. Similarly, six waiting sheds are proposed in the Uppupara route between Poongavanam and Urakkuzhi. Four of these waiting halls could be utilized for pilgrims with Irumudi and the other two for others and pilgrims regulated as indicated earlier.

The over crowding on top of the hill for watching Makara Jyothi can be eliminated if sufficient open ground is made available for this purpose. Such open spaces could be identified and developed on top of the present hill top parking area which will be vacated after shifting parking of vehicles to Nilakkal and also after Cheriyanavattom behind the sewage pumping station at Pampa.

A typical fully developed "Queue" complex will have a series of compartments having separate corridors for entry and exit and all the basic facilities like drinking water, electricity, toilets and food stalls, where pilgrims can wait before moving for darshan. Initially, these can be in the form of semi-permanent structures which can be gradually converted to full fledged structures with all modern amenities like drinking water, electricity, toilets, food stalls, basic medical facilities, communication (and even closed circuit television (CCTV) for darshan/bhajans etc. based on traditions and pilgrim preferences) while waiting in "Queue" compartments.

The pilgrims from compartments will be guided to proceed for darshan according to the priority. Pilgrims may have to wait for a few hours in the "Queue"-complex depending on the peak period. Arrangements should be made to ensure that the pilgrims who proceed from the "Queue"-complex shall follow a queue right up to the sacred eighteen steps to the Srikovil.

Based on statistics, about 80 percent of the pilgrims take the trekking route up from Pampa to Sannidhanam, while remaining 20 percent use the Uppupara route. It is proposed to construct a queue complex to accommodate 50000 pilgrims between Marakkoottam and Nadapanthal and for 12000 pilgrims at Pandithavalam.

Land requirement for construction of a "Queue" Complex on Traditional Route between Marakkoottam and Nadapanthal is **3.248 ha including the existing trek route from Marakkoottam to Sannidhanam.**

Land requirement for construction of a "Queue Complex" for Pilgrims visiting from Uppupara is **0.72ha. The earmarked location falls under the area already in use by TDB at Sannidhanam.**

Design Elements of such a queue complex would be:

- Structure/s with suitable weather protection to house the waiting pilgrims who could move to the Sannidhanam on a 'first come – first move' basis
- The structure could be in the form of cells, each housing around 800 to 1000 pilgrims
- Distributed service core for each cell (may be combined suitably for adjacent cells), comprising of toilets, shops, CCTV etc connected suitably to Watsan services (such as septic tanks / equalisation chamber, water lines etc)
- Exit and entry corridors for pilgrims to get in and out of the cell
- Prime service core after a group of cells with medical aid, shops, communication services accessible from both entry and exit corridors
- Seating and standing facility for queuing pilgrims
- Facilities / design arrangements to suit fire protection and emergency evacuation in case of emergencies
- The cells may be interspersed with open areas

The structure should ideally

- Follow the slope / terrain and built around (conserve) as many trees and natural features as possible
- Retain the ambience of the trek route and the feeling of a trek
- Use materials and construction technology which would have least negative impacts on the surrounding forests and its fauna, and is easy to assemble. It should also consider the off season maintenance and security of the facilities so created from the vagaries of climate, fauna and any other aspect
- Should incorporate features which would help conserve energy / water and provide a comfortable waiting experience to the pilgrims
- Suitable fire safety and pilgrim security to be ensured even in case of disasters

A detailed Terms of Reference has been developed to invite consultants with sufficient experience in designing such infrastructure in eco-fragile areas and has been submitted by the consultants along with the Report[4] on Proposed Works for 2006-07 pilgrim season. (Refer Appendix A.)

The existing condition and suggested interventions for the trek route between Pampa Ganapathy Temple and Sannidhanam are indicated in Table 37.

[4] IL&FS Ecosmart Ltd (September 2006) Details for Implementing Proposed works at Sabarimala and Nilakkal 2006-07, Master Plan for Sabarimala, *Submitted to* Government of Kerala

Table 37: Suggested Interventions for Improvising the Movement along Pampa - Sannidhanam Routes

Sl. No.	*Route*	*Length (m)*	*Average Width (m)*	*Condition*	*Interventions Proposed*			
					Proposed Width	*condition*	*Addl. Land Required (ha)*	*Remarks*
1	Pampa - Neelimala - Marakkoottam (Traditional Path)	1800	5.8	Paved (including steps) for 1520m Mud road beyond 1520m	12.0 (including existing way)	Natural as much as possible. In required sections, Non-slippery, hard trek resistant material , laid with open joints Need resting bays	2.164 ha+ 0.014 ha (resting bays)	Railings to be provided at both edges and at centre. Natural trek ambience to be retained
2	Pampa - Marakkoottam along Swamy Ayyappan road	2260	2.9	Earthen with pebbles strewn along the path	5.0	Compacted	1.0832 ha	Railings to be provided at both edges and at centre. Can be used for one way movement – of pilgrims coming back to Pampa after darshan
3	Marakkoottam to Sabarimala along Chandranandan road	1275	3.9	Earthen with pebbles along the path	7.0	Compacted	0.893ha	Railings to be provided at both edges and at centre. Can be used for one way movement – of pilgrims coming back to Pampa after darshan
4	Marakkoottam to Sabarimala along Sharamkuthi (traditional way)	1100	4.2	Earthen		To be integrated with **Queue complex.** Need to be used for on ward movement to Sannidhanam from Queue Complex	3.248 ha	

Suitable resting bays (with seats, *Irumudi resting trabeates,* oxygen parlours) to be at sufficient intervals along the stretch from Pampa to Marakkoottam and cardiology centers to be provided for care of ailing pilgrims at the steep climbs such as Appachimedu and Neelimala. (This is further explained in the Master Plan module dealing with Health Infrastructure and other amenities)

viii) Emergency Service from Sannidhanam

By the construction of queue complex, concentration of pilgrims is shifted from Sannidhanam to the Queue Complex which would accommodate around 60000 pilgrims at a time. The queue complex would start from Marakoottam. Hence requirement of emergency services would be generally from the Queue Complex.

A separate service way for administrative and service personnel be developed along the side of the queue complex (as part of queue complex), with ramped ingress and egress for stretcher services till Marakoottam when required. This is to be considered during detailed designing of the queue complex.

During emergencies, pilgrim flow is to be controlled and no more further flow up to be promoted. Since the movement from Nilakkal is proposed to be controlled using KSRTC vehicles alone, it would be possible to prevent further shipment of pilgrims to Pampa through the road. Pilgrims along the trek path from Erumely to be retained at Valianavattom. By restricting the entry up from Pampa, it would be possible to enforce one-way movement from Sannidhanam to Pampa through traditional route during emergencies. This would releave the Chandranandan Road and Swamy Ayyappan Road for tractor movement till Ganapathy Temple premises, from where the service vehicles can ply through the proposed service route till Thriveni and from there to Nilakkal and beyond. Since multi modal traffic is proposed to be restricted between Nilakkal and Pampa, it would be possible to control the vehicles here and uni-directional movement towards Pathanamthitta side can be enforced easily.

In addition trek route to Uppupara and forest koop route through Ambalakayam may be used for evacuating the pilgrims on foot in case of emergencies.

b) Erumely to Pampa along Kalaketti

According to the latest pilgrim count, the highest number of pilgrim on any day on this trekking route during Mandalapooja season was around 12,000 whereas it was nearly 65,000 on the peak day during Makaravilakku season.

It has been observed that the available pilgrim amenities along this route are managed by Eco Development Committees (EDCs) and are grossly inadequate to meet the large number of pilgrims on specific days during the pilgrim season. It is therefore necessary that improved pilgrim facilities be provided at the traditional halting places such as Kalaketti, Azhutha and Valiyanavattom. Such facilities could also be developed at Mukkuzhi on the river bank to ensure provision of resting places at convenient intervals. It is proposed that such facilities be developed along the route at convenient locations in such a way that facilities are available at least after each hours walk.

A causeway may be constructed across Azhutha River for pilgrims to cross the river when the water level rises.

Service roads:

Azhutha Pampa valley Road can be used as a service road where ambulances and service vehicles can be parked. Valianavattom also to be developed as a transit node due to the availability of service road and other amenities. This place can serve as a well developed Jyothi viewing point as well due to possibility of evacuation in case of emergencies and possibility to develop necessary pilgrim facilities through EDCs.

c) Trek Route from Sathram to Sannidhanam

As discussed elsewhere in this report, it is considered desirable to route the pilgrims from Vandiperiyar side to Sannidhanam through Sathram. All needed infrastructural facilities

for providing basic amenities to the pilgrims including provision of over night accommodation is to be provided at Sathram utilizing the land belonging to TDB available here. The trekking path from Sathram to Sannidhanam involves a steep climb between Sathram and Seethakulam over a distance of 1.5km, level track between Seethakulam and Uppupara for a length of 4.5km and a gentle downward slope to Sannidhanam over a distance of about 6 kilometers. Since Uppupara lies inside the Periyar Tiger Reserve, it is not desirable to create a transit camp at Uppupara. Therefore, it is suggested that the proposed transit camp be set up at Sathram. However, certain essential requirements such as toilet facilities, drinking water and light refreshment be made available at Uppupara, taking care that the waste disposal is done effectively without causing environmental degradation of the forest area.

6.4.4 Facilities for Jyothi Viewing

The major traffic and transportation problems witnessed during Sabarimala pilgrim season are two fold. The first is the congestion on the road network in the Sabarimala region while the second is the over crowding at the Sannidhanam. The problem of traffic congestion on the roads in Sabarimala region is planned to be solved by a combination of road development and traffic management options. The problem of over crowding at the Sannidhanam is created by two distinct factors. The first is the overnight stay of pilgrims for performing 'Neyyabhishekam' which is performed only during the morning session. Pilgrims arriving at the Sannidhanam in the afternoon have necessarily to stay at Sannidhanam over night so that they could perform the 'Neyyabhishekam' the next morning. The second one is the over night stay of pilgrims prior to Makaravilakku for watching the 'Makara Jyothi'. For this purpose, pilgrims stay for two or even three days at the Sannidhanam. This causes undue strain on the already over stretched facilities available at the Sannidhanam resulting in severe degradation of the environment at the place.

The over night stay of pilgrims during the pilgrim season prior to Makaravilakku can be eliminated if arrival of pilgrims at the Sannidhanam is regulated and controlled. The overnight stay prior to Makaravilakku for watching the Jyothi could be prevented if the pilgrims are assured of sufficient space at Pampa and other convenient locations for watching the Jyothi on Makaravilakku day.

Suitable jyothi viewing locales can be developed at:

- Hill Top at Pampa (for 15000 to 20000 pilgrims)
- Valiyanavattom (for 5000 to 10000 pilgrims)
- Uppupara (for 50000 pilgrims)
- Panchalimedu (for 5000 pilgrims)
- Road side : Nilakkal – Attathodu (for 300 pilgrims)
- Nilakkal (to be explored: for 500 pilgrims)

In addition available area at Pandithavalam in Sannidhanam and on the Thirumuttom can be utilized for jyothi viewing in well laid out viewing spaces, without overcrowding at a rate of 2 sqm per person including internal circulation spaces.

It would be required to examine options for systematically allotting spaces for jyothi viewing to pilgrims. It is suggested that studies be conducted during the phase 1 of this project to identify and develop such options for systematically allotting jyothi viewing spaces. Cubicles

each of not more than 100 persons be demarcated in these areas at a rate of 2 sqm per person including internal circulation spaces. Sufficient strong barricades are to be provided to demarcate the cubicles and required facilities such as essential food and water, sanitation, health care etc are to be provided at these points.

6.4.5 Circulation at Sannidhanam

1. Improving circulation in Sannidhanam area

It is essential to provide suitable service street all around the allotted area at Sannidhanam to facilitate movement of goods and to aid other services. It is also required to provide utilities in underground cables along the streets so as to aid repairs and to prevent their exposure and resultant hindrances to pilgrim's movement and other mishaps to wildlife.

2. Improving circulation around Sanctum Sanctorum

Most important factor which today contributes to the incessant rush around the temple is the lack of sufficient open space for circulation of pilgrims around the Sanctum Sanctorum. Later additions to the temple complex such as buildings closely abutting and overlapping the elevated 'peedom' on which Sanctum Sanctorum is located and the flyover which dominates the Sanctum Sanctorum reduces the circulation space around the Sanctum and deprives the pilgrims of sufficient space required for them to fulfil religious performances. This also would result in lesser area for crowd dispersion in case of emergencies. Hence it is required to free out as much area here and to ensure efficient circulation so that pilgrims get satisfactory darshan and are evacuated from the Sanctum Sanctorum area as soon as the darshan is over.

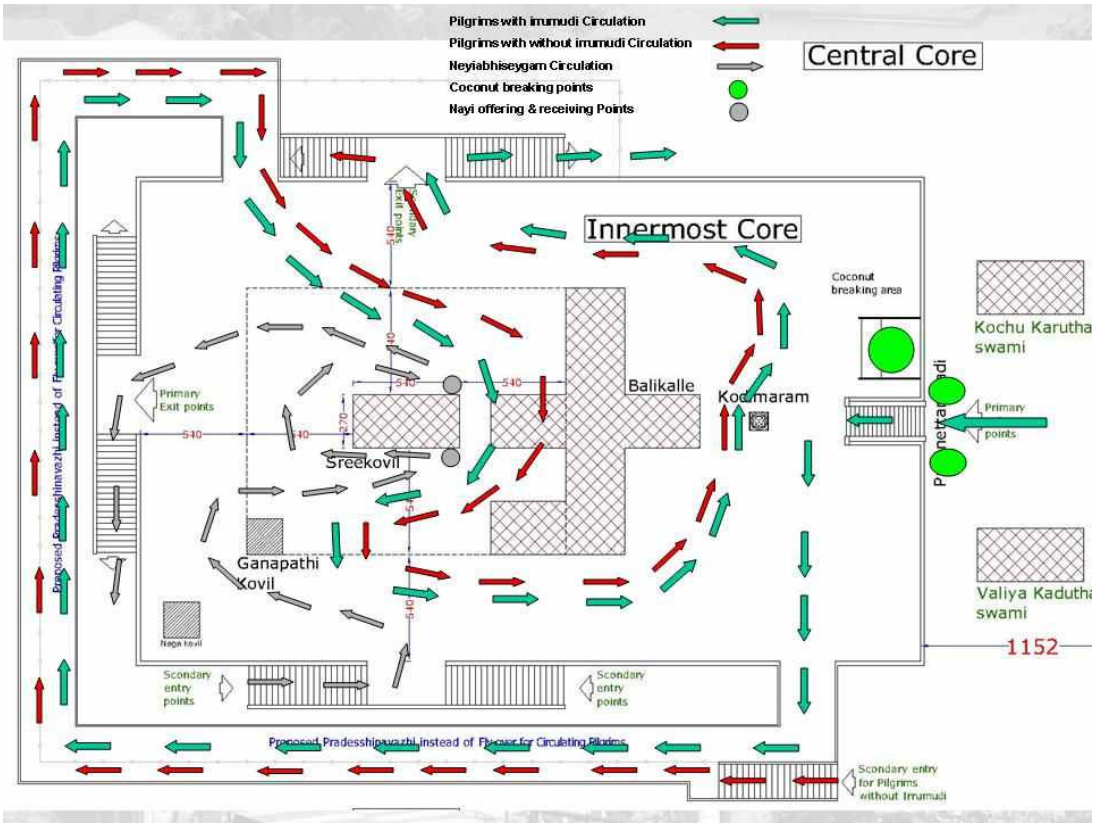

Figure 2: Possible Circulation Pattern at Maha Sannidhi

As suggested in the module on Built Fabric analysis, immediate area around the Sanctum Sanctorum need to be laid out as per principles of Vasthu. Possible options of circulation

plans for Sanctum Sanctorum area after remodelling the area as per Vasthu are shown as in Figure 2.

6.4.6 Crowd Management

Pilgrims throng the holy Temple of Lord Ayyappa in Sabarimala in millions during the annual Mandala – Makaravilakku Season every year from November to January. Lakhs of pilgrims witnessed the holy Makarajyothi on the south-eastern horizon of the Lord Ayyappa temple on the Makaravilakku day every year. Pilgrims chanting "Swamiye Saranam Ayyappa" occupy all possible points in the Sannidhanam, Pampa and Uppupara mainly to view the Makarajyoti.

Pilgrims in hundreds could be seen even on sunshades and building tops in Pampa and Sannidhanam from where the Makarajyothi is visible. Scores of Ayyappa devotees camp at Sannidhanam, Malikappuram, Pandithavalam, Pulmedu, Pampa, Valiyanavattom and Cheriyanavattom before the Makaravilakku day, to get viewing points. It is so unfortunate that the pilgrims could not be offered better viewing and waiting conditions. One could very well exclaim that it is just the grace of Lord Ayyappa which saves the millions from any disaster on the holy day. Such is the crowd and the manner in which they are forced to wait for hours together in Sabarimala.

It is unfortunate that due to the absence of rational management of available space, pilgrims are left to queue up in an unsafe manner. Due to the lack of proper and sound arrangements guaranteeing equal opportunity for all pilgrims to get Makarajyothi darshan, they even start their wait days back at viewing points. In case of any disaster there is no space left for the crowd to disburse and safely evacuate. There is an absolute lack of health care delivery system to the pilgrims in case of accidents or emergencies. Lack of access to water and sanitation facilities during the hours long wait is also disheartening.

Pilgrims rush to the sanctum sanctorum when the Temple opens after Deepaaraadhana. The tedious trek route from Sannidhanam to Pampa witness heavy rush of pilgrims down after Makarajyothi in an attempt to rush back home. This results in stampede and casualties. Sabarimala witnessed one such incidence in 1999 on January 14, when 52 pilgrims died at Pampa hilltop in a stampede. Justice Chandrasekhara Menon Commission report that inquired into the Pampa hilltop tragedy had pointed out that it had happened due to "negligence in ensuring the safety of the pilgrims coming from different parts of the country." According to the Commission, "it is the duty of the Government to see that the pilgrims coming to Sabarimala from different parts of the country do not get injured in their trip, that well laid roads are there, proper and strong barricades are put up in the elevated portion and no over-crowding which might lead to stampede and other tragedies, takes place. If anything happened on account of the breach of duty of the government, the State cannot wash of its hands by stating that it was inevitable in the nature of the huge assemblage of pilgrims."

Such inhuman waiting conditions bring to the forefront the need for effective crowd management and provision of equal and safe facilities for all pilgrims at Sabarimala. Most important is the need for a facility to systematically allocate safe viewing points to the pilgrims. This is possible only when the space available is rationalised and maximum space is freed on ground for pilgrims to spread out for viewing and for effective and planned crowd dispersal facilities.

Enforcement of proper planning and crowd management through an effective system including ***queue complex*** is essential to control the rush of the crowd to and from Sannidhanam. The core concept for pilgrim friendly development should focus on ***decentralizing those activities and events*** (Refer Module on Built Fabric Analysis) that do not necessarily require to be located at Pampa and Sannidhanam; and to provide efficient linkages between all areas and activities. By doing so, and using appropriate crowd management strategies to regulate pilgrim flow, it is anticipated that the current crowded conditions at Pampa and Sannidhanam can be resolved, so as to provide a satisfying experience to the pilgrims coming to Sabarimala. ***Development of basecamps, crowd control measures to ensure regulated pilgrim movement and chanellised and systematic movement of pilgrims to and from Sannidhanam through queue complexes at major exit / entries*** (at trek route from Pampa to Sannidhanam and at Paandithavalam for pilgrims from Uppupara) thus become an absolute must. Through proper planning it is also required to provide access to drinking water and sanitation to the waiting pilgrims.

It is suggested that demarcated movement lines to channellise the crowds from Pampa to Sannidhanam and back and possible slot allocation for Makarajyothi viewing and crowd chanellising to move for Deeparadhana after Jyothi viewing and back to Pampa be scrutised and enforced by the Police Department so as to ensure a regulated and well chanellised flow of pilgrims rather than allowing a crowded condition.

6.4.6.1 Darshan Capacity

Maximum possible number of pilgrims who could have comfortable darshan of the benevolent Lord Ayyappa would be the basis for planning the facilities required at Sannidhanam and to regularise the circulation here. It is also important in this situation where the area under consideration is a forest temple which needs to maintain its pristine character to provide maximum satisfaction to the devotees. For safety requirements and emergency evacuation it is essential that the crowd at Sannidhanam be minimised and regularised in addition to minimising the time the crowd is to be retained near Sanctum sanctorum. In this context, the darshan capacity has been analised considering the spatial attributes of the built and unbuilt areas immediately around the santum sanctorum and the pedestrian flow dynamics.

Considering the temple opening time:

Assuming a total of 15 hours temple opening time[5] total pilgrims who can have darshan for at least 1.5 seconds in three rows (space in front to the santum sanctorum can accommodate three rows) is 108000.

Considering the practical capacity of Holy 18 Steps (Pathinettampadi):

Considering the maximum number of pilgrims who could rush up the steps which have around 1.5m as width as 80 to 100[6] (against the practical pedestrian velocity of 40

[5] Which is not extendable as per tradition considering the anthropogenic nature of the diety who is believed to be rising in the morning, accepting the offerings and showering blessings during the temple opening hours and takes rest during the remaining time. In case of Sabarimala, ritualistic customs like singing the lullaby "Harivarasanam" at 11PM before the God retires for the day, strongly underpins this tradition.

[6] Survey during the peak pilgrim season indicates that maximum number of pilgrims climb up the holy steps is 80 and even in extreme case of assisted climbing it could be not more than 100 persons per minute per metre width.

persons per minute per metre width[7] on level ground during emergency situations), maximum pilgrims who could climb up would be 4800 to 6000 per hour. Considering that around one third of this capacity climbs without Irumudi through the alternate steps, maximum pilgrims who could climb in a day would be 1.2 lakhs. This could definitely be considered as the maximum number of pilgrims who could reach up to the Sanctum Sanctorum in a day.

During peak days, actual visitations exceed the darshan capacity forcing the pilgrims to stay back for darshan. It is advisable to evasde such a situation where pilgrims are forced to stay back without access to facilities. It is hence recommended that the pilgrims be contained in the well developed basecamps and channellised towards Pampa through dedicated / controllable services based on darshan capacity. The following figure indicates the pattern and the fluctations of pilgrim visitations. It is observable that during few days of the year, visitations exceed the actual capacity. It is hence recommended that for optimal utilisation of the darshan capacity pilgrim visitations should be planned and regularised based on the lean days viz a viz the peak days diuring the peak season itself. This would also support the security related activities.

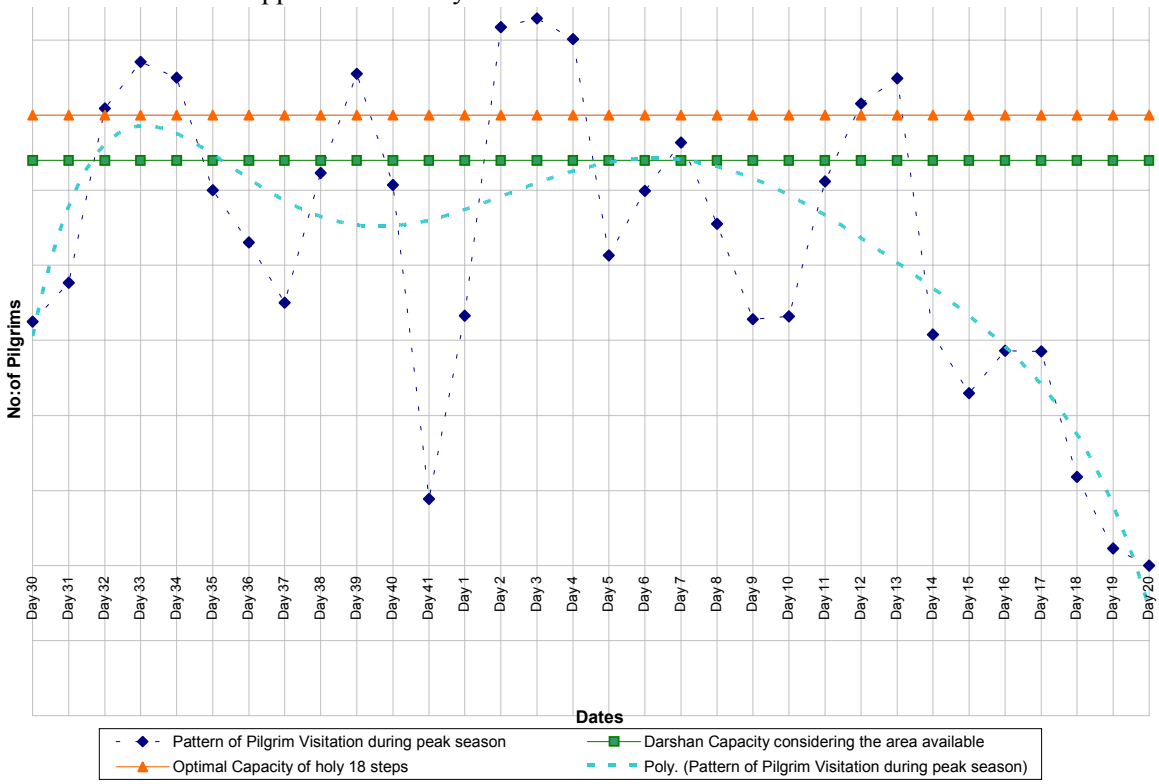

Figure 3 : Pilgrim Visitations at Sabarimala viz a viz the Actual Darshan Capacity

6.4.6.2 Observed Pilgrim Flow Patterns

Pilgrim movement during the peak days of the season were observed. The following are the important points to be considered while planning for better movement patterns.

[7] The Primrose Guide (1998), Guide to fire precautions in existing places of entertainment and like premises. HMSO (ISBN 0113409079)

Movement pattern is mostly unorganised, and lacks chanellised flow. Different types of exchanges made by the pedestrians such as bi-directional, bi-diagonal, cross-diagonal, and cross-forward) are high.

The flyover around the sanctum sanctoirum just aids in retaining the pilgrims for more time without any facilities in the temple precinct. This backlog of pilgrims right around the temple on the high platform with less accesses poses danger.

Conflicts are high at Pampa left bank, Manalpuram, Nadapanthal at Sannidhanam and Sanctum sanctorum premises.

Edges move faster than centre of crowd. Hence demarcated pedestrian ways with railings found effective wherever provided (especially at places along the trek paths were it aids the climb).

Larger groups of pilgrims gain precedence over smaller groups in volume and velocity while moving.

6.4.6.3 Measures for Supporting the Pilgrims by Streamlining their Flow Pattern from Base Camps to Sannidhanam and Back

Short Term:

- Stopping all vehicles at Nilakkal
- KSRTC to run chain services from Nilakkal to Pampa (Chakkupalam)
- Pilgrims directed to move from Pampa left Bank to Thriveni Bridge and through right side of Manappuram (along the shop side) to Pampa Ganapathy Temple premises. From here they can go up to Sannidhanam through traditional trek path to Nadapanthal and then for darshan.
- From Sannidhanam, they can return through Chandranandan Road and SA Road and reach Ganapathy Temple premises. From here they can follow the left side of Manalppuram, perform rituals and move out of Pampa through Thriveni Bridge. They can alight on KSRTC buses at Chakkupalam.
- Pilgrims from Erumely can climb the traditional route from Cheriyanavattom and Ganapathy Temple premises as of now. They are controlled with others at Q Complex up Marakkoottam. Pilgrims from Uppupara are streamlined through the Q complex at Pandithavalam side.
- Emergency service vehicles will be parked at Ganapathy temple area as of now and at Thriveni.
- Widening of trek path, SA Road and Chandranandan Road
- Planning for Jyothi viewing areas with hierarchical internal road networks. Dispersal of jyothi viewing to Pandithavalam area, Uppupara, Hilltop, Valianavattom, Panchalimedu etc.
- Possible slot allocation for Makarajyothi viewing and crowd chanellising to move for Deeparadhana after Jyothi viewing and back to Pampa to scrutinised and enforced by the Police Department so as to ensure a regulated and well chanellised flow of pilgrims rather than allowing a crowded condition.

Medium Term:

- Pilgrims can wait in the Queue complex, construction of should be complete in the medium term. Each cell of 800 to 1000 pilgrims can have darshan in an hour.

- This time, the area around the temple is proposed to be redesigned to remove the unnecessary flyover around the Sanctum Sanctorum which does not adhere to temple vastu, easy pilgrim flow and dispersion during emergencies. The redevelopment proposed would free out sufficient area around the temple at lower Thirumuttom for pilgrims to queue up and disperse.
- Re-planning of circulation in and around Sanctum Sanctorum. Reworked pilgrim flow for darshan would aid easy evacuation of pilgrims after darshan from the sanctum sanctorum premises.
- A movement pattern is suggested for pilgrims at Sannidhanam which would guide them to different temples / sacred areas at Sannidhanam in a row.
- A grade separation is proposed at Marakkoottam to segregate pilgrim flow.
- In case of emergencies pilgrim movement from Sannidhanam to Pampa would be made through traditional route, through a separate edgeway designed as part of the queue complex. Thus Chandranandan and SA road can be freed up for emergency vehicles. Suitable modifications to a tractor can be made to cater for ambulance service. This can effectively use the grade separation at Marakkottam and thus move up to carry the patient down.
- From Ganapathy temple area, along the road, emergency vehicle can move till thriveni area through the service road proposed for Solid Waste Transportation or even through Manappuram as of now, by cautioning the pilgrims. Parking for additional fire service vehicles and ambulances (only) is allowed at Thriveni which is linked to Ganapathy temple area through the service road.
- As the traffic along the road from Pampa to Nilakkal is uni-modal (comprising of only KSRTC buses) which runs as per fixed schedule, it is easy to control them and make room for emergency services. Further this would aid in stopping further pilgrim movements to Pampa in case of a more serious calamity. Communication facilities to be ensured in chain buses.
- Widening of the road to Pampa
- Well planned and dispersed Jyothi viewing areas. Valianavattom, Uppupara, Hilltop and Panchalimedu are accessible by road. Jyothi viewing to be minimised in Sannidhanam area. However, more area would open up for dispersion as a result of detailed redevelopment of area around the temple as per Vasthu.
- Improving hospital facilities around Pampa.
- Pilgrim regulation at each Base Camp with traffic regulation and communication with Sannidhanam (Nilakkal, Erumely, Vandiperiyar)
- Environmental and Social Impact Assessment for Goods Ropeway
- Goods movement channellised through Ropeway, if EIA is positive. Phasing out of Donkeys

Long Term:

- Introduction of parking time slot for pilgrim vehicles, KSRTC Tickets with time slots based on darshan time can be introduced to further streamline the pilgrim movement.
- In the long run, multi-modal tickets for 'Sabarimala Yaathra' (single pass for tickets in train, bus, KSRTC chain service etc) with darshan time slots may be introduced.
- Pilgrim priority at each Base Camp conglomerates (a group of base / transit camps connected together with transport services)

6.5 Compiled list of Interventions, Land Requirement and their Phasing

The developmental activities elaborated for improving the traffic and transportation facilities in the Sabarimala region will involve sizable capital and recurring expenditure, both in the short term and in the long term. It is necessary to carry out detailed estimating for determining the cost involvement of various items detailed in this report. However, a very rough costing has been done to serve as a guide for determining the financial feasibility of taking up different projects and also in determining the source of funding. A compilation of all interventions proposed and their phasing is provided in the following table (Table 38).