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Evaluation of the Environmental Status of the Guruvayur Temple Neighbourhood in Kerala, India

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ABSTRACT

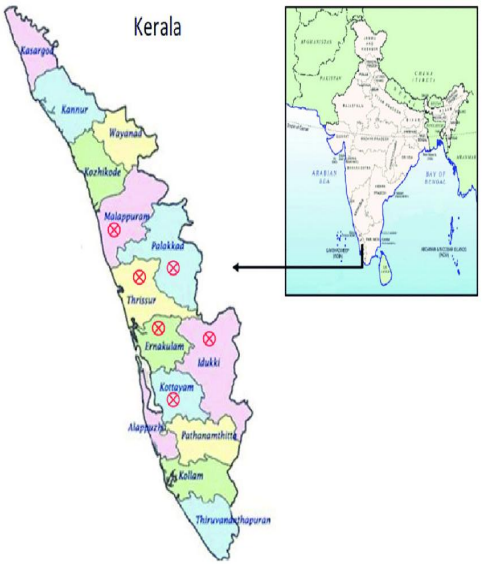
Guruvayur is one of the most significant pilgrimage centres in all of south India, and it is also a key draw for those interested in Indian temples. It is also referred to as the Dwarka of the South in certain circles. Sri Guruvayurappan is another name for the Hindu god Krishna that is often used in Guruvayur. The temple is the centre of all activity in this town, and there is virtually nothing going on outside of what is associated with the temple, even though there are a few other notable temples located in the vicinity. The heart of the activity takes place inside a region within the perimeter of the outer ring road that encircles the temple.

Consequently, in the interest of protecting the environment, state evaluation and this region were considered throughout this research. Under environmental status assessment of Guruvayur crowd control, management of municipal solid waste, management of sewage systems and stormwater drainage, and precincts of temples management are discussed, with consideration given to the delicate ecosystem that exists inside the temple precincts. The Analytic Hierarchy Process (AHP) 's the hierarchical structure of analysis has been used to determine which of the current parking lots would be most suited for which usage. It is an organized format. The method takes into account both mathematics and psychology and is used to organize and analyse complicated choices.

Keywords: Environment, Analytic Hierarchy Process, Crowd Management, Solid Waste Management, and Decentralized Waste Water Treatment are some of the keywords used in this paper.

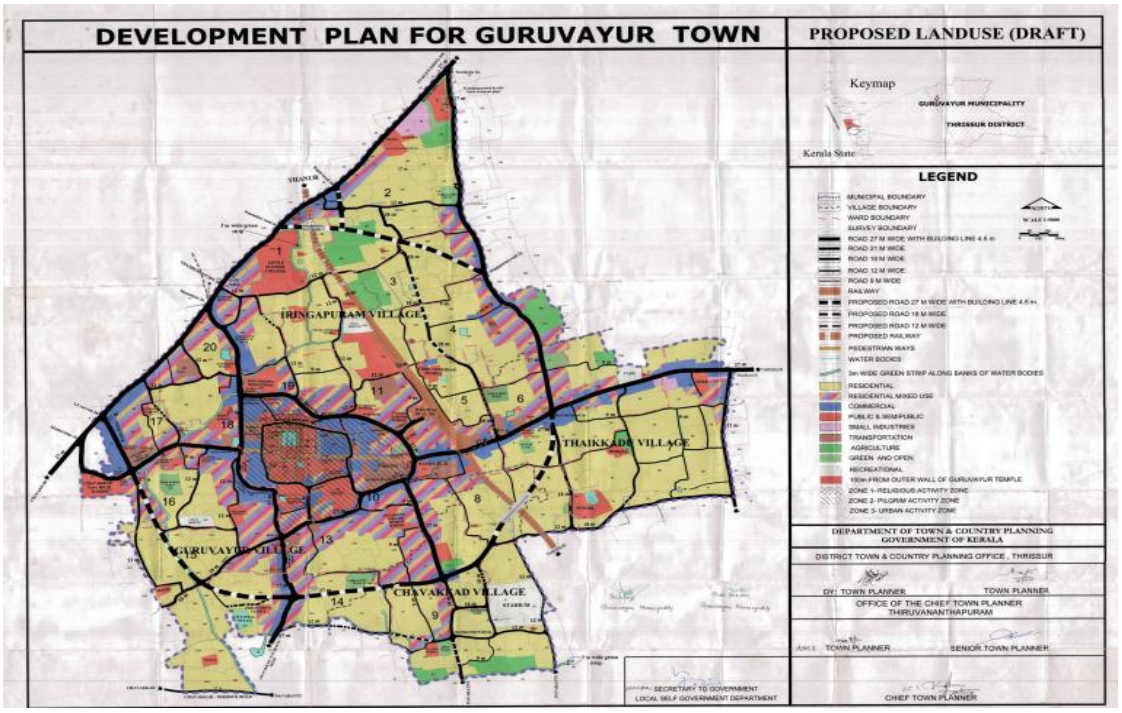
INTRODUCTION

Krishna Temple is the main draw of Guruvayur, a small town in Kerala's Thrissur region. It is located at 100 35' N latitude and 760 00' E longitude, with an average height of 3.5 M above sea level (MSL). Due to the Guruvayur Satyagraha (passive resistance) in 1931, Dalits now have access to all of Kerala's temples. Millions of devotees from all across India place their confidence and devotion in the Krishna Temple, which is described as a temple of special significance in the GuruvayurDevaswom Act of 1978.



The Development of the Guruvayur Community-

The Guruvayur temple area was referred to as Amcom (means region) until 1956, with parts of it in Chowghat panchayat and most of it in neighboringKottappadi panchayat. This had a significant impact on the area's development plans. Thus, the demand for an independent panchayat for this region became so strong that in 1962 a township was founded that included the temple itself and the surrounding villages; this township was later turned into a municipality under the Kerala Municipality Act, 1994. Figure 3 depicts the municipality's 2008 land use characteristics, broken down into percentages (%). The author used the master plan document given by the Town and Country Planning Department, Thrissur, to compute the land use distribution.



In 1965, the first development plan for GuruvayurTown was drawn up. The town's inner and outer ring roads were built as part of this plan. Many other projects were also part of this plan. In 2001, Guruvayur Municipality had a total area of the total area was 7.476 square kilometres, and the population was 21186. To keep up with the growing population, the 43 existing wards were divided into two new ones in 2011.

OBJECTIVE

1. To assess the environmental status of Guruvayur, with a focus on crowd control, municipal solid waste management, sewage systems and stormwater drainage, and management of temple precincts.
2. To identify and evaluate the suitability of current parking lots for various usages within the Guruvayur temple precincts.
3. To utilize the Analytic Hierarchy Process (AHP) as a structured methodology for organizing and analyzing complex choices.

RESEARCH METHODOLOGY:

Review Guruvayur's environmental status, crowd control, waste management, sewage systems, stormwater drainage, and temple precinct management literature and research. This will build knowledge and identify shortcomings.

Gather statistics on Guruvayur's crowd density, trash creation and disposal, sewage and stormwater infrastructure, and temple precinct management. On-site observations, surveys, interviews, and data from government agencies and groups may be used.

Assess Guruvayur's environmental state, concentrating on crowd control, municipal solid waste management, sewage systems, stormwater drainage, and temple precincts. This evaluation will analyze data, identify important concerns and difficulties, and evaluate the temple precincts' sensitive environment.

Analytic Hierarchy Process: Use AHP to evaluate Guruvayur temple precinct parking lots for different uses. Create a hierarchy study that includes temple proximity, capacity, accessibility, and environmental effect. Assign weights to each criteria based on relevance, then analyze and compare parking lots to find their best uses.

ANALYSIS OF THE ENVIRONMENTAL STATUS

The temple's main activities take place in an area just beyond the temple's outer ring road. As a result, this region was considered while determining the current environmental state. Guruvayur temple precincts' environmental status evaluation includes the following main sectors and areas-

In addition to MSWM, sewage management, stormwater drainage, and crowdmanagement are included.

MANAGEMENT OF MUNICIPAL SOLID WASTE

As stated in the Municipal Solid Trash Management Manual, 2000, the phrase "municipal solid garbage" encompasses a broader range of wastes than those generated by municipal operations and services, such as street debris, dead animals, market waste, and abandoned automobiles. Commercial garbage is solid waste that originates from business facilities such as offices, retail shops, and restaurants.Some are categorized as junk, while others are categorized as trash. When food is handled, stored, sold, prepared, cooked, or served, animal and vegetable waste is called "garbage." Rats, flies, and other vermin are drawn to the strong odors produced by putrescible debris found in these wastes. It must be stored, handled, and disposed of right away. The word "rubbish" describes all solid waste, except trash and ashes, that originates from homes, businesses, and organizations. Coal ash and other combustible residues are left behind after burning various combustible fuels in residential and small-scale commercial buildings for cooking and heating purposes.

This temple has a reputation for being a good place to be married, generating an estimated 20 MT of municipal solid garbage in the process. More than 40 percent of India's municipal solid garbage comprises vegetables and leaves. As for the biodegradable garbage, in this case, mostly banana leaves are utilized for serving lunch at weddings. A day's worth of solid waste is generated by the temple and its

precincts, which include the community hall (uttupura), the prasadam counters (for selling sweet dishes and bananas), the circular walk (nadapanthal), the auditorium (for holding annual music events, special performances, etc.), the holy tank (temple pond), and the uralppura. Devaswom's administrative office created 1365 kilograms of garbage, while the elephant sanctuary contributed 12090 kilograms of rubbish, for a total of 13455 kilograms of waste. Out of the 92 collecting stations inside the temple grounds, Kudumbashree is responsible for 83, and the Guruvayur Municipality is responsible for the remaining 9. 36,0000 pilgrims visit the temple core daily, according to Devaswom data from 2005-2006. If each pilgrim generates 0.45 kg of solid garbage daily, the average daily solid waste production is 16,200 kg. The temple precincts and administrative offices create roughly 20 MT of solid trash, excluding the elephant sanctuary.

Kerala and Nabard (National Bank for Agriculture & Rural Development) developed Kudumbashree, a community development initiative for impoverished women, which is implemented by local governments and serves as a community wing for Local Governments. Under the Travancore Kochi Literary, Scientific, and Charitable Societies Act of 1955, a society is known as Kudumbashree (SPEM) was registered. The State Minister of LSG serves as the chairman of the board of directors. Neighborhood groups (NHGs) constitute the foundation of Kudumbashree, and they send delegates to ward-level Area Development Societies (ADSs) (ADSs). The third layer of Kudumbashree's unique structure is completed by the ADS sending delegates to Community Development Societies (CDSs).

To help with the garbage disposal, the city owns 1.8 Hectares of land around 3 km from the temple. Despite the passage of six years after the author's assessment, the solid waste management situation at this site still ends in the open dumping of unsorted garbage.

STORM WATER MANAGEMENT AND WASTEWATER TREATMENT-

Sewage from business enterprises and dwellings is sometimes discharged straight into open sewers because septic tanks are not adequately installed or maintained. Chakkamkandam's backwaters are fed by the drains, validation, and cheriyathod, which run for three kilometers through the town. There are serious environmental difficulties in the surrounding villages due to untreated home and business effluents being discharged into the backwater. In 1995, the municipality began

construction at Chakkumkandam of a centralized Sewage Treatment Plant (S.T.P.) employing A.S.P. technology.

Significant environmental harm is still occurring due to the excessive delay in having the S.T.P. up and running [according to a newspaper story]. The District Town Planning Department researched temple precincts and found the following difficulties with high-rise commercial buildings-

- Buildings producing sullage, mostly restaurants, had worse wastewater treatment efficiency than those merely producing sewage.
- Buildings lack a suitable system for dewatering and disposing of sludge (produced as a waste product during the operation of wastewater treatment facilities).

Because this region's average elevation is 3.35 m above mean sea level (M.S.L.), flooding is more likely after heavy rains. The importance of stormwater management cannot be overstated. The whole research area's road sections have been categorized into stretches to measure the drainage system's condition. The drainage system's condition has been categorized appropriately. Almost all of the central business district is covered by storm drains. Covering the stormwater drainage (side drainage) systems along the main temple walk and minor pedestrianized paths with concrete slabs have been completed. The following problems were discovered-

- Most of the drains are clogged with silt and trash from previous users.
- During the rainy season, several of these drains are in danger of overflow and floods.
- When removing silt and sludge from storm water drains, there are no adequate safeguards in place.
- The dumping of hotel trash and retail waste into stormwater drains creates unsanitary circumstances, and the sluggish flow causes serious sanitation difficulties and health dangers.
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CONTROL OF THE MASSES

Data from Devaswom shows that the highest number of pilgrims were welcomed in December (1691236 people) and the lowest in February (1691236 persons) (814465 souls). According to the statistics, "Ekadashi" in December was the busiest day for pilgrims, with the most visitors (1,33,331 souls).

Research on the impact of pilgrims' physical presence on the temple grounds is underway. Marriages may be performed in the Guruvayur temple, which is considered a promising location. Most weddings take place between August and October of each year. In most cases, the guests and family members on both sides are invited to a hotel for lunch after the primary event of exchanging flower garlands between the bride and groom. During these three months, around 15-20 weddings occur in each of the 16 hotels located within one kilometer of the temple. 240000 to 320000 individuals may be found within a one-kilometer radius of the temple in a given month.

In research by Thrissur's Town Planning department, 70% of individuals who come to the city for a wedding visit the temple, which translates into 168000-224000 visitors every month. Devaswom's statistics show that the average number of pilgrims arriving each month from August to October is 877513. Those are getting married account for between 20 and 25 percent of this total.

On the busiest day of the year, how many people can be accommodated in the temple precincts? In terms of total land area, the temple precincts cover 0.57KM2 = 57 Ha, which is equal to 100%.

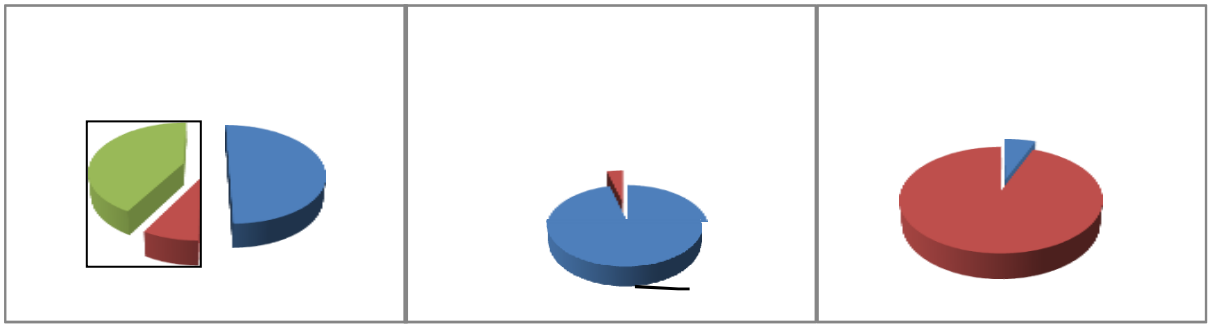
The total built-up area is 7.3 Ha or 12.8 percent of the total land area. Total parking space is 2.9 ha or 5.08 percent of the total land area.

The total circulation area is 10 hectares or 17.54 percent.

During peak days, pilgrims have access to a total area of 3.7 hectares (the area of the walkways).+ Auditorium + Barricaded area + Open space surrounding the temple) + 0.64 Ha (area of the temple complex) = 4.34 = 4.5 Ha. = 7.89%. Coconut and areca nut orchards (32.31 hectares, or 56.69 percent) make up the rest of the land.

When the wedding season is in full swing (August through October), the average number of pilgrims doing Darshan on a given day is 29250. Every day, the temple is available for Darshan for 15 hours (ten of which are spent offering Darshan in the early morning from 3:00 AM to 1:00 PM, and another five from

4:00 PM to 9:00 PM). While marriage season is a peak time for pilgrims, an average of 1950 pilgrims per hour may be expected on any given day. Consequently, a pilgrimage to the temple's precincts can accommodate 1 person every 23 square metres per hour (one). Each person in a line should have at least 1.2 sq. m. of standing and free movement room, following American Association of State Highway and Transportation Officials (AASHTO) rules. As a result, the precincts have more than enough room.

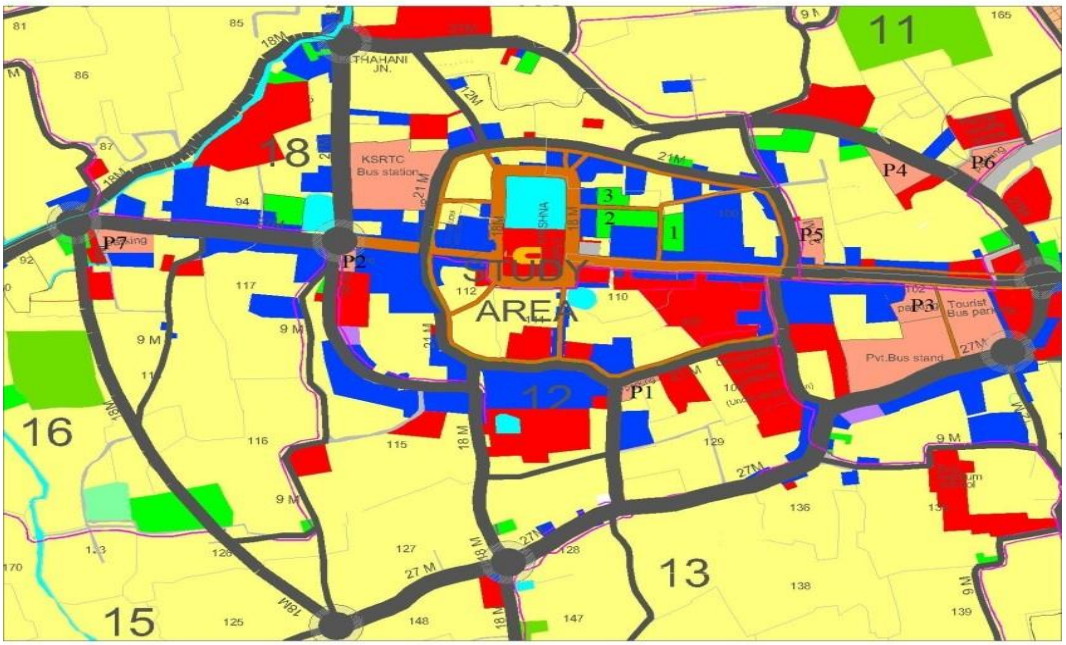


The Analytic Hierarchy Process (AHP) may be used to discover the best usage for parking lots.

There is an effort to apply the Analytic Hierarchy Process (AHP) [6] to determine the best use for the existing parking lots inside the temple grounds. To determine the relative importance of various criteria and alternatives, we utilise the standard comparison scale shown in table 1.

Intensity of Importance	**Definition**	**Explanation**
1	Equal Importance	Two elements contribute equally to the objective
3	Moderate Importance	Experience & judgment moderately favor on element over another
5	Strong Importance	Experience & judgment strongly favor on element over another
7	Very strong importance	There is a clear preference for one ingredient to over another.
9	Extreme importance	The evidence favoring one Element over another.

Vehicles must be restricted from entering the centre core (C1) and solid trash must be separated (C2) if possible (C3) Inadequate hotel and guesthouse waste water treatment and the potential for remediation.



(A1) Parking for automobiles during peak wedding season (A2) Decentralized wastewater treatment facility (A3) Dry waste segregation facility Alternatives and criteria are compared pair-wise in step 1 of AHP, and the relative priority of alternatives are assessed for each criterion. At this stage, criteria are compared to the objective in order to determine the most appropriate use for the existing parking lots inside the temple grounds. Step 2's final outcome is a ranking of the criteria in relation to the aim. In step 3, the final priorities are synthesised and the option with the greatest total score across all the criteria is evaluated for the specified land piece. There are now seven different parking lots shown on the

ALTERNATIVE	C1	C2	C3	GOAL	Parkinghas 1.3times priority thanDWWT(1.3= 0.424/0.334) Parking has 1.8times priority than DWSF (1.8=0.424/0.241) (Note:Consistency Factor not considered)
A1	0.38	0.022	0.022	0.424	
A2	0.156	0.022	0.156	0.334	
A3	0.064	0.156	0.022	0.241	
TOTAL	0.6	0.2	0.2	1	

map, each with a unique number (P1 through P7). This procedure has been performed for each of these lots.

The parking lots P1, P2, P3, and P7 (a combined total of 3115 square metres) may only be utilised for parking when AHP was applied to all of them (parking got higher priority than other two alternatives). P3 and P7 might benefit from a multi-level parking lot. Alternate 2&3 take precedence over alternative 1 in the next three lots (P4, P5 and P6). P4 (3980 Sq.m.), P5 (1993 Sq.m.), and P6 (3980 Sq.m.), respectively, may be used as a dry waste segregation facility (DWSF) and a decentralised waste water treatment facility (DWWT) (2788 Sq.m.).

CONCLUSION

A baffled reactor followed by a septic tank might treat waste water from commercial land uses. Primary and secondary phases of treatment are used in both types of decentralised waste water management Sedimentation and sludge stabilisation are the basic treatment methods used in a septic tank. Because the septic tank is built in the ground, it takes up less area and requires less resources than a traditional septic system. Septic tanks have two major drawbacks: limited treatment efficiency and odorous effluent. The effluent might be transferred to a baffled reactor in the secondary stage to avoid these drawbacks. Anaerobic decomposition of suspended and dissolved particles is used in this case. The following are the benefits and drawbacks of using a baffled reactor: One advantage is that subterranean construction means less permanent space is needed. (1) Start-up time is longer than an anaerobic filter (another anaerobic treatment method)Door-to-door segregation from commercial operations is necessary for improved management of municipal solid waste disposal. After further segregation, the recyclable garbage may be sold from the dry waste segregation facilities to be put up in parking lots (P4, P5, and P6). The biodegradable garbage is to be transferred to a designated location for recycling.Windrow composting technique may be used at a nearby trash site (3 kilometres distant). Sanitary Landfills on the disposal site should receive the waste from the compost facility and DWSF.The temple precincts are a delicate environment; thus, all of the following options are being considered.

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