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Pilgrimage by Pamba: Sustainable Planning For Mitigating Environmental Impact of Tourism along the Pamba River

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ABSTRACT:
Religious tourism is a significant revenue generator globally, but its environmental impact, particularly in Sabarimala along the Pamba River, is a growing concern. This study aims to develop sustainable planning solutions to minimize this impact. Through literature review and water quality analysis, it examines how religious tourism affects the Pamba River environment, identifies key issues, evaluates existing planning approaches, and proposes a sustainable plan. Recommendations include wetland constructions, river dredging, and a high-tech monitoring system. This research contributes to the sustainable management of religious tourism, ensuring the preservation of both spiritual significance and environmental integrity.
KEYWORDS: Religious tourism, environmental impact, sustainable planning, Sabarimala, Pamba River, water quality analysis, wetland construction, river dredging, high-tech monitoring, sustainable management.

I. INTRODUCTION

Religious tourism stands out as a progressively vital contributor to the tourism industry's revenue, garnering substantial attention and investment from various countries. Whether through captivating locations, architectural marvels, artistic expressions, festive celebrations, diverse persuasions, or significant pilgrimages, the diverse elements of religious tourism collectively form valuable resources. These include enduring remnants and meaningful actions that leave a lasting imprint. Positioned as sustainable coffers, religious artistic tourism holds significant potential for positively shaping a country's developmental landscape. Notably, according to Peter Wiltshire (2019), religious tourism has deep historical roots, evolving into a rapidly expanding market. From ancient civilizations to the present day, pilgrims have embarked on journeys to honor sacred places and their guardians worldwide. Over the past 2,000 years, the convergence of tourism and pilgrimage to sacred sites has become increasingly evident. The focal point of this study is to comprehend the environmental impact of religious tourism in Sabarimala, Pathanamthitta.

II. BACKGROUND STUDY

Although a significant number of engine valve-act Sabarimala, nestled along the banks of the Pamba River, stands as a sacred pilgrimage site attracting millions of devotees annually. The convergence of religious activities and the pristine environment surrounding the Pamba River has raised concerns about the ecological impact of such pilgrimages.

Increased footfall, waste generation, and associated activities have raised concerns about water quality, pollution, and the overall ecological well-being of the river ecosystem. The need for a sustainable planning approach is underscored by the delicate balance required to preserve both the spiritual significance of Sabarimala and the environmental health of the Pamba River. The Pampa River is considered the Dakshina Ganga (Southern Ganges) because of its association with Kerala's Largest Pilgrim Centre, Sabarimala. It is the third-greatest river in Kerala, with a surface area of 176km (2235km.)Pamba River running close to the pilgrimage center of Sabarimala in south India has shown levels of E. coli at 95,000 per 100 ml as against the permissible limit of 500 which is largely due to the presence of human excreta that clogs the river along with plastic bags and bottles and coconut husks (E. coli is the measure used to indicate pollution) 40-60 million pilgrims visit Sabarimala every year.

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III. AIM AND OBJECTIVES

AIM: This study aims to develop sustainable planning solutions to minimise the environmental impact of religious tourism in Sabarimala along Pamba.

OBJECTIVES :1. Examine how religious tourism affects the environment along the Pamba River in Sabarimala

2. Identify the specific environmental issues related to pilgrimage activities, focusing on water quality and pollution in the Pamba.

3. Evaluate the existing Sustainable planning approaches and adapt them for effective use in Sabarimala.

4. Develop a sustainable plan to address the environmental impact of religious tourism along the Pmaba River.

V. RESEARCH QUESTION

How can a sustainable planning solution be developed to effectively reduce the environmental impact of religious tourism in Sabarimala along the Pamba River?

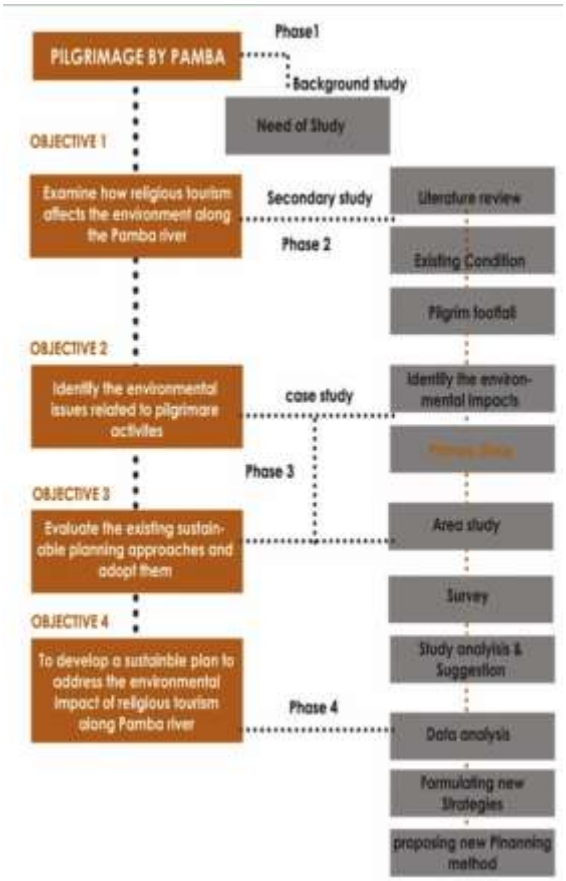
VI. LIMITATIONS

1. The availability and trustability of data on religious tourism and its impact on regional development is limited. Accurate statistics and records are challenging to acquire.

2. The study's time frame may be limited, making it difficult to capture the long-term impacts of religious tourism. The tourism season may come one time a year.

3. The impacts of religious tourism can vary extensively from one region to another, depending on factors like the popularity of religious sites, local infrastructure, and government support. Failing to account for indigenous differences can lead to misleading conclusions.

IV. METHODOLOGY



VII. LITERATURE STUDY

A) TOURISM AND ENVIRONMENT

There is a vast literature on the relationships between tourism and the environment. Cohen (1978, p. 228) has presented a conceptual model suggesting four key ways tourism and the environment are related. The four ways include the intensity of tourist site use (i.e. the number of

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visitors, duration of stay; activities, and facilities at their disposal); the resiliency of the ecosystem (i.e. the capability of the place to absorb the impacts); the pace of development (i.e. of tourist infrastructure); and the transformational character of touristic developments (i.e. attractions and further development). Cohen argued further that a combination of these factors would result in 'the accumulated environmental effects of growth, urbanization, commercialization, and functional diversification on the original tourist core areas. Another significant model is Butler's (1980) Tourist Area Life Cycle, which continues to provide a fundamental understanding of how increases in tourism flows alter the physical environment in a tourist destination.

Based on carrying capacity concerns, this model outlines the different stages of tourism development. While this model has been widely used in leisure-oriented tourism to help develop appropriate tourism developmental and marketing policies, etc.

The host destination environments attract tourists, and the needs of these tourists and the tourism infrastructure developed to meet those needs alter these same environments. One model, proposed by Holden (2007, p. 9), notes that the tourism system has a range of different inputs, including nature and human resources, in which resources are made available to consumers through a market system and regulated by government policies to attract investment. Holden's model also places a focus on broader contemporary environmental issues such as carbon emissions from flights, and tourist satisfaction. Several studies have shown that different types of tourists desire different environmental interactions as a part of their tourism experience (e.g. Young, 1999; Shoval, 2000; Andriotis, 2009). Iso-Ahola (1980),

b)TOURISM IMPACTS IN SABARIMALA, PATHANAMTHITTA

The 'environment' here refers to the definition of the physical environment and follows the definition given in the Indian Environmental Protection Act of 1986 as including 'water, air, and land and the interrelationship which exists among and between water, air, and land, and human beings, other living creatures, plants, micro-organism, and property'(Dived and Khator 1995). The Sabarimala temple is situated on a hilltop at a height of 467 meters above sea level deep in the dense forest in the southernmost part of the Periyar Wildlife Sanctuary in the Western Ghats. The pilgrim center of Sabarimala is unique because of its geographical and ecological peculiarities. The Pampa River is considered the Dakshina Ganga (Southern Ganges) because of its association with Kerala's Largest Pilgrim Centre, Sabarimala.

c) ENVIRONMENTAL ATTRIBUTES

Air, water, climate, soil, natural vegetation, and landforms are all environmental factors. Environmental factors affect everyday living and play a key role in bringing health differences across geographic areas. (definition)

d)ENVIRONMENTAL IMPACT ASSESSMENT

(EIA) is a process of evaluating the likely environmental impacts of a proposed project or development, taking into account inter-related socio-economic, cultural, and human-health impacts, both beneficial and adverse.

UNEP defines Environmental Impact Assessment (EIA) as a tool used to identify the environmental, social, and economic impacts of a project before decision-making. It aims to predict environmental impacts at an early stage in project planning and design, find ways and means to reduce adverse impacts, shape projects to suit the local environment, and present the predictions and options to decision-makers. Environment Impact Assessment in India is statutorily backed by **the Environment Protection Act, of 1986** which contains various provisions on EIA methodology and process.

e)Water and Environmental Policies in India

1. National River Conservation Plan

The National River Conservation Plan (NRCP) covering 38 rivers over 20 states is a centrally sponsored scheme to assist the states in improving the water quality of rivers.

The objective of the NRCP is to improve water quality through the implementation of pollution abatement works. Interception and diversion of sewage and setting up of sewage treatment plants are the main components of pollution abatement schemes.

The NRCP does not cover four major rivers i.e. the Ganga, Yamuna, Gomti, and Damodar in North and Eastern India. They are covered separately by other major river-specific schemes.

Two of the most important river conservation plans that have been implemented in India recently are the Ganga Action Plan (GAP) and the Yamuna Action Plan (YAP). Both have pollution load reduction as their core programme interventions.

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2. Ganga Action Plan (GAP)

The GAP was approved in April 1985 as a centrally sponsored scheme, with 100 percent of the funds flowing from the federal government. To lay down policies and programmes, the Government of India constituted the Central Ganga Authority(CGA) and renamed this the National River Conservation Authority in September 1995.

3. Yamuna Action Plan (YAP)

The Yamuna Action Plan was implemented in two phases envisaging the protection and preservation of the Yamuna River from pollution. The Yamuna runs a length of 1,375 km, spreading across three states.

The key objective of the YAP is to stop wastewater from drains being dumped into the river and to intercept and divert sewage.

The Kerala Government had already launched the 'Suchitwa Mission' in the area of Sabarimala to protect and safeguard the river Pampa. The mission built Awareness among the Ayyappa devotees on the need to keep Pampa and Sabarimala neat and clean and not to throw any waste into the Pamba river. Also, the Ministry of Environment, Forest, and Climate Change launched the Pamba Action Plan for the abatement of pollution of river Pamba for an amount of Rs. 18.45 crore under the National River Conservation Plan(NRCP). The project includes a sewerage system & sewage treatment plants, bathing ghats, community toilets, public participation, etc. at Pamba and Sabrimala.

f)Water management and institutions in Kerala

Water resources management are presently operated at two administrative levels. One is at the secretariat level, which assists respective ministers, and the second is at the field level, which generally operates in the districts.

g)Institutions

1. Kerala Water Authority
2. Groundwater Department
3. Irrigation Department
4. Kerala State Pollution Control Board
5. Pamba River Basin Authority

h)Administration initiatives a Wastewater treatment plant for safe drinking water.

The Pollution Control Board of Kerala (PCB) has undergone laboratory analysis of the water quality of the Pamba River and found that the level of coliform bacteria was considerably high. The Travancore Devaswom Board (TDB) set up wastewater treatment plants at Pamba and Nilakkal to improve the water quality providing the pilgrims. The new plan focuses on enhancing the quality of water better than the earlier constructed plant.

Setting up a new treatment plant was an urgent need since the existing treatment plant failed to provide satisfactory results. The 5 MLD capacity treatment plant will replace the old one after the completion of its construction.

TDB declared that the new treatment plant will eliminate all the technical errors that they have come across in the existing treatment plant.

Sl no	Case study selected	Waste Generation and Management	Sanitation Challenges	Traffic Congestion & air pollution	Water scarcity and Pollution	Mitigation measures/Elements
1.	Kumbh mela ,India	The Kumbha Mela generates a considerable amount of waste, which can strain the local waste management systems.	The sanitation facilities at the Kumbha Mela may be inadequate to cater to the large number of attendees. This can lead to open defecation and other sanitation issues.	The Kumbha Mela witnesses a surge in the number of visitors, leading to traffic congestion and increased vehicular emissions, contributing to air pollution.	River Pollution: The Kumbha Mela is held on the banks of the Ganges River, and the influx of pilgrims can lead to river pollution. Pilgrims often use the river for bathing, and this can lead to water contamination if not managed properly.	-The Kumbh had implemented many modern techniques like advanced water treatment units. -Applying gravel to a dirt road surface. -Sealing unpaved roads with pavement or impermeable materials.
2.	Hajj,Mecca ,Saudi	The Hajj pilgrimage in Mecca generates a substantial amount of municipal solid waste. The waste is disposed of in landfills, contributing to environmental degradation	The waste management infrastructure may not be adequate to handle the surge in waste production during the pilgrimag.	The high number of pilgrims and vehicular traffic during the Hajj season can lead to air pollution due to vehicle emissions. This may have negative effects on air quality in the region.	The influx of millions of pilgrims during Hajj can strain the local water resources. The demand for water can lead to over-extraction from local sources, potentially exacerbating water scarcity issues.	The government of Saudi Arabia has set various strategies and policies to mitigate the impact of the Hajjb activities on the environmental sustainability - such as the Green Hajj project, the Prepared Meal project, and an Environmental Charter .
3.	Comparitive Analysis	Both the Hajj and Kumbha Mela generate significant amounts of waste. Waste management is a challenge in both cases, and improved infrastructure and practices are needed to mitigate their environmental impacts.	Ensuring adequate sanitation facilities and public health measures for large gatherings like these is crucial to mitigate their environmental and health impacts.	Both events are associated with increased vehicular traffic, leading to air pollution. Improved transportation and emission control measures are necessary to reduce air pollution.	While the Hajj may exacerbate water scarcity due to increased demand, the Kumbha Mela has the potential to pollute the Ganges River. Both events need better water management strategies.	—

Figure: a comparative analysis of the case study

Source: Author generated

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VIII. STUDY AREA

LOCATION: Pamba River area at Perunad grama panchayath.Perunad (Ranni-Perunad) village in Pathanamthitta district, Kerala. It's located on the banks of the Pamba River and Kakadu River. Perunad is located on the main road to Sabarimala. According to the Kasturi Rangan report, 6 villages in the Pathanamthitta district are considered as the eco-sensitive villages. The study area Perinadu village is coming under this category.

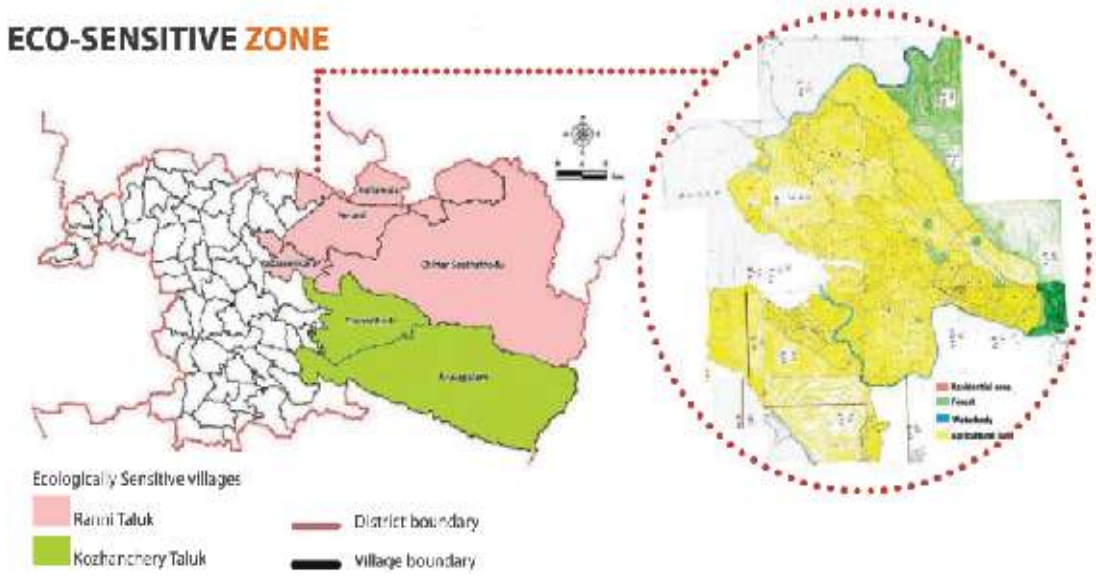

Figure: ESA villages, Pathanamthitta district

For analysing the pollution level in each ward of Perinadu panchayathu Water quality index method is used in the survey.

Water Quality Index Test

Arithmetic Mean Method.

WQI is calculated by the following equation:

$$WQI=\sum_{n=1}^{n} qnwn / \sum_{n=1}^{n} wn$$

- Wn = k/sn
-Wn = unit weight for nth parameter
- Sn = standard permissible value for nth parameter
- k = proportionality constant.
- qn=100 (vn-vi) / (vs-vi)

vs = Standard value, vn = observed value, vi = ideal value

In most cases vi=0 except in certain parameters like pH

- q pH = 100 (v pH – 7.0) / (8.5 – 1.0)

The water was tested for, Turbidity, Conductivity, Chloride, Total Alkalinity, Total Acidity, Total Hardness, Total dissolved solids, Coliforms, and E-coli

The selected wards are Mukkam(S1),Perunad(S2),Madathum,moozhy(S3), Puthukkada(S4),Arayanjilimon(S5),Thulappally(S6),Naranamthodu(S7),Sabarimala(S8),Manakkayam (S9),Kannanumon(S10),Nedumon(S11),Mampara(S12),Kakkad(S13),Madamon(S14).

The water quality in the (S8) Sabarimala ward exhibits a consistent alteration. Before the pilgrimage season, the concentration of coliform bacteria in this area measured 600mg/l, whereas post the pilgrimage season, it escalated to 1800 mg/in 2020. The amount of e-coli bacteria still remains the same in this season also (2023).the Sabarimala ward show more e-coli bacteria presence.

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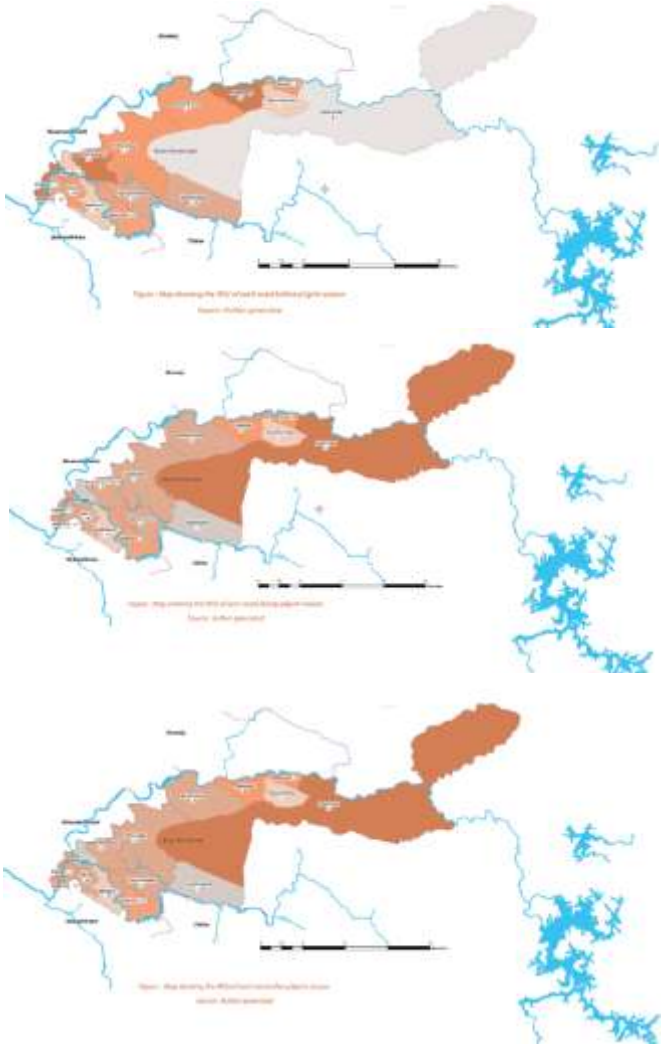
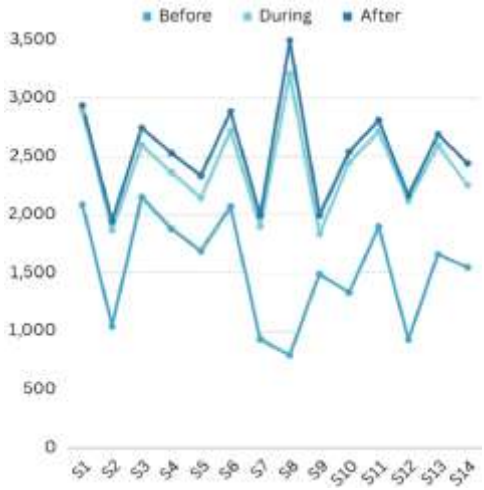


Figure: Map showing the pollution pattern before, during, and after the pilgrim season(2023)
Source: Author-generated



Graph: Comparative analysis of water quality(2023)
Source: Author generated

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IX. POLLUTION STATUS AT SABARIMALA

The congregation of pilgrims at Sabarimala is the cause of pollution and congestion at Pamba. The influx of pilgrims is clogging the roads and polluting the river. Increased commercial activity, mainly hotel business, during the pilgrimage period adds to the pollution problem. The assessment of the impact on the environment due to the pilgrimage and the action plan to protect the environment has been based on the number of pilgrims visiting Sabarimala. All the pilgrims coming to Sabarimala take bathe in the Pamba before proceeding to the temple. There is only very little flow in the river and this makes the river highly polluted. Sewage and hotel wastes from latrines and hotels around Pamba and Sabarimala add to this pollution. Tons of garbage are generated every day and as its collection and disposal are inadequate this also contributes to river pollution. At Pamba the dust and smoke from the thousands of vehicles contribute to air pollution. Sabarimala and Pamba areas are part of the Periyar Tiger Reserve. However human intervention as part of this yearly pilgrimage has degraded the forest cover in the area. The damage to the forest cover has resulted in poor water retention by the forest and is one of the reasons for the low flow in Pamba during the dry period.

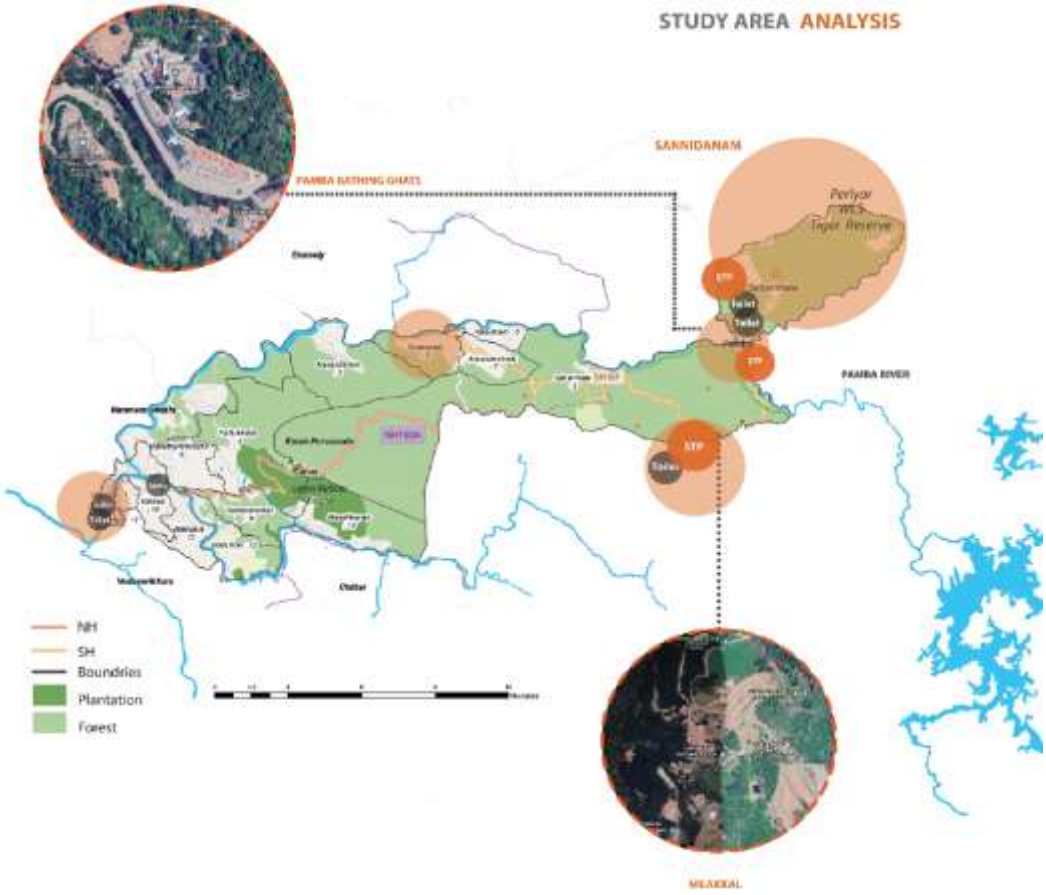

Figure: Major pollution hotspots identified

Author generated

X.ANALYSIS

Pollution in Sabarimala Ward: - Pollution levels are low during the off-season.

- During and after the pilgrimage season, pollution levels exceed 3000, indicating a significant increase.

Pollution in Thulappally and Mukkam Wards:

-Pollution levels are consistently high in these wards.

-Sedimentation may contribute to the high pollution levels in these areas.

-The presence of ferry bathing ghat is also a reason for this.

Overall Trend: - Pollution levels in all wards increase during and after the pilgrim seasons.
-This suggests that pilgrimage activities are a major contributor to the pollution in Perunadu Panchayathu.

Major Pollution Sources:
- Bathing ghats and Nilakkal are identified as major sources of pollution in the Pamba River during pilgrim seasons.
-Low discharge of river water during and after pilgrim season is another factor in the increased amount of coliforms.

XI.SUGGESTIONS/PROPOSALS

a). Proposing wetland constructions to the major hot spot areas such as the bathing ghat at Pamba and Nilakkal.
Wetlands construction helps to filter the pollutants directly entered during the pilgrim season. And also this is a sustainable method, and cost-effective.
b). Proposing river dredging at the Thulapally and Mukkam wards, because the sedimentation level is very high in this region.
c). Introducing a high-tech monitoring system is also helpful in identifying the hot spot areas and concentration levels more accurately during the pilgrim seasons.

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