MASTER PLAN MODULES **LANDSCAPE MODULE**

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1. BACKGROUND

1.1 Introduction and Relevance

Pilgrimage or 'Theertha Yatra' has a vital role in every religion. Theertha Yatra is a journey (yatra) to a holy place, literally a "ford" or "crossing place" (theertha), which is understood as the liberation ('moksha') from earthly attachments and rebirth and is also considered as 'a link between the divine and human worlds'. A pilgrimage centre is thus a crossing place between different worlds and is considered far above the mundane space and time. Hence, upon journey to such a place, the pilgrim who approaches it becomes detached from the ordinary mundane existence and the journey may equate with or substitute for renunciation. In popular Hinduism, there is the powerful image of the ideal pilgrim as 'a person who has renounced the earthly comforts and walks to his ultimate destination of *moksha* with only the bare necessities for subsistence' until he realises his goal.

Among the most important pilgrimages undertaken by the worshippers mostly belonging to the South of the Indian Sub Continent and spreading in popularity far and wide, day by day, is the one to the supreme destination of Sabarimala in Kerala. Sabarimala, the most famous temple of Lord Ayyappa, situated in the Western Ghats is a religious destination par excellence. Its unique location in the dense tropical forests, is established by the legends and beliefs anchored around the Supreme Lord himself being the *'kanana vasan'(who resides in the forests)*. As widely understood, the supreme elegance of this pilgrim centre is to the credit of the deity who showers his blessings upon the pilgrims from his favourite abode in the rich landscape of his own choice.

The flow of pilgrims to Sabarimala and concentration of pilgrims during few auspicious days is enormous and seeks more and more facilities. As a result, as the time advances, it is observed that the pilgrimage has undergone wide deviation from the earlier 'theertha yatra' on foot with 'only the bare necessities for subsistence'. The pilgrimage has started producing pronounced impacts on the surrounding environ in such a way that the pristine virgin nature at Sabarimala has been affected in many ways, sometimes far away from restoration. Ever increasing unplanned facilities especially at Pampa and Sannidhanam shows that attention of the providers has shifted from that of maintaining the sanctity and value of the place as an arduous religious/pilgrim centre to more of an income generating activity/place. Mounting changes at Sabarimala with increased facilities for food and accommodation, shopping, and travel provided in an unplanned manner, does not fall into terms with the central theme that the pilgrimage is valued. It is hence important that any master plan to upkeep the glory of this forest temple should focus on the strategies to minimise the negative externalities of the pilgrimage on the environs, but at the same time provide basic facilities essential for the pilgrims.

It is well understood that the area is part of a "Sacred Geography", the holy Poomkavanam, described as "the garden with no comparison". However, it is illogical to ignore the reality that the past 50 years of "so called development" has disturbed the area to such an extent that it is difficult for the landscape to reverse. This situation is compounded by the influx of population and the growing requirement for at least the basic needs. It is important at this stage to provide planned facilities so as to minimise the negative externalities which have been accrued due to its non-provision. Hence, initial approach should be a corrective one, to first prevent pollution and contain the situations which once established, could lead towards

more stringent eco-sensitive philosophies. Treatment for the disease should start in the form of provision of infrastructure and measures to combat pollution in this 'urbanised' area, as the area is already affected. Prevention of further calamities from the environmental perspective can initiate today and grow. ***Hence initially the approach would be to heal the landscape and making it capable to stand and prevent misuse, while in the long term, aim would be to prevent further degradation***.

1.2 Aims and Objectives

The study is aimed at devising strategies to reintroduce the lost pristine landscape character of the temple environ, trek routes and the base camps.

Objectives of the study are:

a) To analyse the impacts of the pilgrimage on the environment: temple environ, trek routes and the base camps

b) To identify the transition which has occurred due to development

c) To suggest strategies to reintroduce the lost pristine character of the temple, trek routes, its environs and the base camps

1.3 Methodology

Methodology followed for the study is presented in Figure 1.

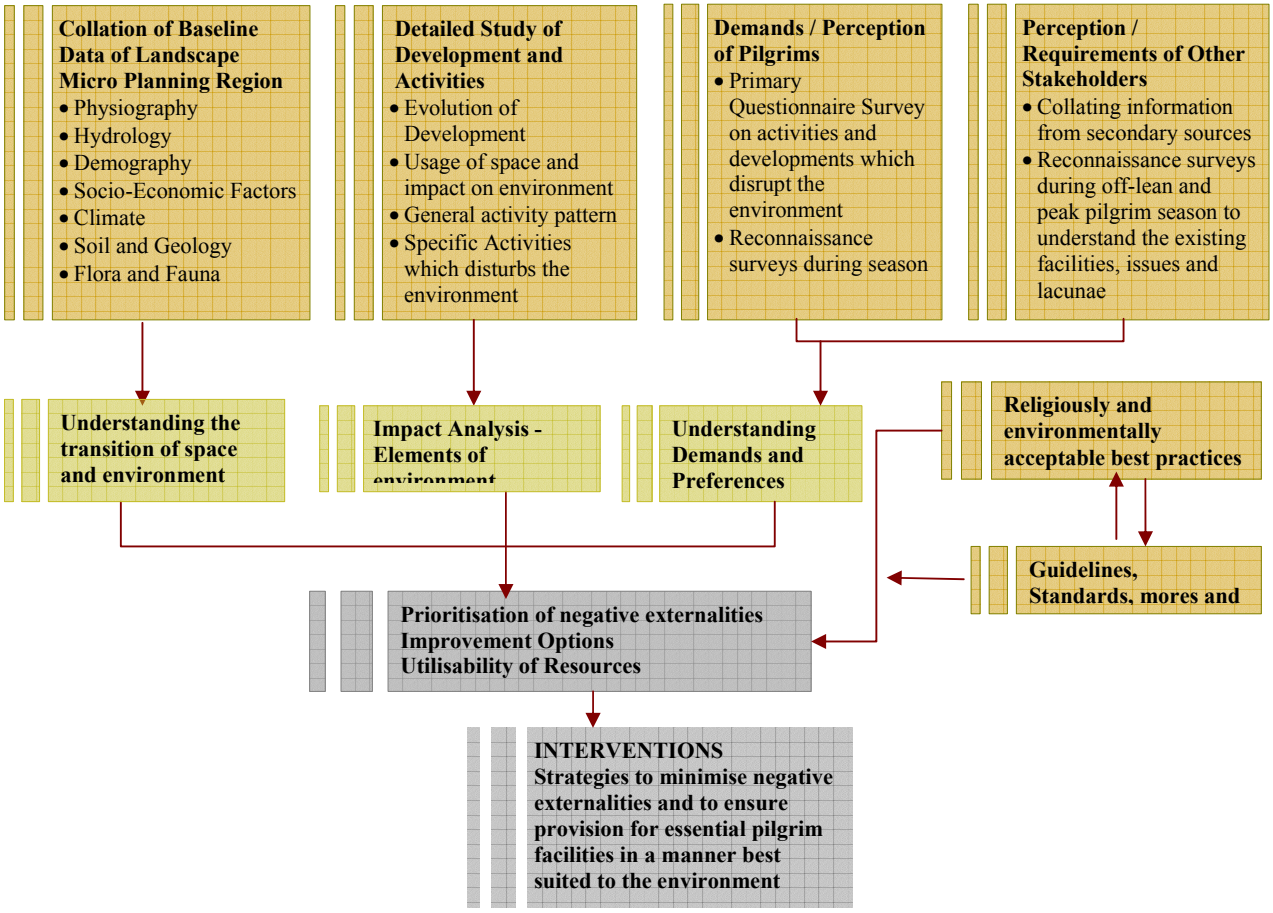

Figure 1: Methodology Adopted for Landscape Study

The Terms of Reference (ToR) adopted for certain components of the Landscape study is presented in **Annexure 1.**

1.4 Scope of the Study

The study was undertaken in the immediate core region comprising of Pampa, Trek route from Pampa to Sannidhanam, Sannidhanam, trek route from Erumely to Pampa (Cheriyanavattom), trek route from Uppupara / Sathram to Sannidhanam. Brief study was undertaken in Erumely, Vandiperiyar / Sathram / Uppupara and Nilakkal which were identified as base camps in the Outline of the Master Plan for Sabarimala[1]. The study was conducted during the peak pilgrim season of 2005 – 2006 and a secondary study was conducted during the Vishu season (April, 2006) and the temple opening period of March and April 2006. The study summarises the baseline information of this core area and identifies the impacts on the core area due to the activities and developments happening in these areas, which has been analysed to mould strategies to ensure minimisation of negative externalities. It also suggests the guidelines for eco-friendly construction typology (for services, facilities), guidelines to minimise negative impacts, guidelines for pre-season, during the season and post season monitoring activities and institutional set up to ensure eco-friendly provision of services and facilities. This would enable the document being used as a base record to formulate the plan of action and development format for the core and precincts mentioned.

The study 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 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 (if any) 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 discussions with various agencies be carried out by respective implementing 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 the scope 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 module on Environment / Landscape Planning, Aims and Objectives, Methodology and Scope of the study undertaken to prepare the module on Environmental / Landscape study, following chapters throws 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 Planning region identified for detailed Landscape Micro Plan in terms of time and space horizons and presents an overview of the existing guidelines for development.

[1] *IL&FS Ecosmart Ltd (2005), Outline of the Master Plan for Sabarimala, Government of Kerala*

Chapter 3 discusses the baseline environment of the micro-planning region

Analysis of Impacts in terms of the reasons and area of impact, its extent and severity in each area as identified during the study has been presented in Chapter 4.

Chapter 5 discusses the proposed interventions and strategies to ensure minimisation of impacts, to ensure protection and preservation of natural environment and the sanctity of the religious precinct while providing necessary facilities and services to the pilgrims.

2. PLANNING REGION FOR LANDSCAPE MICRO PLAN

2.1 Introduction

State of Kerala, phisiographically divided into the highlands midlands and lowlands has a geographic area of 38,863 sq.km, constituting the forests of the Western Ghats and agriculturally fertile midlands and coastal plains. The settlement pattern is characterised by an 'urban – rural continuum format' with highest recorded population density in the country which stands at 819 persons per sqkm. Around 1.1percent of the total population is constituted by Scheduled Tribes. The State ranks 14th among all the States/Union Territories with respect to percentage of geographic area under forest cover which is about 40percent of the total geographical area of the State with per capita forest and tree cover being 0.05ha. The forests and forest resources form a key element of Kerala landscape and contribute to maintaining the physical attributes and socio-economic development of the State. Sabari pilgrimage generates socio-cultural, economic and environmental effects throughout Kerala especially in those districts where much of the areas falls under the forested highlands, which are origins of life giving rivers and abode to unique flora and fauna. The study region forms part of Pathanamthitta, Kottayam and Idukki districts of the state of Kerala. Total forest cover as percentage of total geographical area of these districts is 55.49 percent, 10.35 and 74.24 percent respectively.

2.2 Planning Region

Sabarimala temple is traditionally associated with the larger sacred landscape namely; Poomkavanam comprising 18 holy hills[2] including Sabarimala.

Region demarcated for Landscape Micro Plan includes Sabarimala, Pampa, the trek route from Erumely to Pampa and Trek route to Uppupara / Sathram, while base guidelines are to be formulated for Nilakkal, Erumely, Vandiperiyar and Sathram- the suggested base camps which are proximal to the reserve / forests. This falls mainly in the Panchayats of Ranni Perunad, Vandiperiyar, and Erumely. The reason for demarcating the said region for a detailed landscape micro plan is that it is part of the eco-sensitive and bio diverse Periyar Tiger Reserve, which demands least external intervention and maximum conservation efforts as suggested by Environmental Protection Act. The region in turn is host to the largest sacred landscape of the country namely, Sabarimala and the annual pilgrimage it generates. Sabarimala Sannidhanam is the pilgrimage destination, while Pampa at the foothill of the trek route is the start point of the main trek to Sannidhanam. The routes from Pampa to Sannidhanam, Uppupara / Sathram to Sannidhanam and from Erumely to Pampa are the main trek paths to reach the destination while Nilakkal is the upcoming base camp in the Pampa – Chalakkayam Road. Erumely is the traditional base camp which hosts a number of religious observances associated with Lord Ayyappa. Vandiperiyar and Sathram are the proposed base and transit camps to the northern entry point, which are also proximal to the reserve / forests.

Periyar Tiger Reserve (PTR) with an area 777 sq.km is a representative of Bio-geographic Zone 5-B Western Ghats and occupies part of Idukki and Pathanamthitta districts of Kerala State, and falls within the co-ordinates Latitude (DMS): 9° 25' 60 N Longitude (DMS): 77° 4'

[2] These hills include: Thalapparamala, Kalaketty, Puthusserikanam, Karimala, Inchaparamala, Nilakkal, Thevarmala, Sreepadamala, Vattamala, Sundaramala, Nagamala, Neelimala, Sabarimala, Mayilattummedu, Mathankamala, Chittampalamedu, Ponnambalamedu, Gaundarmala

60 E. It consists of tropical evergreen, semi evergreen and deciduous forests interspersed with high altitude grasslands and *Shola* forests. Unique for its scenic beauty, religio-cultural heritage and a rich spectrum of flora and fauna, it owes its name to the river Periyar whose catchment forms bulk of the reserve. Forests around the Periyar Lake were constituted as Reserved Forests in 1899. The forests were elevated as a Game Reserve in 1935 and were constituted as the Periyar Wildlife Sanctuary in 1950. The importance of the reserve led to its inclusion under Project Tiger in 1978 and under Project Elephant in 1991 both aimed at conservation of the exquisite endangered wildlife. Out of the total area of 777 sq.km, an extent of 350 sq.km, which comprises the core, was constituted as a National Park, while the remaining 377sq.km forms the buffer zone and 50 sqkm forms the tourism zone of the reserve. Altitude of the reserve ranges from 100m to 2016m above the Mean Sea Level (MSL). PTR is the first and only Tiger Reserve in Kerala and the largest protected area in the State. PTR also forms part of Periyar Elephant Reserve (No.10), a contiguous forest tract extending over an area of 3800 sqkm in Kerala and Tamil Nadu. Two life-supporting Rivers of Kerala, namely, the Periyar and the Pampa have their catchments in the PTR.

2.3 Need for Planning Guidelines

a) Provision of Basic Essential Pilgrim Facilities

The region being host to millions of pilgrims annually, it is mandatory that basic facilities are provided to the pilgrims for their minimum requirements of food, water, sanitation, shelter and safety. For this provision of amenities and facilities the region can host, its absorptive capacity need to be considered, while safe guarding the environment.

In addition, the pilgrimage and the tradition associated with it have strong moorings on landscape conservation. It is imperative hence that the forest and the temple are mutually complimentary and supportive and the need to conserve the environment is as important as the need to conserve the pilgrimage and the traditions associated with it.

b) Ensuring Environmental Protection

The region of concern being part of the Core and Buffer zones of the PTR, is particularly guided by the Periyar Tiger Reserve Management Plan[3]. The Ministry of Environment and Forests has accepted the plan and it has been legally enforced that the guidelines prescribed in the same need to be followed so as to ensure the protection of the reserve.

The thoughtful constitution of the buffer zones for the reserves has been that the "Security of wildlife reserves should be ensured by constituting "buffer belts" surrounding the core units"[4], and that "while the core should be free from all human use, the Buffer should allow restricted human use with a strong conservation bias. This would require people to forego all use of forests in the core, while considerably curtailing such use in the buffer zone"[5].

[3] Kerala Forest Department (2002) **Periyar Tiger Reserve Management Plan**
[4] The report of the Task Force of the Indian Board for Wildlife (1983) on "**Eliciting Public Support for Wildlife Conservation**"
[5] **Compendium of Guidelines and Circulars** issued by Director (Project Tiger) New Delhi, (Project Tiger Directorate) Ministry of Environment and Forests, November, 2004

Guidelines for the Management of Buffer Zone/Multiple use Areas of Tiger Reserves:[6]
"The buffer zone of a Tiger Reserve has twin functions, viz.:

- To provide habitat supplement to the spill over population of wild animals from the core area, conserved with the active cooperation of stakeholder communities, and
- Providing site specific, need based, and participatory eco-development inputs to local stakeholders for reducing their resource dependency on the core zone and for eliciting their support towards conservation initiatives in the area.

Therefore, both the buffer zone and the multiple use area, if any, surrounding the buffer, should be subjected to conservation oriented community programmes as a part of eco-development, taking care not to distort the village dynamics in an artificial manner resulting in the *entry of market economy, which may make the whole exercise counter-productive*".

It is important to note that pilgrimage invites increasing number of pilgrims every year, whereas the region which is part of the reserve demands lesser intrusions. However, safety and religious requirements also necessitates suitable technology and management mechanisms in the sacred precinct which may even call for awareness building for the users and *training and skill upgradation* measures for the local communities to gather expected results in the long run.

2.4 Planning Time Frames / Horizon

In order to ensure the protection of the fragile ecosystem of the region of concern and to ensure the upkeep and sustenance of the biodiversity in the reserve, it is essential that the region be planned in such a way to initiate immediate preventive and regenerative measures to nullify the intrusive effects during the immediate season, short term plans to be implemented over a period of 2-5 years to gradually stop the intrusive activities and to gradually initiate alternatives, medium term plans to be implemented over a period of next 10 to 20 years to promote natural regeneration of impaired landscape and supportive interventions, long term plan / policies to be implemented over a period of next 20 to 50 years to ensure only eco-friendly activities, to provide for reconstruction of impaired landscape, monitoring and upgradation.

[6] Ibid

3. ENVIRONMENTAL AND SOCIAL SCENARIO OF THE HOST REGION

3.1 Natural Setting

3.1.1 Physiography

"From a geographical point of view, Sabarimala is a space where the human density progressively gives way to the density of the forest located in a hostile environment, synonymous of danger and risk for the men willing to adventure through it. Such places of worship are all the more sacred that they are inaccessible, disconnected from the dominant flows, implying long distance travel in harsh conditions for the body. Crossing mountains and forests is the price to pay to obtain the blessing (darshan) of the deity. The distance and inaccessibility are geographical criteria which reinforce the value and experience of the pilgrimage"[7]. Physiography of the region (Pathanamthitta district) is as in Figure 2.

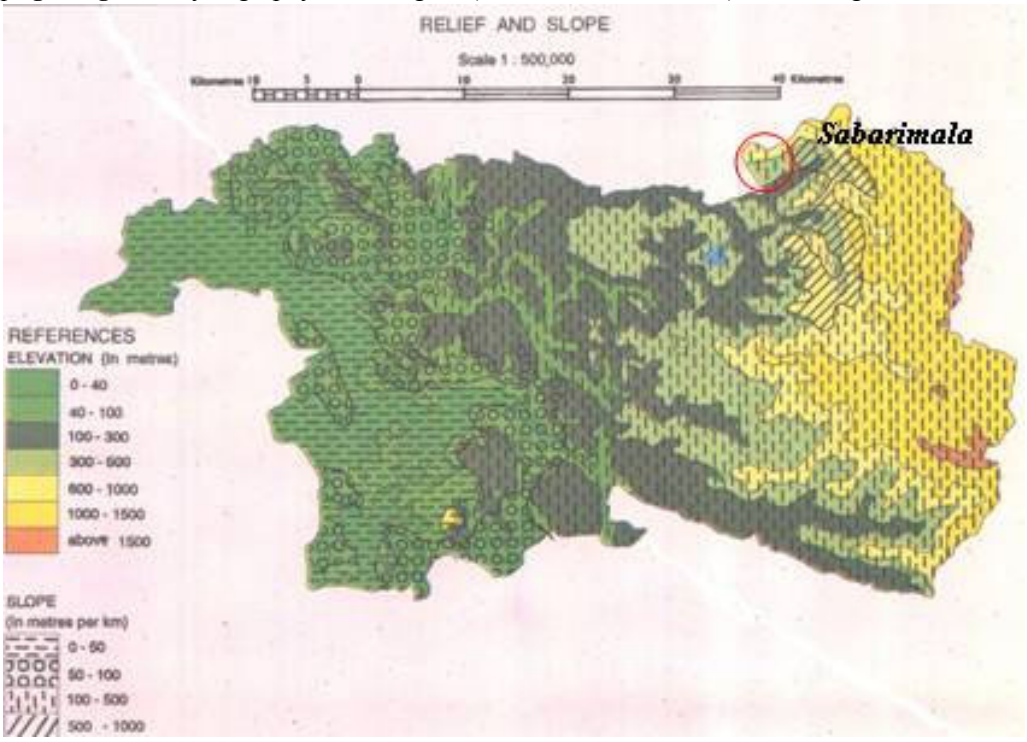

Figure 2: Relief and Slope in the Region[8]

Sabarimala is located in the north-western foothills of Pampa plateau on the southwest part of PTR. It falls under the upper catchment area of River Pampa basin, where as the trek route from Erumely mainly falls under the Azhutha drainage area. The PTR is located in the high ranges at an altitude 900 to 2019m above MSL. The Sannidhanam is situated in a small plateau region called Sabarimala plateau. The landform is very steep with slope of more than 40percent, which however reduces to about 20percent in some parts of the project area. Topographic profile of the study region is presented in figure 3, figure 4 and figure 5 below.

[7] Delage, Remy (2004), **Pilgrimage and Environment in South India: A Research of Compatibility Between Conflicting Ideologies**

[8] Source: Survey of India Map

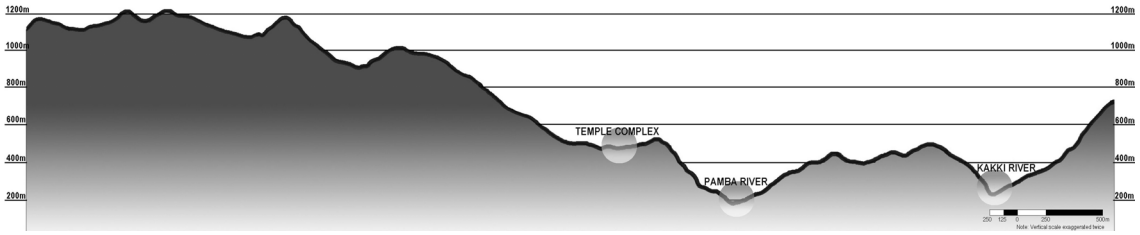

Figure 3 : Topographic Profile of Sabarimala

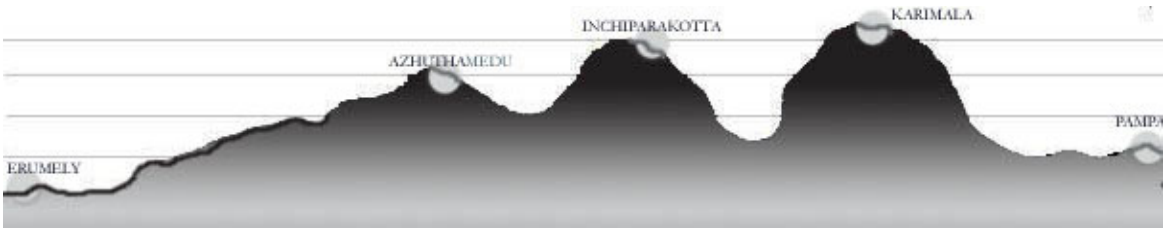

Figure 4 : Topographic Profile of Erumely – Pampa route

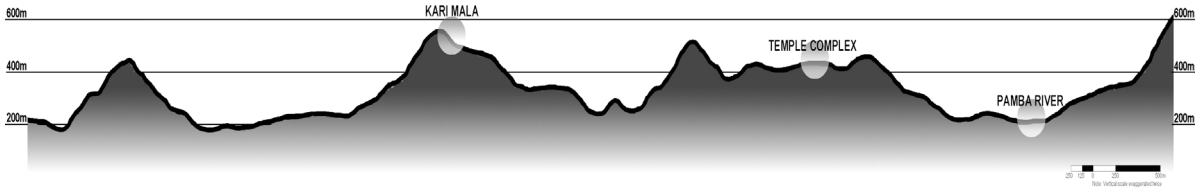

Figure 5 : Comparison of the Elevation at Karimala with that of the Temple Complex

3.1.2 Hydrology

Sabarimala and Pampa falls within the catchment of West flowing rivers Pampa and its tributary Kakki, which flows through the valley portions of various hills such as Sabarimala, Neelimala, Ponnambalamedu, Shanthamala, Karimala, Vellachimedu, and Kollakunnu etc. The Pampa River is the third largest river in Kerala; which ultimately empties into a predominant wetland ecosystem in Kerala which is also a notified Ramsar Site - Vembanad Lake; at the heart of Kuttanad. The second largest hydro - electric project of Kerala, `Sabarigiri project' is in the Pampa River. The present water availability of this river is about 3164 million cubic metres and the river has an annual runoff of around 6308million cubic metres.

The trek route from Erumely falls in the catchment area of Azhutha River, towards the north-western side of Sabarimala. The Pampa and the Kakki Rivers are dammed at their upper reaches located towards the east of the study area forming the Pampa and Kakki reservoirs respectively.

At Sabarimala, topography indicates wide drainage network formed by criss-crossing of various tributaries, mainly of Pampa. Two major drainage channels Puthussery thodu and Urakkuzhi thodu drain into the Pampa River. A spring Urakkuzhi Theertham is located towards the north of the temple complex area.

Ground water potential is less in the region. Though rainfall is high, water retention is less due to higher elevational differences. In addition deforestation and surface coverage due to heavily built up condition at plateau regions like Sabarimala also contributes to lesser water retention. Figure 6 presents the ground water potential and hydrology of the region.

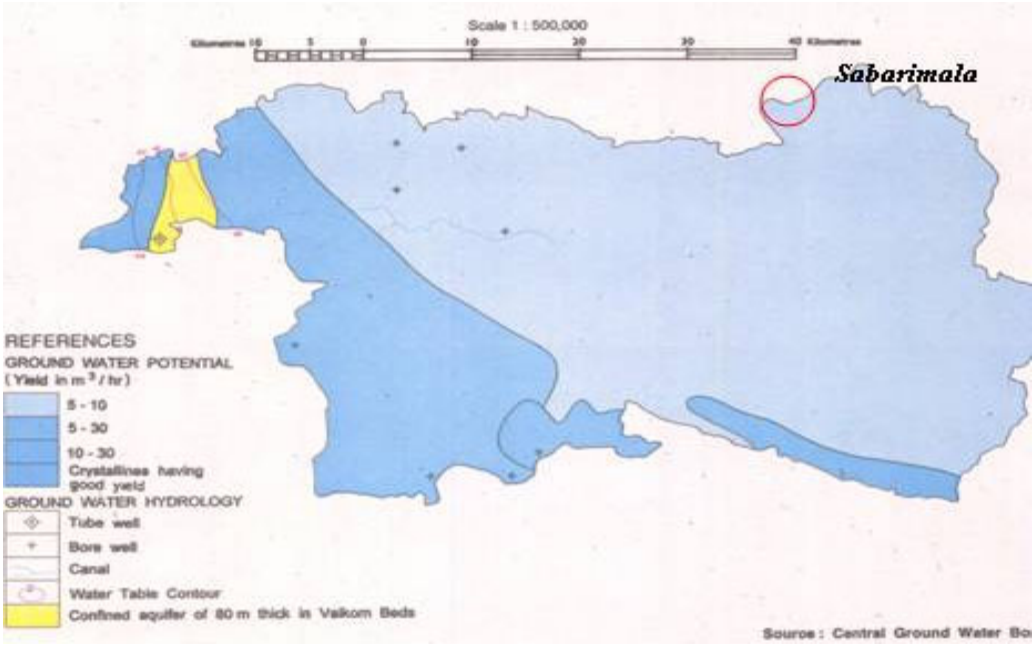

Figure 6 : Ground Water Potential and Hydrogeology of the Region

A network of perennial rivers and streams traverses the study region. The River Pampa, the second longest river in Kerala and three of its main tributaries, viz. Kakki Ar, Kakkad Ar and Kallar drain the whole area (other main tributaries are Azhutha, Kochupampa, Moozhiyar). Pampa Ar takes its origin from the ridge formed by Chinnamel Malai, Pulichi Malai, Nagamalai and Sundara Malai in Peerumedu plateau at an altitude of around 1676m in the Western Ghats and flows in South-West and North-West direction with a number of falls, till it drains finally as many tributaries into the Vembanad Lake.

The Kakki Ar originates from an altitude of about 1524m, flows in a north-westerly direction up to about 380m altitude. It receives Chinnakakki Ar and Anathodu and then flows in a westerly direction. Further it flows north and joins the Pampa Ar at Thriveni. The Kakkad Ar formed by Moozhiyar and Mani Ar with their origin from the ridge formed by Valanjakadu Malai on the South Kakkiar Malai and Palampara Medu on the East and Puda Malai, Valia medu and Kollakunnu on the North; flows more or less in a westerly direction as far as Angamoozhi, and then flows to Seethathodu in the South and again westwards, till it joins the Pampa Ar at Perunad.

The Chelikkal Ar and Wackal Ar which originate from the hills north east of Chembalakar and South of Valanjakatu Malai from the main Kallar, flows north west direction and joins Pampa Ar at Vadasserikkara. Pampa River from Perunad downwards is navigable. All the tributaries are navigable by rafting reeds and bamboo.

Pampa and Kakki reservoirs have their water spreads at plateau area at an elevation of 1034 m to 1061m above MSL. Pampa Ar has definite course of its own about 10 km away from its headwaters and at an elevation of about 1500 m above MSL. Pampa cut across the crystalline, laterites covering both crystalline and sedimentary and coastal alluvium. Pampa Ar, in its course carries considerable sediments and develops flood plain in Kuttanad region, after draining through the backwaters.

3.1.3 Climate

Ecologically, rainfall is one of the most powerful factors controlling the patterns of tropical vegetation and in turn has a strong influence on the topographic profile. Favourable orography and exposure to trade winds are major factors, which contribute to the abundance of rainfall in the study area. Annual rainfall ranges from 2700mm in the lesser altitudes to about 4200 in the hills. Figure 7 presents the climatic conditions of the region. Most of the rains are attributed to Southwest monsoon. During rainy season namely, monsoons (June to August) and retreating monsoons (October to November) heavy torrential rains could be expected. Water flows quickly from the hills to the valleys owing to undulated terrain conditions and empties into the backwaters and the sea in the low lands in no time owing to the minimal distance and higher slope difference between the highlands and the low lands.

Temperature of the region varies from 19°C to 36°C. Temperature gradually decreases, as one climbs up the higher altitudes and the variation in microclimate during the climb up the region is noticeable. Winter months are cold and frosty.

Humidity at lower altitudes and valleys varies from 70 to 100 and it is lesser at higher altitudes.

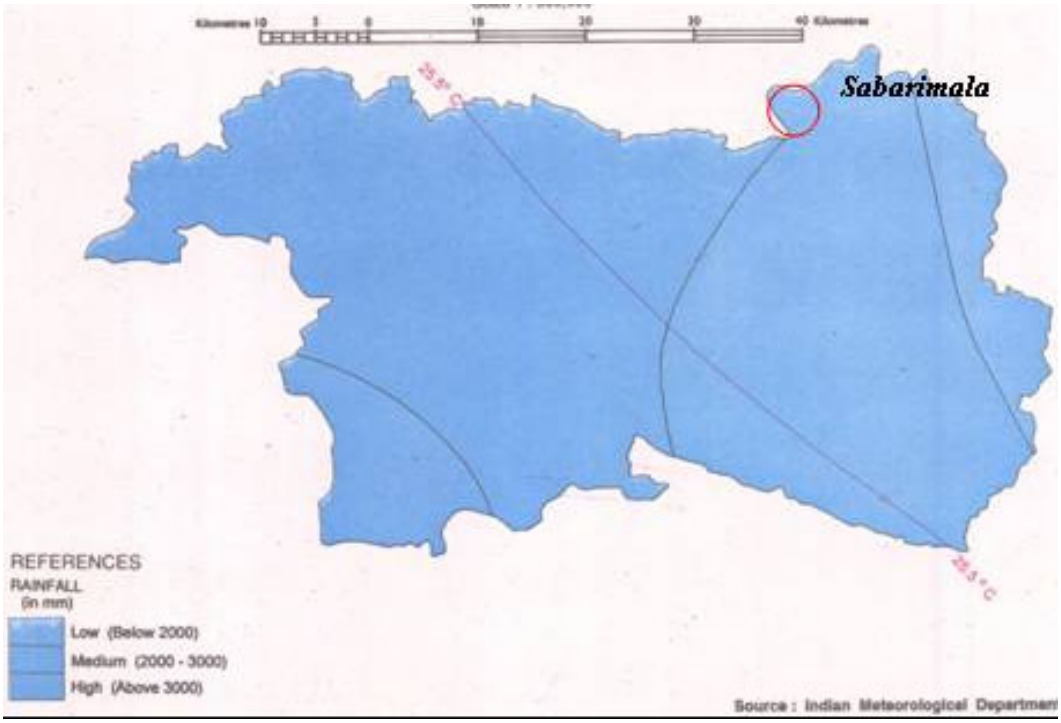

Figure 7: Climatic Conditions of the Region

3.1.4 Geology

The geological formation in the study area comprise of Archean metamorphic rocks – the Charnockites. Charnockites are metamorphic rocks of igneous origin characterised by presence of hyperstene, a mineral rich in its iron content. Charnockites contain about 3 to 4percent Iron (Fe), 1 to 7percent Calcium Oxide (CaO), 2percent Sodium Oxide (NaO), and 1 to 4percent Potassium (K), depending on the basic or acidic nature of the rock. Charnockites on weathering leads to the formation of soils rich in iron content. The foliation of the rocks strikes North West - North East with steep dip to the South West.

The rock exposures, landform and drainage pattern are also indicative of a number of lineaments in and around the temple premises. The temple is located almost on one of the suspected weak planes and also near a suspected intersection of two lineaments. The lineament with an east - west alignment is already an active zone of erosion. Configuration of the Pampa and Kakki reservoirs reportedly exhibit a prominent fracture direction. Figure 8 presents the broad typology of rocks and minerals in the region.

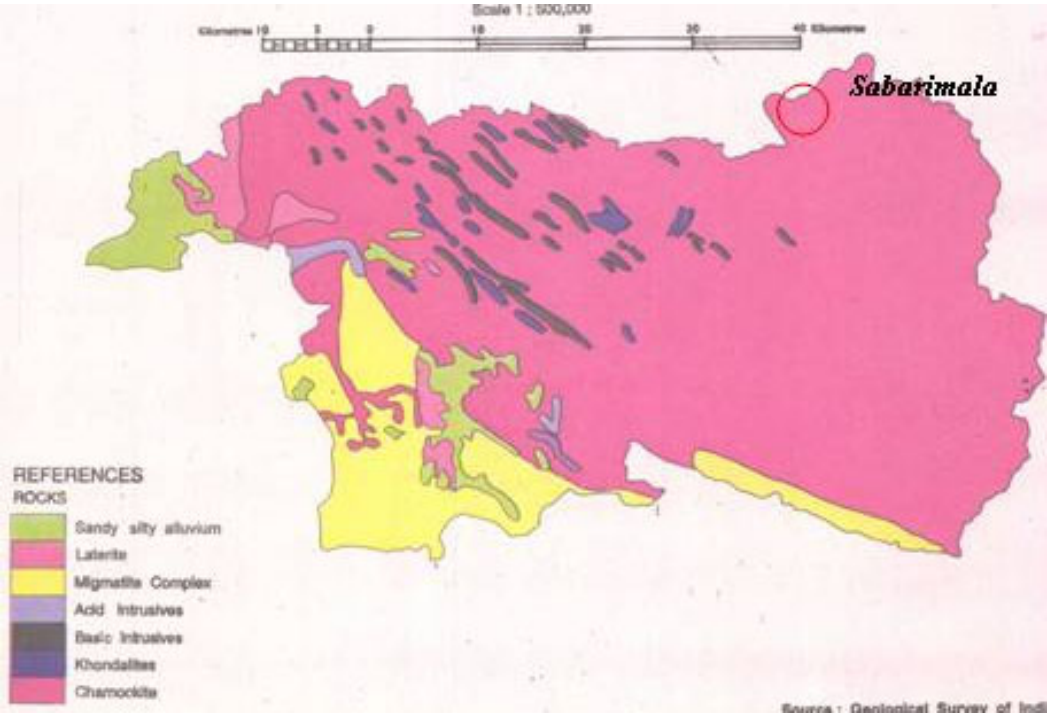

Figure 8: Rocks and Minerals of the Region

3.1.5 Soil

The broad soil typology of the immediate region falls under the category of Ultisols, which are virgin soils of recent origin and of an unstable nature. These soils are:

- Generally deep and acidic
- Characterised by intense chemical weathering and leaching
- Clay rich B-horizon with compounds of iron and aluminium.
- Formed in sub-humid and warm climates

Figure 9 presents the predominant soil typology of the region.

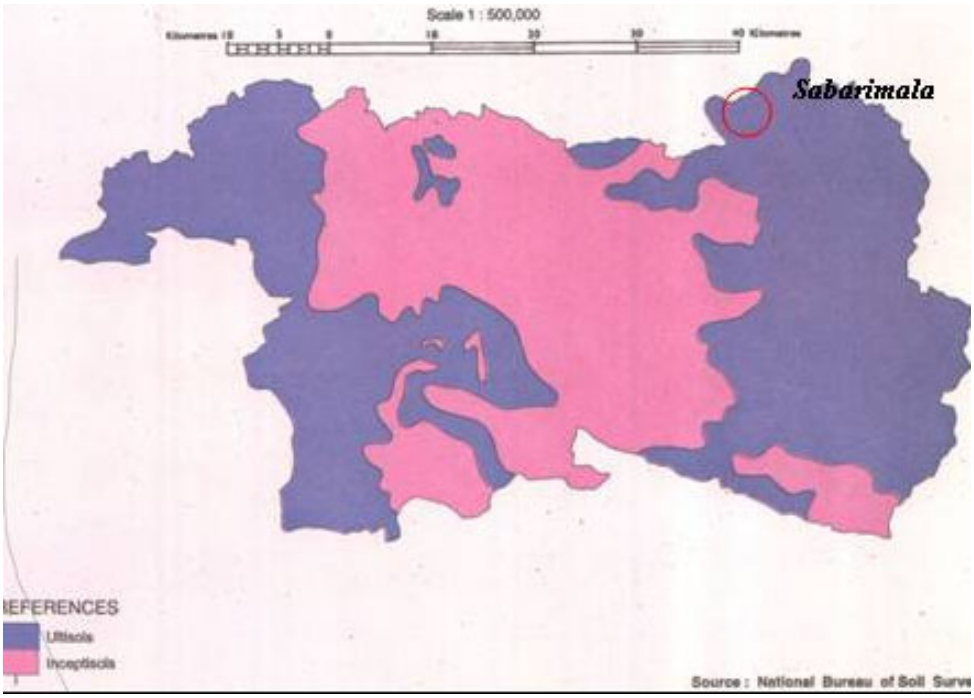

Figure 9: Predominant Soil Typology of the Region

In the forest surrounds, the soil category is mostly forest loam. However, on the top terrain, especially at the Southern part of Sabarimala temple, it is dominantly residuum. The soil here is thin and the usual transition zone (weathered rock) between the soil and the hard rock is mostly thin or absent. This is mainly due to the horizontal fracturing and subsequent sheet weathering of the country-rock, Charnockite.

The soil being very thin is of recent origin formed by the disintegration of the rocks. It is often washed off by heavy monsoon or its fertility is tends to get depleted by the leaching action of the rain and water. However, it is enriched year after year by addition of the newly formed soil and the fertility of the soil is thus maintained. Thus, all the gentle slopes in this region have a thin layer of virgin soil rich in minerals, which is very fertile and permits good growth of tropical plants.

The soil derived from Charnockite rock seems to be more fertile, as the forests growing on it are more thick and vigorous. High percentage of humus content is noticed in virgin forests and valleys whereas it is absent in steep slopes and cleared lands.

Narrow strips of deep alluvial soils are present along the banks of the rivers. The soil depth varies considerably from place to place. In gentle slopes the depth is reasonably high which supports tall trees and thick vegetation. On the other hand, on steep slopes the surface soil is frequently washed down owing to torrential rains and only thin vegetation is retained in this type. The height of the forest growth is an indicator to the depth of the soil beneath it. Evergreen forests have rich loamy soil well-drained, ideally suited for the growth of the trees. Thus, rapid urbanisation within the forests resulting in deforestation and surface cover-up with built mass and paving results in further degradation of soils and ground stability.

3.1.6 Landuse, Flora and Fauna

The region mainly falls under the low altitude evergreen ecosystem of the PTR and the Ranni Forest Division of Kerala. The area to the north of river Pampa, including the western bank of trek route from Pampa to Sannidhanam, most parts of trek route from Erumely, trek route from Uppupara and Sathram, access road from Vallakadavu to Uppupara, western bank of river Pampa at Thriveni and Sannidhanam falls under the PTR. Landuse is predominantly forests, with dispersed rural settlements. Figure 10 presents the landuse of the region.

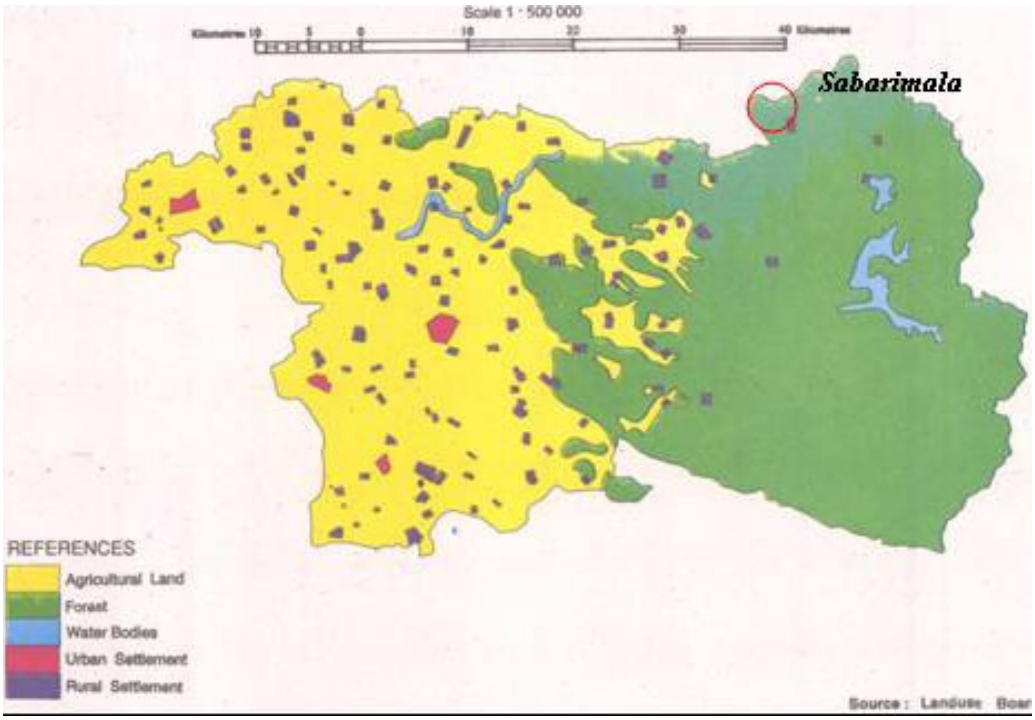

Figure 10: Landuse of the Region

PTR with the adjoining forested tract in Tamil Nadu (Sirivilliputhur Grizzled Giant Squirrel Sanctuary, proposed Meghamalai Wildlife Sanctuary and Tirunelveli Division) and those in Kerala (Kottayam and Ranni Forest Division) form an important conservation unit. The tract has a critical role in regional connectivity in the otherwise fragmented forests of Western Ghats. As per Champion and Seth's classification[9], seven different types of vegetations have been identified from Periyar Tiger Reserve. These are West coast tropical evergreen forests, Southern hilltop topical evergreen forests, West coast semi evergreen forests, Southern moist mixed deciduous forests, Southern Montane wet temperate forests, Southern Montane wet grasslands, and South Indian subtropical hill savannahs. Of these, evergreen and semi evergreen forests form the major chunk. Broadly the area is comprised of tropical wet evergreen and semi evergreen forests (74.6percent), moist deciduous forests (12.7percent), grasslands (1.5percent) and Eucalyptus Plantations (7.1percent).

The diverse habitats of PTR account for its unique assemblage of flora and fauna. It has around 2000 recorded plant species, 26percent of them endemic and 7.5percent threatened.

[9]Champion, H.G. and Seth, S.K. (1968), **A Revised Survey of the Forest Types of India,** Government of India Publications, New Delhi.

The *Angiosperms* are represented by 1965, the *Gymnosperms* by 3 and the *Pteridophytes* by 150 species. More than 300 species of the plants available in PTR have found to be of medicinal values. So far, 1,963 species of flowering plants belonging to 823 genera and 159 families have been documented[10]. Some important species are *Hopea parviflora*, *Dipterocarpus indicus*, *Palaquium elliptium*, *Veteria indica* and *Myristica dactyloides*.

In Periyar Tiger Reserve 49 species of mammals, 265 species of birds, 36 species of reptiles, 12 species of amphibians, 35 species of fishes and 160 species of butterflies have been identified so far[11]. Project Tiger aims to conserve tiger (Panthera Tigris) at the apex of the biological pyramid and thus the related biotypes. Presence of endemic fauna of the South Western Ghats namely, lion tailed macaque (*Macacca silenus*), Nilgiri Langur (*Presbytis johnii*), Nilgiri Matren (*Martes gwatkinsi*) and Nilgiri Tahr (*Hemitragus hylocrius*) enhances the conservation value of this region. Other threatened mammals include leopards (*P. Pardus*), Wild Dog (*Cuon Alpinus*), Elephant (*Elephas Maximus*). Other carnivores include Sloth Bear (*Melursus ursinus*), Jungle Cat (*Felis chaus*), Palm Civet (*Paradoxurus hemaphroditus*), Jackal (*Canis aureus*), Otter (*Lutra lutra*). Sambar (*Cervus unicolor*) is the most common of the ungulates present. Others include Indian Muntjac (*Muntiacus muntjak*) and Indian spotted chevrotain (*Tragulus meminna*). Wild boar (*Sus scrofa*) is relatively abundant. Other mammals include Giant Indian Squirrel (*Ratufa indica*), various smaller Squirrel species, and Mongoose, Porcupine (*Hystrix indica*) and Black-naped Hare (*Lepus nigricollis*). There were an estimated 44 tigers in 1985, while 1993 estimate was 33, 24 leopards (1984), 932 elephants (1983) and 281 gaurs (1983), based on census by the Forest Department [12].

Some 181 bird species have been recorded, many of which are residents. The spectacular Great Indian Hornbill (*Buceros bicornis*) is found in relative abundance (Vijayan et al., 1979, KFD).[13]

Estimates suggest that some 20 to 30 thousand people in the immediate vicinity are substantially dependent on PTR for their livelihoods. This includes some 2,500 tribals belonging to the castes including Mannan, Paliyan, Urali, Malmpandaram and Malarayan with distinct eco-cultural association with the forests of Periyar.

In the region under consideration for this study, Pampa – Sannidhanam trek route passes through a mix of Moist Deciduous and Semi-Evergreen forests for a comparatively smaller distance in the initial stage beginning from Pampa, after which it passes through a mix of Semi-Evergreen and Tropical Evergreen forests. A portion of the Traditional Marakoottam - Sannidhanam stretch falls under purely Tropical Evergreen Forest. Figure 11 presents the disposition of forest types across the region.

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[10] Dr. N. Sasidharan (1998), Kerala Forest Research Institute and Kerala Forest Department
[11] MoEF(2001), **Project Tiger Status Report**
[12] E Kunhikrishnan etal, Impact of Development on the Bio diversity of Sabarimala Enclave: A Rapid Biodiversity Assessment, in Gurukkal etal (2001) **Enclave Management Study**, India Eco Development Project, Project Tiger, Kottayam
[13] Vijayan, V.S., Balakrishnan, M. and Easa, P.S (1979) **Periyar Tiger Reserve - a Reconnaissance Report**, Kerala Forest Research Institute, Peechi
Kerala Forest Department (2002) **Periyar Tiger Reserve Management Plan**, GoK

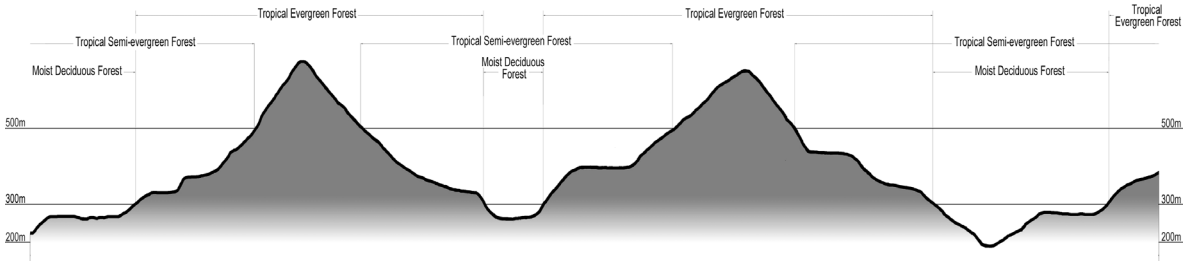


Figure 11: Section depicting Forest Types across Elevations

3.1.7 Demographic Character

Administratively, Sabarimala falls in Nilakkal ward of the Ranni Perunad Panchayat of Pathanamthitta district. Total population of Ranni Perunad Panchayat as per the Census of India (2001) is 22435 persons in 5500 households with a sex ratio greater than one and density of population of 460 per sqkm. Around 16 percent of the total population belongs to SC/ST categories. Literacy is around 85 percent with higher number of female literates.

Trek route from Erumely to Pampa passes through Erumely (Kottayam District), Peruvanthanam Panchayat (Idukki District), and Ranni Perunad (Pathanamthitta District) Panchayat, while Sathram / Uppupara trek route falls under Vandiperiyar (Idukki District) and Kumily (Idukki District) Panchayat

However, the region considered for landscape micro planning includes the areas that also form part of PTR except for a small stretch in Pampa which falls under the Ranni Forest Division. Table 1 presents the demographic details of main panchayats in the Region considered for landscape micro planning.

Table 1: Demographic Details of Main Grama Panchayats in the Region Considered for Landscape Micro Planning

Name of Panchayat / Ward	*District*	*No. of Households*	*Total Population (including institutional and houseless population)*	*SC/ST Population*	*Literacy Rate*	*Sex Ratio*
Vandiperiyar	Idukki	10740	45778	39percent	70percent	<1
Kumily	Idukki	8060	34558	25percent	75percent	<1
Erumely	Kottayam	10169	43803	17percent	84percent	>1
Ranni-Perunad	Pathanamthitta	5500	22435	16percent	84percent	>1

Source: Provisional Population Totals.2001 Census of India

According to the official records, the PTR accommodates about 2,25,000 people with a population density of approximately 750 per sq. km[14]. Of the total population about 2percent are tribals, 27percent scheduled castes, and the rest the other castes/communities. The tribal communities in the Fringe Area of PTR[15] are *Mannan*, *Paliya*, *Malayaraya*, *Malapantaram*,

[14] 'PTR Wildlife Management Plan, 1986-87 to 1995-96, (Revised) 2000-1 to 2011 -2

[15] There are three major settlements of the tribals in the periphery of the PTR. It was during the turn of the fifties that the tribal communities were transplanted from their habitation sites within the PTR to the following Fringe Area sites: Labbakkandam (near Kumily, situated on the northern edge of the PTR. The settlement occupies in all about 88.4 ha. jointly for two tribes: Mannan and Paliya; Mannan 60 ha. and Paliya 28.4 ha.) Vanchivayal (on the western edge within the buffer zone of the PTR. Here the settlement of

Urali, and *Ullada*, of which the numeric strength of the last two is marginal. The most populated tribal community is that of the *Mannan* and the least populated *Ullada*. There are 47 *Malapantaram* and 35 *Ullada* families. The *Malayarayas* are the relatively most developed among the tribals in the area.

Nearest settlement to Pampa area is the Attathodu colony (of Ranni Perunad Panchayat) on the bank of the river Pampa inhabited by the tribes such as *Malapantaram*, *Malayaraya*r, *Ulladar* and *Kuravar* in around 148 households. In addition to these tribals there are about 68 households of scheduled castes like *Sambavar* and a few *Ezhava* immigrants.

3.1.8 Influence on Socio-Economic factors of the Host Community

Host Community is mainly dependent on agriculture. Work participation rate of Ranni Perunad Panchayat, which houses Sabarimala, is 32 with main workers forming 76percent of the total work force. Main crop in Erumely Panchayat is rubber and only 30percent of rubber farmers are agricultural / rubber labourers. There are 4605 small farmers[16], 2465 marginal farmers and 793 big farmers.

Work Participation and worker categories of main Panchayats in the region considered for Landscape Micro Planning region ranges from 32percent in Erumely and Ranni Perunad Panchayats, 44percent in Kumily and 45percent in Vandiperiyar respectively. Figures below show the spilt of main workers in each Panchayat in the region considered.

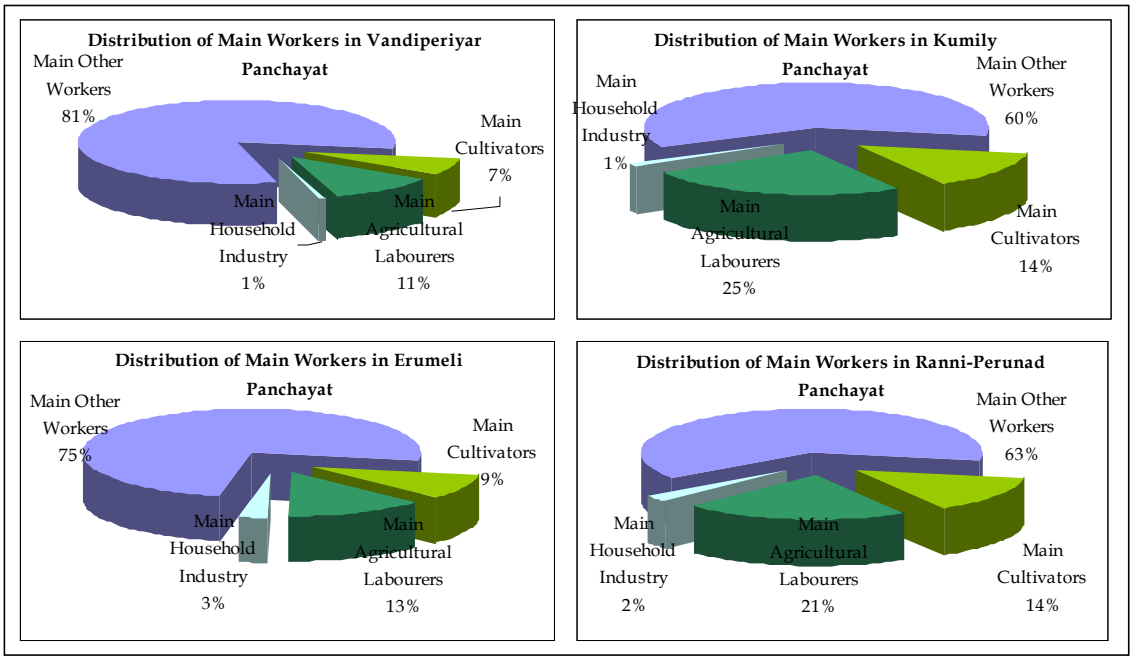


Figure 12 : Distribution of Main Workers in the Region considered for Landscape Micro Planning

the Urali tribe occupies about 39.39 ha.) Muzhikkal (on the western edge within the buffer zone of PTR. This is a Malayaraya settlement occupying about 112 ha.)

[16] Those who own less than or equal to 1 hectare of land

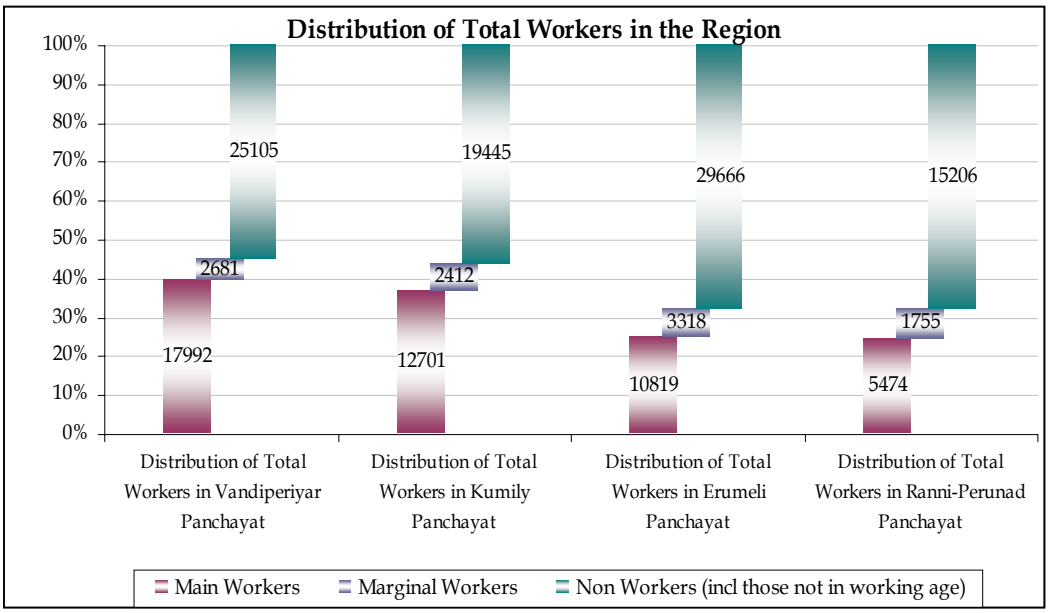


Figure 13 : Distribution of Total Workers in the Region Considered

However, a look into the annual socio-economic profile of the region proves the wider influence of Sabarimala pilgrimage on their livelihoods. Social and economic exposure and changes resulting from the pilgrimage are enormous. For the three months during the peak season, the settlements gets exposed to pilgrims from neighbouring states as well as the officials who manage the pilgrimage, businessmen and traders from outside and other support people. The repercussions of the pilgrimage and related exodus of people to the regions are enormous.

Mostly the indigenous people and those living in and near protected areas and Ranni Perunad Panchayat from the immediate host community. Since ages, the people from outside the region had been benefited mostly from the pilgrimage as they get the leasehold rights to manage the season business. It is noteworthy here that, one of the projects which aimed at the upliftment of the indigenous groups and support them in receiving the benefits of the pilgrimage in their home environs is the World Bank Sponsored Eco Development Project with the central aspect of the Village Eco Development Component (VEC) that envisages forming small local associations of people for community development through ecological conservation based on clearly spelt out reciprocal commitments. The operation of the project at the grassroots is vested with the local associations called the Eco Development Committees (EDCs)[17].

The temporary or permanent employees of the Forest Department constitute the members of Professional Group EDCs. There are 4 Professional Group EDCs. Those people who subsist on the biomass of PTR are members of the User Group EDCs. In addition, the Swami Ayyappa Poongavana Purnarudhaarana (SAPP) EDCs were formed as the outcome of the efforts to organise the people doing business during the Sabarimala Season at different

[17] So far seventy-two EDCs have been formed along the Fringe area of the PTR. They are broadly of four categories: a) Village EDCs, b) Professional EDCs, c) User group EDCs, and d) the Swamy Ayyappa Punkavana Punarudharana (SAPP) EDCs. The people in the 26 hamlets along the Fringe Area of the PTR are the members of the Village EDCs. There are 58 such Village EDCs in all.

Thavalams-s along the traditional route. The corpus fund of the EDC was subsequently redistributed to SAPP members trading at various *Thavalams*.

Table 2 presents the list of EDCs who are engaged in Sabarimala season business. Around 6 EDCs solely depends on Sabarimala season business for their subsistence.

Table 2: List of EDCs Dependent on Sabarimala Season Business for their Living[18]

Sl No:	*Name of EDC*	*Social Group*	*No: of Families*	*Means of Living*
1	Nampupara	ST	73	Subsistence Farming> Govt.Employment> Sabarimala Season Business>Misc. Wage Labour>Collection of Forest Produce
2	Moozhikkal ST	ST	98	SubsistenceFarming>Govt.Employment Sabarimala Season Business>Misc. Wage Labour>Collection of Forest Produce
3	Thadithodu	ST	47	SubsistenceFarming>Govt.Employment Sabarimala Season Business>Misc. Wage Labour>Collection of Forest Produce
4	Ezhukumon 1	General	81	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
5	Ezhukumon 2	General	74	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
6	Azhuthamunny	General	91	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
7	Arattukayam 1	General	75	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
8	Arattukayam 2	General	69	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
9	Angel Valley 1	General	58	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
10	Angel Valley 2	General	79	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
11	Angel Valley 3	General	95	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
12	SAPPAzhuthakkadavu	General	84	Sabarimala Season Business
13	SAPPKallidamkunnu	General	60	Sabarimala Season Business
14	SAPPVallithodu	General	77	Sabarimala Season Business
15	SAPPVellarachetta	General	64	Sabarimala Season Business
16	SAPPPuthussery	General	88	Sabarimala Season Business
17	SAPPKarimala	General	33	Sabarimala Season Business
18	Kandankayam	General	101	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
19	Koruthodu	General	124	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
20	Kuzhimavu	General	122	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
21	Kuzhimavu	SC and others	122	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
22	Anakkallu	ST and others	49	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>

[18] *Source:* Compiled from Gurukkal (2003), **The Eco Development Project and the Socio-economics of the Fringe Area of the Periyar Tiger Reserve: A Concurrent Study**, KRPLLD, CDS, Thiruvananthapuram

Sl No:	*Name of EDC*	*Social Group*	*No: of Families*	*Means of Living*
23	Kollampattada 1	General	78	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
24	Kollampattada 2	General	128	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
25	Kollampattada 3	General	101	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
26	Kollampattada 4	General	72	Subsistence Farming>Misc. Wage Labour>Sabarimala Seasonal Business>
27	Attathodu 1	ST	76	Subsistence Farming>Misc. Wage Labour>Collection of Forest Produce> Reed Work>Sabarimala Season Business
28	Attathodu 2	ST	79	Subsistence Farming>Misc. Wage labour>Collection of Forest Produce> Reed Work> Sabarimala Season Business
29	Attathodu 3	SC and others	67	Subsistence Farming>Misc. Wage Labour>Collection of Forest Produce> Reed Work>Sabarimala Season Business
30	Kalaketty 1	ST and others	99	Subsistence Farming>Sabarimala Season Business>Misc. Wage Labour
31	Kalaketty 2	ST and others	85	Subsistence Farming>Sabarimala Season Business>Misc. Wage Labour
32	Mookkenpetty 1	SC and others	96	Subsistence Farming>Sabarimala Season Business>Misc. Wage Labour
33	Mookkenpetty 2	SC and others	88	Subsistence Farming>Sabarimala Season Business>Misc. Wage Labour

The local people states that even the sale of pineapples for 4 hours could fetch Rs 500 per seller per day during the peak pilgrim season even along the transport corridors, as against his daily income of less than Rs 200 per day during other working days of the year.

During off-season, majority of the households in Erumely Grama Panchayat depends on agriculture for living. Out of the 8062 households nearly 25spercent are involved in business activities and the rest in service sectors. But during the pilgrim season there is a paradigm shift in the occupational pattern of the households. Almost 60percent of the households near the main roadsides have direct involvement while 20percent have indirect involvement in providing pilgrim facilities to support Sabarimala pilgrimage. Most of them provide *viri*[19] facilities, or set up temporary hotels, stalls selling consumables and articles related to rituals. Some of them are directly involved in seasonal business activities, like selling ritual articles, selling coconuts, vessels, snacks, operating motor workshops, telephone booths etc. Certain others earn income by letting out their surroundings for parking, business purposes, or making profit by providing toilets, bathroom facility, *viri* facility etc, while certain households traditionally provide such facilities to the pilgrims free of cost.

3.1.8.1 Traders / Businessmen / Service Providers from outside the community:

Besides the households, business people are also widely involved in pilgrim related activities. Owners of hotels, shops, petrol pumps, and telephone booths are the prominent groups who are benefited most by the pilgrimage. Earlier, the pilgrimage to Sabarimala

[19] *Viri* means 'Spread', represents a makeshift bedding by spreading just a mat or bed sheet over bare ground and sleeping on that using minimum space just enough to stretch the human body.

was closely associated with renunciation and surrender, where Pilgrims largely surrender to Lord Ayyappa and pay respect to the sacred landscape chosen as abode by the Lord himself as is evident from various ritualistic moorings. In olden times, pilgrims' consumption patterns and mode of conduct used to be largely influenced by the traditions. However, over the period of time, the pilgrims have succumbed largely to market forces, as is evident from large scale purchase of bottled water, preference to move up the hills in *dholis*[20] even by healthy pilgrims, preference for comfortable stay conditions as opposed to traditional *viri* system etc. This could not be considered as only an effect of changed times, but also as a response to gather comparatively good / healthy products /services which the markets ensure as against the poor quality services otherwise available. Market Survey at Erumely after the season shows that there has been a seasonal demand for various items during the season. This included commodities such as Tobacco products, Kumkum (used by pilgrims to anoint during petta thullal), glucose, mineral water confectionaries etc. Figure 14 presents the seasonal variation in trade of certain commodities at Erumely.

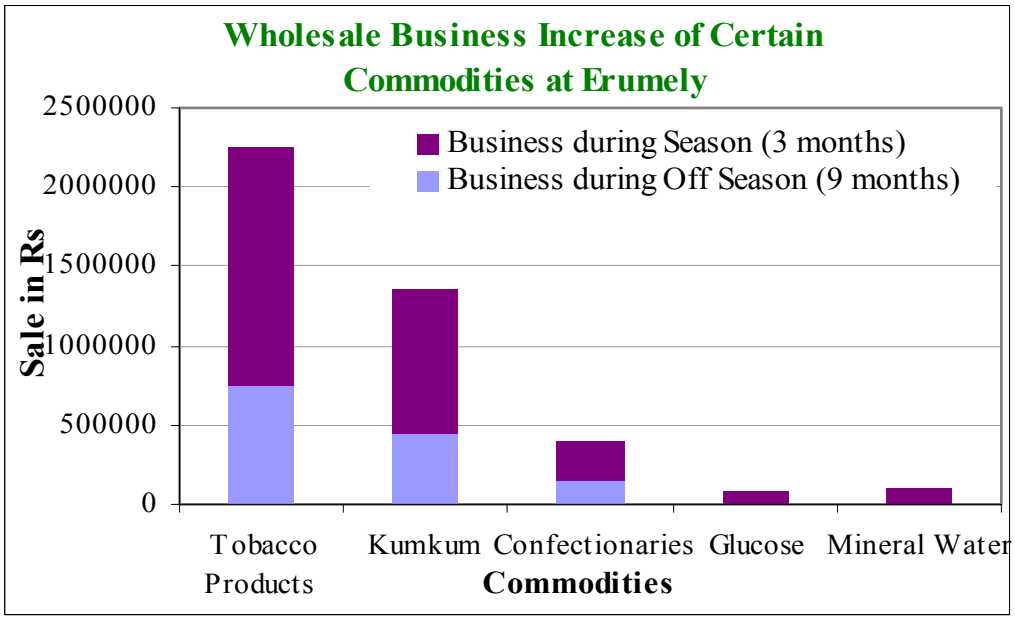


Figure 14 : Sabarimala Season Business in Erumely

This has resulted in large influx of traders to the region and extends profound impact on the socio-economic aspects of the surrounding wider region. In order to cater for the needs of this massive inflow of pilgrims and various agencies directly or indirectly providing facilities to the pilgrims and managing the pilgrimage to the region mostly during the peak pilgrim season spanned across two months, innumerable local and outstation tradesmen gear up by setting up temporary and permanent facilities, expecting '*Sabarimala Kolu'*, in local parlance which means 'high profit due to the opportunistic costs of goods and services (as demand is more and supply is less) during Sabarimala season'. Even various agencies who provide / sublet services to the pilgrims charge a higher rate than what is acceptable for the level of service.

[20] A wooden chair; each arm of which is shouldered by four men, used to carry the pilgrims up the trek route from Pampa to Sannidhanam in seated position.

A Pilgrim spends on an average - a day at Erumely during peak season. The devotees, especially those on their first visit to the holy temple (Kanni Ayyappan-mar) buys provisions from the Erumely market (*Petta* means market and *thullal* dance) and pack it in cloth and suspend on long rods as a preparation to begin the trek through the forest which would last 2 days. It has been arrived at from Perception Surveys and other studies that the amount a pilgrim spends for these ranges from Rs 50 to Rs 100.

Sabarimala Kolu – Mattanoor Colony, Erumely

Around 50 families of the Mattannoor colony at Erumely save their time during the two months just preceding Sabarimala season to get engaged in the preparation of artifacts for 'Petta Thullal' such as s*harakkol* (arrows), *sword*, *maze*, *armour* etc.
The raw sticks which are stems of a shrub variety commonly known as *'Communist pachcha'* are mostly collected from Kanakappalam forest area. Sticks are shaved, cut, dried, painted and decorated with feathers to form the arrows. Once ready, these are transported to town and sold for 10 paise per *kol*. Swords and mazes are made of *Murrikku* (Erythrina variegata) branches. Each household makes bunches of swords and mazes, and sells for Rs.30 for each hundred. Women make cloths for the Kanni-Ayyappans for their ritual dance. This is their main economic activity during the period.

Source: Primary Survey

It is estimated that during off-seasons there are only 200 business people in the Erumely town, while during the peak season their number increases to around 400. Most of them belong to the category of service providers and petty traders and more than 50 percent of the business income during the year is accrued during the three months of the pilgrim season.

3.1.8.1 Agencies / Departments providing pilgrim services

TDB and Juma-Ath are the religious agencies involved in arranging / providing facilities to pilgrims. Besides provision of ritual facilities they provide *viri*, parking, shops and toilet facilities at areas under possession / lease. Juma-ath and TDB holds much of the prime land at Erumely Town (market area). They are economically benefited by way of offerings, auction, lease on land etc. Besides these, voluntary agencies like Ayyappa Seva Sangam are actively involved in providing services to the pilgrims.

The other important agencies involved in seasonal activities are the Panchayat, the K.S.R.T.C, Primary Health Centre, Electricity Board, Kerala Water Authority, Police Department, Post and Telegrams, Civil supplies etc. Primary survey and secondary sources affirms that the households, traders and agencies (such as TDB, Juma-ath, KSRTC etc) are benefited in the form of toll, rent, wage/salary, taxes, hiring charges profits and infrastructure developments. It is quoted that *"during off –season; earning per km for K.S.R.T.C ranges between Rs.14-16, whereas during the season it is more than Rs.26 per km*.[21]

The above discussion elaborated the Sabarimala business across the region, while at Sabarimala per se, the temple authorities gather large amount of goods and use it for

[21] Dr Baby MD (December 2003), **Economics of Sabari Pilgrimage with special reference to the Households in Erumely Grama Panchayat**, KRPLLD, CDS, Thiruvananthapuram

various religious, management and commercial purposes, which has created another niche. Porters and tractors transport such goods and materials up from Pampa to Sannidhanam. A prominent study[22] thus observed *"…Chances of market and potentials of revenue have brought the merchant class and the state closer to the temple. The temple has become fabulously rich. The goods and services pooled and redistributed by the temple have reached amazing proportions. This has made the management of the temple as well as the pilgrimage an affair of great political importance involving a lot of competitive power relations…"*

Thus, the repercussions of the pilgrimage in the social and economic aspects of the region are wide and ranging.

3.2 Critical Planning Considerations based on Natural Landscape Characteristics

As described earlier, the terrain in the immediate region is characterized by steep slopes, recent and hence thin layer of utisols which has less bondage with the under lying rocks. The land stability is maintained by the intense root system, distributive ground water percolation, uninterrupted subsurface flow, and relatively low overland flow. This is indicative of the fact that deforestation and extensive ground clearance and land modifications would destabilise the soil system. This can even result in disasters such as landslides at the upper reaches in the vicinity of heavily built-up areas.

Topographically, the terrain is highly vulnerable to slips and disasters but is already subjected to haphazard development activities. Development here hence need to be restricted and if at all any development is required it should be with minimal ground clearance and land modifications as it is important for the sustenance of the natural topography, slope patterns and thus the prevention of any ecological disasters in the region.

The rich ecosystem here sustains and nourishes the rivers, which originates from its upper reaches and feeds the settlements down stream. Extending the development up the hills can influence the catchment areas, micro climate, disrupt the natural flow patterns and pollute the streams which become critical considering the increasing demands of the settlements down stream.

Highly endangered floral and faunal existence in the PTR and the surrounding forest tracts are affected by the almost continuous inflow of pilgrims to the holy spot and related activities. It is also important thus to ensure sustenance of the flora and fauna especially the tiger habitat which sustains critical linkages in the ecological pyramid, being the apex species.

Pilgrimage invites huge crowd to the sacred geography, who visits just for a day or two. They visit the temple for around 36 percent of the year, where as during remaining part of the year, the natural environ tries to cope up and rejuvenate from the negative externalities created due to the pilgrimage. But intermittent and frequent opening of the temple leaves lesser time for rejuvenation of sacred natural landscape.

Though "*Poomkavanam"* or *"the Garden of Ayyappa"* and the codes of conduct during the pilgrimage had traditionally differentiated itself from other pilgrim spots, the *Poomkavanam* stays altered and disturbed and is not given the status as important as a sacred wood or

[22] Gurukkal, etal (2001) **Enclave Management Study**, India Eco development Project

"coppice" (*kaavu*)[23], or the concept of *devatayatana,* more concerned with a cult place administered by Brahmins, located on high mountain ridges. Theses two notions therefore hold a positive environmental value (conservation) unlike the "garden of Ayyappa". Over the decades the administrators and thus the pilgrims have started viewing the holy garden as an "object of gratification without any environmental value. This could help to explain the gradual destruction (water pollution, trash, etc.) of the *Poomkavanam* by the Pilgrimage today"[24]. Hence it is important to reconsider these changes which are currently not so far away from getting corrected and restored through "understanding with the heart and endeavoring through will" and reinstate the lost quality of the landscape which the Lord Ayyappa chose as abode for himself owing to its environmental character.

[23] Traditionally, the sacred site / enclosure with huge trees forming home of the Snakes and the Goddess, conserved and protected as part of ritual in Kerala

[24] Delage, Rémy (2004), **Pilgrimage and Environment in South India: A Research of Compatibility Between Conflicting Ideologies**

4. ANALYSIS OF IMPACTS

Each **homogenous section** of the study region namely, Sannidhanam, Pampa, Trek route from Erumely to Pampa, Trek route from Uppupara to Sannidhanam, and trek route from Pampa to Sannidhanam have been analysed separately to note the impacts and to prioritise these as it would be easier this way to bring them into actions for implementation. Analysis has been based on various study methods such as:

- Regional Studies
- Sample Transect Studies for vegetation identification
- Impact Assessment Studies
- Pilgrim Perception Survey
- Reconnaissance and verification to note the impacts at the end of the peak pilgrim season
- Secondary Collation and Analysis

4.1 Regional Impact

4.1.1 Impact of Intrusive Landuse and Activities on Biodiversity

The PTR with its nearby forest tracts of the Western Ghats listed as among the biodiversity hotspots in the world, forms part of a contiguous corridor connecting Kerala and neighbouring States. "PTR and surrounding forests form the single largest compact forest block in the South Western Ghats and play a key role in maintaining regional connectivity of the otherwise fragmented forest tracts" (Forest and Wildlife Department (GoK), 2000)[25]. Figure 15 presents Bird's Eye View of Interlinked Biodiversity Hotspots of the Western Ghats.

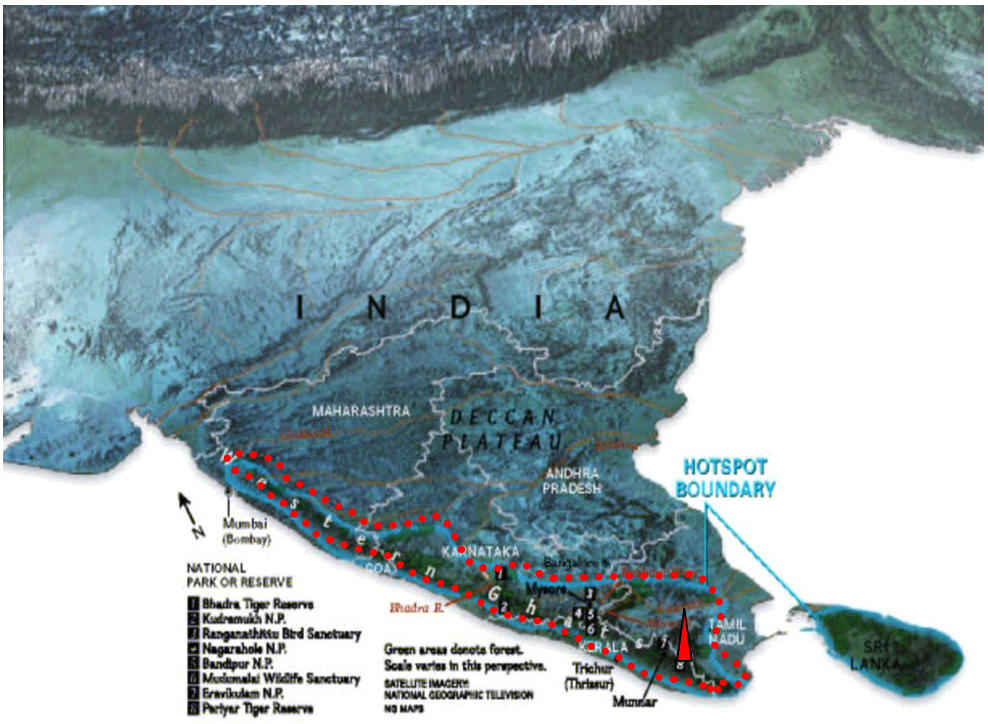


Figure 15 : Bird's Eye View of Interlinked Biodiversity Hotspots of the Western Ghats

[25] Forest and Wildlife Department, GoK (2000), **Periyar Tiger Reserve Management Plan (2001-2010),** GoK

PTR is contiguous with forest tracts of Theni division with the proposed Meghamalai Wildlife Sanctuary (WLS) of Tamil Nadu (TN), Srivilliputhur Grizzled Giant Squirrel Sanctuary of TN and Thirunelveli Forest Division of TN and Kottayam and Ranni Forest Divisions of Kerala. Periyar Conservation unit extends till Shengotta gap and has linkages with Agasthyamalai Conservation unit comprising of Kalakkad-Mundanthurai Tiger Reserve in TN and Neyyar, Peppara and Shendurunni WLS in Kerala. The region also forms part of the contiguous tract connecting the elephant reserves particularly in the region. In addition to posing as a rich and linked forest tract hosting many endemics, it contains the catchments of two life-giving rivers of Kerala namely the Periyar and Pampa. Hence it could be gathered that severing its homogeneity need to be viewed as a serious negative externality affecting the natural resources of the State and the region in toto, which would in fact affect all the settlements directly or indirectly dependent on these resources.

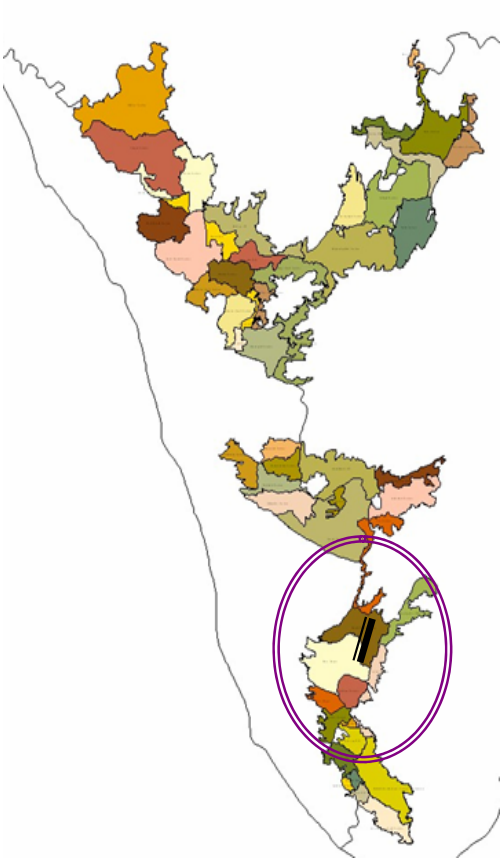


Figure 16 : Reserve Forests along Western Ghats and the Line of Shear

Sannidhanam and the trek route from Pampa to Sannidhanam fall in the Buffer Zone of Periyar Tiger Reserve, the 10th Tiger Reserve in the Country, while most part of Pampa area falls in the Ranni Forest Division. Trek route from Erumely to Pampa also falls in the forest area, though initial stretches are eucalyptus plantations now in the process of re-conversion to forests. Grassland Uppupara and the trek route from Uppupara to Sannidhanam fall in the PTR.

It is observed that diversion of forestland for non-forest purposes has resulted in fragmentation and parcellisation of the reserve and adjoining forest tracts[26].

[26] Forest fragmentation is defined as the dividing of contiguous blocks of forestland by roads, development and other non-forest uses. Source: Thorne, S. and D. Sundquist (2001). New Hampshire's Vanishing Forests: Conversion, Fragmentation, and Parcelization of Forests in the Granite State. Concord, Society for the Protection of New Hampshire Forests. Fragmentation is a complex phenomenon resulting from dynamic interactions between the natural landscape and society's ever-increasing demands on the land, creating a mosaic of natural and human-modified environments. The question of how to define and measure fragmentation is equally complex it can be anything from a road bisecting a forest to suburban sprawl. Habitat fragmentation is a landscape-level process in which a given habitat area is divided into smaller, geometrically more complex, and more isolated fragments as a result of both natural processes and human activities. It is the process of reducing size and connectivity of stands that comprise a forest
Source: Rochelle, J., L. Lehmann, et al. (1999). Forest Fragmentation: Wildlife and Management Implications. The Netherlands, Brill Press.
All over the world trends indicate that fragmentation and parcelization are shrinking forestlands. Forest division caused by fragmentation and parcelization has an overall negative environmental effect. is concern

Private enclosures in and around PTR tend to break the continuity of the habitat for various species. TDB being the second largest lessee from forest department, having taken on lease 50 acres at Sannidhanam and 10 acres at Pampa with activity over spills all around, prompting further expansion has caused the development of near urban-like situation amidst the dense tropical forests. Figure 17 depicts the line of shear created by developments in Sabarimala area tending to exert 'breaking'pressure on the PTR and the contiguous forest tracts.

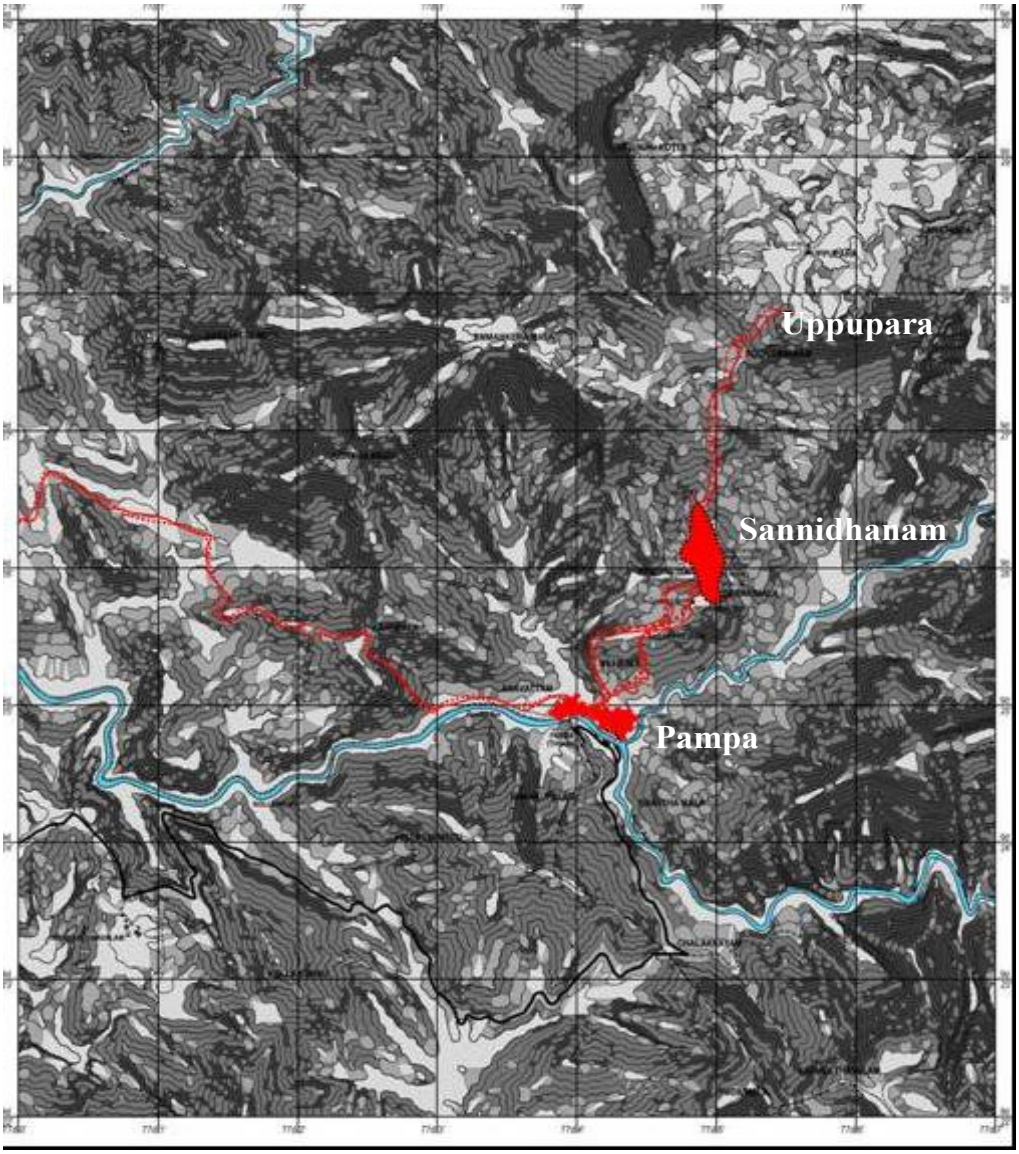


Figure 17 : Line of Spread of Sprawl along the Forests

It is observed that growth trends indicate a multi axial line of shear tending to break / fragment the forests and create a discontinuous tract for habitats (*habitat fragmentation*). Large, contiguous habitats, and healthy prey populations, are important for animals,

that continued declines and fragmentation of the forest land base may lead to the impairment of our forest ecosystem's ability to protect water flow and quality, to provide healthy and diverse forest habitat, and to remain a viable economic resource that provides recreation, timber, and other forest products" (Hill et al. 1998). Forestland base fragmentation leads to sustainable development impairment.

especially tigers to thrive. As humans move into the tiger landscape, tiger habitat becomes increasingly fragmented, tiger preys are over hunted, and human-tiger conflicts ensue. In addition, a line of spread of sprawl is under formation, linking Chalakkayam and beyond with Pampa, Trek route from Pampa to Sannidhanam, Sannidhanam – Pandithavalam, Uppupara – Vallakadavu – Vandiperiyar – Kumily through the forest tracts, as indicated by the figures 16 and 17.

Irregular development of Sannidhanam, in an elongated form tending to extend *to and through* the trek routes – from Pampa to Sannidhanam and from Uppupara to Sannidhanam indicates the chance for spread of sprawl along these lines of movement. If the so-called 'development' is allowed along these movement corridors or linkages of least resistance, it would result in clear fragmentation of the otherwise sensitive and homogenous landscape.

4.1.2 Impact of Activities on the Settlements

4.1.2.1 Pollution of River Pampa

The haphazard and uncontrolled developments and activities in the upper reaches of River Pampa have a detrimental impact on the settlements downstream. The river, which literally forms a waste carrier due to excessive usage during the season, is reported to cause communicable diseases downstream through all settlements enroute till its merging point with Vembanad Lake at Edathuva in Alleppey District. This is further compounded by the ineffective waste management practices prevalent at all down stream settlements, and the river ends up emptying the waste from Sabarimala and all settlements down stream to the Vembanad Lake, the soul of Kuttanad region of Kerala. Pampa Action Plan of the Ministry of Environment and Forests is an attempt to arrest the entry of such pollutants to the holy river. The plan has outlined the essential waste management practices required at Sabarimala and settlements downstream.

At Sabarimala, the water flow at Pampa is comparatively less during the season. Structures to hold water upstream when there is flow / during rains and to slowly release during summers is less in the upper reaches of the main rivers. The geographical disposition of Kerala, with a steep East – West natural gradient from the point of origin to the final emptying point warrants that the waste reaches the Vembanad Lake quickly. However, from mid December to mid March, the Thanneermukkom Barrier across the lake remains closed as a win – win solution to the agriculture *versus* fisheries debate in the Kuttanad (where, most of the area is mostly 1 to 2 m below the MSL) which further prevents the waste from being washed off ultimately into the sea. Instead, it accumulates at the Lake and harness many communicable diseases.

A look at the coliform content of the river water at Pampa before and during the season is indicative of the pollution levels. Increase in the number of cases of communicable diseases immediately following the peak pilgrim season proves the case. The medical practitioners downstream refer to this situation as the 'Sabarimala Fever'.

In addition, around 22 water supply schemes downstream of Sabarimala are designed to extract water from River Pampa, for supply to the people after chlorination. This totally amounts to more than 160 MLD of water supplied to a total population of 1.85 million. This serves around 30percent of the people of central Kerala. Table 3 presents list of these water supply schemes.

Table 3: List of Water Supply Schemes Sourcing from River Pampa [27]

Sl. No:	***Water Supply Schemes***	***Populated intended to be served(in Lakhs)***	***Capacity of the Scheme (in MLD)***
A	*Commissioned Schemes*		
1	Sabarimala Water Supply Scheme (at Pampa)	2.00	7.70
2	Vechuchira Rural Water Supply Scheme (RWSS)	0.50	2.50
3	Chittar RWSS	0.24	1.20
4	Ranni – Perunad RWSS	0.50	1.50
5	Adichipuzha RWSS	0.20	1.00
6	Vadasserikkara RWSS	0.20	1.00
7	Ranni – Thottamon RWSS	0.10	0.50
8	Ranni – Angadi RWSS	0.40	2.20
9	Ayiroor RWSS	0.40	2.00
10	Thottapuzhasseri RWSS	0.50	2.50
11	Kozhenchery RWSS	0.30	1.50
12	Mallapuzhasseri RWSS	0.20	1.00
13	Aranmula RWSS	0.30	1.50
14	Chengannur RWSS	0.50	2.50
15	Augmentation of Chengannur Water Supply Scheme (WSS)	0.60	3.00
16	Cherukole – Naranganam RWSS	0.60	3.00
17	Thiruvanvandoor WSS	0.10	1.00
18	Augmentation of WSS to Thiruvalla and Changanassery WSS	1.22	25.00
19	Ranni – Iythala WSS	0.30	1.50
	Total	***9.16***	***62.1***
B	*Schemes in various completion stages*		
1	WSS to Aleppey and 8 adjoining Panchayats	4.37	80.00
2	WSS to Panchayats in Kuttanad region	3.52	18.00
3	WSS to Ranni – Pazhavangadi and Vadasserikkara Village	1.60	8.00
	Total	*9.49*	*106*
	Grand Total	***18.65***	***168.1***

4.1.2.2 Pollution of other rivers and water bodies

The pilgrims who traverse through the wider region to reach the final holy destination, halts in between the journey for basic amenities and ends up polluting the premises in the absence of facilities. Lack of toilets and waste management practices in the transit points / base camps results in wide spread pollution.

Such pollution of Muvattupuzha River, Periyar, Meenachil River, Manimala River, Achenkoil River and Pampa River are specifically evident. This affects the settlements

[27] Source: Kerala Water Authority, Nov 2005

and the wildlife, which depend on these rivers directly or indirectly. Hence it is extremely important to deal with the specific pollution issues at each transit / halt point in the immediate term and device conservation efforts for each of these rivers in the long run.

In addition, as the origin of all these rivers is the Western Ghats, the preservation of topography and biodiversity of the Ghats becomes important for their sustenance and life. Details regarding such pollution at each transit / halt point are recorded and specific interventions for each point have been detailed out in the Regional Module of this Master Plan document. Figure 18 maps the rivers from upstreanm areas which face the impact of the pilgrimage, emptying into the Kuttanad region.

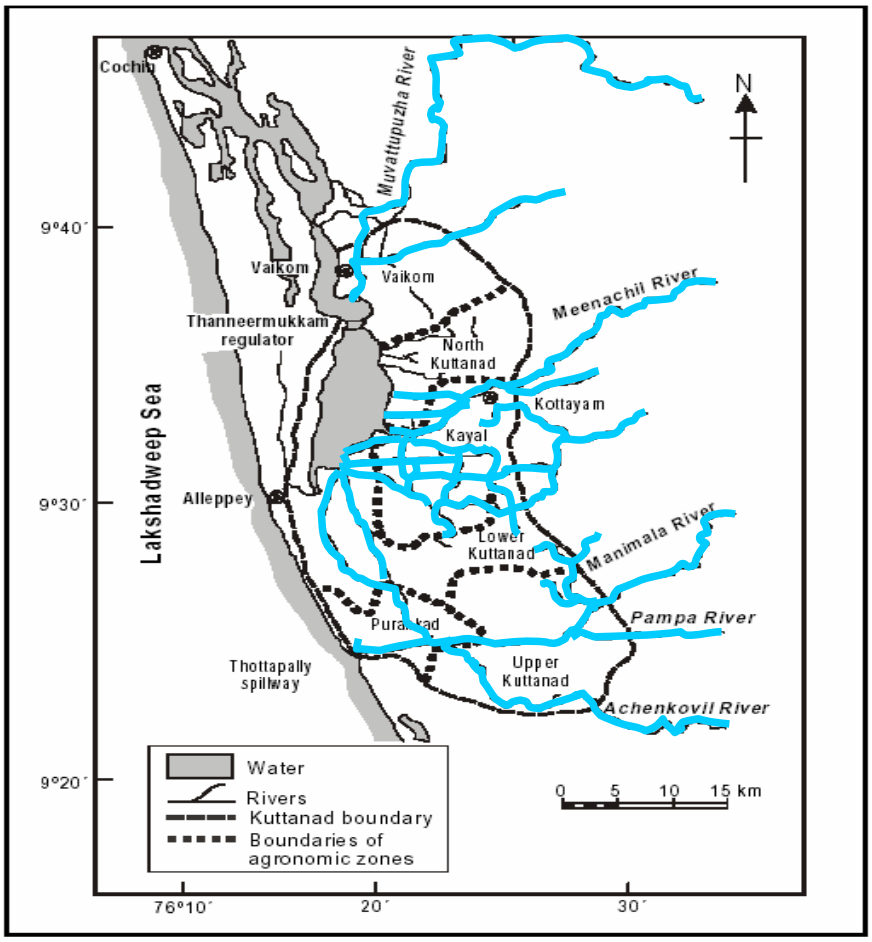


Figure 18 : Various Rivers from Impact Area Emptying into the Kuttanad Region

4.2 Impacts on Sannidhanam area

Sannidhanam represents the precinct of Sree Dharma Sastha Temple at Sabarimala and includes all developed/used area around the Sanctum Santorum. The area which originally housed only the abode of the Lord Ayyappa is now a mini-township with various amenities and facilities provided all around for pilgrims and the administrators. Main entry points to Sannidhanam include entry from Pampa through traditional trek route and Chandranandan Road which joins towards the south of Sannidhanam area. Entry from Uppupara side is through Pandithavalam, the North of Sannidhanam area. TDB owns around 13.35 acres of land, which holds and immediately surrounds the temple and has 50 acres of land around the

temple, which has been leased out for use from the PTR over the years. Region all around the available area / leased land is under reserved forests. Towards east and west, the land is sloping steeply and hence it is difficult to access the areas beyond the east and west of the currently developed Sannidhanam area

4.2.1 Critical Landscape Features

Most prominent **natural** landscape features at Sannidhanam are the raised ground protected with walls and approached by the holy 18 steps where the temple is situated, views to surrounding hillocks including Ponnambalamedu where millions look up for viewing Makarajyothi and the pristine forests and rolling hills around.

Created/man-made features include the dense urban-like built-fabric with dominant high rises blocking the views around, plantations by pilgrims to commemorate their visits, other newly planted trees, Bhasmakulam, the Sabari Gardens and extensively modified land for construction purposes. The Sannidhanam area depicts horizontal and vertical fragmentation of the pristine forests. Horizontal fragmentation has been resulted by more than 60 acres of sprawl amidst the thick tropical forests of PTR while vertical fragmentation has been effected by extensive land modifications and high rise buildings, which stand at the once 'forests over rolling terrain'.

4.2.2 Density of Development

Total area available for use by TDB at Sannidhanam is 56.61 acres (around 229190 sqm)[28]. In addition to this around 5acres of land at Sannidhanam is let out by Forest Department for *viri*. Total built up area in the developed area at Sannidhanam is around 62000 sqm, while 22000 sqm is paved area. Thus the density of development is (built up vs. total area) is 27 percent where as the total ground coverage is (including concrete paved area and rubble steps) is 37 percent.

Percentage of open spaces / vacant areas is 63 percent including the ponds/ water bodies and open space used for various religious functions and congregations and unusable area. Open spaces (both organised and unorganised together) is 22 percent of the total zonal land allocation. Figure 19 depicts such niche spaces at Sannidhanam.

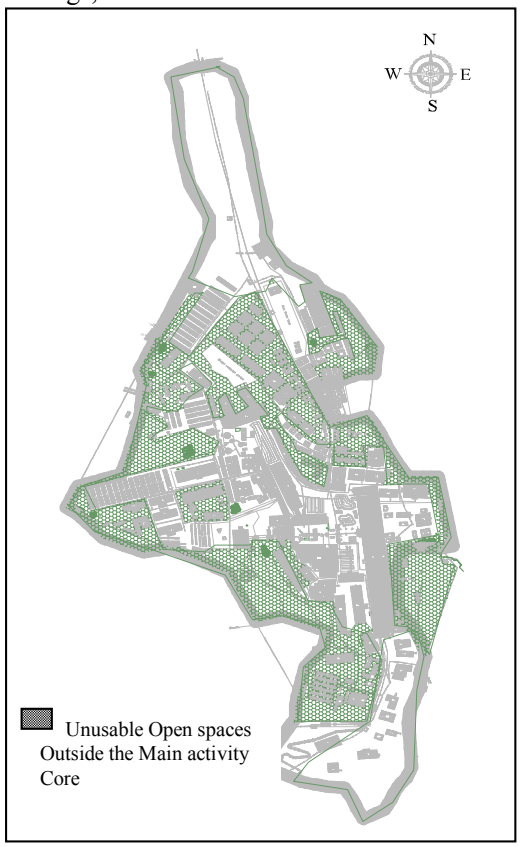


Figure 19 : Unusable Niches at Sannidhanam

Mostly, throughout the usable area, open spaces which are largely left as corners between buildings and backyards become waste accumulation points and unusable niches except in the main activity core - the high platform where temple is situated. Around 35percent of the land

[28] As per the data provided by Forest Department

is thus positioned unusable / ineffective being niche spaces in the sprawled mass of buildings, created due to unplanned development and irregular placement of buildings excluding the irregular niches in the central core and main activity area of Sannidhanam. This clearly depicts that lack of attention to land allocation and placement of buildings has resulted in a sprawl, with higher degree of disturbance or entropy.

Irregular placement of buildings and their view blocking heights have diminished the possibility of required area for pilgrims to view *Makarajyothi* or for spreading out in case of emergencies.

4.2.3 Landuses at Sannidhanam

Predominant landuses in Sannidhanam include Religious, Accommodation, Institutional, Commercial, and Storage. Percentage allocation of area under various landuses is presented in Figure 20.

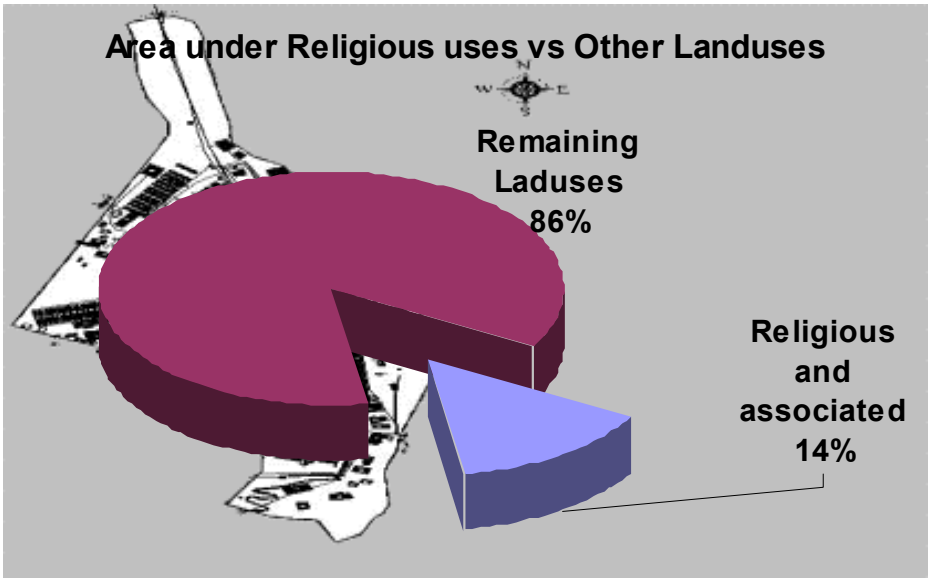


Figure 20 : Areas under Religious and Associated Landuses at Sannidhanam

Out of the available leased area for use at Sannidhanam, only 14 percent is for religious purposes (including temple complex and associated activity areas such as Nadapanthal, queuing up area, preparation and distribution of presidiums etc). Around 43percent of buildings (all types) are used for accommodation purposes. In addition it is notable that out of the total leased land available; around 15percent is kept aside for use of around 10percent of the pilgrims. Total area under accommodation use is 25percent of the total built up area. Among this, 48percent is *viri* while 52 percent of permanent and semi permanent buildings used for accommodation purposes exclusively caters for the elite pilgrims. The so called 'privatization of public space' has resulted over time, rather than its democratic alternative and stands as a clear impairment of the common property rights of the pilgrims.

It is observed that around 46 buildings (39 percent of total permanent buildings) with a total of around 1000 rooms provide lodging of permanent nature. Each room has an average area 20 sqm and accommodates 1 to 5 persons for an average of 1day. Considering an average occupancy (3 pilgrims per pilgrim day), it could be inferred that these buildings together provide average accommodation for 3000 pilgrims a day. These buildings together occupy an

area of 62000 sqm. Total area devoted for *viri* is 15900 sqm. Considering a spill over pilgrim population of around 10000 at Sannidhanam, it could be inferred that while 99.5 percent of the pilgrims get a space of 1.8 to 2.5 sqm per pilgrim in *viri* (including circulation area), around 0.5 percent of the 'preferred' pilgrims gets a minimum area of 20 sqm per pilgrim.

As discussed earlier, over the years, the place has witnessed considerable landuse changes from a temple in the forest to a mini-township. In the process, there have been considerable additions and deletions in the landuse categories to suit the requirements and interests of the time. A look into the development history of Sannidhanam as remembered by the pilgrims and recorded in the available literature points out that some important water bodies here were filled to pave way for multi-storeyed buildings.

"... to the left side of holy 18 steps is the Vavar's building and to the left of this is the big pond. Most of the shops and stalls are located in southern nada. The area to the north of temple is called Valiyaalinchuvadu and Konnachuvadu. In addition to Bhasmakulam and Valiakulam there is another pond towards the north of Bhasmakulam near the street. This is used as 'Paathrakulam' (pond for washing utensils)'....[29]. Such a reduction in the ponds and open spaces over time for sake of developing multi-storied buildings diminishes the landscape quality and negatively influences the microclimate. Figure 21 presents a bird eye view of the mini township at Sannidhanam, within the tropical forests.

Figure 21 : Mini Township within thick Tropical Forests! A Birds eye view of Sabarimala

4.2.4 Construction Typology

Most of the buildings are permanent in nature with Reinforced cement concrete roofs, brick walls, column and beam structures for high rises and permanent flooring. Around 39percent of the permanent buildings hold accommodation purposes. Next most prevalent typology is temporary structures of Tin / asbestos sheets and Kutcha flooring, while semi permanent structures are made of Tin / Asbestos roof, bamboo/ wood/tin partitions and cement flooring. Figure 22 presens the utility wise classification of permanent buildings at Sannidhanam.

[29] *Narayana Pillai, Kurumalloor (Vidwan) (2004 reprint), "Sri Bhoothanaathasarvaswom" Devi book stall, Kodungalloor*

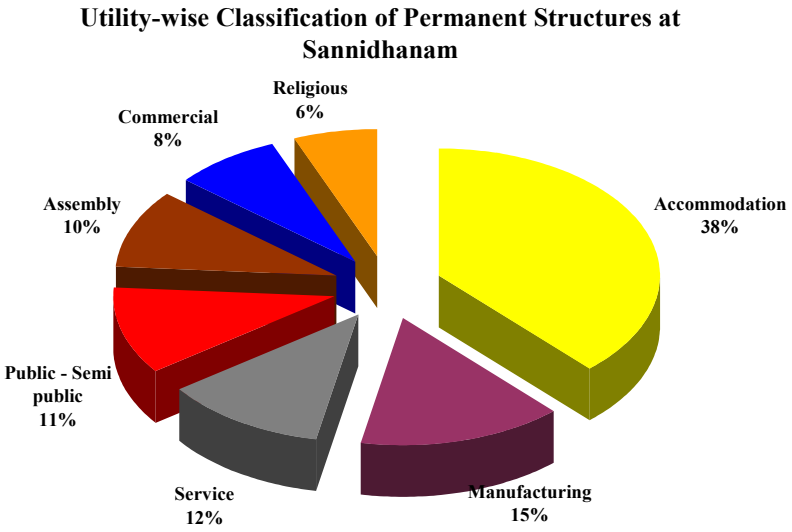


Figure 22 : Utility wise Classification of Permanent Buildings at Sannidhanam

These typologies affect the micro climate by creating a heat shaft owing to the thermal capacity of such materials, especially concrete, called thermal mass or fabric energy storage which enables it to store and re-radiate heat. This is stark contrast with the micro-climate prevalent in the forests around and creates an alien ambience.

Permanent buildings at Sannidhanam include Devaswom guesthouses, Offices, Mess, Appam Aravana Complex, Toilets, Devaswom Pilgrim Complexes, Malikappuram Building (with shops on ground floor, offices and accommodation for media personnel on top floor) hotels and shops, Annadana Mandapam, Donor Houses, Police Barracks etc. Semi permanent buildings include Police Barracks, some toilets, Kitchens, hotels, Store, Nadapanthal; queue-waiting sheds etc, while pilgrim's accommodation is provided mostly in temporary *viri* panthals except for the privileged few. Few toilets and shops are also of temporary nature.

Around 50 percent of the roofs are of RCC, 30percent of Tin sheets and 20percent asbestos. Concrete pavements cover around 10percent of total area of Sannidhanam. Distributive water percolation system can be said to be absent at Sannidhanam area due to increased coverage and concrete flooring. Thus the entire wastewater and rainfall, collected over the concrete surface is subjected to point infiltration at certain spots. This leads to the enhanced subsurface flow and consequent escape of small particles of the subsurface soil layer. This process could in the long run loosen and weaken the ground which in turn could fail to sustain the weight; finally give way with resultant rock slips.

Table 4 presents the height of various buildings/structures around Sanctum Sanctorum. The height of prominent structures around ranges from single floor to six (plus stair room) floors. Most of the permanent buildings dominate the skyline. Around 90 percentof the buildings at a radius of 100 m around the Sanctum dominate the skyline and mars natural vistas and views towards the tropical forests.

Table 4 : Height of Buildings/Structures around Sanctum Sanctorum

Distance around Sanctum Sanctorum	***Buildings / structures which mars the views***
Around 10m	Flyover for Pilgrims around the Sanctum - 12 to 15m high from the plateau where Sanctum is situated
Around 15m	Appam Aravana Plant – more than 12m, standing at a lower elevation than Sanctum, but dominant structure higher than Sanctum by around 3m
Around 30 to 40 m	Pilgrim complexes at a height of around 25m

It is obvious that even without any consideration to the terrain, resultant cost of transporting materials and cost of construction, huge amounts of materials have since 1970's been transported up to Sannidhanam to create concrete high rise structures which have changed Sannidhanam from a pristine forest to an ineptly built up urban-like spread today.

4.2.5 Services and Access Corridors

4.2.5.1 Services

Drainage pattern at Sannidhanam is not distributive owing to massive ground coverage leaving lesser area for percolation. Drainage network and treatment systems are absent. Water from Bhasmakulam and Urakkuzhi area carrying filth, dirt and waste empties into Kumbalam thodu located at around a kilometre west of Sannidhanam. The black coloured water runs slowly emanating foul odour and finally empties into Njonangar which meets River Pampa at Pampa. Kakkathodu to the south-eastern side of Sannidhanam carries plastic bottles, filth and dirt including sewage from the eastern part of Sannidhanam.

Temporary pit latrines provided during the season and permanent toilet blocks with septic tanks, which overflows during the peak season, constitutes the sanitation arrangement here. Solid waste is collected though not in a systematic way or that mandated by prevalent rules applicable to any local body area[30], by the Sabarimala Sanitation Society (SSS) and is burned in an incinerator. Water supply to Sannidhanam is met by four-stage pumping from Pampa in addition to tapping from Kunnar Dam upstream of Sannidhanam. Power needs are met through a mini station recently positioned at Pampa. Details regarding each infrastructure are available in respective modules. Services are on a whole spread throughout the area and do not keep up to the peak day pressure.

4.2.5.2 Pilgrim Access

Most of the pilgrims access Pampa through Chalakkayam - Pampa road and from here, reach Sannidhanam through the traditional Trek Route through Neelimala and Sharamkuthy, Swamy Ayyappan Road and Chandranandan Road. Pilgrim access from Uppupara is through Uppupara Sannidhanam Trek route.

[30] Panchayat Act is applicable here. In addition, since the area acquires an urban situation during the two months peak pilgrim season, with pronounced repercussions of unmanaged accumulated waste on the settlements downstream, on the health and hygiene of all including wildlife, Municipal Solid Waste (Management and Handling) Rules 2000 of the MoEF and guidelines by Hon'ble Supreme Court of India should be considered applicable.

On the way up to Sannidhanam, pilgrims prefer Traditional route, as they have to fulfil many religious / ritualistic observances on the way up, including praying at Sabaripeedom, throwing arrows at Sharamkuthy etc. while, on the way back, they prefer returning by Chandranandan Road as it is less arduous and hence during peak season, one-way movement is introduced by the police to provide space for pilgrims and to effectively manage the crowd movement.

From Pampa, some pilgrims on *dholis* are carried up through Swamy Ayyappan road and Chandranandan Road, as it is less arduous for dholi-men to carry weight through these routes compared to the steep gradient and steps of the trek route. A flyover is positioned at the entry to Sannidhanam for cross over of those approaching by Chandranandan Road and traditional Trek Route.

From Uppupara, pilgrims trek up to Pandithavalam to the north of the developed area at Sannidhanam. Some pilgrims from Uppupara return via Pampa, after taking the holy dip.

In case of emergencies, pilgrims are carried down in dholi through the same routes.

4.2.5.3 Service Access

Goods are transported to Sannidhanam on donkeys, porters or tractors. Generally the goods are carried through Chandranandan Road and Swamy Ayyappan road, as it is less arduous compared to the steep gradient and steps of the trek route. During peak season, tractors are not allowed to move up from Pampa. These are offloaded near the godowns / appam aravana building to the west of the developed area at Sannidhanam.

Movement of goods carriers up the Chandranandan Road and the pilgrims downhill create pedestrian – animal conflicts.

4.2.6 Impact of Activities and Space Usages on Critical Elements of the Landscape

Main activity periods in Sannidhanam could be classified as peak, lean and off seasons. Peak season corresponds to the main pilgrim season – the Mandalapooja – Makaravilakku festival season – from mid November to mid January each year. Lean seasons correspond to other periods when temple is opened though not for a continuously long period. This includes temple opening periods during the beginning of each Malayalam month, Vishu and newly shifted festival period and other auspicious days in a year when the temple remains opened. While off-season corresponds to periods when temple remains closed. However, during the off seasons also there is considerable movement of men and material to and from Sannidhanam and Pampa corresponding to construction activities and management of properties at Sannidhanam and Pampa. Peak season corresponds to around 43percent of total temple opening time or 16percent of the total days in a year, lean season about 21percent of the year while off season forms 63percent of the year. Traditionally, the temple was to be opened for monthly poojas and the annual mandalam – Makaravilakku festival. During 2005, the temple opening days were around 125, while in 2006 the temple was opened for around 140 days as a result of the shifting of Temple festival from Mandala season to during Vishu.

It is seen from various surveys that more than 70percent of pilgrims who visit during the peak season are from Karnataka, AP and TN. Around 15percent of the pilgrims claim that they have visited the temple more than 10 times. Many claim that they have been visiting since

past 35 years. During lean season most of the visitations are from Kerala. Thus it is clear that most of the pilgrims who visit the temple during the peak season are those without much know how of the traditional ethics and importance of the locale where the temple is situated. It is important that the pilgrims receive considerable training on the traditions of Sabarimala pilgrimage so as not to allow them to resort to unacceptable practices, which disrupt the environment. In addition it is equally important to provide good facilities at affordable rates so as to discourage them from searching for avoidable alternatives.

Total pilgrim arrival during lean season varies from 20000 during month beginning to 30000 during Vishu festival season while, during off-season, no pilgrims are allowed to Sannidhanam. However, the movement of men and materials from Pampa to Sannidhanam during the off seasons is considerable. Around 100 staff belonging to various departments involved in management of Sannidhanam would be present there during off-season, out of which 50percent is TDB staff. In addition around 500 to 1000 construction workers and around 5 to 10 hotel employees are also present at Sannidhanam on an average day during off-season. Around 7000 staff and other service personnel are present during peak season. While during the peak season, maximum number of staff present belongs to Police Department; during lean and off peaks maximum concentration is of TDB staff.

Construction activities take place during off-season, with increased concentration during the September – October months, for preparatory works for the peak pilgrim season starting from November every year. During this period, movement of men and material to Pampa and from Pampa up to Sannidhanam is enormous. Around 15 tractors transport goods from Pampa to Sannidhanam during this period carrying out an average of 50 trips per day.

4.2.6.1 Impact of Noise

Construction activities and tractors contribute the noise during lean and off peak seasons while firecrackers and loud speakers are the main contributors to noise at Sannidhanam during peak season. Chants of pilgrims are audible even from far off places like Uppupara. Average noise levels recorded at Sannidhanam at day and night time was 70 dB. Highest sound concentration was observed near Devaswom Book Stall.

4.2.6.2 Impact on Water

Main water body at Sannidhanam is Bhasmakulam, which is a sacred tank used by pilgrims as well as for rituals. A water treatment plant has been installed to purify water from the tank. However due to indiscriminate uses the water in the sacred Bhasmakulam is highly polluted. Other main water bodies around Sannidhanam are Urakkuzhi Theertham, Kumbalamthodu and Kakkathodu.

Colour of the water in the water bodies is an indicator of its quality / potability / usability. Yellowish colour of water at Kumbalamthodu, Kakkathodu and Bhasmakulam indicates the exposure to pollution due to sewage / waste water emanating from various landuses and overflowing sewage tanks.

Quality tests conducted during the last pilgrim season (November 2005 to January 2006) on the water in Bhasmakulam provide the following results.

Table 5 : Water Quality at Sannidhanam 2005-2006

Parameters	***Optimal Ranges***	***Sample taken from Bhasmakulam on 05Jan 2006 (mid season)***	***Sample taken from Bhasmakulam on 16 Jan 2006 (after peak season)***
Colour	Colourless	Colourless	Colourless
Odour	Odourless	Odourless	Odourless
pH	6.5 to 8.5	5.7	5.8
Dissolved oxygen	>_6mg/l	0.9	1.2
COD (mg/l)		2.2	340.0
BOD (mg/l)	<_2mg/l	Trace	150.0
Acidity (mg/l)		1.2	0.5
Alkalinity (mg/l)		55.7	173.4
Chloride (as Cl)		Trace	102.0
Coli form		Present	Present
E.Coli		Present	Present
MPN Count (/100 ml)	MPN <500 per 100ml	1100/100ml	1460/100ml

Source: Primary Survey and Laboratory Tests, 2005-06

4.2.6.3 Impact on Air

Air quality analysis indicates the presence of higher SPM and NOx levels. SPM levels are high owing to flying dust due to pedestrian / pilgrim movement, while NOx levels are attributed to religious activities such as bursting of crackers, burning of camphor, burning of fuel namely coconut shells for drying copra, throwing of 'neyy thenga' (coconut carried along with ghee in pilgrim's (*Irumudi)* into aazhi / fire place. Predominant odours at Sannidhanam are presented in the table 6 below:

Table 6 : Odour at various locations at Sannidhanam

Location	***Odour***	***Remarks***
Entry to Sannidhanam and All along periphery of the developed area / forest edge	Stench of Urine and Faeces	Unpleasant - Nuisance to Olfactory senses
Pandithavalam area	Cooking Food and decomposing Waste	Unpleasant - Nuisance to Olfactory senses
Bhasmakulam area	Stench of decayed matter in water, urine and faeces	Unpleasant - Nuisance to Olfactory senses
Around Sanctum Sanctorum	Camphor, Ghee	Pleasant and masks other olfactory nuisances
East side of Sannidhanam	Fire Crackers / Sulphur	Irritation to mucus lining accompanied by soot irritating the eyes

4.2.6.4 Impact on Flora and Fauna

Impacts on Flora:

It has been reported that "of the 406 flowering plants identified from Sannidhanam region, 36 are rare and endangered; majority if which are confined to lowlands evergreens if Southern Western Ghats"[31]. In addition, the presence of certain 40 exotic weeds is

[31] Gurukkal (2000) ibid *pp 78*

threatening the existence of endemic plants. Weed concentration is higher near Pandithavalam and entry to Sannidhanam. The only organised garden in Sannidhanam is the Sabari Gardens that does not appear to be well planned or maintained. Certain varieties of plants (yielding commonly used garland flowers mainly propagated by seeds) such as such as Celosia argentea var. cristata (Cockscomb Crested locally known as *Kozhipoovu*), Tagetes erecta (Marigold locally known as *Jamanthi/Genda)*, and Cosmos Sp. are found around the temple or near *viris* in Sannidhanam. It is believed that that these have grown from the dried seeds in the garland flowers used for rituals, decorating pilgrim's vehicles etc.

Main tree varieties observable at Sannidhanam are Cocos Nucifera (Coconut), Peltophorum (Capripod), Ficus sp, Cassia sp etc. Total destruction of canopy at Sannidhanam for sake of construction has created an unfavourable micro-climate coupled with the heat emanating from concrete high rise structures around. In addition, erosion, cutting of natural profiles, disturbance to fluvial patterns, reduced water holding capacity etc is continuously disturbing the natural growth of evergreen varieties and thus in turn, adversely affecting the flora and fauna. This coupled with growth of weeds, introduction of new varieties of flora and fauna, increased and prolonged contact with people is tending to create a completely new patch of 'urban like character' amidst the otherwise pristine evergreen forests. Deciduous varieties dominate areas closer to Sannidhanam, including trek route from Pampa to Sannidhanam and Pandithavalam. Deciduous trees shed their leaves during winter and gets dry during summer, which increases chances for forest fire.

Impacts on Fauna:

A historical description of Sannidhanam explains that the temple has been constructed on a raised platform approached by steps, so as to prevent the entry by wild animals; in addition, there were huge moats around Malikappuram temple to protect it from destruction by wild animals[32]. Horizontal fragmentations have mainly resulted in discontinuity between the forests and built-up edges. Native fauna that visits Sannidhanam now only during the off-seasons leaves back horizontal linkages across Sannidhanam. Animal crossings are observed near Kunnar pipeline, Pandithavalam, Kakkathodu and Ampalakadavu at Sannidhanam area. Continuous presence of human beings around Sannidhanam and their activities such as loud chants (which were traditionally used by pilgrims to scare away the animals in this forest area) and bursting of crackers have resulted in many species getting pushed more and more from this buffer area towards the core of the Reserve.

a) *Tiger*

Forest Department reports that pugmarks were identified from Sannidhanam during annual tiger census in PTR and sighting of tiger in the locality during off-season also has been reported[33] in 2001, though the Sannidhanam falls in the buffer of PTR. A detailed survey of tigers and their habitats is being undertaken by the Wildlife Institute of India using Geographic Information System and as a tool.

[32] Narayana Pillai, Kurumalloor (*Vidwan*) (2004 reprint), "**Sri Bhoothanaathasarvaswom**" Devi Book Stall, Kodungalloor

[33] E Kunhikrishnan etal, Impact of Development on the Bio diversity of Sabarimala Enclave: A Rapid Biodiversity Assessment, in Gurukkal etal (2001) **Enclave Management Study**, India Eco Development Project, Project Tiger, Kottayam

b) *Elephants*

Elephants could be seen in large herds near Sannidhanam during off seasons. They feed on ash and waste left along after the pilgrim season. A study conducted by Balasubramanian[34] on quantification of plastics and other wastes in the dung piles of elephants along the trekking routes leading to Sabarimala, indicated that 82.1 percent samples had plastics and the remaining 17.9 percent contained other degradable materials. This shows the increased contact of the wildlife with the *left over of the pilgrimage* especially due to lack of proper waste collection and disposal methods. It has been reported by duty staff that Elephants which frequents the traditional trek route (mainly the Marakoottam - Sharamkuthy area) Pampa and Sannidhanam area during off seasons dismantles structures and railings. Hence it is preferable to construct stable structures with less exposed glass surfaces or with iron / wooden grills to protect openings in such corridors so as to save the structures as well as to ensure minimal harm to the elephants and other wildlife.

c) *Other Native fauna*

Most commonly observable animals and birds such a common monkeys, Lion Tailed Macaque, varieties of birds and butterflies are directly or indirectly affected by the activities of human beings and due to contact with other animals. Cutting of trees and using dried logs as firewood have depleted available nesting areas for avifauna, clearing of undergrowths have affected the butterflies and reptiles, food left overs have bought mokeys and other animals to the brink of domestication. The pathways and buildings across the forests have disturbed their natural movement corridors. Pollution due to coliforms and plastics on all the streams from Sannidhanam area, leading to River Pampa has resulted in poor quality of water available for the native fauna. Continuous lighting arrangements during the season and exposed utility lines disturb the wildlife. In addition, chances of spreading infections among the wildlife through domesticated animals are more.

d) *Impacts due to Domesticated Animals*

- *Donkeys*

Donkeys are used to transport the goods from Pampa to Sannidhanam. They move along the Swamy Ayyappan and Chandranandan Road till near Sannidhanam, from where they bifurcate and move towards the west of developed area at Sannidhanam to reach near Appam Aravana Building. The donkey droppings along the traditional route are a menace to moving pilgrims. Flies could be seen hovering around the unclean donkeys all through out. These flies can act as contaminant carriers. It has been reported that the donkeys spread diseases among the wildlife. There were around 153 donkeys in service here during 2001, while the numbers have increased to 700 by 2005. Donkeys are packed up at a congested narrow strip of space along the way to Ganapathy temple / origin of trek route from Cheriyanavattom. In 2005, as per the donkey permits issued by KFD, about 700 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. These donkeys are brought from Tamilnadu across

[34] Balasubramanian M., (1999),. **Base line Survey and Ecological Impact Assessment in Poonkavanam at Sabarimala**, India Ecodevelopment Project Periyar Tiger Reserve, Kerala

the eastern border of Kerala and are given permit to operate by KFD only after compulsory vaccination at the entry check post.

These donkeys are stacked near Godown / Appam Aravana Complex near Sannidhanam and mostly near the ambulance station / homeo hospital at Pampa. They could be observed waiting along the Chalakkayam – Pampa road side also. Most of them suffer from sores all throughout the body, frequented by flies and insects. During the recent pilgrim season veterinary troops had been arranged (to camp and operate from Pampa) by animal lovers to attend to the misery of these donkeys.

- *Domesticated Bovines*

As part of the ritual, pilgrims leave cows and goats at Sannidhanam as offering to the Lord Ayyappa and sub-deities. These cows mostly roam around at Sannidhanam area without any control or care. It has been observed that some of these are domesticated by the staff and others and is used for milking purposes. During the early days goats also used to be offered to Vavar Swamy.

- *Domesticated Wild Bores*

Many wild bores could be seen around near Sannidhanam, feeding on the waste strewn around. It has been reported that the construction workers at Sannidhanam sometimes kill these during off-season.

It has been proved that some domesticated or partially domesticated animals, which comes in contact with their wild relatives, allows for the transmission of newly modified infectious agents from the human habitat to the virgin wild habitats in forests or Savannahs. Contact between wild animals of the PTR and domesticated or partially domesticated animals mainly by sharing of same water / food source or wild animals getting exposed to humans can lead to microbial diseases and other infections among the wild species in the natural environment. Such wildlife causalities have also been reported in other tiger reserves in the country (refer box). As a precaution, in many areas vaccination of all possible intrusive species such as all cattle in surrounding villages has been resorted to, in addition to efforts to minimise such intrusions.

In 1968, the entire gaur population in the forests near Bandipur Tiger Reserve and the adjoining forests of the Nugu Wildlife Sanctuary and Himavad Gopalaswamy forest range was on the verge of being wiped out, following an outbreak of rinderpest. It was found that gaurs contracted the disease from domestic animals that had ventured into forests.

Aravind Gowda. ' Cowed down by cattle, tigers flee Bandipur forest', www.timesofindia.indiatimes.com, 13/10/03, As reported in Protected Area Update: No: 46, Dec 2003

In 1999, in Sariska Tiger Reserve, some animals, including tigers and leopards, which were killed in road accidents or were found dead, were found to be suffering from Tuberculosis or liver infection. Experts believe that the infection was brought to the sanctuary by monkeys and langurs who return to the forests after making forays into towns or that the diseases of domestic cattle are being contracted by the wild animals as they share the same water holes in the park.

Source: 'Sick in sanctuary'. Down to Earth, March 15, 1999

- *Rats*

Rat menace is critical in Sannidhanam area. Rats could be observed easily, especially in the drains, godowns (which also store materials for prasadams) and hotel kitchens, indicating the unhygienic conditions and lack of care in storing food items. In

addition, presence of these could lead to many infectious diseases, which may spread far and wide through the pilgrims. This should be viewed in the light of increasing leptospirosis and instances of other such diseases, which have had an epidemic effect on many areas.

4.2.6.5 Impact on Land / Topography

Vertical fragmentation resulted from construction activities without consideration for natural slopes and high rise buildings are visible in all directions. The fabric at Sannidhanam has obviously blemished the landscape. Figure 23 presents a view of the constructions over the slpoppy terrain of Sannidhanam.

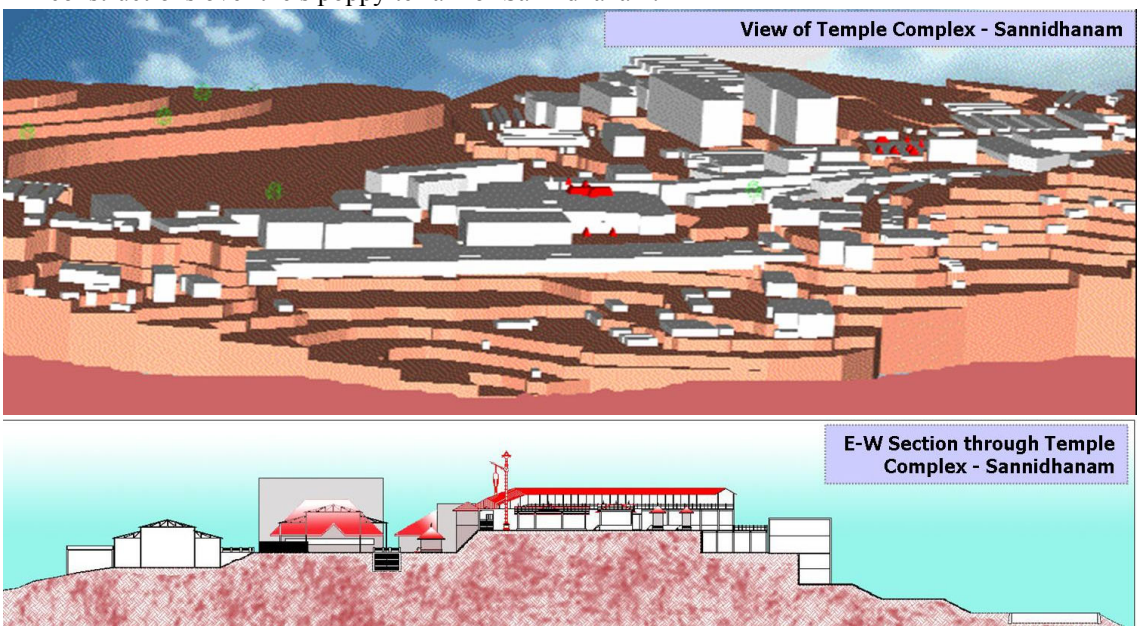


Figure 23 : View and Section of Terrain and Buildings at Sannidhanam

Overlay of existing landuse map over the topo sheet clearly brings it to the fore the extensive land modifications which have been carried out to create the present built form here. Such cutting and filling of the land here is uncalled-for and entirely against the option of 'building with the nature', utilising the available slopes. Such vertical fragmentation has also resulted in interrupted views. In Sannidhanam, the blockage by high rise buildings has resulted in lesser area from where even Makarajyothi is visible.

The temple activity is confined to a radius of about 700m to 1 km from the sanctum sanctorum. Approximately about two -third of this area, especially the North, East and Southern side of the temple has concreted surfaces with numerous multi - level buildings. Available area at Sannidhanam is mostly with steep slope of more than 1:5, where construction necessitates higher degree of land modification resulting in permanent injuries to the land, obstruction of natural underground drainage patterns and higher costs of cutting and filling the slopes. Sanctum Sanctorum and immediate area is located in moderately steep slopes, while some area to the south of the temple has lesser slopes. Most of the construction activities have taken place in areas with steep and moderately steep slopes.

Land is sloping down towards East and west beyond the leased out area, while to the north it perches up towards Uppupara and to the south is the trek route from Pampa to Sannidhanam. Further expansion of the area towards the east and west would necessitate extreme cutting and slope filling for any building purpose and hence allocation of more area at Sannidhanam could not be recommended except for essential facilities, which would not require much land modification.

Around 25000 sqm of land at Pandithavalam and 10000 sqm near trek route entry remains the only sizeable chunk of land within the leased area, which may possibly be used for any development. But Pandithavalam area is steep with 1:5 slopes, which will incur huge amount of land modifications if used for construction purposes. In addition, being the single vast tract of land from where Makarajyothi is visible with lesser visual interruptions, this area needs to be protected as a no-construction zone.

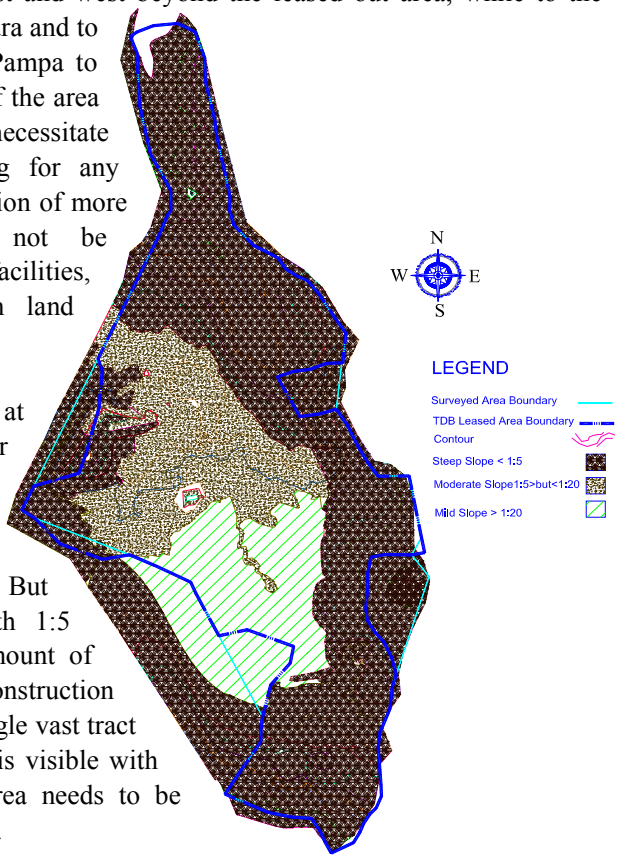


Figure 24 : Topography of Sannidhanam

Cost of construction up at Sannidhanam would be multifold than that is at the level ground, mainly owning to its far off location in the forest up a hilly terrain where materials need to be transported on head, animals or in tractors rather than by conventional methods. Figure 24 presents the topography of Sannidhanam

4.2.7 Compilation of Critical impacts on Elements of Landscape - Sannidhanam

Critical impacts on elements of the landscape and the nature of impacts can be tabulated thus:

Table 7 : Critical impacts on elements of the landscape at Sannidhanam

Element	*Critical Impact*	*Nature of Impact and probable intervention group*
Land	Unwarranted development density and sprawl due to unplanned development	Reversible in a phased manner over a long period of time
	Extensive Land modifications	Irreversible
	Unutilisable niche spaces	Reversible in a phased manner over a long period of time
	Waste Accumulation	Reversible
	Heavy Erosion	Irreversible
	Point infiltration of drainage	Reversible
	Space for pilgrims to spread *viri* replaced by high rises	Reversible in a phased manner over a long period of time
	Lack of organised open spaces	Reversible
	Covered up water bodies	Irreversible

Element	***Critical Impact***	***Nature of Impact and probable intervention group***
	Less space for pilgrims / people to spread in case of emergencies	Reversible in a phased manner over a long period of time
	Blockage of vistas and views	Reversible
	Hampered water percolation due to extensive hard ground coverage	Reversible
	Impact on existing lineaments and shear planes due to intense high rise development	Irreversible
	Open defecation resulting in odour and poor visual ambience	Reversible
Air	Odour pollution due to sewage, sullage, solid waste strewn around	Reversible
	Emissions due to various religious activities and other associated activities like 'burning of Copra'	Reversible
	Dust menace	Reversible
Water	Spillage of sewage from soak pits	Reversible
	Waste water cess pools from commercial joints spilling over / flowing to water bodies	Reversible
	Indiscriminate use by Pilgrims	Reversible
	Polluted water running down stream and further polluting Pampa	Reversible
Flora	Cutting of trees for fire wood and for construction of *viri*s	Reversible
	Depleting under growth	Reversible
	Changing character of vegetation	Reversible
	Cutting of trees by authorities for little reason	Reversible
	Landscape fragmentation	Reversible in a phased manner over a long period of time
	Intrusive species	Reversible
	Change in floral type and pattern and resultant habitat depletion and risk of fire	Reversible in a phased manner over a long period of time, through enhancement and conservation
	Lack of vegetative cover within the urban sprawl of Sannidhanam	Reversible
Fauna	Built – Hindrances to Natural movement corridors	Irreversible, but can free out currently followed movement routes and ensure minimisation of such future hindrances
	High noise levels due to bursting of 'vedi' (bursting crackers for religious purposes)	Reversible, if allowed from a religious stand point
	Habitat Fragmentation	Irreversible
	Communicable diseases through intrusive species like donkeys	Reversible
	Disturbance to Flora including displacement from their natural habitat due to human intrusion into their habitat	Irreversible as the animals would tend to move more and more closer to the core of PTR during the peak season due to influx of pilgrims, and noise emanated due to religious and other activities

4.3 Impacts on Pampa Area

Pampa can easily be segmented into following homogenous sections for ease of understanding:

1. Left Bank of River Pampa including hilltop: This is the entrance to Pampa. This area holds shops, hotels, offices, police station, hospital and hilltop parking lot. Vehicles are allowed to traverse the entire stretch up till hill top parking area except during peak days of the peak season. After alighting here, the pilgrims move to the Thriveni and Manalppuram.

2. Pampa Manalppuram, including Cheriyanavattom and Thriveni: It was on this sandy floor along the bank of Pampa that the Pandalam Raja found infant Ayyappa. Pampa Manalppuram could be approached from the other (Left) Bank of Pampa through a footbridge starting towards the North of Police Station and a small motorable bridge near Thriveni. This forms the main approach for pilgrims coming through Chalakkayam – Pampa route by walk or in vehicles. In addition, this area can be approached from Cheriyanavattom through a small bridge across Njonangar River here. This forms the main approach for trekking pilgrims from Erumely. Pampa resembles a thriving business node or market during the peak season these days, with many shops and hotels, pilgrims and tradesmen thronging the place in addition to hordes of dholi men running behind the prospective customers. In addition, rituals like bath in the holy River Pampa and rituals for ancestors are preformed here. The area is home to accumulated waste and odour. Thriveni is the holy sandy platform at the confluence of Pampa and Kakki Rivers. The sandy beach here is used for parking and also for rituals for the ancestors.

3. Area up the Manalppuram – till trek route including the Ganapathy Temple premises: This area at a higher elevation than the Manalppuram is approachable through a surfaced road up till Ganapathy Temple premises along the bank of Njonangar and by a flight of steps from near the Annadana Mandapam through a garden to the Ganapathy Temple premises. Godowns and stores for goods, shops and Donkey halting places, two storied toilet blocks and the Pandalam Raja's stay area are located here. Vehicles are allowed to come up till Ganapathy Temple premises. However, tractors carrying goods to Sannidhanam are allowed beyond this point through the Swamy Ayyappan Road, except during peak pilgrim season.

4.3.1 Critical Landscape Features

Critical natural feature here is the River Pampa and its sandy beach. This place is considered sacred and demands preservation considering its religious and natural importance. Both the banks of Pampa are undulating with the highest point in the left bank being the Hilltop and that in the right bank being the Pampa Ganapathy Temple premises.

Critical manmade feature is the urban market like area on both sides of the river. The shacks, niches with accumulated waste and buildings which are oriented with a negative reverence here contribute to visual displeasure. This needs to be corrected to regain the lost glory of the sacred precinct.

4.3.2 Density of Development

Total area available for use by TDB at Pampa is 20acres, while the total developed area is 48acres. Total built up area is around 25000 sqm while the percentage of open spaces is

8percent. Height of the buildings ranges from 4 to 15m (single floor to four floors). Total built coverage at Pampa is 25percent.

4.3.3 Landuses at Pampa

Mainly, left Bank of Pampa up to hilltop is the area where pilgrims alight and park their vehicles. Administrative offices, shops and hospital are located here. Two bridges cross the river connect it with the right bank / Manalppuram.

Manalppuram is were the pilgrims approach the river mainly and move towards the trek path uphill. Ganapathy Temple premises are located close to trek route beginning. Thriveni is used for parking as well as for religious observances. Total area allotted on lease is 20acres at Pampa, it is seen that an excess of 28acres of land is put to use here.

Activities which take place at Manalppuram are Commerce, movement of pilgrims and staff to Pampa Ganapathy temple and further to trek path, pilgrim flow from Cheriyanavattom to Pampa, Bathing and related activities at River Pampa, Pampa Sadya, Pampa Vilakku, Commercial activities, pilgrims halting in between the walk to eat and buy essentials, etc. Percentage allocation of area under various landuses is presented in figure 25. Predominant landuses in Pampa include Religious, Institutional, Commercial, and Storage.

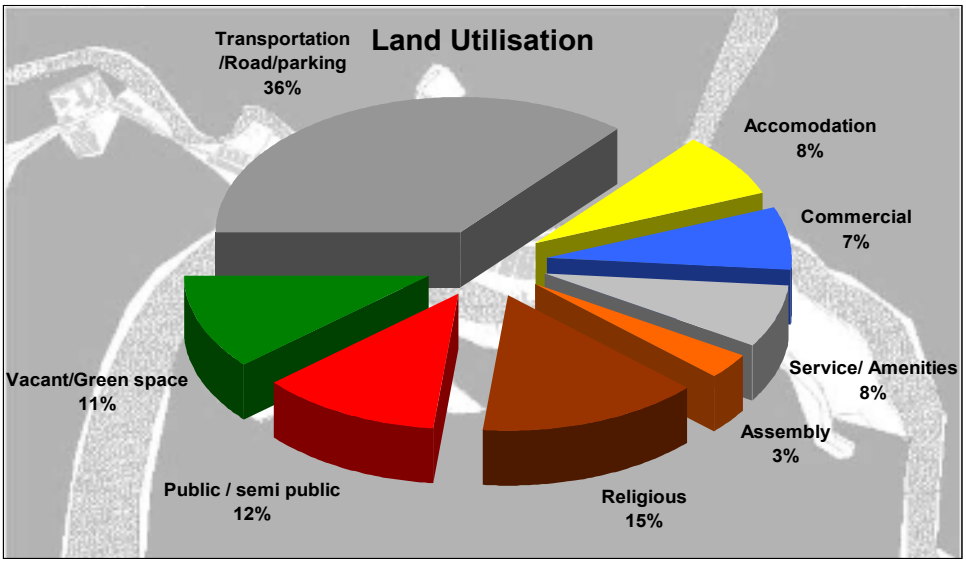


Figure 25 : Land Utilisation at Pampa

Though it is considered as the existing base camp, area let for accommodation is only for around 7500 pilgrims. More than 850 toilets exist in Pampa. Around 57percent of accommodation facilities are temporary in nature (*viri*). Maximum chunk of land in Pampa is used for parking vehicles. Thus it could be inferred that Pampa area as such is today used mainly for pilgrims just to alight and for basic ablutions before the trek uphill. Lack of proper access and visibility to toilet facilities forces the pilgrims to resort to open defecation.

Area from Cheriyanavattom to Pampa is congested as well. The space available here without shrub cover is allocated to EDCs for constructing shops. These shops sell commodities such as grains, pulses, packed food, packet foods, tetra packs of juices, cool drinks, space for *viri* etc. They also use timber poles and tin sheet roofing for construction. Area of each shop

ranges from 100 to 200 sqm. A pathway is left in between the shops. Total area of shops here is 1500 sqm.

Activities at Thriveni include parking and religious observances such as 'pithrutharpanam'. It is found necessary to restrict the parking here so as to free the land for religious use. Parking can be allowed for emergency service vehicles and staff vehicles here.

4.3.4 Construction Typology

Around 79percent of commercial activities are housed in temporary structures made of poles, shacks, tin sheets rendering a shabby image to Pampa. Around 78percent of sanitation facilities are of permanent nature, housed in buildings of more than two stories. TDB auctions out / sub-leases the right to construct and operate shops annually. It could be observed that each shop has more than one section: one (or more) dealing with selling packed food items and light refreshments, one selling articles such as black cloth, bangles, toys etc and a larger one functioning as hotel. It is clear from site observances and informal surveys that the lessee further subleases out the space, which has been leased out to him.

The shops here remain throughout the year and are not dismantled after the peak season. Some are opened during off peak seasons. Area of temporary shops varies from 20sqm to 725sqm with an average of 200 sqm per shop (35 shops). Area of semi permanent shops also varies from 13 to 264 sqm. Height of buildings ranges from 3 to 15m (one to five stories). Figure 26 presents the percentage of buildings under various structural characters.

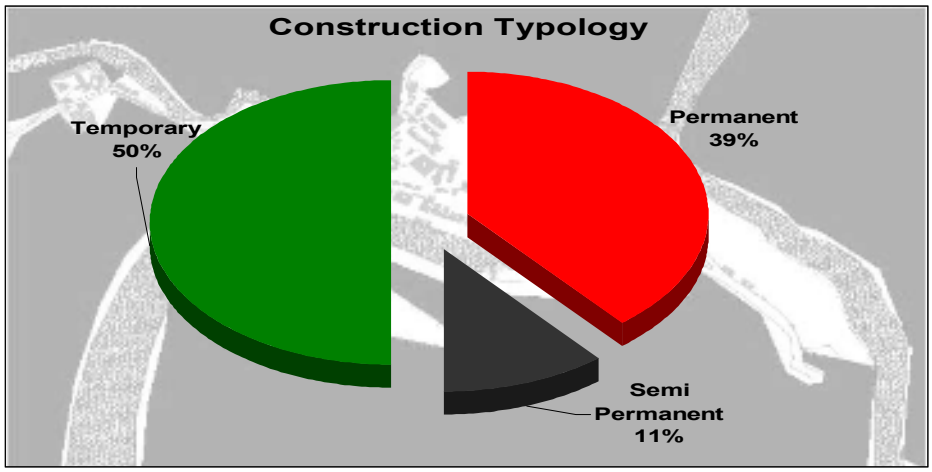


Figure 26 : Construction Typology at Pampa

Predominant Construction Materials:

- Permanent: RCC and Brick
- Semi Permanent: Brick, RCC frame, tin sheets
- Temporary: Bamboo, Sticks,

Continuous length of temporary construction is more than 30m at places, while a space of 1 to 2 m is left between some shops. Such arrangements in an area which mostly holds much of semi-permanent and temporary structures as well as combustibles leave least scope for efficient fire management or emergency services. The area poses high risk in case of collapse or fire.

4.3.5 Services and Access Corridors Services

Wastes from the shops at Pampa are strewn around, though the authorities have made it mandatory through a suitable contractual clause that the shop owners should make arrangements for primary storage of waste. Metal drums are placed for secondary collection, while transportation is met by small open trucks, which share the pilgrim movement corridor. Incinerator at Cheriyanavattom is the main arrangement for disposal. Wastewater from the shops flows into soak pits behind the shops which overflow usually during the season. Wastewater including wastewater from hotels, drainage and sewage from broken septic tanks flows into River Pampa and Njonangar. In Njonangar, water is less and almost stagnant and yellowish black in colour after the peak season. Waste could be seen accumulated along the edges of the river near Cheriyanavattom. The authorities are in the process of implementing the immediate interventions suggested in the Outline of the Master Plan for Sabarimala, which would help in improvising the situation. Main source of water supply is upstream of river Pampa, from where around 9 MLD of water is tapped and used at Pampa, trek route as well as Sannidhanam. Water is not available in sufficient quantities during peak season and is extremely polluted. Power supply is met through a mini-station and transformers installed here. Lighting is provided by network of electricity lines and hanging tube lights. This hinders the movement through Manalppuram and may pose a safety hazard. There are many places along the trek route where the post junction and wiring are dangerously exposed. Detailed description on these services and utilities are provided in relevant modules of this master plan report.

4.3.5.1 Pilgrim Access:

Currently it is observed that 6 rows of pilgrims move through Manalppuram during peak days in extremely crowded condition. For this, width of the corridor available is 8m where as 12m is required. It is also observed that 3 rows of pilgrims move towards Pampa from Cheriyanavattom near Njonangar during peak days in extremely crowded condition. For this, width of the corridor available is approximately 5m; where as 10m is required. No space / corridor is demarcated for emergency escape / exit, where as for bringing an emergency escape vehicle such as ambulance, it is required to demarcate and allocate a strip of 4.5 m width either separate or clubbed with service access, from Thriveni to the foot of Pampa Ganapathy temple.

It is observed that general movement velocity of the pilgrims through Manalppuram in uncongested situation is 1.5km/hr, excepting the slower pace of those who enter the shops/hotels.

To ensure this velocity during crowded situation it is required to provide 9m corridors for free movement of 6 persons in a row during crowded conditions. Hence total width to be left for general pilgrim movement is 12m considering the need for emergency evacuation in dholis or stretchers, even after providing a secluded service access for emergency service vehicles.

4.3.5.2 Service Access:

There is no service access behind the shops. Tractors and mini lorries carrying waste run amidst the pilgrims and cause Pedestrian – Vehicle conflicts. Waste collected from the shops and pathways are lifted manually and placed inside the transporting vehicles

emanating stench and causing unpleasant and unhygienic atmosphere for the pilgrims and those workers who handle the waste.

4.3.6 Impact of Activities and Space Usages on Critical Elements of the Landscape

Activities: Peak Season

Religious Activities

Pampa is a sacred locale were many ritual observances are carried out. Pilgrimage to Sabarimala is incomplete without 'P*ampasnanam'* or a dip in river Pampa. *Pampasadya* (feast held at the banks of Pampa), *Pampavilakku* (lighting of lamps around and in the river) and *pithrutharpanam* (observances for the ancestors) are carried out here. For Pithrutharpanam, around 50 kiosks are provided to accommodate a total of 100 pilgrims at a time. These stalls are found in Thriveni as well as on Pampa Manalppuram. Pampa Manalppuram is the sacred precinct where land is to be preserved for such observances.

Pilgrim shelters and *viri* are provided here. During olden days some of the pilgrims used to stay for two or three days in pious atmosphere on the banks of Pampa forgetting all their mundane affairs and immersing themselves in reading holy texts, prayer and mediation. Now Pampa is far from a holy precinct with the rush, dirt and stench and pilgrims rush to Sannidhanam and back without staying back once the rituals are done.

On reaching Pampa, the pilgrims, after setting their camps, take a holy dip in the river, Pampa. Many of them perform the rite *Pithrubali*, the propitiatory rites for the ancestors, expressing their love and regard for those who had passed away.

An important function, which the pilgrims, who come in groups, arrange here, is the ritualistic feast called Pampa-sadya, a sumptuous feast commemorating the feast Ayyappa and his soldiers arranged at the banks of Pampa to celebrate victory. The pilgrims believe that there will be the presence and participation of Lord Ayyappa as an unseen guest in the feast.

There is a festival of lights on the banks of Pampa a day before the most important *Makarasamkrama pooja* called Pampa Vilakku. As per legends, this also commemorates the victory celebration on the banks of Pampa conducted after the defeat of Udayanan. Innumerable camps of pilgrims are illuminated with oil lamps and candles on this occasion.

Other Activities:

Pampa is the most crowded place with many traders, pilgrims, service staff and utilities. This is the main parking area for pilgrims. Thriveni and hilltop are kept aside for parking. There is no separate service access. Pampa thus becomes a place of pedestrian – vehicular, vehicular – vehicular and pedestrian – pedestrian / hawker conflicts. Lack of service and emergency access further contributes to the clutter and chaos here.

At Pampa, the pilgrims also fulfil their basic needs such as washing, bathing, discharging and eating. These activities demand space for toilets, shops and bathing ghats. Many single to three storied toilet blocks are provided at Pampa. But poor visibility and poor maintenance standards of these often forces pilgrims to resort to river and surrounding areas for open defecation.

Hotels and shops here let out the organic and inorganic waste to the river or allow it to be strewn around. This pollutes the river, adjoining forests and the land alike.

STP and incinerator are located at Cheriyanavattom. However, small bridge access across Njonangar and crowded shops from Cheriyanavattom lessen the space available for movement and result in conflicts as it is the main entry point for the pilgrims trekking from Erumely. Pilgrims uses the bushy area for open defecation also. Lack of separate service access to Cheriyanavattom causes difficulty to tractor / service vehicle movement till here.

During peak season many governmental, quasi-governmental and voluntary agencies work at Pampa. These include SSS, TDB, KSEB, KWA, KSPCB, Police, Post Office, Excise Department, Forest Department, Banks, and Health Department NGOs like Ayyappa Seva Sangham etc, together contributing staff strength of around 1000. Barracks are provided for police and fire force personnel who manages the law and order, emergency and rescue services, while office and accommodation for TDB staff is provided in Maramath Complex. All other offices have attached office and stay facilities, creating a mixed land use at Pampa

Other category of occupiers at Pampa is hotel workers and vendors / hawkers whose total strength falls around 800. In addition other service personnel such as head load workers / coolly men, donkey keepers, workers and *dholi* men occupy Pampa in large numbers. Their number falls around 500, out of which around 30 were donkey keepers. Most of them come from nearby areas such as Kumily, Vandiperiyar, Peerumedu, Vadasserikkara and even far off locales of Tamil Nadu and stay here till the peak season is over.

Members of namely Narikkuravar (nomadic tribe originally based in Tamil Nadu and Andhra Pradesh) tribe also sell their wares (mainly beads, chokers etc) here. Their population at Pampa is around 250. The impact due to their presence is thus reported … "nomadic tribes, most of them reportedly coming from the high health risk areas of neighbouring Tamil Nadu, camp at Pampa and along the trekking path, vending neck-chains, bangles and tribal medicines"[35].

Activities: Off and Lean season

Mainly TDB officials reside and work at Pampa during off / lean seasons. They are involved in maintaining the precincts and property of TDB and also in carrying out construction activities at Sabarimala. Usually, around 30 TDB personnel are put up at Pampa during off-season. Few forest officials also reside and work here. In addition some of the hotel workers (5to8) also reside here. Most of the shop structures remain throughout the year while only one or two shops continue commercial activities during the off-seasons.

During off and lean seasons, percentage of staff at Pampa reduces to around 5percent of that during the peak. Off season just prior to the peak season shows higher level of activities including shop owners erecting the shops, construction / maintenance activities hurriedly arranged by TDB to cope up the demand of the forthcoming peak and maintenance works arranged by other agencies.

Few construction labourers (around 20 to 50) from nearby locales also work here during off-season. During off seasons, the place is noisy due to such activities like roaring of concrete

[35] The Hindu, " No move to distribute condoms in Sabarimala", September 19, 2002

mixers, blasting of rocks, burning of tar, movement of tractors etc, which is intense during the off seasons just prior to the peak season.

4.3.6.1 Impact of Noise and Odour

Existent sound levels are far above the recommended limits even during night time at Pampa mainly during the peak season, the lean seasons and the off-seasons immediately preceding the peak-season. Maximum average noise levels were recorded near Chakkupalam KSRTC depot. Noise which averages around 70 db is mostly generated by vehicles, fire crackers, and loud speakers. During off-season which precedes the peak-season construction activities and movement of tractors are the main noise contributors.

Predominant odours at Pampa are camphor smell around the Ganapathy temple precinct and Thriveni where *pitrubali* is carried out, foul smell emanating from *alfresco* defecation and decaying waste dumped mainly in and around Thriveni parking, Cheriyanavattom, toilet blocks at Manalppuram (rear side of shops), and the food fragrance emanating from hotels at Manalppuram.

4.3.6.2 Impact on Air Quality

Air quality analysis indicates that SPM and NOx levels are higher during the afternoon hours till around 10 PM where as it is lower during the night, probably wing to higher vehicular movement during this time. Filter paper collected at Pampa was blackish owing to carbon emanated due to vehicle soot.

4.3.6.3 Impact on Water Quality

The solid and liquid wastes which include human excreta and other degradable wastes like food wastes, leaves etc., and also the non-degradable wastes like plastic, bottle, metal cans etc; ultimately reaches the River Pampa, thereby leading to high level of water pollution.

The pollution of water ultimately affects the quality of drinking water. At present there is no facility for purification and treatment of drinking water supplied to the pilgrims. A primary survey was undertaken to examine the quality of water during mid and peak seasons. The results of the analysis of the samples collected are presented in the table below.

Table 8 : Water Quality at Pampa

Parameters	***Optimal Ranges***	***Thriveni (Mid Season#)***	***Thriveni (after peak season*)***	***Cheriyanavattom (Mid Season#)***	***Cheriyanavattom (after peak season*)***	***Njonangar (after peak season*)***
Colour	Colourless	Colourless	Colourless	Colourless	Colourless	Colourless
Odour	Odourless	Odourless	Odourless	Odourless	Odourless	Odourless
pH	6.5 to 8.5	5.7	5.7	6.3	6.3	6.3
Dissolved oxygen	>_6mg/l	6.9	6.2	7.1	6.2	6.0
COD (mg/l)		2.2	4.0	0.6	10.8	8.0
BOD (mg/l)	<_2mg/l	Trace	2.4	Trace	9.4	2.8
Acidity (mg/l)		1.5	0.5	1.0	0.7	0.5
Alkalinity(mg/l)		13.4	16.8	11.6	22.3	18.6
Chloride (as Cl)		Trace	13.7	Trace	16.8	15.8
Coli form		Present	Present	Present	Present	Present
E.Coli		Present	Present	Present	Present	Present

Parameters	***Optimal Ranges***	***Thriveni (Mid Season#)***	***Thriveni (after peak season*)***	***Cheriyanavattom (Mid Season#)***	***Cheriyanavattom (after peak season*)***	***Njonangar (after peak season*)***
MPN Count (/100 ml)	MPN <500 per 100ml	>460/100ml	>150/100ml	>460/100ml	>1100/100ml	>1460

*Note: # Sample collected 31 January 2005, * Sample collected on 16 January 2006*
Source: Primary Survey, (2005-06 pilgrim season)

Physical analysis of water samples suggests that lower pH of water in Thriveni area of river Pampa indicates acidic nature owing to discharge of waste water. Water was highly turbid in Njonangar during mid and after peak season, indicating the presence of faecal matter. Water samples were subjected to chemical analysis for the parameters such as Chloride, Dissolved Oxygen, COD and BOD. Chloride concentration during mid season was only in traces at Thriveni and Cheriyanavattom, whereas it was found to be more after peak season indicating contamination due to sewage / effluents. DO levels were well within permissible limits. However, BOD values show variation during mid and after peak season. This indicates increased accumulation of oxygen demanding wastes after the peak season. BOD and COD are higher in Pampa near Cheriyanavattom area after peak season.

The MPN gives an index value for an estimate of mean densities of coliforms in the samples. It has been noted that the values for Pampa near Cheriyanavattom are much higher than the permissible limits after the peak season even when compared to mid season. It is obvious that water quality at Pampa is especially poor, after the Makaravilakku season. This could be attributed to waste directly thrown into the river (after Pampa Sadya, Pampadanam, waste from hotels etc), waste water and sewage (from open defecation, direct waste water outflow into the river from septic tanks, hotels etc). Flow is hampered not only by the check dam regulator upstream, but also slackened by the increasing numbers of cloths thrown into the river by pilgrims.

Main visually observable foreign bodies in River Pampa at Thriveni and Cheriyanavattom stretch include cloths, plastic carry bags, bottles and lids, food waste, floating soap and oil etc.

It is observed that pilgrims use plastic mineral water bottles as floats for floating the decorated temple models in which the ‘vilakku’ (lighted lamps) is lit during ‘pampa vilakku’, a ritual performed at pampa. These settle ultimately along the banks, downstream, spilling oil and leaving the bottle floats. In contrast to the earlier times when pilgrim visitations were low, now the intensity of such usages and waste deposits is higher. After the season, multi-varieties of flies harbour all along Pampa and downstream where such wastes get deposited. While bathing, the pilgrims also leave aside their cloths at Pampa River, which clogs up the River which is already shallow. TDB tenders out the collection of these cloths from the River to contractors who mostly recycles the same. In addition, pilgrims throw soiled banana leaves into the river in huge quantities after the Pampasadya. These get washed away down the river. Pampa is the ultimate reservoir where all different types of wastes emanating due to various activities are collected. Flow of water in Pampa decreases to 1.6cu m /sec during peak season. A study by KSPCB suggests that only a flow of 5.2 cum / sec can help wash of pollutants.

4.3.6.4 Impact on Flora and Fauna:

Species mostly seen around Pampa and Cheriyanavattom include evergreen species such as *Mesua ferrea* and *Elaeocarpus serratus*. Plant saplings below 1m height were less near and around Pampa than the traditional Uppupara Sannidhanam route as well as Pampa – Erumely route.

Certain varieties of plants (yielding commonly used garland flowers mainly propagated by seeds) such as such as Celosia argentea var. cristata ('Cockscomb Crested' locally known as *Kozhipoovu*), Tagetes erecta ('Marigold' locally known as *Jamanthi/Genda*, and Cosmos Sp. are found at places along the road access and at Pampa, especially at Thriveni and hilltop. It is believed that these have grown from the dried seeds in the garland flowers used for decorating pilgrim's vehicles or from flowers used for rituals.

4.3.6.5 Impact on Land / Topography:

Pampa, the holy foothill of Sabarimala is the place where most important rituals and observances are performed. Legend says that infant Lord Ayyappa was found by Raja of Pandalam at Pampa Manalppuram. Besides, bathing in the holy River is an important part of the pilgrimage. But it is seen that the available space here is occupied by huge shops / hotels of total area 9000 sqm. Each shop has an area of 200 sqm average[36]. These are constructed using timber and tin sheet roofing. Most of them remain throughout the year here. Overall visual appearance rendered by the temporary and permanent structures at Pampa is that of "shacks in an urban landscape". Figure 27 presents Area Classification at Pampa

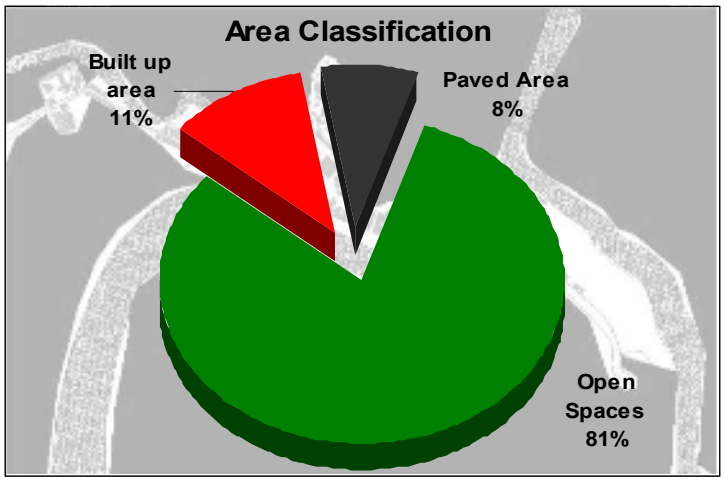


Figure 27 : Coverage at Pampa

Earlier picture of Pampa, before it's succumb to commercialisation is evident from the following description presented in 'Bhoothanaathasarvaswom[37] *"……..when you reach near Kochaanavattom and Valiyanavattom, river Pampa could be seen as spread as a blue expanse of water. It is said that Kochanavattom is the abode of various types of wild animals. ...if we go further from here we can see Pampa with the holy river as beautiful and auspicious as river Ganga and its beautiful banks with many trees lined up along, bearing flowers and fruits of various colours and types…when you reach pampa, pilgrims experience immense happiness seeing the beautiful hub here. Though the shops here are just hutments, they have an underlying beauty….it resembles the market lane of a small town….with many business men, pilgrims and various visuals…entry to Pampa*

[36] Site surveys

[37] Narayana Pillai, Kurumalloor (Vidwan) (2004 reprint), "**Sri Bhoothanaathasarvaswom**" Devi book stall, Kodungalloor. pp125

Manalppuram is at a point were Kumbalamthodu joins river Pampa…. for around 4 furlongs, the river runs along this side….further up, where Kallar and Pampa rivers joins is a beautiful sand beach called Thriveni".

4.3.7 Compilation of Critical impacts on Elements of Landscape - Pampa

Critical impacts on elements of the landscape at Pampa and the nature of impacts can be tabulated thus:

Table 9 : Critical Impacts on Elements of the Landscape at Pampa

Element	*Critical Impact*	*Nature of Impact and probable intervention group*
Land	Unwarranted development density and sprawl due to unplanned development	Reversible in a phased manner over a long period of time
	Extensive Land modifications	Irreversible
	Unutilisable niche spaces	Reversible in a phased manner over a long period of time
	Waste Accumulation Waste deposited on ground and in the River by pilgrims, shop keepers, others	Reversible
	Heavy Erosion	Irreversible
	Point infiltration of drainage	Reversible
	Space for pilgrims to spread *viri* replaced by high rises	Reversible in a phased manner over a long period of time
	Less space for pilgrims / people to spread in case of emergencies Ground overage by commercial buildings	Reversible in a phased manner over a long period of time
	Blockage of vistas and views	Reversible
	Hampered water percolation due to extensive hard ground coverage	Reversible
	Open defecation resulting in odour and poor visual ambience	Reversible
	Lack of emergency / service access	Reversible
	Continuous - Temporary buildings built of combustible materials covering up the Manalppuram, posing fire hazard and other safety issues	Reversible
	Buildings blocking the movement space along Manalppuram Shops blocking movement and emergency escape route along Cheriyanavattom Pampa stretch	Reversible
Air	Odour pollution due to sewage, sullage, solid waste strewn around	Reversible
	Dust spew	Reversible
Water	Spillage of sewage from soak pits	Reversible
	Waste water cess pools from commercial joints spilling over / flowing to water bodies	Reversible
	Letting out sewage effluent in to river which does not conform to standards	Reversible
	All natural causeways of water modified	Irreversible

Element	*Critical Impact*	*Nature of Impact and probable intervention group*
Flora	Vegetation completely lost along the banks and beyond	Reversible
	Landscape fragmentation	Reversible in a phased manner over a long period of time
	Roots of most of the trees exposed due to high rate of erosion which result in uprooting of trees	Reversible in a phased manner over a long period of time
	Dogs and cows which feeds on left over and waste from shops	Reversible
Fauna	Built – Hindrances to Natural movement corridors	Irreversible, but can free out currently followed movement routes
	High noise levels due to bursting of 'vedi'	Reversible
	Habitat Fragmentation	Irreversible
	Communicable diseases through intrusive species like donkeys	Reversible
	Impacts due to waste strewn around	Reversible

4.4 Impacts on the Routes from Pampa to Sannidhanam

Route from Pampa to Sannidhanam is the most frequented route, by pilgrims, staff and support services. These include, traditional route from Pampa to Sannidhanam, Swamy Ayyappan Road and Chandranandan Road. These route are currently under the ownership of KFD, but managed by TDB.

Traditional route was the believed to have been followed by the Lord himself and thence the pilgrims since yore. Swamy Ayyappan Road and Chandranandan Road were constructed later. It has been reported that Swamy Ayyappan Road was constructed in 1970's during the making of the famous film on Lord Ayyappa, which publicised the glory of the temple far and wide. Along the routes, critical landscape features are the elevation and the physiography. Around 90percent of the pilgrims reach Sannidhanam through these routes. Pilgrims reaching Pampa by Chalakkayam-Pampa road and those who trek down from Erumely along the traditional Erumely Route reaches Sannidhanam from Pampa moves through these routes. Distance from Pampa to Sannidhanam is around 4 kms.

4.4.1 Route Profile and Flow Characteristics

Route 1: The Traditional Route

This route, starts from Pampa Ganapathy Temple premises and climbs through the evergreen forests to reach Sannidhanam. Vertical sectional-elevations across critcal representative points along the route are provided in **Map 1** to present the route profile.

The route starts from Pampa and follows the nodes such as Neelimala, Appachimedu, Sabaripeedom, Marakkoottam, and Sharamkuthy to reach Sannidhanam. Neelimala is a steep climb, which is stressful to the devotees.
Traditionally, each point along the trek route from Pampa to Sannidhanam used to have its own religious importance and had customary religious observances.

On the top of the high hill of Neelimala is Appachimedu, on both sides of which are very steep gorges called '*Appachikuzhi'* and '*Eppachikuzhi'.* Appachimedu is considered to be the

seat of evil spirits and the pilgrims propitiate them by throwing offerings of rice -powder balls into the gorges. Appachimedu falls almost mid-way between the climb to Marakkoottam, which is at least two hours walk from Pampa. Still, no toilet facilities have been provided here except for some temporary pit latrines during the peak season which are rendered practically unusable after first use. As a result, pilgrims resort to urinating on both sides of the trek route.

At a short distance from Appachimedu, is an almost flat ground which houses the sacred spot, Sabaripeedom, the seat of Mother Sabari after whom the holy hill got its name. The pilgrims make offerings and worship at this holy spot. About a kilometre from Sabaripeedom is another sacred spot known as *Sharamkuthiyaal*, which means the banyan tree under which the arrows are to be dropped commemorating similar act of discarding weapons by Lord Ayyappa.

Concrete pavement is provided along the route from the start near Ganapathy temple premises at Pampa till Sabaripeedom.

Existing one way and two-way capacities of the stretch of the Traditional Route from Sannidhanam to Marakkoottam are 4800 persons per hour (P.P.HR) and 3,200 P.P.HR respectively, and the route is uneven without sufficient railings.

Stretch between Marakkoottam and Pampa is currently is 5 to 5.5m wide and surfaced with cement concrete pavement steps with railing, Existing two way capacity of this stretch is 2,500 P.P.HR while one way capacity is 3,750 P.P.HR

Route 2: Swamy Ayyappan Road and Chandranandan Road

Swamy Ayyappan Road and Chandranandan Road are used mainly for tractor movement to carry goods such as construction materials and consumables including those for religious purposes and prasadam making. Pilgrims use these routes for travel up and down from Sannidhanam as well. Swamy Ayyappan Road is currently 3.0m wide and unpaved with sharp bends. Existing two-way capacity is 1120 P.P.HR (with donkeys) while one-way capacity is 2400 P.P.HR for pilgrims alone and 1920 P.P.HR with donkeys.

Generally, the tractors and donkeys use Swamy Ayyappan and Chandranandan routes to carry the goods. During peak season, vehicular traffic through this route is forbidden and dholi carrying labourers carry pilgrims up and down using these routes, donkeys carry goods as backpack along with some trekking pilgrims. The pilgrims mainly use the traditional route to climb up and while coming down they may prefer Chandranandan road. During the lean seasons and off peak seasons, most of the pilgrims and staff uses Chandranandan road. During the peak days of main pilgrim season, people are allowed to go up only through the traditional route and come down through Chandranandan road and Swamy Ayyappan road. A temporary stair / flyover is kept at Marakkoottam to chanellise the pilgrims here.

Women are not allowed access ahead of Ganapathy temple premises. However, it has been reported that the presence of women folk mainly belonging to Narikuravar tribe, who sell bangles made of stones, bones, horns and animal teeth, herbal medicines etc between Pampa

and Sannidhanam and even at Sannidhanam, could be observed as convention did not oppose their presence in the sacred grove[38].

4.4.2 Landuses

Stalls / shops, resting sheds and benches, services and utilities such as water tank, transformer, pump houses, lighting and electric poles are the prominent landuses along the routes. Pipelines and electric wires are mostly exposed.

The Hon'ble High Court of Kerala has suggested the number of shops permitted along the routes from Pampa to Sannidhanam through an order. TDB auctions out / sub-leases the right to construct and operate shops along these routes annually. It could be observed that each shop has more than one section: one (or more) dealing with selling packed food items and light refreshments, one selling articles such as black cloth, bangles, toys etc and a larger one functioning as hotel. It is clear from site observances and informal surveys that the lessee further subleases out the space, which has been leased out to him.

Main usage of the traditional route is as a pedestrian way through the evergreen and semi-evergreen forests. Along the route are shops, water tanks, services and utilities, health care centres and religious structures / use areas. However, now with the increasing pilgrim traffic and the landuses, which have sprung up along, the natural charm of the trek has been long lost. Water tank, pump house and shops/stalls are located in between Pampa Ganapathy temple premises and Neelimala. Telephone line runs along the west side while light poles are aligned towards the west edge of the route till the water tank. A transformer is located opposite to the water tank. Between Pampa and Marakkoottam road is stepped at many places. Stalls are provided into the forest edges. Benches and sheds are provided for pilgrims here and there. Hospital run by the Health Department is located At Neelimala, in addition to a water tank and transformer. Stalls are seen on both sides of the road. Water tank, pump house and transformer are located close to Appachimedu. After Appachimedu till Sabaripeedom, stalls are aligned on both edges of the trek route. A prominent landmark here is a statue after Sabaripeedom.

From Marakkoottam to Sannidhanam, number of stalls is less along traditional route. Fencing provided almost all along the traditional route, on the western seam of the trek route up from Marakkoottam till Sannidhanam, barring the initial stretch. A queue-ing arrangement provided from mid way after Marakkoottam up till Sannidhanam. This is the locale where pilgrims mostly queue up, waiting to enter the Sannidhanam Nadapanthal. Last season, TDB provided orchid nets for shade here. Electric poles and lighting poles run along. Sharamkuthy is the main node along this stretch. Water tank, stalls and pilgrim sheds are provided here.

Swamy Ayyappan road and Chandranandan road are mostly used for goods movement. But pilgrims prefer Swamy Ayyappan road to climb down, as the trek down the traditional route is arduous. Along Chandranandan road from Sannidhanam to Marakkoottam, rock formations are seen. At Many places along this stretch soil erosion is observable and need for a retaining wall is felt. Along Swamy Ayyappan road, around 12 stalls / shops are provided along both forest edges. All these stretches join at Marakkoottam, where foot-over bridge is provided for pilgrims to cross over between the routes without hindrance. A police aid post and 4 stalls are

[38] Gurukkal etal (2000) Ibid

provided near Marakkoottam. Pilgrims mostly prefer trekking up to Sannidhanam through the traditional route, but while climbing down they prefer Swamy Ayyappan Road.

4.4.3 Services, Route furniture and hardware

Traditional Trek route is characterised by concreted path, steps and railings at most points. The concreted routes are slippery and tend to get moist during the rains. Advertisement boards and welcome boards by EDCs, TDB, other agencies, display boards, gateways to Swamy Ayyappan and Chandranandan road are other visible hardware and furniture. In addition, water lines and electricity lines runs along the route.

Signages and advertisements are provided, but the pilgrim activities such as open defecation and urination clearly shows that these are not effective. This is either because they are less communicative or even when communicative; pilgrims are unable to follow the directions therein either due to inconvenience or due to the obscurity of directions.

Lack of basic pilgrim facilities marks the routes from Pampa to Sannidhanam. Till Neelimala top, drinking water is scarcely available. Temporary pit latrines provided along the way are rendered unfit for use after initial use due to lack of water and cleanliness and they remain without usability, emanating stench.

Fixed drinking water facility and medicated water is available at Appachimedu. Water taps provided are mostly inaccessible for queuing pilgrims as they prefer not to skip their position in the queue during their wait to climb up.

4.4.4 Impact of Activities and Space Usages on Critical Elements of the Landscape

4.4.4.1 Impact on Flora and Fauna

The routes from Pampa to Sannidhanam fall under west coast tropical evergreen forests of the PTR. Major association of trees are Mesua-palaquim-cullenia, *Hopea-dipterocarpus-vateria* and Polyanthia-myristica-calophyllum. Large groupings of Bamboo could be seen on both edges of the trek route till Neelimala bottom.

Major observable fauna during all seasons are Lion Tailed Macaque, Nilgiri Martins, Squirrels, Reptiles, Birds, Butterflies and Spiders. Malabar giant squirrels, Nilgiri languor, Lion Tailed Macaque, hornbill, varieties of butterflies and elephant groups are observable mainly during lean seasons. It has been reported that higher activity concentrations and noise levels during the pilgrim seasons forces the fauna to retreat to the core of the reserve[39].

a) *Change in Forest Type*

The zonal transition from evergreen to deciduous tree varieties is the obvious example of disturbed habitat here. In Marakkoottam region around 80 percent of the trees observed are Deciduous. Such transition from evergreen to deciduous types would impair the growth cycle of many species of butterflies, whose larval food plants are undergrowths in the evergreen forests.

[39] Kerala Forest Department (2002) **Periyar Tiger Reserve Management Plan**

Loss of original evergreen forest cover is evident along Pampa to Sannidhanam stretch. This in turn affects the fauna including Nilgiri Languor and Lion Tailed Macaque who otherwise depends heavily on fruit bearing evergreens such as *Ficus* varieties, *D. Panniculata, D. Malabarica, Palaquium Ellipticum* etc and forces them to the brink of domestication along this route, mainly staring to depend on the waste left over and feeds provided by pilgrims. In addition, extinction of such large trees affects avifauna like hornbills who losses their nesting habitats. Dry nature of deciduous trees, which shed their leaves during winters and dries up during summers, also makes the area more fire prone.

b) *Ground Cover and Tree Growth*

The route shows infestation by weed varieties such as Parthinium *Hysterophorous*, Mimosa Diplotrichaa, Eupatorium, Abutilon Ramosum, and Mikana Cordata near Marakkoottam. Such weeds can affect the growth of native species and some of them like Mimosa Diplotricha can be dangerous to herbivores. It has been observed that the concentration of deciduous trees are more for which regeneration rate is higher and number of medium sized evergreen trees are less. Congregation of weeds and plastics around, excessive damage to vegetation due to multiple cross routes created by pilgrims, clearing of undergrowth by vendors have clearly affected the ground cover and tree growth.

This route is a marked example of deforestation and negative regeneration. During the peak pilgrim season of 2005-06 it has been observed that a huge tree with a trunk base diameter of 2.5m approximately, was being removed in the traditional route up Marakoottam. Uprooting of such trees is the result of soil erosion. However, this indicates gradual deforestation along the trek route, which is mostly devoid of canopy even this day. Some roots are also seen in chopped manner especially along the Pampa - Sannidhanam route.

c) *Disturbance to Faunal Corridors and overall health*

Animal crossings have been observed near Appachimedu – Cardiology Centre, Swamy Ayyappan Road – Charalmedu, Madukka, and Urakkuzhi. Steep cuts made to create the Swamy Ayyappan and Chandranandan Road severs the natural movement corridors of the wildlife. Fencing is provided along the traditional route from Marakkoottam to Sannidhanam. This, as well as the railings erected along traditional route is not usually taken away and stacked during off-seasons. If left without stacking, these obstruct the free movement of animals, especially herds of elephants.

The donkeys which are used to carry goods uphill also pose a serious problem. These donkeys, which are in constant contact with the humans, can get affected by various viruses, which can get transmitted to the wildlife.

4.4.4.2 Impact on Land

a) *Widening of Routes and Change in Landuse*

Pampa - Sannidhanam route talks about a history of widening over the years. Pilgrims who had been visiting since past 30 years report that in 1970's the trek route from Pampa to Sannidhanam was only 2 to 3 m, while currently the width averages around 8 to 10m. TDB leases out the stalls and shops here though the ownership of the route

is with KFD[40]. These stalls are located off the routes, into the forests thereby exerting pressure on the forests along the seams. However, a High Court Order has restricted number of shops at Pampa, Sannidhanam and trek routes. Shop owners clear the undergrowth and cut poles for erecting stalls. These practically clear the forests and widen the way.

In addition pilgrims make multiple short cuts through the forest mostly along Swamy Ayyappan Road, as it is a winding tractor route, which has been made to follow some gradient. Pilgrims can practically bypass this gradient by foot, thus avoid winding curves and reduce the trek distance. In addition the route surface is not conducive to walk, at many places. Cutting of trees along the seam of the traditional route, Swamy Ayyappan and Chandranandan Roads, clearing of undergrowth and creation of multiple shortcuts by pilgrims to bypass queues and to avoid winding routes act as prelude to widening of the routes. Unrestricted movement of tractors and other modes of transport like dholis along the routes, which with commercial developments and other uncontrolled activities mentioned above would ultimately lead to ever-increasing width of the routes and exterminate the traditional concept of trekking from Pampa to Sannidhanam.

b) *Garbage Accumulation*

Garbage including food items, packaging material and plastic sipping straws could be seen strewn around the shops, though SSS workers tries to collect and dispose them. All along the route, garbage could be seen strewn around deep inside the forest, wherever there is a valley. Last season, KFD had requested around 40 sanitation workers from SSS to be deployed to pick up the garbage from the valleys and deep inside the woods.

Solid waste accumulation is noticeable at the start of trek route, Neelimala top and bottom. Huge pile of tender coconut left over could be seen towards the edge of the route at the beginning of the traditional route.

In addition to visual unpleasantness, the waste decomposes and emanates stench. The workers pile up the plastics and combustibles and burn them risking a forest fire. The plastic waste accumulation also depletes soil fertility and affects the green ground cover.

750 volunteers take part in the (plastic waste clearing) **drive in Sabarimala forests:** The Forest Department on Tuesday held a plastic waste clearing drive in the Sabarimala forests, in association with the Confederation of Eco-Development Committees (EDCs). Nearly 750 volunteers attached to 38 EDCs in Attathode, Koruthode and Pampa Valley participated in the day-long plastic clearing operation in the forests on either side of the trekking paths. …….Around 12.6 tonnes of plastic waste was collected by the EDC workers from the forests. The drive was held in an area up to 60 metres from either side of the trekking path ……. The EDC workers were deployed on either side of Swami Ayyappan Road, Neelimala path, Chandranandan Road and Saramkuthi path, and in the areas surrounding the Lord Ayyappa Temple and Pandithavalom.

Source: The Hindu, National News Daily dated April 26, 2006

[40] It has been recommended in the 'Outline of the Master Plan for Sabarimala' prepared by Ecosmart that the route be leased out to TDB.

c) *Soil Erosion*

Construction activities, cutting of forest undergrowth and inconsiderate usage of the trek route has resulted in soil erosion. Edges of the route are fast slipping, suggesting danger especially when huge crowds of pilgrims queue up close to edges. Need for construction of retaining wall is felt especially along Swamy Ayyappan road and Chandranandan road along many stretches. Outline of the Master Plan suggests construction of retaining wall along the edges of this road for which land has been allotted. However, prevention of erosion and thus the danger it brings forth is to be considered an utmost necessity. Vehicular and donkey movement along the route increases the erosion considerably.

Trees get uprooted owing to soil erosion and loss of grip due to cutting of side roots by pilgrims and shop owners. "The domination of *Xylia Xylocarpa* and the presence of *Careya Arborea* in the Marakkoottam area are clear indications of soil degradation and laterisation" [41]. Swamy Ayyappan road is experiencing massive soil erosion. It has been estimated that around 200 tons of soil gets washed away along Swamy Ayyappan road annually, thus severing Neelimala. Loss of vegetative cover, movement of tractors and multiple bypass routes contributes to the damage. Along Chandranandan road, soil erosion is visible and areas without retaining wall face the danger of slips, which is increasing every year.

4.4.4.3 Other Activities and their Impacts

a) *Public Nuisance due to begging:*

Beggars are found throughout the Pampa - Sannidhanam stretch. They call out for alms amidst the pilgrim's chants of 'Saranam'. Though there is a high court order preventing the begging, and in spite of warning boards on 'no begging', it has been observed that beggars are a constant presence here. Beggars with amputated legs are seen up the trek route in large numbers. It is hence obvious that they reach here with external aid / support. It has been reported by officials who work here that these beggars are used by middlemen to make money from begging. Police officers remark that though they are arrested in view of the court's and district collectors order; it is not possible to transport them down the hill. If they are to be transported downhill, Police will have to seek assistance of Dholis, which cost around Rs 500 one way. Another difficulty is that beggars even if transported down the hill and taken away, would need a rehabilitation centre or dormitory to accommodate and keep watch and vigil. Due to the absence of these facilities, it has become difficult for police to control begging here. The beggars hence continue to throng the available area and deprive the pilgrims of walking space.

It is also difficult to identify the middlemen who transport these beggars and the beggars themselves till they squat, as the dress code would be near similar to the pilgrims. Same is the case with vendors, who mostly dress up the same way as pilgrims do and hence it is rather difficult to monitor and control behaviours of different sections of people differently in the Poomkavanam.

[41] E Kunhikrishnan etal, Impact of Development on the Bio diversity of Sabarimala Enclave: A Rapid Biodiversity Assessment, in Gurukkal etal (2001**) Enclave Management Study**, India Eco Development Project, Project Tiger, Kottayam pp 12, Appendix III

b) *Disturbance due to Donkeys and Goods and Dholi carriers*

Movement of donkeys carrying goods along the trek route till Marakkoottam obstruct the free movement of pilgrims. After Marakkoottam, donkey-path turns into the forest and reaches Sannidhanam from the west.

The dholi carriers and goods carriers share the available routes with the pilgrims and effectively reduce the available space for free movement of pilgrims. Around 500 dholi men transport goods and pilgrims up hill through the routes used by pilgrims. Different movement velocities of the pilgrims and the goods / dholi carriers effectively reduce the general flow and results in conflicts.

c) *Stench and Odour:*

Few temporary toilets are provided along the routes up from Pampa to Sannidhanam during peak season. These are mainly pit latrines, which are rendered unusable after a use or two owing to the unhealthy behaviour of pilgrims and lack of sufficient water for flushing. Due to the absence of usable toilets, pilgrims use the seams of the routes for urinating and defecating. This renders an unholy stench all along the holy trek uphill.

Foul odour is also contributed by the waste accumulation mostly around the shops and pilgrim rest areas. Pilgrims and waste collecting crew throw waste plastic bottles, packets etc into the forests on both sides of all the routes.

The excreta of the donkeys also are seen strewn around the trek route, emanating odour and disturbing the trek.

4.5 Impacts on the Trek Route from Erumely to Pampa (Cheriyanavattom)

This is the traditional Sabarimala pilgrimage route. Pilgrims, after Erumely *Pettathullal* walks through the forests from Erumely to Cheriyanavattom in Pampa and climbs up the Pampa – Sannidhanam route to visit the temple complex. Prior to 1960's this was the only route to reach Pampa. Around 30percent of pilgrims who visit the shrine during the peak season follow this route to reach Pampa. The route is open to pilgrims only during the peak pilgrim season.

Erumely is a Panchayat in the Taluk of Kanjirappally in Kottayam District. It is a historical place with an integral role to play in the legend of the Sabari Pilgrimage and has been traditionally a major transit point for the pilgrims. "Pettathullal", the famous ritualistic ceremony associated with the pilgrimage take places place at Erumely. It is compulsory and customary that the devotees on their first pilgrimage (Kanni Ayyappan) should visit Erumely. Before the beginning of *Petta thullal*, they pray at *Kochambalam*, the small Saastha temple. From the small Saastha temple they dance their way to the accompaniment of drumbeats to the place of worship of the Muslim lieutenant Vavar and his followers. From there, they proceed to the *Valiambalam*, the bigger Shrine of Dharma Saastha, where the *Petta thullal* is completed.

After Pettathullal the pilgrims embark on the traditional trek to Pampa through forests. This route is around 42 kms long and covers the following places. (1) Erumely (2) Peruthodu, (3) Irumpoonikkara (4) Arasumudikotta (5) Kalaketti (6) Azhutha (7) River Azhutha (8) Kallidumkunnu (9) Inchappara (10) Mukkuzhi (11) Kariyilamthodu (12) Karimala peak (13)

Valiyanathavalam or Valianavattom (14) Cheriyanathavalam or Cheriyanavattom (15) Pampa.

4.5.1 Route Profile and Flow Characteristics

The figure below represents the profile of the trek route from Erumely to Pampa through the forests.

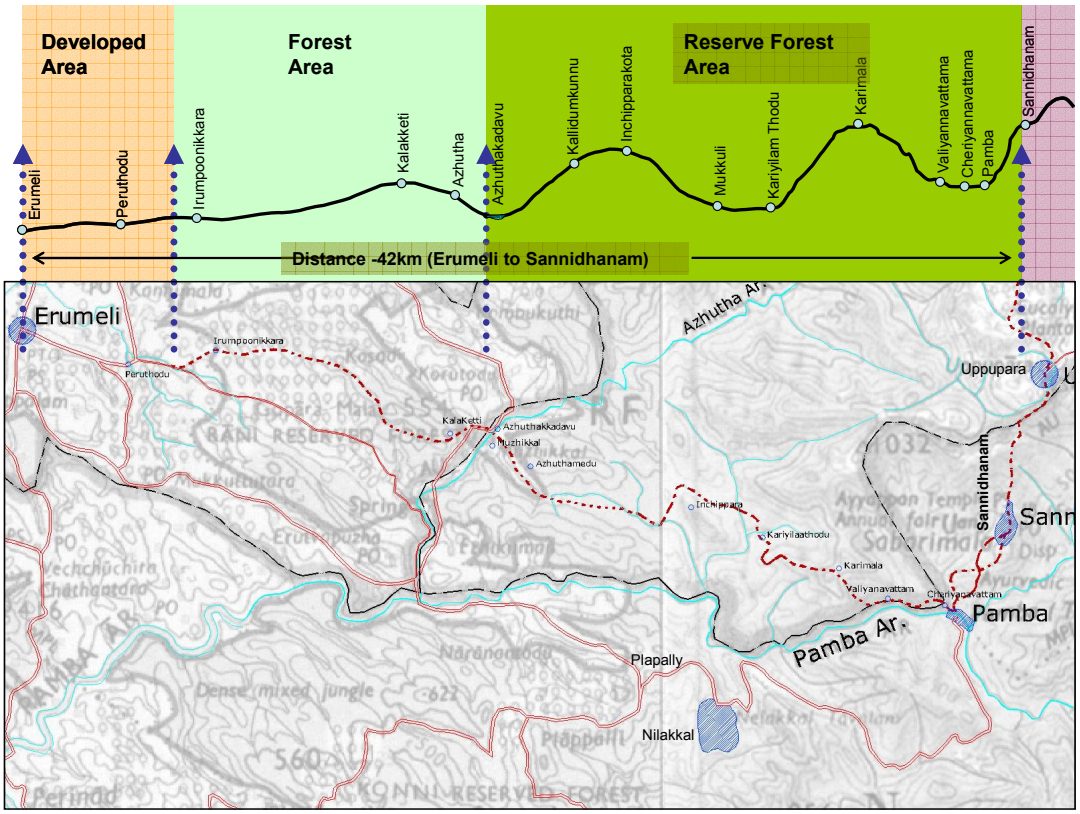


Figure 28 : Profile of the Trek Route from Erumely

Till about two decades ago, the pilgrims taking the traditional trek route used to step directly into the forests immediately after Erumely, but now the pilgrims trek at least 4 kms through public roads before entering the forests. After the walk through the inhabited areas and the rubber estates, pilgrims reach Peruthodu, with a stream of the same name; once considered the boundary that separated the inhabited land from the forests. But now villages extend from here up to Irumpoonnikara, 3kms eastwards, where Eucalyptus plantation is the most prominent vegetation. At Irumpoonnikkara there are three temples, dedicated to Lord Shiva, Sri Subramanian and Goddess Balabhadra Devi. After about 3kms walk, crossing some of the gentle forest streams is *Arasumudikotta*, where it is believed that Ayyappa and his soldiers took rest for some time. Here is a shrine for the guardian deities of the forests. From here, the forest path runs along the side of a River called Peruthodu.

An important centre of pilgrimage in the forests, after leaving Erumely, is a place called Kalaketti, about 11kms from there. It is a sacred spot where Lord Siva is believed to have tied his vehicle (*Kala* or the Bullock) to a tree while watching the victorious dance of Lord Ayyappa. This place has enough shade due to many huge forest trees around the temple of Lord Siva managed by a trust. The trek is rather difficult for some distance from

Arasumudikotta to Kalaketty as the route is surfaced with gravel in clay. The route gets muddy and uncomfortable during the rains. In addition pilgrims complain about the bamboo reeds and tree branches causing hindrance while trekking.

After passing through Irumpoonnikkara and Kalaketti, it enters the PTR at Azhuthakadavu.

Azhutha, which is on the bank of a river known by the same name, about 2 kms from Kalaketti, is another major resting place of the pilgrims. The river, Azhutha is a tributary of the river Pampa. Many of the pilgrims camp at the place during night, and there are a number of temporary sheds that provide accommodation. A special ritualistic ceremony performed at the temple here is Aazhi-*pooja*, which is a prayerful-walking around a huge pile of fire, chanting aloud "*Swamiye Sharanam Ayyappaa"*.

Azhutha River is shallow except during heavy rains. From the other bank of Azhutha, pilgrims start the 3kms climb of Azhuthamedu hill, which is one of the three major steep climbs of the pilgrimage.

The holy bath in the river Azhutha is a part of the pilgrimage. While making a dip, the pilgrim, as a ritualistic custom, takes a pebble from the river which he later reverentially drops on reaching *Kallidumkunnu*, which literally means the hill where the stone is dropped, on the top of a mountain which he climbs next. According to the Puranic / historic lore, it is believed that Kallidumkunnu is the place where Mahishi's body lay buried and pilgrims drop the stone here to form a padding from which *Mahishi* (demoness) could not rise again or that the pilgrims drop stones in reverence to Lord Ayyappa and his fellows gesture of bringing stones from Azhutha to fill the protective trenches around Udayanan's fort - Inchappara Kotta. After a walk over almost level ground from Kallidumkunnu is Inchappara with the temple for the guardian deity Sri Inchappara Mooppan. This is a Thavalam for trekking pilgrims where they cook food or take refreshments at the EDC run shops here.

From Inchapparakotta, pilgrims trek down the valley to reach Mukkuzhi as the name indicates this is deep valley which is also a major Thavalam or 'resting place' with a small Devi shrine.

From Mukkuzhi is a 10kms arduous trek, the pilgrim reaches the banks of the stream Kariyilaamthodu after around 6hours of trek from Azhutha. Kariyilamthodu with its small rivulet is also a main *Thavalam* for trekking pilgrims. Temporary sheds and food stalls are provided here through EDCs.

After crossing Kariyilaamthodu and walking for around 3kms through dense forests, the arduous trek to Karimala starts. Shrines of Vana Durga, Karimalanaathan and Kochu Kadutha, are present at Karimala, which is climbed in seven stages. There are two ancient wells on the top of Karimala from which Ayyappa and his soldiers are believed to have drunk water to quench their thirst after their fight with Udayanan. Resting places are provided here through EDCs.

Climbing down Karimala through the fairest trails takes the pilgrims to the valley and further to the plain land at Valiyanavattom. At the southeastern corner of this place is a raised platform, which is the resting place for those who carry the *Thiruvaabharanam*, the ornaments, brought from the palace of Pandalam to adorn the idol of the Lord, during *Makara-Samkrama Pooja*. Valianavattom is a main Thavalam of pilgrims, and is located on

the bank on River Pampa. Following this is Cheriyanavattom, once known as the abode of varieties of fauna, and lofty trees. From here the pilgrims walk along the path flanked by STP, stalls /shops and *viri* to the narrow bridge across Njonangar which connects Cheriyanavattom to Pampa Manalppuram.

Average width of the trek route is around 5m. Usually, the pilgrims trek during day time, but some prefer trekking during night (starting 2 AM)

4.5.2 Landuses and Facilities

As per available statistics about 10 lakhs of pilgrims[42] had trek down during the pervious season (2005 – 06) During Mandala season the pilgrim traffic is less (say 5-10 thousand maximum per day) but during Makaravilakku season starting from 1st January to 13th January the pilgrim traffic is more than 40,000 per day.

Barring Erumely, which is a small market town, predominant Landuse all along the route is vegetation, dominated by evergreen forests of the PTR. Temporary / seasonal *Thavalams* or resting places are developed along the route by the EDCs, under the supervision of KFD.

Till the year 2000's high court verdict[43] regarding the management of this route, KFDs role in managing this route was marginal. TDB was through the court order barred from leasing out the properties along these routes to traders. Since then KFD has taken effective control of this area and are managing the provision of basic services and amenities along the forest tract through EDCs.

Main aspects, which guide such an attempt by KFD, include:

- To provide better basic facilities to pilgrims without disturbing the Forests
- To provide better quality of goods and services to the pilgrims at reasonable costs
- To inculcate sense of belonging / ownership among EDCs and partner them for protecting the environment in which they live
- To develop systems that would ensure clean and healthy environment, protection of forests and wildlife
- To share a portion of the benefits / profits also towards protecting the forests
- KFD purchases the goods and sells it to the vendor EDCs who have to pay back in instalments. In addition materials for construction of stalls are also supplied by EDCs. KFD also controls the size of stalls, type of stalls, location and allots the locations to different vendors. Thus this effort can be seen as a sustenance support mechanism where locals are made part and parcel of protecting their environment while at the same time utilising the possibilities of earning benefit from the activity which intrudes their natural living habitats. Vendors claim that profit margin is almost non-existent. They are satisfied with the support they receive from KFD and are organised as a whole. Most of them were satisfied that last pilgrim season, they could get the bulk goods and other relevant support such as materials for making the stalls from KFD on time and believe that such support could benefit their operations.

[42] Source: KFD and Pilgrim Count by GoK
[43] *High Court verdict on the OP NO: 15586/2000*

It has been observed that KFD staff offers sufficient support to vendors and pilgrims. Their attitude towards conservation of the forests and their attempts to ensure this is to be well taken considering the difficulties they face, especially in the existing socio-political set up of the State.

Women are generally exempted from working in the stalls along traditional route in response to traditional customs. This is found to have affected the smaller, single vendor operated stalls. Vendors do not pay lease to KFD for use of land for stalls during the season.

During our reconnaissance and questionnaire survey, it has been noted that pilgrims are:

- Satisfied with the no: and type of stalls along the route
- Satisfied about the behaviour of the vendors towards them
- Satisfied about the price of products sold and often compare it with the opportunistic cost extracted by vendors from outside along the route from Pampa to Sannidhanam and pilgrims buy necessary things in advance
- Satisfied about the range of goods available and their quality

4.5.2.1 Thavalams and Facilities along the route:

Description of the trek and the relevance of each area have been explained in the section on route profile and characteristics. A description of the facilities at each *thavalam* is presented here.

Kalaketty and Valiyanavattom are the most important *edathavalams* along this route in addition to some minor *thavalams* along.

<u>*Peroorthodu* (</u>4 kms from Erumely)

Rest area at the start of the forest route, near Erumely estate. Two small hotels with *viri* facilities exist here. No sanitation facilities are provided here. Various philanthropic / religious groups from Tamilnadu provide free food and water in paper plates and plastic bottles in sheds here. Due to the absence of effective solid waste management, bins and plastic could be seen accumulated here. Kerala water authority pipes (private and public tap) and wells are the source of water here.

The location is important as pilgrims traditionally observe the ritual of depositing 'puffed rice' into the stream here to feed the fish, commemorating similar act by Lord Ayyappa. Stream here, usually is seen filled up with paper covers and puffed rice. The stream carries less water during the season.

<u>*Irumpoonnikkara*</u>

Few Hotels and resting places are located here. Sanitation facilities are available. It has been observed that Plastics are strewn around along on both edges of the road. Hare Rama Hare Krishna trust from Ezhupunna, Alleppey provides free food from Malayalam months Vrischikam 1 to Makaram 1 here. No effective waste management. Source of water is KWA pipes and wells.

<u>*Koikkakavu*</u>

Small hotels and resting places along the route near the Forest outpost located at the start of teak plantations. Few residences are located here and along the way. Due to the absence of effective solid waste management, plastic could be seen accumulated here;

especially mineral / drinking water bottles and plastic bags. No sanitation facilities are provided here.

Mampadi

Few small shops and *viri*s are provided here. Due to the absence of effective solid waste management, plastic could be seen accumulated here.

Karisseri

Here philanthropists supply free drinking water to pilgrims. No sanitation facilities or solid waste management.

Thalapparakotta or Arissumudikotta

Few small shops and *viri*s are provided here. Due to the absence of effective solid waste management, plastic could be seen accumulated here. No sanitation facilities are provided here.

Parathodu

This is the dependent water resource from Koikkakavu to Kalaketty. Sanitation or waste management facilities are lacking. Piles of plastic waste could be seen accumulated here. A private health centre (Jayanthi Hospital) is located here.

Kalaketty

This is a major Thavalam after Erumely located in the premises of Kalaketty Sivaparvathy temple. At Kalaketty, temple trust provides facilities such as water, *viri*, cooking facilities toilets etc. Temporary materials are used for making sheds; shops etc while toilet floors, few toilets and water kiosks are of permanent nature. Cooking places are arranged by pilgrims using few stones / bricks. Waste piles (especially plastics) could be seen during and even after the season. No effective waste removal is carried out here; people incinerate / burn the waste themselves and emanate soot and smoke. Around 7 large hotels with *viri* facilities were seen functioning here during the season. Along the way from Kalaketty to Azhutha (Part of Pampa Valley – Mundakayam road), plastic could be seen strewn around along both edges.

Azhutha

Two small hotels with *viri* facilities are provided near Azhutha Sree Mahadeva temple. Main water resource here is Azhutha River. Sanitation or waste management facilities are lacking. Piles of plastic waste could be seen accumulated here.

Karimala

Climbing of Karimala is the most difficult part of the trek. Few shops managed by EDCs functions here. However, emergency evacuation and other facilities are meagre here. Figure 29 presents the photographic view of the pilgrims climbing the Karimala.

Figure 29 : Pilgrims up the Karimala Trek

Valiyanavattom

Valiyanavattom is a mini-township of around 2 ha. EDCs manage the stalls and facilities here. Shops are made of bamboo poles, palm trunks, plastic sheets and corrugated sheets that render a shabby appearance to the place. Shop owners confirm that construction materials were bought from outside PTR and that the poles of earlier years were reused this time and cutting of forest wood for the purpose was not resorted to. Area immediately around the shops is clean, whereas the waste is deposited at open spaces in between the shops. Toilets are of temporary nature. Bathing facility is in the form of a water tank and hose operated by a person who stands at higher elevation and pouring water over each pilgrim turn by turn who wishes to have a bath. Pilgrims stand in a semi partitioned enclosure near the tank whereas the operator stands on the top of the tank and showers water over pilgrim's head, thus forming an efficient bathing system, minimising the wastage of water and energy. However the bathing water stagnates and flows ultimately to the river. Toilets were temporary in nature; mostly of pit latrine type and emanated odour. Fly menace was observed near pits. Pampa River runs along near to the Thavalam. This area is accessible by trucks, which brings in wares and construction materials. Food and plastic waste could be seen strewn around near Valiyanavattom and Cheriyanavattom. Food waste was mainly the left over of the free food (khichdi and kheer) distributed by the pilgrims to other passer-by pilgrims. Pilgrims just take a bite of the offered food received in '*pala* plates / *channa* leave plates' and leaves the rest on ground.

Cheriyanavattom

Close to reaching Cheriyanavattom from Valiyanavattom, is a terraced area of around 3000 sqm used by pilgrims to stay. They clear the forest undergrowth here and create a niche under the canopy where they cook and spread *viri* in the open. This place is seen quite littered.

At Cheriyanavattom, size of shops was comparatively large and they were found to be obstructing the Cheriyanavattom–Njonangar–Pampa way which is already constricted due to the less space availability, presence of a narrow bridge and flow of pilgrims. Prior to the season it was recommended that the stalls maintain an average of 6m as clear route for passing pilgrims after leaving sufficient space for pilgrims to stand and purchase goods from stalls. However it was observed during the season that the stalls had already spilled over on the right of way. The fact that EDCs were much co-operative and showed the readiness to accept the suggestion should be appreciated. But such practices of shops spilling over the right of way of pilgrims need to be discouraged and strict enforcement of the same is necessary.

Details of Facilities

- Each shop consists of 200sqm. of space which is allotted to a group consisting of 13 to 25 people from EDC's
- At Azhutha kadavu there were 52 such shops allotted during the previous season
- The shops may hold *viri*, food stalls, hotels, water kiosk, etc.
- Building material used: Bamboos, plastic sheets, aluminium sheet, etc. Forest department had put a strict curb on cutting of trees or bushes for deriving the building materials for construction.
- Distribution of shops along the route: Generally, one can find shops/stalls within short walking distances
- There are four locations in between the trek route which are actually owned and run by private parties / temple Devaswom. Respective Devaswoms have provided separate facilities such as permanent toilets, and resting places along with other shops for pilgrim conveniences at Kalaketti, Mukkuzhi etc.
- All the shop areas are demarcated in advance and these areas are only used during season for constructing shops
- All EDC communities have there own generator set. All shops are provided with one bulb connection for the night for which the owners where charged Rs 100/day during pervious season. The amount thus collected is used for meeting the running cost along with the maintenance of the generator.
- Revenue generated/ earned by EDC is deposited in community development fund, which sustain them for the year.
- Total number of shops from Azhutha kadavu to Cheriyanavattom is 270

4.5.3 Flora and Fauna

The route passes through typical evergreen forests of the PTR. Following table presents the distribution of flora along the route.

Table 10 : Dominant flora along the route

Location	*Species*
Cheriyanavattom area	Mesua ferrea, Elaeocarpus serratus
Valiyanavattom to Karimala	Mesua ferrea
Karimala - Puthussery	Garcinia gummi-gutta, Canthium dicoccum, Cullenia exarillata
Puthussery - Mukkuzhi	Agrostisachys borneensis, Schleichera oleosa, Flacourtia montana
Mukkuzhi - Azhutha	Hopea parviflora
Azhutha - Kalaketty	Hopea parviflora, Rubber
Kalaketty -	Teak, Bamboo, Eucalyptus

Location	*Species*
Irumpoonnikkara	
Koikkakavu	Teak Plantations
Parathodu	Bamboo
Irumpoonnikkara - Erumely	Rubber Plantations

Faunal species sighted along the route include Leopards, Nilgiri Languar, Wild boar, Sambar, Elephants, Squirrels and Lion Tailed Macaque. Easily spotted avifauna includes Nilgiri Martin, Hornbill etc. Many varieties of butterflies are observable especially near Valiyanavattom and Cheriyanavattom.

4.5.4 Route Furniture and Hardware

The route is devoid of furniture or hardware as it runs through the protected forests. Pilgrims trek only during daytime for fear of wild animals and due to the lack of visibility. The exhibits and banners were inadequate with respect to number, not informative and limited to only single or two languages hence they do not effectively convey the message to the pilgrims. However, as an option to erected sign boards, it is found imperative to warn the pilgrims sufficiently and spread the message of conservation and waste management along the route through special squads of EDCs.

4.5.5 Impacts of Activities and Space Usages on Critical Elements of the Landscape

As described earlier, traditionally the route starts from Erumely and after Pettathullal, pilgrims used to directly enter the forest from Erumely town. But currently, as a result of development of the town, pilgrims have to walk through the tarred road mostly flanked by commercial establishments and residences in the initial stretch and rubber plantations till they reach Peruthodu.

Most of the pilgrims, especially those from neighboring states prefer trekking bare-footed keeping up the tradition of trek through the forest as a sign of the hardship they are willing to undertake to meet the Lord and as an offering to the Lord. But as against tradition, currently the stretch immediately following Erumely is tarred till Peruthodu. Due to the lack of proper footpath or shoulders and intensity of vehicles plying through the road, the pilgrims mostly have to step barefooted into the hot-tarred surface of the road.

Pilgrims, traders and residents opine that major issues at Erumely are lack of parking facilities, inadequate disposal of waste, inadequate drinking water, toilet facility and unhealthy trade practices and lack of medical facilities, especially cardiac care facilities.

Most of the pilgrims stay over for at least a day at Erumely. Due to the lack of facilities, mostly pilgrims resort to open space to spread their *viri*. Types of accommodation which pilgrims resort to at Erumely are presented in the chart below.

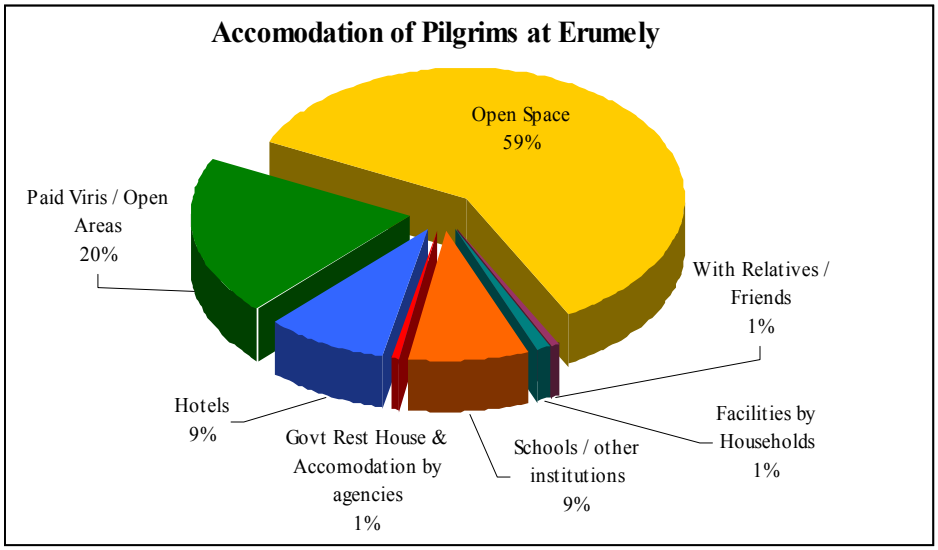


Figure 30 : Types of Pilgrim Accommodation available at Erumely

4.5.5.1 Impact on Water

Water Sources at Erumely:

Due to the lack of adequate facilities at the base town, pilgrims resort to the Rivers around for defecation and bathing. Open defecation is also common wherever space is available. Hence during and after the season, as the bathing ghats are close to the intake point, water contamination by Coliforms is higher. The town water supply is dependent on these Rivers from were water is supplied after chlorination. Solid Waste disposal is also unscientific. TDB and KWA have joined hands to provide water to pilgrims from Manimala River, which is not adequate. Multiple handling of garbage, lack of proper collection, transportation, treatment and disposal facilities results in unscientific solid waste Management, though the SSS workers and the Panchayat continuously strives to collect the garbage, and burn it in the available coconut shell based incinerator. There are 225 toilets owned and operated by the TDB in addition, there are 142 privately operated toilets, about 100 temporary toilets are also made available every year. The Kerala Tourism Development Corporation has established a Pilgrim Service Centre with 100 toilets, worth Rs.1.5 crores. All the tanks of the latrines empty into the Koratti River. Thus the line pollution is carried downstream through the Pampa and Manimala River systems all around mid-Kerala including Kuttanad and then empties into the Vembanad Lake. Table 11 presents the results of the water quality analysis at various points along River Pampa.

Table 11 : Water Quality of various points along River Pampa during 2000-01[44]

Test Date	*Test area*	*pH*	*BOD (Mg / l)*	*Dissolved Oxygen (Mg / l)*	*Coliform (C/ 100ml)*
14-Dec-01	Erumely	6.6	0.6	6.4	12100
12-Jan-02	Erumely	6.8	1.2	6.2	7000
13-Dec-01	Neerettupuram	6.7	1.4	5.3	6100
11-Jan-02	Neerettupuram	6.7	0.9	5.2	6000

[44] Source: KSPCB; as quoted in Dr Baby MD (December 2003), **Economics of Sabari Pilgrimage with special reference to the Households in Erumely Grama Panchayat**, KRPLLD, CDS, Thiruvananthapuram

Test Date	***Test area***	***pH***	***BOD (Mg / l)***	***Dissolved Oxygen (Mg / l)***	***Coliform (C/ 100ml)***
6-Dec-01	Edathua	6.6	1.5	6.4	16000
11-Jan-02	Edathua	6.7	1.4	3.3	5000
6-Dec-00	Thakazhi	6.8	0.9	6.5	12000
11-Jan-00	Thakazhi	6.6	1	4.7	3500
CPCB Standards					
Water Class A *:		6.5 to 8.5	2 Max	6 Min	50 max
Water Class B **:		6.5 to 8.5	3 Max	5 Min	500 Max
Note: * Class A Drinking water with out any conventional treatment but after disinfection					
** Class B - Out door bathing					

This contaminated water due to excessive usage and sewage let out into the rivers without treatment runs downstream as a source of line pollution through the densely populated towns and villages and receives effluent and other wastes from them on the way towards the Vembanad Lake. There are 14 drinking water projects in the Manimala River between Erumely and Thiruvalla, which supplies water to the towns and cities without purification.

Water Sources along the trek route from Erumely:

Between Erumely and Koikkakavu, only natural water source is Peruthodu, where pilgrims could be found taking bath. Traditionally, pilgrims throw puffed rice into the stream to feed the fish and leaves the stream filled up with paper covers and puffed rice.

Dependable natural source of water in between Koikkakavu and Kalaketty is at Parathode, where the River water level remains usually sufficient during the season.

Between Azhutha River and Karimala, water sources used are Azhutha Ar, Puthussery Thodu and Kariyilanthodu. Waste deposits are visible in and around the water bodies. This includes plastic bags, containers, and bottle lids, food waste etc.

4.5.5.2 Impact on Land

The plastic waste which gets accumulated has disturbing effects on the soil. These do not get degraded for a considerable number of years decreasing the vegetative capacity of the soil by covering up the space otherwise available for growth of trees and undergrowth. It also decreases the land stability by resulting in decreased bondage between successive soil layers.

Some pilgrims along the trek route expressed concern over the litter strewn around the stalls and presence of inorganic material and plastic packaging materials, especially at Kalaketty and Valiyanavattom. During primary reconnaissance it was observed that plastic bottles were found thrown into the forest. In few places (Karimala, Puthussery and Valiyanavattom), it was noticed that glass and plastic bottles were hidden behind the trees or bushes. Upon informal discussion, EDC members remarked that they collect the waste strewn around by the pilgrims along the route, wherever visible. However, it could be concluded that density of mineral water bottles thrown into the forest was lesser than the situation in 2003. On an average, 2 mineral water bottles was observed in every 50m, with a concentration near Thavalams as against 1 bottle per metre reported in 2003. This means, around 4200 (250 kg – with lid) numbers of mineral water bottles were observed. On reconnaissance and count in sample transects of 10m into the forest by 10 m length of

the route, during the last days of the peak season, it was observed that from Azhutha to Cheriyanavattom, an average of 8 plastic carry bags per 100 sqm, 8 paper plates / '*pala'* plates (soiled and clean) per 100 sqm, 4 bottles per 100 sqm, 5 paper and leaf packs per 100 sqm and 3 tetra packs per 100 sqm were observed. This is comparatively less when compared to the situation 3 years back. Table 12 presents comparison of wastes observed along the Azhutha – Cheriyanavattom Route

Table 12 : Comparison of wastes observed along the Azhutha – Cheriyanavattom Route [45]

Type of Waste Sampled	***Concentration of wastes (direct observation) – 2003 ****	***Concentration of wastes (Sample transects -2006) *****
Mineral water bottles	480 per ha (4.8 per 100 sqm) (14 kg / ha)	4 per 100 sqm
Plastic carry Bags	280 per ha (2.8 per 100 sqm)	8 per 100 sqm
Other Plastic Bags	740 per ha (7.4 per 100 sqm)	
Paper and Leaf packets	-	5 per 100 sqm
Paper Plates / *Pala* plates	-	8 per 100 sqm
Tetra Packs	40 per ha (0.4 per 100 sqm)	3 per 100 sqm

During 1999, major component of the wastes were plastic carry bags whereas during 2003 it was the plastic mineral water bottles which has been attributed to the shortage of water supplied by KFD along the traditional routes and increased availability of bottled water both in the market as well as in the shops along the traditional routes. The shortage of water along the route continues. However, number of mineral water bottles observed as in the forest was less, probably because of increased collection of such bottles by EDCs. In 2006, sample transect survey was carried out on the number of paper plates and '*pala*' plates as well as leaf and paper food packages as these were found concentrated in Thavalam areas and along the route. At Valiyanavattom and Cheriyanavattom, increased concentrations of such packets were found, heaped up near edges or open areas, adding to the stench emanated by temporary toilets.

It has been observed that EDCs also sell food packed in plastic covers, bottles and tetra packs in the shops managed by them just similar to the ones sold in stalls managed by others.

Few attempts on the use of '*pala*' plates, paper plates and cups for supplying cooked food by various agencies were also noticed. But these are also found piled up near the shops in open areas, without any attempt to efficiently manage the treatment and disposal of these. In addition, most of the pilgrims either take a bite of the cooked food thus freely supplied or thrown it down without consuming. Such food waste litters the area, especially around Valiyanavattom - Cheriyanavattom – Pampa stretch and harbours fly and odour menace.

4.5.5.3 Impact on Fauna and Flora

a) Provision of basic pilgrim facilities

Prior to year 2000, the operation of shops along the trek route from Erumely was by the businessmen from outside the region, who get the rights tendered out by TDB. Pilgrims who had been visiting for more than 5 years observe that the behaviour of the vendors as

[45] Source: * Sivadas (2003) & ** Primary Sample Transect Survey – 14 January 2006

well as the quality of the goods and services they get along the route and the quality of the landscape has changed considerably since past 4 years.

Movement of increasing number of pilgrims along the forest path and Provision of pilgrim facilities in the thick forests would definitely have an adverse effect on fauna and flora. However, the movement through this traditional route is an important part of the pilgrimage. Hence, facilities also need to be provided along the route. But it is noticeable that the impacts due to these activities have reduced considerably over the years following the high court verdict and resultant management of the route by the native EDCs and the custodian KFD.

- Concentration of shops:
  Number of shops and Thavalams along the trek route from Erumely has reduced drastically except between Puthussery and Azhuthakadavu. During 1999, there were only 199 shops between Puthussery and Azhuthakadavu, where as during 2003 the number increased to 270. Details of pilgrim facilities provided along the route by EDCs during 1999 – 2003 are as shown in the table below:

  Table 13 : Commercial Activities along Trek Routes – 2003

Sl No:	***Location of Thavalams***	***Pushers - 1999***	***Sheds - 1999***	***Total - 1999***	***Pushers - 2003***	***Sheds - 2003***	***Total - 2003***
1	Uppupara to Sannidhanam	11	33	44	14	9	23
2	Cheriyanavattom	0	14	14	5	0	5
3	Valiyanavattom-Karimala	13	65	78	16	11	27
4	Karimala to Puthussery	0	70	70	24	19	43
5	Puthussery to Azhuthakkadavu	0	199	199	270	0	270
	Total	24	381	405	329	39	368

Although the number of shops has increased in this stretch, the total area under shops and Thavalams had been reduced in 2003 and more people were given the opportunity to establish shops in the confined area with space restrictions. The restricted nature of shops and Thavalams along the routes helped in improving the regeneration (indicated by secondary species) in the area where previously shops were established. The impact due to establishment of shops was restricted to few pockets rather than all along the routes. In 2006, number of hotels between Puthussery and Azhuthakadavu were 124. Other shops, pushers and stalls were around 45 in this stretch. It could be gathered that this is an effort to provide for the increasing demands of the pilgrims. Details of pilgrim facilities provided along the route by EDCs during 2005 – 06 are as shown in the table below:

Table 14 : Commercial Activities along Trek Routes – 2006 (Azhuthakadavu to Cheriyanavattam)

Sl No	*Camp Name*	*Hotel*		*Viri*	*Refreshment/ food stall*	*Drinking water Kiosk*	*Stationery, Grocery*	*STD booth*	*Tender Coconut*	*Latrines*	*Medical shops*	*Information centre*	*Other offices*	*Others*
		Viriand shop	Viri and water Kiosk											
1	Azhutha Kadavu	15	1	5	1	8	1	1		1	1	1	3	Water supply pipe
2	Kallidamkunnu	15	3			15							1	9 firewood
3	Inchipparakotta (cheeni Camp)	18							3	1	2	1	2	2 (temple,coconut breaking/cracking yard)
4	Vallithodu (mukkuzhi)	29		1		3					2	1	1	1 coconut cracking/breaking yard, 1 food stall, 1Mukkuzhi devi Temple
5	Vellaramchetta	26	1			2							1	
6	Puthussery	21								2				1 (latrine and staff shed)
7	Karimala Top	20				19					1	1		1 Coconut cracking/breaking yard, 1 Kanikka vanchi, 1Temple-Vanadurga
8	Oliampuzha					10			5					1 (Tank) Water Supply to Karimala
9	Valiyanavattom	14		3			2		4	2			2	1 Ayyappa Seva Sangam
10	Cheriyanavattom	5	8			1			1	1			1	1 Sewage Treatment

- Construction Materials:
  The materials such as bamboo (collected from outside forests), eucalyptus (from forest plantations), iron rods, plastic sheets, coconut leaves and ropes are commonly used for construction of shops here. All the construction materials except Eucalyptus used in the shops were brought from outside except 2 shops at Azhuthakadavu and Kallidumkunnu, which used few dried poles and rafters collected from the forests. The shops in the vicinity of reed brake partially used reed leaves as thatching material. It has been estimated that savings due to stoppage of cutting wood from forests for shop construction in 2003 was a minimum of about 14730 poles and 29460 rafters when compared with the situation in 1999. At Thavalams such as Inchaparakotta, Karimala and Kallidumkunnu, accessibility is difficult and hence the shop owners depend to an extent on forest for twigs for use as firewood etc.

- Clearing of forest undergrowth:
  By Vendors
  It has been observed that the vendors cut off the branches of trees and clear the undergrowth during the start of the season. This activity was more in the initial stretches of the trek route (near Peruthodu, Irimpoonnikkara and Kalaketty). However, due to reduction in number of shops over the years, the impact due to this activity has been found decreasing.

- Use of fuel:
  It was observed that all the shops used dried and wind fallen firewood collected from the forests in addition to the LPG and rubber wood. A total of 1293 commercial LPG cylinders (19 kg.) have been supplied to shops at Uppupara, Pampa, Cheriyanavattom and Valiyanavattom by the KFD/ EDCs. [46]Thus a total of 140 tones of firewood extraction from the forest has been saved and thereby prevented the biomass removal and reduced the damage on vegetation[47]. However, ecologists observe that using dried and fallen wood for various purposes should be discouraged as they form the nests and hatcheries for many types of avifauna.

  Some of the EDC shops used smokeless *choolas* for cooking purposes. They claim that this saves time and energy used for cooking.

Impact of Traditional Erumely Trek Route Management by EDCs

"No new wood was cut from the reserve for construction of sheds—a saving of about 200,000 young poles of forest trees on previous years. There has been substantial reduction in the fuel wood consumption for domestic use and sale as other opportunities for income generation have improved.
An independent study revealed an improvement in pilgrim satisfaction and maintenance of the cleanliness of the routes and overall positive change in the perception and attitude of the reserve staff towards local villagers

World Bank (June 2001), Supporting the Web of Life- Bio Diversity of the World Bank, www.worldbank.org/biodiversity

b) *Impacts due to activities of Pilgrims:*
It has been observed that the pilgrims cut off the branches of trees for using as fire for cooking, warming up, walking sticks etc. Areas cleared for cooking and spreading *viri* are observable especially in Valiyanavattom and Cheriyanavattom. Affected species including those, which were cut for using as support poles, include *Elaeocarpus Serratus, Hardwicka pinnata, Anacolosa densiflora*, and *Canthuim dicoccum*. Pilgrims mostly cut branches of *Hopea Parviflora* for use as firewood.

Some roots are also seen as in chopped manner especially in Pampa to Sannidhanam route and in Karimala and Valiyanavattom Thavalams in the Erumely Trek route. Some resting pilgrims were seen smoking and inscribing their names and addresses on the barks of trees and on exposed rocks along the Erumely trek route.

[46] While burning, one kilogram LPG generates 46 MJ of calories whereas one kilogram of fuelwood (rubber) generates 8 MJ of energy. Thus it is calculated that one cylinder of LPG (19 kg.) provides 874 MJ of energy. Thus, nearly 82 kg of fuel wood can be considered equivalent to one cylinder of LPG.
[47] Sivadas (2003):

Pilgrims clear the forest undergrowth and flowery bushes which hosts many varieties of butterflies at Valiyanavattom and Cheriyanavattom. Size of such cleared areas observed at Valiyanavattom is 20 to 25 sqm. EDCs and KFD officials explained that such clearances occur mostly during peak days when crowd is more and is difficult to monitor.

It was observed that pilgrims chop tree branches and bamboo at Peruthodu and Irumpoonnikkara, Kalaketty and Azhuthakadavu or collected long sticks from the seams of the route for use as walking sticks. Few shops at Azhuthakadavu-Karimala route were selling stems of tapioca and bamboo as walking sticks. Out of the total pilgrims around 10percent use walking sticks.

It has been thus observed that though the dependence of the pilgrims on forest resources has decreased when compared to the scenario prior to year 2000, activities such as clearing of forest undergrowth for creating resting spaces, spaces to spread *viri* and cook food, cutting of tree branches and roots for making fire and for cooking, creation of fire by igniting gathered dried leaves and branches etc still continues along the stretch, though the number of instances has reduced. In addition, though the chopping of trees by traders and the vendors could not be observed, the clearing of forest undergrowth as preparatory activity for constructing stalls and burning of wastes underneath the trees were observed. Due to such activities the forest undergrowth risks complete loss and chances of initiating a forest fire which could spread far and wide, are still at a higher rate.

c) *Impact of plastics strewn around*

Observations made in 1999 and 2003, on the dung piles of elephants indicated evidences of consumption of plastics. It has been reported that during post-season survey in 2003, a total of 879 dung piles have been counted along the traditional routes, including Sannidhanam and Pampa route, of which 38.5percent of them were having plastics. During 1999, about 93percent of dung piles had undigested plastic materials. In the segments Cheriyanavattom-Karimala and Karimala-Azhuthakadavu, 43.28 and 31.55 percent of the dung were having plastics respectively. When compared to 1999, the decrease in the percentage plastics in dung piles observed in 2003, indicates that over the period the no: of shops had decreased, dumping of the waste has been reduced and the EDCs have started collection and disposal of such waste dumped. Table 15 presents the observed extent of plastic consumption by Elephants.

Table 15 : Observation on Plastic Consumption by Elephants -2003

Sl No:	***Locations***	***No: of dung piles without plastics***	***No: of dung piles with plastics***	***Total dung piles observed***
1	Uppupara to Sannidhanam	91	34	125
2	Sannidhanam to Pampa	41	81	122
3	Cheriyanavattom to Valiyanavattom	41	30	71
4	Valiyanavattom to Karimala	73	57	130
5	Karimala to Puthussery	131	44	175
6	Puthussery to Mukkuzhi	135	68	203
7	Mukkuzhi to Azhutha	29	24	53

Source: Sivadas (2003)

4.5.5.4 Impact of Noise:

The animals along the route are scared away by the chants of the pilgrims during the peak pilgrim season. However, pilgrims claimed the siting of elephants, sambar and lion tailed macaques. In addition pug marks and fresh droppings of various species are observable along the route. The noise emanated due to the bursting of firecrackers at the temples along the route also scares away the animals.

4.6 Impacts on Trek Route from Sannidhanam to Uppupara / Sathram

From Vandiperiyar and Kumily on KK road, pilgrims can reach Sannidhanam without touching Pampa. They either follow the Vandiperiyar (Spencer Junction) – Sathram – Uppupara (4 kms) route or Vandiperiyar (Vallakkadavu / Kozhikanam) – 6th Mile – Uppupara (20 kms) route. The routes mostly converge at Uppupara[48] and advance to Pandithavalam in Sannidhanam through thick evergreen forests of the PTR.

Vandiperiyar – Sathram route was the traditional route followed by pilgrims. This mostly travels through the privately owned tea plantations. Vallakadavu – Uppupara Koop road (forest road) was opened to public as the condition of the Vandiperiyar – Sathram road deteriorated and the private planters failed to repair and make it motorable. But off late (since around five - six years back), pilgrims from Tamilnadu mostly travel to Vandiperiyar / Kumily and from there to Vallakkadavu and Uppupara by road. The Sathram route remains more or less abandoned after the opening up of Koop road to Uppupara.

At Uppupara, hotels, shop and stalls and temporary toilets are provided through EDCs. At Sathram, temporary facilities are provided by locals in TDB owned land near the temple here.

4.6.1 Route Profile and flow characteristics

Route profile is presented in **Map 1.**

Route from Vandiperiyar to Sathram, which passes through Tea plantations, is winding and has an undulating profile. The route is poorly surfaced, with exposed surfaces at most stretches and lacks adequate width. The average width of the road is 2.5m, with one edge abutting the cut slope of the terraced tea plantation. At Sathram is a flat land belonging to TDB around a temple.

As opposed to Pampa Sannidhanam stretch, trek from Uppupara to Sannidhanam is downhill, along the valley. Around 20 percent of the pilgrims who reaches Vandiperiyar / Kumily by private vehicles to trek by Uppupara route shift to jeeps or buses at Vandiperiyar / Kumily while their vehicles runs to Pampa / Nilakkal awaiting these pilgrims to return by Sannidhanam - Pampa route as a holy dip in river Pampa is an important part of the pilgrimage. After darshan at Sannidhanam, large numbers of pilgrims congregate at Uppupara grassland since two days before the Makarajyothi and camp here to view the Makarajyothi at Ponnambalamedu.

[48] There is a separate route to Sannidhanam from Sathram without touching Uppupara. However, Uppupara route is most widely used

4.6.2 Impacts of Activities and space Usages on Critical Elements of the Landscape

4.6.2.1 Impact on Flora and Fauna

Dominant flora along the route are *Artocarpus Hirsutus, Lagerstroemia Microcarpa, Cinnamomum Malabaratum, Agrostistachys borneensis, Mesua Ferrea, Neolitsea Scrobiculata, Macaranga Indica, Haldina Cordiflora, culenia exarillata* and *Schleichera Oleosa*.

Observable Fauna along Uppupara Sannidhanam route are Lion tailed macaques and Nilgiri Languar, elephants and wild boar. Animal crossings are observed near Pandithavalam and Kazhuthakuzhy.

a) *Impact due to Pilgrim Activities*

Highest concentration of pilgrims was observed in Urakkuzhi and Pandithavalam where camping and cooking, bathing activities takes place. In addition, pilgrims halt at certain pockets in between the stretch. However, EDCs claimed that the KFD and EDCs could prevent pilgrims from camping in the forests, clearing undergrowths, lopping, setting up fire, and cooking under the trees during the last and this season.

Less quantity of Plastic material was observed along the route when compared to other routes.

b) *Impact due to Vendors*

EDCs of neighbouring area run the shops along Uppupara – Pandithavalam stretch. EDC shop owners claim that the materials used for construction were either bought from outside PTR or supplied by KFD and trees are not cut for the purpose. Palm timber or other wood like rubber for columns, bamboo rafters, and plastic *patula* roofing sheets were used for shops. Shops mostly use firewood as fuel.

Types of trees / saplings which were seen affected due to illegal cutting by pilgrims are *Mesua Ferrea* and *Argostistachys borneensis* etc.

Trees in the route exhibit degradation. The trees are deciduous, especially near Pandithavalam, where infestation with weeds like Parthenium is also observed higher. Such weeds choke other plants and seedlings and can affect the regeneration of native flora**.**

4.6.2.2 Impact on Water:

Only Water source along this route is a stream near Poomkavanam Thavalam, where pilgrims could be seen bathing and performing ablutions. Waste deposits in and around the water bodies could be noticed. Carry bags, strewn food items, containers, bottles and lids were conserved. It can be presumed that wild animals along this route also happen to consume these.

In addition, a route towards the north - west of Pandithavalam leads to Urakkuzhi, where a waterfall used by pilgrims for bathing purposes exists. Around this area rags and plastic bottles were observed.

4.7 Traditional Practices related to Environment

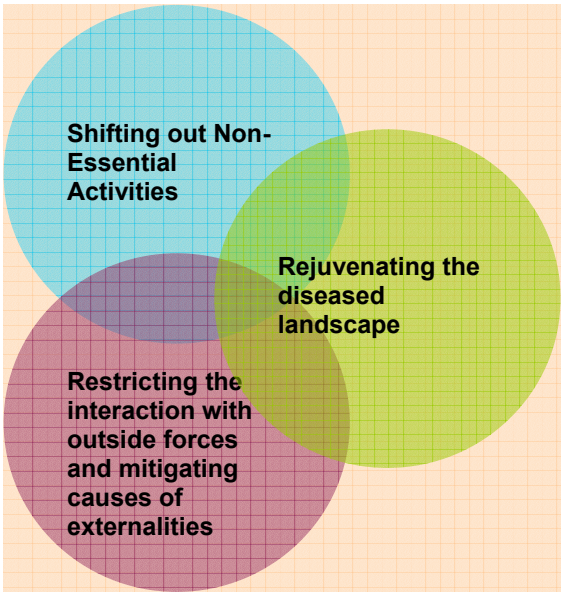
The legends and the tradition associated with the pilgrimage clearly exemplify its deep moorings on the environment that hosts the temple and the pilgrimage.

Some of the legends and traditional observances which have strong base on the need for environment management are:

i. Songs and Legends on Ayyappa choosing his abode in the forests
ii. Pilgrims to plant trees and contribute to religious landscape
iii. Trek through the forests venerated as an important part of the pilgrimage
iv. Customs like picking up stone from Azhutha and dropping at Kallidumkunnu
v. Respecting the forest gods who supported Ayyappa
vi. Feeding fishes at Peruthodu
vii. Dip in holy River Pampa venerated as the most important part of the pilgrimage
viii. Dropping arrows at Sharamkuthy Aal, signifying submission to the nature
ix. Appeasing the gods of the gorges Appachikuzhi and Eppachikuzhi
x. Veneration of Poomkavanam
xi. Legends and canards respecting tigers and the forests
xii. Respectful addressing of Lord Ayyappa as 'kanana *vasan'*

5. PRIORITISATION OF CRITICAL ENVIRONMENTAL ISSUES AND PROPOSED INTERVENTIONS

Interventions outlined here are aimed at reducing the negative externalities, which tend to disfigure the landscape. Above chapters clearly outlined that change in landuse and activity patterns induced by the pilgrimage has profound impact on the otherwise homogenous natural forests of the host environment. Hence the basic premise for planning the area is the dictum: "landscape entropy, or disorganisation, increases with sprawl". Hence interventions should ideally reduce and contain the sprawl and spread of activities, by:



- Shifting out / phasing out non-essential activities,
- Conserving the natural environment by efforts to restrict interaction with outside forces and mitigating causes of externalities; and
- Rejuvenating the diseased landscape.

Critical issues affecting each element of the natural landscape have been prioritised considered based on

1. Safety
2. Perception of users
3. Environment sustenance
4. Opposition to Traditionally observed practices

5.1 Sannidhanam

5.1.1 Issue Prioritisation

- Uncontrolled Sprawl which interrupts and fragments previously homogenous forest landscape, thereby increasing landscape disorganisation
- Lack of 'usable' space around the temple for pilgrims to queue up or spread in case of emergencies
- Lack of emergency evacuation facilities
- Lack of agreement between surrounding environment and the created features at Sannidhanam including extensive land modifications and increase in ground coverage
- Reduction of days available for landscape to rejuvenate
- Lack of adequate pilgrim and staff facilities and equal accessibility to such facilities by all
- Unequal exercise of Common Property Rights among pilgrims as against the traditionally upheld principles of equality
- Negative externalities of various activities including waste and pollution

5.1.2 Development Vision:

Sannidhanam as an area which goes hand in hand / merges with surrounding landscape, with temple as the dominant focal point and retaining the forgone charm of the forest temple where equality and care for environment prevails, as envisioned by the Lord Ayyappa himself as per legends.

5.1.3 Developmental guidelines:

To reduce the sprawl and negative externalities due to activities and resource usages by:

- Curtailing the creation of pathways through which the sprawl spreads to nearby tracts or fragment the homogenous landscape
- Allowing only the most essential facilities at Sannidhanam as required for religious activities and for the visiting pilgrims
- Fine-tuning the circulation and activities of pilgrims at Sannidhanam
- Spatial planning to effect bringing in landscape continuity or natural ways through the urbanscape linking various points in the landscape, rather than cutting them / fragmenting the edges
- Curtailing the activities which negatively affect the sanctity of the place
- Curtailing further developmental activities except those extremely necessary to provide most essential pilgrim services (water, sanitation, health, disaster management)
- Completely stopping the activities at Sannidhanam during off season (shops, construction, repairs) except monitoring and rejuvenation of landscape elements.
- Curtailing the activities which disturb the elements of the landscape
- Phasing out the high rise concrete buildings which create unpleasant micro-climate
- Reducing ground coverage
- Conserving landscape features and restoring views and vistas
- Curtailing waste accumulation
- Rejuvenating the landscape in and around during off and lean seasons

5.2 Pampa

5.2.1 Issue Prioritisation

- Uncontrolled pollution due to dumping of various wastes to river Pampa
- Vehicular Pollution and conflicts
- Uncontrolled commercial and such development at Pampa which renders a shabby appearance to Pampa and consumes available space without leaving space for religious activities
- Lack of agreement between surrounding environment and the created features at Pampa including Extensive Land modifications and increase in ground coverage
- Reduction of days available for landscape to rejuvenate

5.2.2 Development Vision:

Pampa as an area which goes hand in hand / merges with surrounding landscape, with the holy river as the dominant focal point and reinstating the sandy beaches for religious observances and movement of pilgrims.

5.2.3 Developmental guidelines:

To reduce the sprawl and negative externalities due to activities and resource usages by:

- Curtailing the activities which pollute the river and the elements of landscape around
- Freeing out available area for religious observances and use by pilgrims
- Allowing only the most essential facilities at Pampa as required for religious activities and for the visiting pilgrims
- Spatial planning to effect bringing in landscape continuity or natural ways through the urbanscape linking various points in the landscape, rather than cutting them / fragmenting the edges
- Curtailing the activities which negatively affect the sanctity of the place
- Curtailing further developmental activities except those extremely necessary to provide most essential pilgrim services (water, sanitation, health, services and disaster management)
- Completely stopping the activities at Pampa during off season (shops, construction, repairs) except monitoring and rejuvenation of landscape elements.
- Reducing ground coverage
- Conserving landscape features
- Rejuvenating the landscape in and around during off and lean seasons

5.3 Routes from Pampa to Sannidhanam

5.3.1 Issue Prioritisation

- Uncomfortable surface, hardware and furniture along the traditional trek route which creates an artificial trek route, increases ground coverage, and resultant repercussions on the land
- Uncontrolled tractor movement through the Swamy Ayyappan road and Chandranandan road and uncontrolled use by pilgrims resulting in ever increasing width of routes and soil erosion
- Commercial activities and uncontrolled activities by pilgrims and shop owners clearly establishing edges along the route, as against the seams expected of such traditional trek routes
- Lack of essential pilgrim facilities along the route resulting in an uncomfortable climb
- Conflicts between dholi movement, goods movement by porters and donkeys with pilgrim movement
- Lack of emergency evacuation facilities
- Pollution and impacts on flora along the route
- Uncontrolled commercial and such development at Pampa which renders a shabby appearance to Pampa and consumes available space without leaving space for religious activities.
- Lack of agreement between surrounding environment and the buildings created along the route including Extensive Land modifications and increase in ground coverage.
- Reduction of days available for landscape to rejuvenate

5.3.2 Development Vision

Traditional route from Pampa to Sannidhanam to be reinstated to feature the charm of the holy trek route through the forest as existed during of olden days, but with access to essential facilities so created as to merge with the landscape and the winding trek and reduction of miseries during the wait for darshan. Swamy Ayyappan road and Chandranandan Road to act as routes for controlled goods movement with reduced negative externalities.

5.3.3 Developmental guidelines

To reduce the sprawl and negative externalities due to activities and resource usages by:

- Curtailing the activities which pollute the elements of landscape around and / or negatively affect the sanctity of the trek
- Allowing only the most essential facilities along the route as required for religious activities and for the visiting pilgrims
- Spatial planning to effect bringing in landscape continuity or natural ways through the urbanscape linking various points in the landscape, rather than cutting them / fragmenting the edges
- Curtailing further developmental activities except those extremely necessary to provide most essential pilgrim services (water, sanitation, health, information, disaster management including emergency evacuation)
- Completely stopping the activities along the trek routes during off season (shops, construction, repairs, movement of vehicles) except monitoring and rejuvenation of landscape elements.
- Providing facilities along the route where most required and thereby preventing pilgrims from entering the forests for their needs
- Conserving landscape features
- Rejuvenating the landscape in and around during off and lean seasons

5.4 Trek Route from Erumely to Pampa (Cheriyanavattom)

5.4.1 Issue Prioritisation

- Pedestrian – Vehicular, Vehicular – Vehicular and pedestrian – Pedestrian Conflicts and uncomfortable surface, hardware and furniture along the initial stretch of the trek route
- Uncontrolled movement of pilgrims through the route without reverence to preserving the pristine natural landscape, once trekked by the Lord Ayyappa himself, increasing the negative externalities
- Lack of essential pilgrim facilities (water, sanitation, health and information) along the route
- Lack of emergency evacuation facilities
- Waste accumulation, Pollution and impacts on flora and flora along the route
- Unscientific and abstract planning for provision of facilities
- Lack of agreement between surrounding environment and the stalls created along the route
- Few instances of commercial activities and uncontrolled activities by pilgrims and shop owners tending to establish edges along the route

5.4.2 Development Vision:

Traditional route from Erumely to Pampa to be conserved upholding the tradition and legends which upholds its grace as the holy trek route through the forest as existed during of olden days, but with access to essential facilities so created as to merge with the landscape and the winding trek.

5.4.3 Developmental guidelines:

To reduce the negative externalities due to activities and resource usages by:

- Curtailing the activities which pollute / disturb the elements of landscape around and / or negatively affect the sanctity of the trek
- Scientific planning to allow only the most essential facilities along the route as required for religious activities and for the visiting pilgrims
- Curtailing further developmental activities except those extremely necessary to provide most essential pilgrim services (water, sanitation, health, information, disaster management including emergency evacuation)
- Activity monitoring prior to, during and after the peak season and rejuvenation of landscape elements during off and lean seasons
- Conserving landscape features
- Creating awareness among the pilgrims regarding the observances to be followed during the trek – traditional/religious aspects as well as environmental conservation

5.5 Trek Route from Sannidhanam to Uppupara / Sathram

5.5.1 Issue Prioritisation

- Increasing vehicular movement from Vallakadavu to Uppupara through the forests, which started few years back as a stop-gap arrangement disturbing the habitat, fauna and flora is currently in the verge of continuance every year
- Uppupara grasslands stressed due to increasing no: of pilgrims congregating here without adequate basic facilities every year for an average of one to two days prior Makaravilakku
- Uncontrolled movement of pilgrims through the route without reverence to preserving the pristine natural landscape
- Lack of essential pilgrim facilities (water, sanitation, health and information) along the route
- Lack of emergency evacuation facilities
- Waste accumulation, pollution and impacts on flora and flora along the route
- Unscientific and abstract planning for provision of facilities
- Lack of agreement between surrounding environment and the stalls created along the route
- Few instances of commercial activities and uncontrolled activities by pilgrims and shop owners tending to establish edges along the route

5.5.2 Development Vision:

Uppupara grassland and the forest tract from Vallakkadavu to be conserved and reinstated before it succumbs to the pressures exerted by mass pilgrim movement, while promoting the traditional access to pilgrims from Sathram. The evergreen forests along the route to be

maintained with least development or activities as it existed during olden days, but with access to essential facilities.

5.5.3 Developmental guidelines:

To reduce the negative externalities due to activities and resource usages by:

- Restricted vehicular access to Uppupara for only the day of Makarajyothi and the next day as pilgrims arrive here after darshan from Sannidhanam and return after viewing Makarajyothi, in the immediate.
- No vehicular access to Uppupara except for monitoring and goods movement to the stalls here in the long run
- Improving and maintaining the route to Sathram through plantations so as to encourage trek from Sathram to Sannidhanam.
- Curtailing the activities which pollute / disturb the elements of landscape around and / or negatively affect the sanctity of the trek
- Scientific planning to allow only the most essential facilities along the route as required for religious activities and for the visiting pilgrims
- Curtailing further developmental activities except those extremely necessary to provide most essential pilgrim services (water, sanitation, health, information, disaster management including emergency evacuation)
- Activity Monitoring prior to, during and after the peak season and rejuvenation of landscape elements during off and lean seasons
- Conserving landscape features
- Creating awareness among the pilgrims regarding the observances to be followed during the trek – traditional/religious aspects as well as environmental conservation

5.6 Proposed Measures for Mitigation of Impacts

Predominant activities which have profound impacts on the elements of the landscape and safety and the interventions suggested to mitigate these impacts could be grouped and following measures are recommended for mitigation of critical impacts.

5.6.1 Suggested measures for Mitigation of Critical Impacts

Table 16 : Suggested Measures for Mitigation of Critical Impacts

Sl No:	*Activities*	*Impact Location/Zone*	*Impact*	*Proposals for Mitigating the Critical Impacts*
1	***Activities spilling over into forest area***			
a)	Urination and Open defecation	(Up to 100m)	▪ Unsanitary conditions ▪ Damage to saplings and smaller plants ▪ Trampling and Damage to ground cover, odour and flies	▪ Provision of Toilet facilities along Pampa-Sannidhanam stretch and Thavalams ▪ Provision of pre-cast septic tanks and mobile toilets units along
	Specific Locations	Along Swamy Ayyappan road (Pampa end), Marakoottam area		

Sl No:	*Activities*	*Impact Location/Zone*	*Impact*	*Proposals for Mitigating the Critical Impacts*
		Around camping sites (Thavalams) in Erumely- pampa trek route and water sources, (Uppupara, Poomkavanam Thavalam, Pandithavalam, Urakkuzhi Theertham, Pampa)	▪ Pollution of water, odour and flies	accessible Thavalams (Azhutha, Kalaketty, Mukkuzhi, Valiyanavattom) along trek route from Erumely to Pampa ▪ Management of toilets through NGOs, EDC ▪ Awareness generation attempts through volunteers ▪ Better signages, lighting, access, proper design, water availability and area planning to facilitate better visibility at Pampa, Sannidhanam and trek route from Pampa to Sannidhanam to aid the pilgrims to use toilets
		Around Sannidhanam area, Pampa area		
b)	Use of area for Camping, Cooking, Eating, Resting	(Up to 150 m into the forest area)	▪ Over crowding deforestation, littering, damage to vegetation, Fire risk and blockade in case of need for emergency evacuation ▪ Damage to vegetation and wildlife ▪ Loss of ground cover, Soil and water pollution, littering ▪ Generation of wastes, Fire hazard, littering	▪ Designated cooking areas managed by CBOs/NGOs ▪ Distribution of food packets ▪ Identification and demarcation of specific areas/bays where pilgrims can rest, eat along the stretches and provide signages ▪ Provide base camp facilities
	Specific Locations	Along Swamy Ayyappan road (Pampa end)		
		Marakoottam area		
		Around camping sites (Thavalams along Erumely-Pampa trek route) and water sources, (Uppupara, Poomkavanam Thavalam, Pandithavalam, Urakkuzhi Theertham)		
c)	Exploitation of vegetation e.g. Cutting of branches of trees etc for cooking fuel by Shopkeepers andpilgrims, and for use as walking sticks	Upto 25 m into the forest area	Damage to vegetation, loss of tree saplings and small plants	Supply of sticks through EDCs along the route Supply of gas / alternate fuel to EDCs along the route Watch and Ward, awareness generation for shop keepers / EDCs collecting wood from near the locations Designated Cooking areas with fuel at main Thavalams along Erumely – Pampa route and at Pampa Provision of strong handrails removable after pilgrim season at steep ascends (except in places where pilgrims would be diverted through queue complex)
	Specific Locations	All along the Erumely to Pampa route, Pampa – Sannidhanam Route	Damage to vegetation, loss of tree saplings and small plants, risk of fire	
		Pampa and Sannidhanam	Damage to vegetation, loss of tree saplings and small plants, risk of fire	
		Along the Erumely – Pampa and Pampa – Sannidhanam routes especially along the steep ascend near Sannidhanam	Damage to ground cover	
d)	Creation of Short	Along Swami Ayyappan	Damage to vegetation	Provision of better routes and

Sl No:	*Activities*	*Impact Location/Zone*	*Impact*	*Proposals for Mitigating the Critical Impacts*
	cuts / movement routes	road	Loss of ground cover Soil compaction, Destabilisation of slopes	facilities Pilgrim Management using queue complex Slope stabilisation through bio-engineering after the season, ground stabilisation Closing short cuts during lean, off peaks Provision of watch and ward
e)	Cutting across forest area to jump the queues to avoid waiting in queues	Along traditional Marakoottam-Sannidhanam route near Sharamkuthy.	Damage to vegetation, loss of ground cover, soil compaction, destabilisation of slopes	Provision of full fledged q-complex - Marakoottam - Sannidhanam stretch, streamlining and regularising pilgrim movement
2	Ablution	Along water sources at - Poomkavanam Thavalam, Urakkuzhi theertham, Weir near Uppupara	Water pollution	Provision of designated ablution facilities at base camps and trek routes, with drainage and percolation arrangements to minimise stagnation and criss cross flows Aeration of Bhasmakulam, conservation efforts to preserve the sacred temple tank Use of aquatic plants, fishes for upkeep of tanks, small water bodies Distribution of ecofriendly soaps, and ensuring supply and enforcement of only these through all Shops, CBOs, Volunteers
	Specific Locations	Sannidhanam area _ Bhasmakulam	Stagnated water becoming cess pool of wastes due to large scale ablutions	
		Pampa	Low water flow at Pampa - around 1.6cum/sec and throwing of wastes from shops and surrounding landuses, wastes after 'Pampasadya', dumping of used cloths as part of 'Pampadanam'	
		Along water sources along Erumely-Pampa stretch	Lack of drainage arrangement resulting in water stagnation and criss-cross flow of waste water all along especially at points like Valiyanavattom	
3	Movement of pilgrims along the routes	All Trek routes	Trampling due to intense pedestrian traffic	Immediate post season restoration efforts Directions and Awareness attempts through signages reminding that forest environ is part of temple complex
4	Liquid and Solid wastes	Upto 5m along straight area projectile and more than 25m down slopes as per gradient and vegetation	Wastes from shops and waste thrown by pilgrims	Comprehensive SWM- Sweeping, collection, transport and disposal Bio processing, recycling, minimising, storage at source, segregation, awareness, monitoring

Sl No:	*Activities*	*Impact Location/Zone*	*Impact*	*Proposals for Mitigating the Critical Impacts*
	Specific Locations	Erumely – Pampa and Uppupara – Sannidhanam Trek routes - Around camping sites (Thavalams) and water sources, (Uppupara, Poomkavanam Thavalam, Pandithavalam, weir near Uppupara, Urakkuzhi Theertham)	Soil/Land pollution, Water Pollution Waste consumption by wild animals Spread of communicable diseases due to fly menace Adverse impact on vegetation, wildlife and Fire hazard	Proper waste management during all seasons at all Thavalams Hospital waste management Prevention of flow of waste water into open water bodies Waste water conveyance and treatment system at Pampa and Sannidhanam Drainage channels at Pampa, Sannidhanam and trek route from Pampa to Sannidhanam Insisting hygiene standards in shops (including covered display of food items, usage of safe drinking water for cooking) Preventing waste disposal into rivers/channels by policing / fine etc – physical and visual barriers Signages, awareness generation attempts with involvement of NGOs, CBOs, and volunteers. Distribution of ecofriendly soaps, cups, plates, bags etc, and ensuring the use of these through CBOs, Volunteers Awareness raising, training, capacity building
		Sannidhanam	Pollution of Pond, Land, Decrease in water percolation Cess pools of Stagnated water Open Drainage channels flowing downstream and polluting Njonangar and ultimately River Pampa Hospital wastes polluting all solid wastes Solid waste piles causing fly menace, stench	
		Pampa	Water stagnation due to low flow (1.6 cum/sec) Waste water overflowing soak pits behind shops at 'Manalppuram' Pollution of water intake points Water pollution reaching downstream and affecting settlements Hospital wastes polluting all solid wastes Solid waste piles causing fly menace, stench	
5	Clearing of ground for constructing sheds	(Varies _ generally up to 10 m into the forest area along the routes)	Deforestation, mortality of species, threat to wildlife	Pilgrim management and base camp development Thavalams along traditional routes only at identified locations: at every 5 kms, one main Thavalam and at every intermediate point (2.5km), water kiosk and few toilet facilities Planned developments at Pampa and Sannidhanam
		Traditional Pampa-Marakoottam stretch	Damage to vegetation	
		Swami Ayyappan road	Loss of ground cover, land pollution	
		Mainly concentrated at camps (Uppupara, Poomkavanam, Pandithavalam) , scattered along rest of the route	Disturbance to profile, soil	
6	Shops and Hawkers	(Varies, but up to 5m into forest area)	Damage to vegetation, Blockage to the pilgrim movement resulting in pilgrims spilling over to adjoining areas	Designated areas / shop layouts with planned hawkers platforms Detachable and modular designs

Sl No:	*Activities*	*Impact Location/Zone*	*Impact*	*Proposals for Mitigating the Critical Impacts*
		Mainly concentrated at camps (Uppupara, Poomkavanam Thavalam, Pandithavalam), scattered along rest of the route	Compaction of soil	facilitating reassembling of designated number of shops during peak, lean and off peak seasons. Usage of fire resistant Materials which do not provide obsolete visual effect
		Sannidhanam area	Fire hazard, unnecessary / unimportant articles sold causes more of plastic wastes, large coverage of ground	Planned layout with liquid and solid waste management facilities and fire escape standards
		Pampa area	Fire hazard, unnecessary / unimportant articles sold causes more of plastic wastes, large coverage of ground	Phasing out unwanted commercial units in Sannidhanam Re-planning Pampa and decide on number and type of shops trading only in essential articles Shops to sell only necessary articles to pilgrims Management by CBOs,NGOs
7	Exploitation of forest resources by traders	Upto 1.5 km into forest area	Deforestation Damage to vegetation Mortality of species	Ensure supply of necessary forest produce or alternatives through EDCs, volunteers
	Specific Locations	Traditional route (throughout)	Damage to ground cover, Slope destabilisation Increase in run-off, erosion	Watch and Ward Plan the number, type of shops and goods to be sold in routes, Pampa, Sannidhanam
		Swami Ayyappan road		
		Concentrated around Thavalams		
		Sannidhanam area and Pampa area		
8	Building construction activities	Sannidhanam, Pampa, and Route from Pampa to Sannidhanam	Visual aversion	Minimise construction activities and minimise ground coverage, need for transporting goods, sound pollution during off season and need to host large number of construction workers Use of modular elements - for easy dismantling and reconfiguring during season with partition walls, earth floor etc for easy modifications, additions Impose design guidelines. Design should follow the slopes and merge with the forest landscape Reorganise activities outside sanctum sanctorum and complete re-planning of Pampa, freeing the Manalppuram for free pilgrim movement and religious observances Strict guidelines on materials and type of stalls along trek routes Prevent any permanent structures along all trek routes
			Increased vehicular movement, continued presences of labourers, noise pollution and activities during off peaks Reported blasting of rocks, cutting of trees from the forest	
			Concrete permanent buildings are energy intensive, covers ground, visually disturbing Skyline resembles urban sprawl with multi-storied structures Increased ground coverage hinder percolation and result in floods in valleys	
9	Parking	Pampa and along the Chalakkayam - Pampa stretch	Damage to vegetation, Mortality of species, littering Damage to ground cover, Slope	Provision of adequate parking at base camps and pilgrim logistics

Sl No: Activities	*Impact Location/Zone*	*Impact*	*Proposals for Mitigating the Critical Impacts*
		destabilisation Noise and Air Pollution	Parking for ambulances, service vehicles only at Pampa Freeing the current parking areas for *viri*, viewing *Makarajyothi* etc

5.6.2 Suggested Prime Measures for Upgradation / Enhancement of Critical Elements of the Landscape

Location	*Elements*	*Impacts*	*Suggested upgradation / rejuvenation Measures*
Sannidhanam	Land	Density of development and coverage above approved limits.	No more buildings of permanent nature to be constructed at Sannidhanam except shifting those, which are critical for safety of Pilgrims.
		Disruption of Topography due to improper site planning of buildings, infrastructure.	Layout Plans for Reconstruction / shifting of all most essential buildings considering the safety and security aspects to strictly follow the slopes and resort to modular construction, rather than constructing huge complex to take care of next 30 to 50 years. Further upgradation can be planned after ten years based on then prevalent statistics and upgraded for next ten years using modular units. Least land modification
		Ground surface coverage and resultant blockage to water percolation	Prohibition of concreting the pavements of pathways, Nadapanthal etc. Suitable fire resistant terracotta / earth based blocks capable of withstanding the crowd, granite slabs, and grass cover to be used depending on use. Any material for pavements should be loose jointed (joints may be planted with trample resistant grass varieties) slabs / blocks so as to allow percolation
		Concrete buildings influencing the micro climate	Volume of Concrete buildings to be reduced. Greening of Sannidhanam required. Spaces to be created with trees, shrubs and plants rather than with concrete buildings
		Blockage to the movement paths of native animals	Free Movement paths to be left along natural animal movement corridors through Sannidhanam
		Sprawl of activities and spillage along irregular edges	Regularising the layout and provision of buffer
	Water	Pollution of water bodies	Drainage layout, prevention of waste deposition into water bodies, restricting access of pilgrims to water bodies, cleaning and protection of Bhasmakulam, proper sewage carriage and treatment system, relocation of polluting landuses and activities from the vicinity of water bodies
	Air	Dust, pollution due to religious and associated activities, stench and unpleasant odour	Proper ground coverage (earth and vegetation based) along pedestrian routes and open areas Relocation of polluting landuses (like burning Copra) from Sannidhanam Management of waste Discussion on possibility of managing Aazhi in a better way

Location	***Elements***	***Impacts***	***Suggested upgradation / rejuvenation Measures***
	Flora and fauna	Sprawling Fragmentation, communicable diseases from other animals, depletion due to activities of pilgrims shop keepers and others	Buffer and layout regularisation, restricting pilgrim stay at Sannidhanam, restricting donkeys and other animals, reducing unattended waste
Pampa	Land	Commercial Activities clogging up the Pampa Manalppuram, leaving no space in the holy land where Raja of Pandalam found infant Ayyappa	Phased demolition of permanently constructed buildings at Manalppuram. No temporary sheds allowed after peak season Modular shops / hotels in prescribed layout Restricting the area for commercial activities
	Water	Pollution of river due to depositing waste, defecation	Restricting activities which pollute Pampa Restricting stay at pampa Waste, sewage and drainage management Proper management of STP
	Air	Dust, pollution due to religious and associated activities, stench and unpleasant odour	Proper ground coverage (earth and vegetation based) along pedestrian routes and open areas Management of waste Restricting parking at Pampa
Trek route from Erumely to Pampa	Land	Slope and soil disturbances	Ground Bioengineering techniques (slope retention and ground stabilisation using structural construction techniques combined with the use of plant materials) to be used to protect and stabilise landforms that are under threat from erosion. Points to be identified immediately after each season by Forest Department and suitable bioengineering technique to be adopted based o the severity of impact.
	Water	Pollution of water bodies	Protection of water sources enroute and raising awareness among pilgrims
	Flora and fauna	Disturbances to Flora and fauna	Restricting no: of shops, activities by pilgrims and shop keepers, restrictions on cooking activities, carrying of fuel and sharp objects by pilgrims, Solid waste management Restriction to use of plastics
Trek route from Pampa to Sannidhanam	Land	Vehicular movement and Soil erosion along Swamy Ayyappan Road	Ground Bioengineering techniques (slope retention and ground stabilisation using structural construction techniques combined with the use of plant materials) to be used for traditional route, SA Road and Chandranandan Road for soil protection, and ground stabilisation basically to protect and stabilise landforms that are under threat from erosion. Points to be identified immediately after each season by Forest Department and suitable bioengineering technique to be adopted based o the severity of impact. Restricting / stopping vehicular movement

Location	*Elements*	*Impacts*	*Suggested upgradation / rejuvenation Measures*
	Flora and fauna	Disturbances to and change in floral patterns	Restricting no: of shops, activities by pilgrims and shop keepers Stopping the removal of vegetative cover, cutting of trees, restricting access by channellising pilgrim flow through a regular circulation pattern and queue complex which would not allow people to go on their own Restricted access to queue complex for defaulting pilgrims moving up through Swamy Ayyappan road Planting tree types to regain canopy over trek route Restrictions on cooking by pilgrims Solid waste management Restriction to use of plastics
Trek route from Sannidhanam to Uppupara	Land	Disturbances due to Pilgrim movement	Ground Bioengineering techniques (slope retention and ground stabilisation using structural construction techniques combined with the use of plant materials) to be used for soil protection, and ground stabilisation basically to protect and stabilise landforms that are under threat from erosion. Points to be identified immediately after each season by Forest Department and suitable bioengineering technique to be adopted based o the severity of impact. Discouraging this route except during Makarajyothi by restricting the movement from Vallakadavu to Uppupara in vehicles
	Flora and fauna	Disturbances to and change in floral patterns, plastic menace	Restricting no: of shops, activities by pilgrims and shop keepers Stopping the removal of vegetative cover, cutting of trees, restricting access by channellising pilgrim flow through a regular circulation pattern and queue complex which would not allow people to go on their own Restricted access to queue complex for defaulting pilgrims moving up through Swamy Ayyappan road Planting tree types to regain canopy over trek route Restrictions on cooking by pilgrims, carrying of fuel and sharp objects Solid waste management Restriction to use of plastics

5.6.3 Information, Education and Communication

Ecosensitisatioon prior to the trip along the trek routes should be made compulsory. This means creating awareness among the pilgrims regarding the religious importance of the 'Poomkavanam' and the trek and in turn the need to protect these areas and to help recreate their lost character. Sharing of such information or creating awareness among the pilgrims and thus seeking their co-operation in conservation and rejuvenation is important as more than 70percent of the pilgrims who visits during the peak pilgrim season are non-Keralites. However, considerable number of pilgrims is those who are visiting the area more than one time. Eco-sensitisation can be through 'manager' groups actively involved in the area like the EDCs who knows the area well or through temple priests, high priests, Guruswamy's and Periyaswamy's who had been visiting the temple since decades.

Method of awareness generation can vary depending on the locale and pilgrim movement patterns. It can be through

- Specialised training to groups which are actively involved in pilgrim management
- Brochures / Pamphlets: Brochures / pamphlets made of leaves/ natural material may be distributed by EDCs. Local community to be given preference to prepare such items, signboards etc
- Special products: Sabarimala kits with all or some essential materials needed for the trek or medicine /food kits may be made available to the pilgrims at trek paths or at base / transit camps. These can be of ecofriendly materials. Suitable arrangements should be made at Ranni-Perunad, Vandiperiyar and Erumely for manufacturing such products. Local tribal know-how on such eco-friendly products to be utilised and thus they can be assured some returns from their know-how.
- Short religious films or traditional folklore conveying the message at base camps / transit camps by EDCs / other groups for resting pilgrims
- Pilgrim's physical contribution: This can be in the form of spending few minutes to collect the waste seen strewn around and deposit in suitable containers or in the form of an eco-contribution of currency of any denomination or plastics / waste which would go to the agency who collects the waste in that locale
- Audit of non-biodegradables: At the beginning and end of trek route or main entry points to Sannidhanam / Pampa, the pilgrims should declare the list of plastic articles carried by them and exchange them for eco-friendly alternatives as much as possible. Pilgrims may be given incentive badges of varied colours denoting the types of incentives as an encouragement for lesser amount of non-biodegradable with them.
- Buy-back arrangements: EDCs / NGOs can buy back the PET bottles or other non-biodegradable wastes from pilgrims. These can in turn be sent for reuse / recycling
- Policing: Eco-policing to guide the pilgrims towards proper eco-friendly alternatives and activities in calm and friendly manner
- Announcement by the religious leaders at temples or group leaders (to each group) regarding the need to follow eco-friendly practices at religious centres / after prayers / start after each break journey.
- Mule operators may be given an incentive for collecting the mule waste and depositing it in specially designated bins. Such incentives may be in the form of eco-badges, 5 of which can earn them a meal.

5.7 Guidelines for Implementing the Prominent Interventions to Reinstate the Landscape Quality

This module outlines the locations and requirement of type of amenities and facilities at each location to provide essential pilgrim facilities as well as to mitigate the negative impacts on landscape, and for upgradation and enhancement of critically affected components. However, detailed guidelines for Sanitation and Solid Waste Management facilities and Water Supply Facilities are provided in respective modules.

5.7.1 General Guidelines for Enhancement of the Regional Environment

Ensure:

- Well organized movement of people and goods along least intrusive as well as mostly exploited routes and thus preventing further intrusion and exploitation of routes in the currently least disturbed areas of the reserved forests and the PTR

- Elimination of Landscape fragmentation and cordoning
- Decreasing the patch size/ sprawl and sprawl spreading corridors
- Reintroducing the traditional codes of conduct to be observed in the Poomkavanam
- Reintroducing the landscape conservational effects by according a 'Sacred Grove Status' to Poomkavanam
- Reconstruction of the Builtscape to bring it in tune with the Landscape, with least adverse impact to the Topography
- Granting Poomkavanam, the sacred geography, the importance accorded to traditional "sacred grove" and ensure its conservation and restoration
- Monitoring the activities, 'watch and ward' to ensure implementation of the conservation interventions
- Awareness rising among pilgrim groups to ensure code of conduct and eco-friendly practices
- Institutional co-ordination and increased participation of indigenous people and locals

5.7.2 Guidelines for Re-planning Sannidhanam

Proposals in the temple complex area should address the following-

- Building regulations
- Surface treatment
- Waste disposal system
- Controlled Pilgrim Flow
- Minimising the no: of pilgrims concentrating here
- Ban on non degradable waste
- Stop urbanising of Sannidhanam
- Enclave awareness among pilgrims
- Encourage afforestation
- Encourage buildings in the defined zone creating a street edge and consistent skyline with enhanced green infill.
- Buffer of native trees and shrubs of trample resistant and fast growing varieties to be provided around the activity area / proposed area for development
    - Percentage of total and relative; Evergreen (100percent) contributed by species such as Ficus sp, Lagerstroemia sp., Mesua sp. and others in consultation with KFD,
    - Percent basal[49] and/or foliar[50] live cover : (Basal 30 to 40 / ha)
    - Percent ground cover[51] (includes vegetation, fallen leaves, and rock; min 70percent
    - Percent bare ground; min 10percent
    - Tree and shrub density; total trees: min 3 per 10 sqm
    - Species diversity by life forms and individual species: encourage butterflies and related species by providing suitable low storey growth
- Trees should be planted in the South and West directions of the temple. Planting of trees in the North and East directions should be avoided.

[49] **Basal area or cover:** Area of plants at or near the ground surface.
[50] **Foliar cover:** The area of the ground covered by leaves. Canopy cover minus the gaps. (Canopy cover: A vertical projection of the perimeter of a plant canopy to the ground. Ignores small gaps in canopy)
[51] **Ground cover:** Percent of the soil surface covered by some type of protection (litter, rocks, vegetation)

- Type of vegetation selection should be based on:
  - Plant association of the study area
  - Capacity to withstand wide range of adverse factors which can happen due to pilgrimage activity
  - Root system which are adequate to bind the soil together
  - Capacity to improve the soil quality which enhance the natural progressions to meet higher plant associations
  - Time taken by the species to establish themselves
- Development of critical infrastructure facilities should be based on proper Environmental Impact Assessment Study as per MoEF Guidelines

5.7.3 Guidelines for built forms in the Satellite centres

The built forms in the satellite centres would be of temporary nature, except for buildings required for purposes such as administration, store houses, medical centres etc. The temporary structure would be erected just before the start of every season and dismantled and stored at site after the season. Modular and pre-fabricated system of construction needs to be used for temporary structures, which would make their erection and dismantling easier. The temporary structures would be planned and built in such a way that no trees or a minimum number of trees will have to be cut from the site.

Consultancy from expert agencies of considerable national experience will have to be sought regarding the design, planning, construction and erection procedures. Use of locally manufactured products such a straw mats for flooring etc. should be encouraged. This would boost the traditional crafts as well as benefit the local people economically.

Use of hard pavings, which could have a significant effect on microclimate, should be avoided and traditional substitutes for paving materials, such as gravel should be used. Wherever hard paving cannot be avoided brick paving is recommended.

- Green area should be at least 10 to 15 percent of the total area
- Minimum trees to be cut for providing facilities
- Buildings to be designed around natural features / by conserving them
- No building should be constructed within 50m of water bodies (with exception for requirement related to religious customs and water supply i.e. pump house)
- Rows of shading tree are to be planted on both side in the shoulders of the pathways/ roads all along the Main Street and secondary streets. Trees should be planted at a minimum interval of 10meters.
- The minimum width of the footpath should be 3 meters. Additional width of 2m should be provided in shopping areas to allow for activity spillovers.
- The minimum right of way for all main road in base camp should be 12meters and 9 m for secondary roads
- Minimum parking space for service vehicles should be provided. The minimum parking requirement for each car and truck is as follows
  - Car : 3m x 6m (when individual parking space is required) and 2.5m x 5 m when community/group parking space is required)
  - Truck : 4 x 10 m
  - Tractor: 3.5 x 7.5 m
  - Ambulance: 3.5 x 7m
  - Fire Fighting Service Vehicle: 4 x 10m

- All the utilities should be placed underground in suitable horizontal ducts with manholes at suitable intervals so as to facilitate easy repair and maintenance without much disturbance and resurfacing works.
- Green Buffer to be provided for critical infrastructural facilities
- Development of critical infrastructure facilities in forest areas should be based on proper Environmental Impact Assessment Study as per MoEF Guidelines

5.7.4 Guidelines for Re-planning Pampa

Most important activity at Pampa Manalppuram is bathing at holy river Pampa. It is proposed that pilgrims be encouraged to leave their belongings at locker spaces 10m away from Pampa River and move towards the river only with essentials. It is also proposed to provide shaded landscape cloisters or 'rooms' created with shady trees for pilgrims at Manalppuram. Each cloister to host a locker room, waste bin for emptying the waste if any, and shade for waiting pilgrims. Information on toilets available in the vicinity and display maps also to be provided at each cloister.

Currently it is observed that 6 rows of pilgrims move through Manalppuram during peak days in extremely crowded condition. For this width of the corridor available is 8m, where as 12m is required. It is also observed that 3 rows of pilgrims move towards Pampa from Cheriyanavattom near Njonangar during peak days in extremely crowded condition. For this width of the corridor available is barely 3m to 6m in between shops, where as 9m is required. No space / corridor is demarcated for emergency escape / exit, where as for bringing an emergency escape vehicle lie ambulance, it is required to demarcate and allocate a strip of 4.5 m width either separate or clubbed with service access, from Thriveni to the foot of Pampa Ganapathy temple.

It is observed that general movement velocity of the pilgrims through Manalppuram in uncongested situation is 1.5km/hr, excepting the slower pace of those who enter the shops/hotels.

To ensure this velocity during crowded situation it is required to provide 12m corridor for free movement of 6 persons in a row during crowded conditions. Soft Shoulders with trees and underground utility lines of 1.5m may be provided within the row of 12m.

Activities at Thriveni include parking and religious observances such as 'pithrutharpanam'. It is required to restrict the parking here so as to free the land for religious use. Parking can be allowed for emergency service vehicles and staff vehicles here.

Activities at Thriveni include parking and religious observances such as 'pithrutharpanam'. It is required to restrict the parking here so as to free the land for religious use. Parking can be allowed for emergency service vehicles and staff vehicles here.

- Green area should be at least 10 to 15 percent of the total area
- Rows of shading trees are to be planted on both sides in the shoulders of the pathways all along the main street at a minimum interval of 10meters. Trees of *Ficus* species or any other species suitable to the surrounding evergreen forests and with some religious significance may be permitted.
- Development of critical infrastructure facilities should be based on proper Environmental

Impact Assessment Study as per MoEF Guidelines

5.7.5 Guidelines for Facility provision along the Routes from Pampa to Sannidhanam

- Restrict the no: of shops along this route as Queue complex after Marakoottam would serve the purpose. No: of shop clusters from Pampa to Marakoottam can be limited to 2 at the locations agreed by the high court. Two shops can be built into the design for proposed toilets and cardiology centers. Queue complex would hold the shops and other facilities from Marakkoottam to Sannidhanam
- Queue complex should be built as service cores which can be spanned over by roofing and grills during season
- Along Swamy Ayyappan road also, places demarcated for shops and approved by high court may be used for the purpose. However, care should be taken to see that the activities here would not interfere with general pilgrim and service movement.
- Donkeys should not be pressed into service. Dholis may however be used along a separately demarcated lane along the track.
- Existing trees along the route are to be maintained. In no circumstance, a tree should be cut unless it is a cause of concern for pilgrim safety.
- Rows of shade trees are to be planted and maintained on both sides all along the main trek route. These should be planted at a minimum interval of 10 m and with 1.5m setback from the edge. Trees of Ficus species or any other species existing in / suitable to the surrounding evergreen forests and with some religious significance may be permitted. Those with wide spreading canopies and branching starting at around 2m to 3m from the base would be preferable.
- At places where commercial uses are provided, they should be planned in such a way that allowed width of the route is not masked by spilled over activities from such areas. Design/siting of these units should be carefully carried out so as to segregate spillovers into the main pilgrim trek areas. The width should be increased by 1.5 m in shopping areas to allow for dead width. In case of longer adjoining shopping frontage or double loaded corridors a minimum of 6m should be maintained. In case if the single lane of 3 meter trek path is insufficient to cater to pilgrim traffic multiple such lanes with tree median in between should be provided.
- All the utilities should be placed underground in suitable horizontal ducts with manholes at suitable intervals so as to facilitate easy repair and maintenance without much disturbance and resurfacing works.
- Continuous concrete paving of the trek route should not be allowed. Concrete paving may be done only at locations where the slope of the ground is more than 1:2 or if the base consists of very soft mud. But in no case should the continuously - concrete paved stretch extent beyond 50m length.
- No structure what so ever should be constructed on or over the trek route (natural shading should be maintained through out) except specific structures for resting, minimal commercial facilities and for queuing up of pilgrims.
- Development of critical infrastructure facilities should be based on proper Environmental Impact Assessment Study as per MoEF Guidelines

5.7.6 Guidelines for Facility provision along the Trek Route from Erumely to Pampa and Uppupara to Sannidhanam

- Establishing group shops must be encouraged along the traditional routes, since it

reduces the impact on the ecosystem. Pushers must be discouraged.

- Ban on use of non-biodegradable materials, packing materials etc
- Ensure collection and segregation of waste and eventual treatment and disposal (refer SWM module)
- Supply of LPG must be ensured in all possible Thavalams to reduce the fuel wood collection from forests.
- Information, Education, Communications (IEC) to be strengthened
- Harmful materials such as nails, iron ropes, tin sheets, and glass pieces must be disposed off just after the season y the shop owners
- Lack of availability of water may be dealt with through supply of water by EDCs on head load hygienically; Buying back pet bottles from pilgrims etc. in addition, possibility of using small micro schemes for harnessing water may be explored through NGOs
- Pit Latrines must be covered immediately after the season
- Explore the possibilities of using alternate temporary toilets through NGO participation
- Walking sticks and necessary facilities to be provided to pilgrims
  Strict measures like imposing fine on users and suppliers for violating the environment rules, encouraging ecofriendly initiatives by giving eco-marks etc
- Monitoring and post seasonal evaluation
- Transit camp to be provided only at an interval of 5 km or 1 hour walking distance which ever is more.
- Maximum area at a location for Transit facilities should not exceed 1 acre, where as maximum area of a shop should not be more than 200 sqm
- No artificial lighting should be provided to facilitate pilgrim movement during night
- No permanent construction what so ever should be done in these areas
- Specifically designated facility areas have to be maintained at these locations and main base areas if located within the forests should not be more that 1-acre in extent.
- Clustering of amenities and services need to be done
- All layouts should follow the pattern so described here even for temporary structures.
- No multistoried temporary structure should be constructed; the maximum height for any given structure should be 3 meters.
- Construction should be modular and construction members should be easy to dismantle, store and reassemble for use during the succeeding seasons.
- Total Area (including circulation) to be allocated per person per *viri* to be not less than 2.5 sqm
- The Camp facilities should be clustered and restricted to one or few permitted areas only. A sprawl should be strictly controlled. Maximum lot area shall be 1 acre. Maximum lot width shall be 100 meter and depth 40 meters and should be allowed in an area if the location would not require cutting / pruning of trees or extensive removal of ground cover. Lot area and width requirements shall be strictly observed as it is the intent not to locate such facilities in high/densely Forest vegetated areas.
- Total area for commercial amenities at each location should not exceed 200sqm. Area for *viri*s at each location should not exceed 500sqm
- Each *viri* should not accommodate more than 100 persons and open space between two *viri*s should be at least 3m
- *Viri*s of temporary materials shall not be of more than single bunk arrangement. An area of at least 2.5 sqm to be provided per person in a *viri*
- Campground facilities shall meet "Compliance Standards for fire and structural safety "

or updated applicable standards as enforced/stipulated by the District administration. Said facilities shall be subject to applicable local, State and central regulatory authorities and all permit requirements.

- Development of critical infrastructure facilities should be based on proper Environmental Impact Assessment Study as per MoEF Guidelines

5.7.7 Guidelines for Ground Stabilisation Techniques:

These would include various bio-engineering techniques used for soil protection and ground stabilisation. Such techniques are used to protect and stabilise landforms that are under threat from erosion, slides etc. due to various natural as well as man-made causes. Ground bio-engineering techniques essentially consists of slope retention and ground stabilisation using structural construction techniques combined with the use of plant materials soil protection and stabilisation. The uses of bio-engineering techniques and the methods adopted are described below in Table 17:

Table 17 : Ground Bio-engineering Techniques

Ground Bio-engineering Techniques		
Requirement	*Ecological Aspects:*	*Aesthetic Aspects:*
Need for Protection of the soil surface from erosion caused by precipitation, wind and frost. Due to damage and loss of ground cover. Due to movement of pilgrims through the forest and other activities associated with pilgrimage.	Moderation of the temperature and moisture extremes of the air at ground level. Creation of more ideal growing conditions in the vegetation zone Improvement of the soil water status (drainage and retention) by way of water interception, evapo-transpiration and increased water capacity Soil improvement and humus formation from decaying and decomposing vegetation resulting in as built up of soil flora and subsequent increase in the nutrient content. Creation of new and better living conditions for plants and animals.	Structures and construction elements integrated into the landscape, rendering it more attractive.

Techniques to be adopted should depend on:

- Slopes
- Forest type or the ecology of the area
- Type of impact
- Intensity and seasonality of impact
- Soil type
- Rooting character of the species

The various methods adopted depending on slopes are:

a) *Stable slopes*: Slope Protection methods

They rapidly protect the soil, by means of their covering action, from the surface erosion and degradation. Improve the water capacity and promote biological soil activity.

b) Marginally stable slopes: Ground stabilization techniques

These techniques are designed to reduce or eliminate mechanical or disturbing forces. They stabilize and secure slopes liable to slides by means of root penetration,

decreased pore pressure through transpiration and improved drainage. In principle, they consist of linear or single point systems, shrubs or trees, or their live cuttings respectively. Ground stabilizing techniques are generally supplemented by the soil protection works to guard against soil erosion.

c) *Unstable slopes:*

Combined methods with adequate retaining structures, which would include-

- Protection methods
- Stabilisation methods
- Vegetative drainage method combined with mechanical measures.

They comprise of seeding and plantings in the widest sense of the word and secure the transition from the construction stage to the completed project.

Criteria for species Selection for use in various bio-engineering techniques

- Species of the ecological character which are the part of the plant association of the study area
- Species which can withstand wide range of adverse factors which can happen due to pilgrimage activity
- Species with a root system which are adequate to bind the soil together For e.g. The most effective species would be the one with root system which penetrate into the lower subsoil
- Species should have the capacity to improve the soil quality which enhance the natural progressions to meet higher plant associations
- Time taken by the species to establish themselves
- Coir and other geo-textiles also may be used for ground stabilisation

Construction Timing:

- Time of planting during which vegetative methods of construction can be carried out and is determined by the growing cycle of plants which is governed by the seasonal factors
- The construction work, which was vegetatively propagated plant materials, must take place in vegetative dormancy period.
- Grass seeding takes place during the periods of active growth.

6.1 Compiled list of Interventions, Land Requirement and their Phasing

A compilation of all interventions proposed and their phasing is provided in the table below. The developmental activities elaborated for improving the landscape 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 estimation for determining the cost involvement of various items detailed earlier in this report. However, a very rough costing has been done to serve as a guide for determining the financial feasibility for taking up different projects and also for determining the source of funding.

ANNEXURES

Annexure 1: Terms of Reference and Details for Landscape Study

Objective

1. To identify the special landscape features, flora and fauna at Sabarimala, Pampa and trek route which would have a role in determining the development and its impacts
2. To identify the existing practices which disrupts the landscape _ with consideration on all elements including soil, water, fauna, flora, topography - and suggest alternate development options to reduce impacts
3. To suggest the master panning guidelines (landscape and environmental conservation related), which would guide the potential development of Sabarimala

Tasks:

1. Flora and Fauna: Broad listing in the study area- Sabarimala
2. Impact study - on landscape elements - of existing activities and development (during various hours of the day / seasons)
3. Formulation of Critical considerations for development
4. Development of Guidelines for future development (for next 50 year span) (including development type, conservation / preservation requirements, guidelines on materials to be used, technology to be followed etc)

Time Span:

1. Impact of pilgrimage - till January 15, 2006
2. Post season scenario study - January 20 to January 25, 2006
3. Draft Report: February 10, 2006
4. Final report: Feb 20, 2006