DHARA-SPRINGS

A Profile to Visakhapatnam's Spring Shed Ecosytem

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By Centre for Urban Water Resources, DHAN Foundation

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Preface

Visakhapatnam, historically and hydrologically, stands as a unique spring shed ecosystem. This urban context, unlike any other in India, houses a delicate yet essential balance of natural water sources that have supported generations. Core to this ecosystem are the springs that have traditionally been a primary source of water. However, over the last few decades, these vital resources have seen a decline, largely due to urbanization, deforestation, and unsustainable land use. DHAN Foundation, with its dedication to empowering marginalized communities, has long recognized the need for informed decision-making rooted in reliable data. This book seeks to revive the lost knowledge and practices surrounding spring conservation, presenting it as a crucial part of sustainable water management for the city and beyond.

The challenge now is to integrate this knowledge into contemporary water management practices, ensuring that the springs of Visakhapatnam, and the cultural values they embody, are preserved. This book is not just an academic resource, but a call to action for policymakers, researchers, students, and the community at large. By reconnecting with the water systems that have sustained us for centuries, we can begin to build a more sustainable future for Visakhapatnam and its springs.

We are grateful to the Visakhapatnam District Administration, Visakhapatnam Metropolitan Region Development Authority (VMRDA), and the Sri Varahalakshmi Narasimha Swamy Vari Devasthanam, Simhachalam, for their unwavering support throughout this project. Our heartfelt thanks also go to the Redington Limited for their CSR support through Redington Foundation, which made this book possible, bringing indigenous water conservation knowledge to the forefront.

We hope this work sparks conversations, collaborations, and a renewed commitment to conserving the precious water resources that lie at the heart of our existence. Let us honor and protect the DHARA—the lost & last key of sustainability.

Centre for Urban Water Resources,
DHAN Foundation.

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Chapter 1: Springs - The Missed Prime Sources

"Our ancestors restricted the misuse of precious water by assigning divinity to it, proving their social commitment to water." as repeatedly stated in the book Indian Water Culture. The nexus of India-Water-Culture safeguarded several water resources in the name of Sacredness. The prime sacred water resource is the springs. Natural springs have been a vital part of the hydrological cycle for millennia. The very existence of springs has given rise to unique indigenous biodiverse ecosystems, which act as catalysts for human settlements in highland regions from Himalayan ranges to Western & Eastern Ghats of Deccan Plateau.

The unusual trend of urbanization in India is done by compromising our several Social commitments towards the environment. India, The oldest civilisation of the world is entering into the most brutal urbanization either in the name of western Impact or in the name of Survival. This urban transformation is mostly homogeneous by compromising the uniqueness of the local land's topology, Hydrology and even geology. Visakhapatnam, an ecosystem rich terrain is also a victim of this urbanization. The city is in a trend of losing its unique features like Springs in hills of Simhachalam, Kambalakonda, Yarada. This book throws a limelight on the importance of Springs and the dissemination of local springs in Visakhapatnam City.

Defining Springs and Their Relevance to Visakhapatnam

A spring is a natural outflow where groundwater from an aquifer surfaces, becoming part of streams and rivers. Springs are formed through forces like gravity and hydrostatic pressure and are commonly found on hillsides, valleys, or slopes. In Visakhapatnam, springs are crucial to the water supply, particularly in hill ranges like Simhachalam, Kombalakonda, and Yarada.

Springs are connected to aquifers, which store groundwater and feed water bodies. There are two main types of aquifers: confined and unconfined. Confined aquifers, located deep within impermeable layers, feed springs under pressure, while unconfined aquifers allow easier water movement. In Visakhapatnam, springs emerge from different geological features, including gravity, contact, fracture, artesian, karst, and fault springs. These types vary in their formation based on topography, rock types, and faulting conditions.

However, urbanization, deforestation, soil erosion, and changes in land use have impacted spring recharge areas, leading to reduced spring discharge and the drying of some springs. The deterioration of these springs affects the flow of streams and rivers, highlighting the need for sustainable management to protect Visakhapatnam's valuable spring resources. Proper conservation of these springs and their recharge areas, or springsheds, is essential to maintain water availability for both ecological and human needs.

Hydrological Understanding of Visakhapatnam and Its Connection to Springs

Visakhapatnam's hydrological context, shaped by its tropical wet and dry climate and rainfall patterns, is directly linked to the availability and sustainability of its natural springs. Although the city's annual rainfall is slightly below the national average, the seasonal monsoon rains play a critical role in replenishing water sources. These rains help maintain the groundwater levels that feed the 32 identified springs in the Simhachalam Hills, including key sources like Gangadhara and Saidhara.

The region's hydrological boundaries, defined by river basins such as the Gosthani, Madhurawada, Narvagedda, Saradha, and Anakapalli basins, also influence the water flow and quality of these springs. The hill ranges, which form catchment areas for the river basins, serve as natural water reservoirs, supplying water to both springs and downstream waterbodies. The diverse ecosystems within these basins help in regulating water flow, supporting both the springs' discharge and the local water supply.

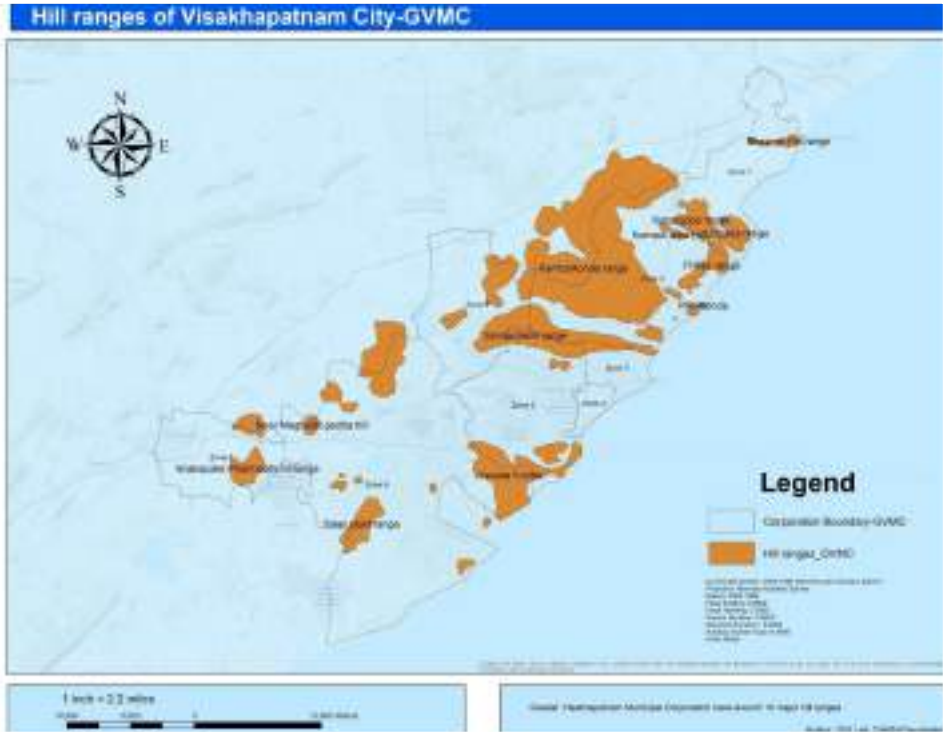
However, urbanization and the complex overlap of administrative boundaries with hydrological zones pose challenges to water management in Visakhapatnam. The city's dependence on water from distant sources, like bore wells, and the pressure on local resources from increasing development, calls for a more integrated approach to water conservation. Understanding and managing these river and hill basins effectively are essential not only for the protection of the springs but also for ensuring sustainable water availability in the city for all uses, including drinking, agriculture, and industrial needs. Proper conservation of these natural water systems, including the springs in the Simhachalam Hills, is vital for maintaining ecological health and supporting the city's future development.

Geographical Understanding and Its Connection to Springs

Visakhapatnam's unique geography, with its mineral-rich terrain and diverse rock formations, directly influences the availability and flow of water sources, including springs. The meeting point of the Eastern Ghats and the Bay of Bengal creates a varied topography, with hills and estuaries that contribute to the region's water systems. The mineral wealth and geological structures, including gneisses, granites, and schists, have shaped the region's natural springs, such as Gangadhara, Saidhara, and Aakasadhara, which rely on groundwater movement through these rock formations.

The region's 10 hill ranges are crucial in sustaining these springs. As catchment areas, these hills not only support the natural flow of groundwater but also regulate the water supply for both the local population and the Simhachalam temple. The presence of mangroves and estuaries along the coastline further supports the water cycle, impacting the flow and quality of spring water by stabilizing the environment and preventing erosion

Given the region's seismic activity, the movement of tectonic plates could also affect the hydrology of the area, influencing spring discharge and availability. The interplay between the hills, geology, and springs underscores the importance of protecting these catchment areas to ensure the long-term sustainability of the springs that are vital to both ecological balance and human use in Visakhapatnam.



Chapter 2: Simhachalam Spring Shed Ecosystem

Core Visakhapatnam city is historically and hydrologically a spring shed ecosystem. This is a unique ecosystem in the urban context for entire India. Simhachalam hills are in altitude of 800 feet from the MSL, in a Kailasa range of Eastern Ghats. The noteworthy feature of the hill is abounding in perennial rivulets, Springs and Seepages. Interestingly the names of the nearby settlements are Simhachalam Dhara, Sitamma Dhara and Madhava Dhara. Where Dhara refers the Springs. There were more than 34 springs names in the Simhachalam Hills are mapped by the tribals. But now locals were able to list only a few springs, namely Gangadhara, Naagadhara, Saagidhara, Aakasadhara, Pichhukadhara, Madhavadhara, Seekudhara, Pulletidhara. Among which Gangadhara, Naagadhara, Saagidhara, Pulletidhara, Madhavadhara, Seethammadhara are almost perennial. Aakasadhara, Pichhukadhara, are seasonal. Many Springs are dysfunctional. The simhachalam ranges are extended upto 40kms but the southern facing valley have many springs due to joints and fractures have resulted in micro valleys. Geologically, Simhachalam rock has a property of charnockite which is metamorphic rocks with variable chemical composition. Previously, The Simhachalam temple meets all water requirements without digging a borewell or getting water from GVMC. Now they have three borewells in the temple permises. Again Previously Muddasarlova Cheruvu which is completely fed by Springs originating in Kailasa and Kombalakonda ranges acts as the main sources of drinking water. In fact, several efforts have been made to know the origin of the water springs of Simhachalam, but understanding the hydro-geology is remains challenging. In this book, we attempted to understand the springs of Simhachalam hills based on its feature.

From the tribals we identified 34 names of the springs in Simhachalam Hills

1.Gangadhara
2.Naagadhara
3.Saidhara
4.Aakasadhara
5.Pichhukadhara
6.Hanumandhara
7. Devidhara
8.Seethammaadhara
9.Rittlavadhara
10.Zeelikadhara
11.Ganesh Colony Dhara
12.Madhaavadhara
13.Seekudhara
14.Gogidharaa
15.Zedugadhara
16.Pulletidhara
17.Sivitidhara
18.Govidhara
19.Puttidhara
20.Musalidhara
21.Enugudhara
22.Guridhara
23.Lavvudhara
24.Adduludhara
25.Vaddaladhara
26.Solladhara
27.Venkatarammurtydhara
28.Emmanadahara
29.Dhummuldhara
30.Anthaladhara
31.Chandrammadhara
32.Mallammadhara
33.Ananthadhara
34.Kasiganagdhara

Out for this 34 spring names; 18 springs were identified; 4 springs has two names; remaining 9 springs are under track with support of local tribes.

Geographical Location of Springs in the Simhachalam Hill Range

Traditionally, temples are constructed facing the east direction. However, the Simhachalam Temple is uniquely oriented to face the west. This unusual alignment might have been influenced by the flow of the principal spring, Gangadhara, which travels from east to west, in accordance with scriptural traditions.

The springs in the Simhachalam Hill Range are classified into five key areas:

1. Simhachalam Temple Area
2. NSTL Area
3. Madhavadhara Area
4. Seethamadhara Area
5. Central Jail Area

These areas exhibit significant Land Use and Land Cover (LULC) changes around the perennial springs. Special attention to these regions is critical in the context of urban master planning to ensure the springs' sustainability.

Springshed Area 1: Simhachalam Temple Area

The Simhachalam Temple vicinity hosts over eight springs, five of which are actively utilized to meet the temple's water requirements. The principal springs, Gangadhara and Anathadhara, hold religious significance and are integral to rituals and the preparation of prasadam (holy offerings).

Springshed Area 2: NSTL Area

This defense area contains three springs that primarily support agroforestry practices. The drainage systems here are well-maintained, ensuring effective water collection. However, some spring-adjacent lands are under dispute due to ownership conflicts, with certain cases pending in the Court.

Springshed Area 3: Madhavadhara Temple Area

The Madhavadhara Temple area hosts six springs. These springs serve multiple purposes, including rituals, agroforestry, and effective drainage collection. Similar to the NSTL area, some land parcels here are embroiled in ownership conflicts, with ongoing legal cases.

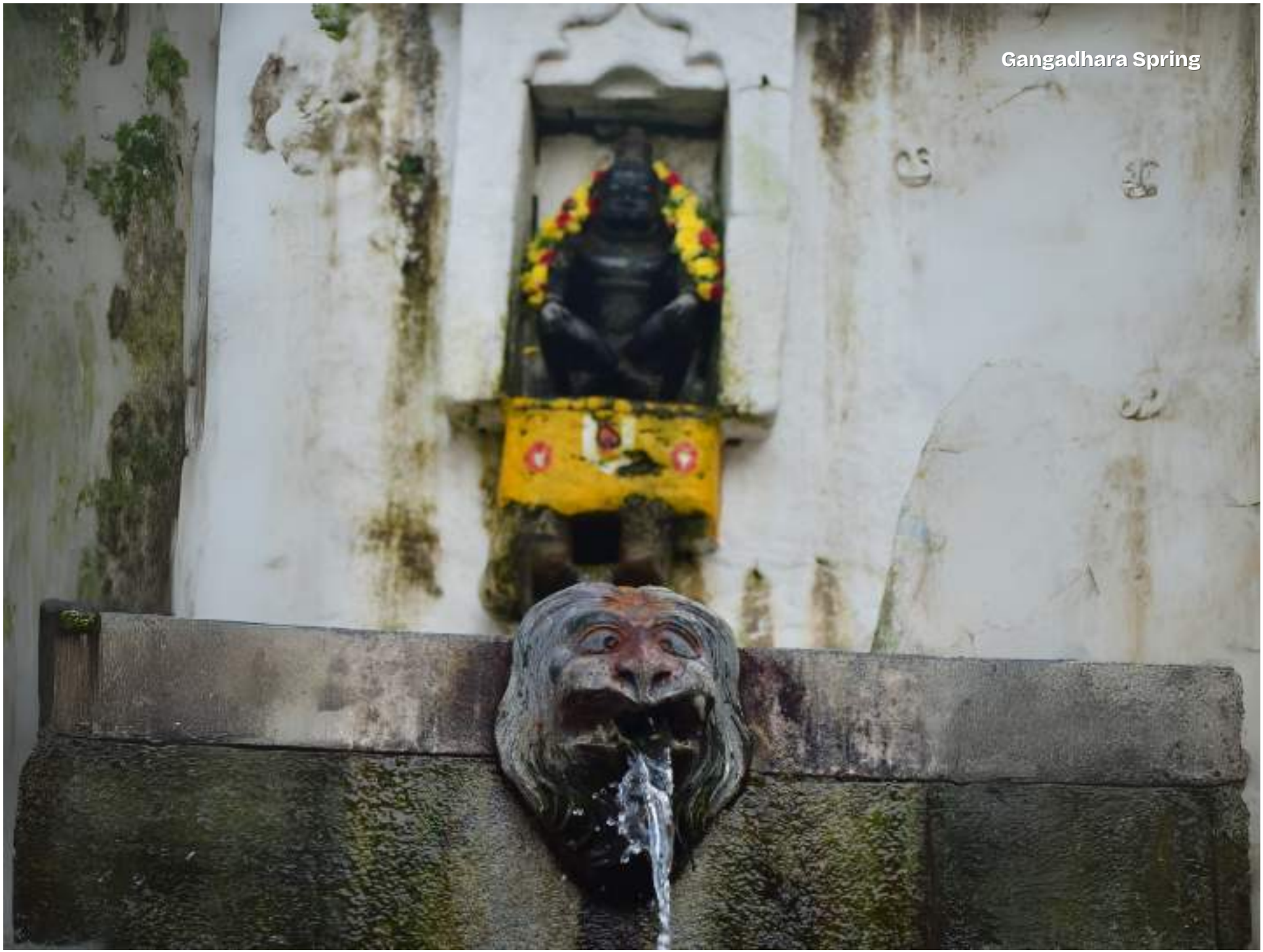
Springshed Area 4: Seethamadhara Area

This area is home to three springs, two of which are perennial and discharge water efficiently. The Ganesh Colony Springs are effectively used for domestic purposes. However, like other areas, certain lands associated with these springs are under ownership disputes, and related legal matters are awaiting resolution.

Springshed Area 5: Central Jail Area

This located on the opposite side of the hill, this area hosts two springs. These springs have been tentatively identified, but pinpointing their exact locations remains a challenge due to limited accessibility and data.

This classification highlights the ecological and socio-economic importance of springs in the Simhachalam Hill Range. A focused approach to spring conservation and resolution of land disputes is essential for their sustainable management.


Gangadhara Spring

Chapter 3: Details of Individual Springs in Simhachalam

1.Gangadhara Spring

Historical and Cultural Significance

Gangadhara is the most sacred spring of the Simhachalam Hill Range, celebrated for its historical, cultural, and spiritual importance. Located at the right corner of the Simhachalam Temple, Gangadhara sits at a higher altitude than the temple structure, symbolizing its prominence in religious traditions. The ancient mandapam built around the spring emphasizes its antiquity and its role as the Lord's bathing ghat. Also known as Kasigangadhara and Puttidhara, this perennial spring is revered for its uninterrupted flow, which increases during the rainy season.

Geographical and Physical Characteristics

The spring is geographically situated at latitude 17.768284°N and longitude 83.251688°E. It is classified as a depression or gravity-fed spring, with a discharge rate of approximately one liter per second under normal conditions, doubling during the monsoon. The water quality is exceptional, with Total Dissolved Solids (TDS) levels below 45 mg/L, making it highly suitable for sacred and practical use. Near the spring, two ancient inscriptions written in Sanskrit using the Telugu script have been found. One inscription highlights the sanctity of bathing in the spring, while the other commemorates a victory by a local king, cementing its historical significance.

Water Usage and Management

The temple administration manages Gangadhara's water through two primary systems. One system channels the water into a one-lakh-liter storage tank, while the other supplies it directly through pipelines for devotees to use for drinking, bathing, and preparing annaprasadam. The temple also constructed a tank at Kesakhandanasala using Gangadhara's water for holy dip rituals. Historically, water was transported daily by an elephant for the Lord's bathing services, a practice now replaced by modern plumbing systems. Among all the springs in the Simhachalam Hill Range, Gangadhara is the most productive, with the highest discharge rate.

Infrastructure Development and Ecological Impact

To accommodate the growing number of devotees, significant infrastructure developments have been undertaken around the spring. These include the construction of wide roads, high retaining walls, rest houses, and storage tanks. While these measures enhance accessibility and convenience, they have also affected the surrounding ecology. The spring continues to be a vital resource for the temple, fulfilling both ritualistic and daily needs of devotees.

Preservation and Future Outlook

Gangadhara remains a cornerstone of the Simhachalam temple's spiritual and cultural heritage. However, to ensure its sustainability for future generations, there is a pressing need for adopting eco-sensitive management practices. Balancing infrastructure development with ecological preservation will be crucial to maintaining the sanctity and utility of this sacred spring.

Naagadhara (Ananthadhara)

2. Naagadhara (Ananthadhara)

Historical and Cultural Significance
Naagadhara, also known as Ananthadhara, holds spiritual importance within the Simhachalam Temple premises. It is named after the Nagaswami statue from which its water flows. Although less popular than other springs due to restricted access, Naagadhara plays a vital role in temple rituals, as its water is exclusively used for preparing prasadam, connecting devotees spiritually through this sacred offering.

Geographical and Physical Characteristics
Naagadhara is the only spring located within the temple premises, situated at latitude 17.766067°N and longitude 83.250897°E. It is positioned on the left side of the temple, at a certain height along the wall, with its outlet crafted in the shape of a naga face. As a perennial spring, it discharges water at a slow but steady rate of approximately 1 liter per minute. Despite its modest flow, the spring remains reliable throughout the year, with Total Dissolved Solids (TDS) measuring less than 45 mg/L, indicating high water quality.

Water Usage and Management
The water from Naagadhara is entirely reserved for making prasadam within the temple premises, highlighting its exclusive spiritual role. Though its discharge is relatively low, the water supply is sufficient for its dedicated purpose. The spring is connected through a pipe system to a 1,000-liter capacity storage tank to ensure efficient collection and usage for temple needs.

Infrastructure Development and Ecological Impact
Naagadhara is no longer directly visible to visitors because of its elevation, as it is enclosed and integrated into a pipe-based collection system. While this arrangement secures the water supply for its sacred function, it limits the natural aesthetic and ecological expression of the spring. The infrastructure ensures adequate water availability for the temple, but changes in its natural flow may impact the broader spring ecosystem over time.

Preservation and Future Outlook
Despite a reduction in flow over time, Naagadhara continues to fulfill its primary role in prasadam preparation. Preserving this sacred spring requires a balanced approach, ensuring its continued functionality while exploring eco-friendly measures to maintain its natural state. Restoring visibility and incorporating traditional practices could enhance its cultural and ecological significance.


Chakidhara (Saagidhara/Enugudhara)

3. Chakidhara (Saagidhara/Enugudhara)

Historical and Cultural Significance

Chakidhara, also known as Saagidhara or Enugudhara, is a prominent spring used primarily by locals and priests for bathing. Its significance stems from its convenient location and reliable discharge, making it one of the most accessible springs in the region. The spring outlet features an elephant-head statue, which inspired the name "Enugudhara," meaning "elephant spring." The intricate sculptures surrounding the spring reflect its millennia-old existence and cultural importance.

Geographical and Physical Characteristics

Chakidhara is located at latitude 17.767435°N and longitude 83.247884°E. It is the topmost spring on the hill, positioned conveniently near the staircase, making it easily accessible. As a perennial spring, Chakidhara functions as a fracture spring, with a discharge rate of approximately 45 liters per minute even during peak summer. The water flows through a gravity-fed pipe system, and its Total Dissolved Solids (TDS) content is recorded at less than 190 mg/L. Over time, concrete structures were added around the spring to channel water for domestic use, which has impacted the natural aesthetics and sensitivity of the ecosystem.

Water Usage and Management

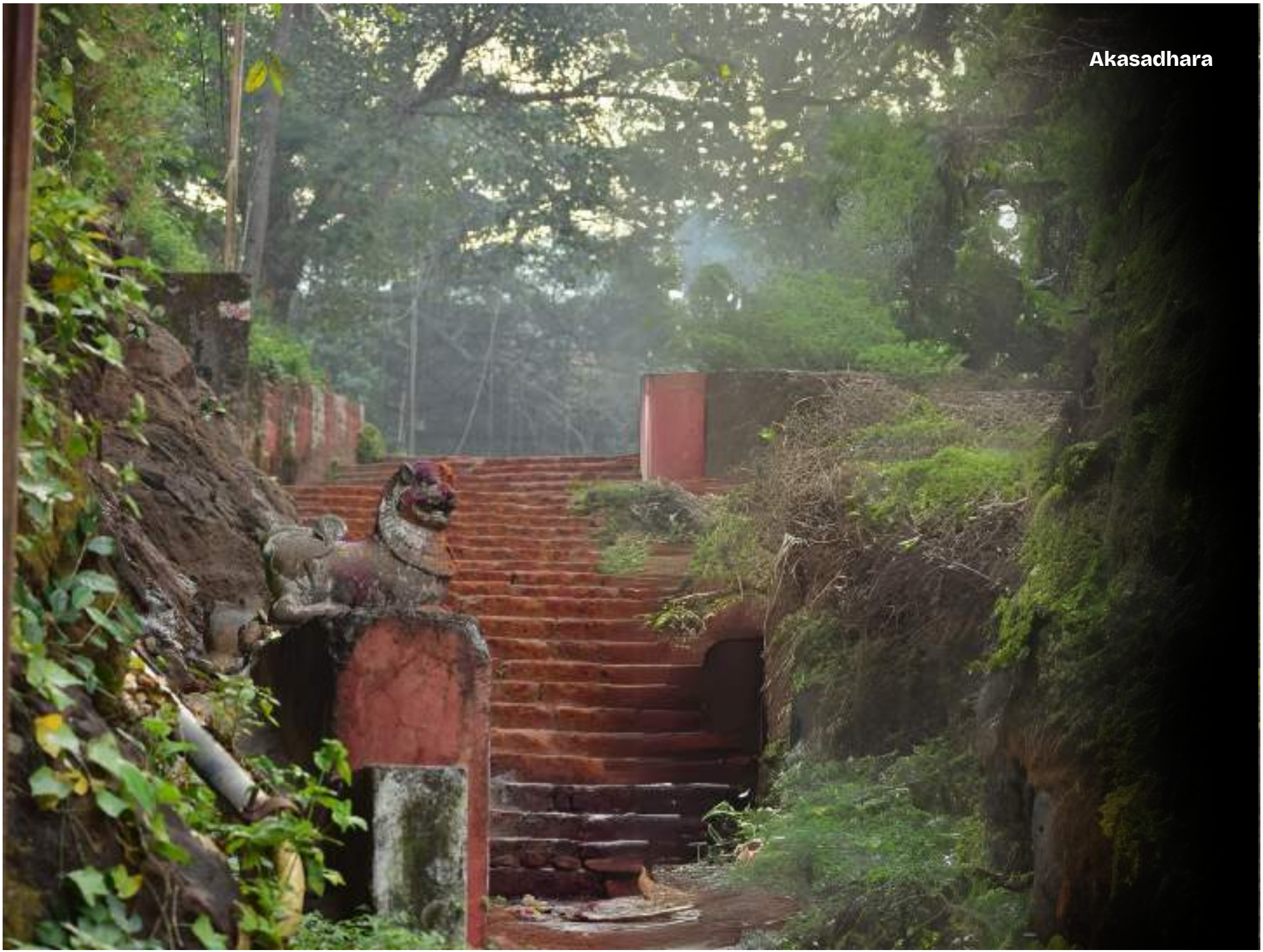
Chakidhara serves multiple purposes, including domestic use and water supply for a treatment plant. Water from the spring is also diverted to a storage structure for irrigation, particularly for maintaining the nearby flower garden. Historically, the spring's water supported agricultural practices, but modern interventions have shifted its usage toward household and decorative applications. However, excessive concrete structures have altered the natural flow and may affect the spring's long-term sustainability.

Infrastructure Development and Ecological Impact

The spring is surrounded by infrastructure, including a staircase, water diversion structures, and a concrete-lined flow system, which have disturbed the sensitive spring ecosystem. Despite these developments, the spring has maintained its high discharge efficiency, even during summer months. A large banyan tree adjacent to the spring may play an ecological role in sustaining its flow, but the increasing human interventions pose challenges to the spring's ecological balance.

Preservation and Future Outlook

Chakidhara continues to provide vital water resources for domestic and irrigation purposes, yet the growing infrastructure around it requires careful management. Efforts must focus on preserving the ecological flow of the spring, especially during summer when water demand peaks. Balancing its utility with ecological preservation will be essential to sustaining Chakidhara as a valuable natural and cultural resource.


Akasadhara

4. Akasadhara

Historical and Cultural Significance
Aakasadhara, meaning "waterfall from the sky," is a naturally formed seasonal spring resembling a waterfall. Though no ancient structures are associated with this spring, it holds spiritual significance due to its proximity to deities and images of gods placed around it. Its name and form evoke a sense of divine connection, making it revered despite its intermittent flow.

Geographical and Physical Characteristics
Aakasadhara is located at latitude 17.767963°N and longitude 83.247906°E, positioned to the left of the main pathway on the hill. This spring is categorized as a seasonal and periodic fracture spring, with its flow resembling a waterfall during the rainy season. The surrounding ecosystem remains relatively untouched, likely due to its seasonal nature. Unlike other springs, no ancient structures are found near Aakasadhara, but its natural beauty is marked by its unique waterfall-like characteristics.

Water Usage and Management
Although primarily a seasonal spring supporting ecological flow, evidence of GI, plastic, and HDPE pipe systems indicates that its water is partially diverted for domestic use at the hilltop. During peak flow in the rainy season, it contributes significantly to the surrounding greenery and natural water systems. However, its utility during dry months is minimal due to limited discharge.

Infrastructure Development and Ecological Impact
Aakasadhara remains less impacted by human activities compared to other springs, with its surrounding ecosystem largely intact. The minimal infrastructure around the spring reflects its seasonal nature, though the presence of pipe systems suggests an attempt to utilize its flow efficiently for practical purposes. Its untouched surroundings are an ecological asset, preserving the biodiversity in its vicinity.

Preservation and Future Outlook
During the rainy season, Aakasadhara transforms into a waterfall, drawing devotional significance and adding to the natural beauty of the area. Efforts should focus on maintaining the ecological flow during rainy days while minimizing human intervention. Its limited flow during non-rainy seasons necessitates sustainable practices to balance domestic use and ecological preservation. Emphasizing its natural and spiritual value will ensure its continued significance in the Simhachalam hill ecosystem.

Chakaradhara and Pichhukadhara

5 & 6. Chakaradhara and Pichhukadhara

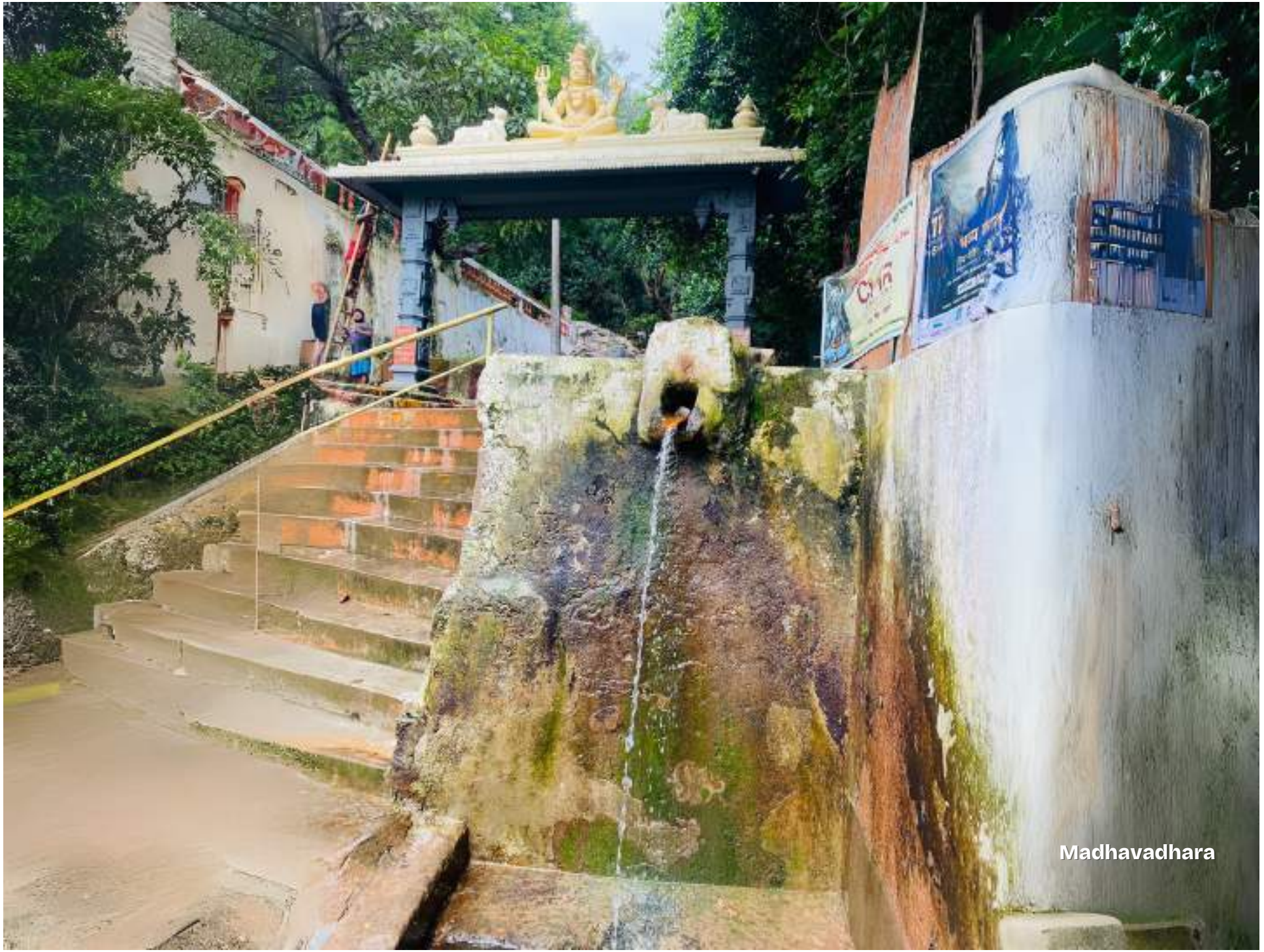
Historical and Cultural Significance
Pichhukadhara, also known as the Sparrow Spring, derives its name from the numerous outlets within the fractured rocks, resembling the scattering of sparrows. Chakaradhara and Pichhukadhara collectively serve as significant water sources, forming a confluence of multiple outlets that are revered for their perennial flow.

Geographical and Physical Characteristics
Located at latitude 17.767603°N and longitude 83.247728°E, these springs are positioned on the left side of the pathway leading to the temple. Their altitude is lower than the temple structure. Classified as perennial fracture springs, their discharge rate is approximately 2,400 liters per day during peak summer. The springs have a Total Dissolved Solids (TDS) level of less than 50 mg/L, reflecting high water quality. Historically, the water from these springs was used for agricultural purposes, benefiting local farmers.

Water Usage and Management
Currently, the water from Chakaradhara and Pichhukadhara is diverted by the temple administration to a minor treatment plant for purification before being utilized for domestic purposes. This managed use underscores the importance of these springs in supporting the daily needs of the temple and nearby residents.

Infrastructure Development and Ecological Impact
To safeguard the springs, a concrete enclosure has been constructed, which, while effective in protecting the water source, entirely obstructs the natural visibility of the springs. The spring wall is partially constructed using traditional stone pitching, but the extensive use of concrete impacts the surrounding environment. The collected water is transported through HDPE pipelines for storage and treatment. Unfortunately, no ecological flow is maintained, adversely affecting the dependent ecosystems in the area.

Preservation and Future Outlook
Efforts to balance preservation with sustainable water management are essential for Chakaradhara and Pichhukadhara. While infrastructure developments ensure water safety and usability, it is crucial to incorporate measures that maintain ecological flow and minimize environmental disruption. Enhancing visibility and ecological connectivity would restore their natural and cultural significance, benefiting both biodiversity and the local community.


Madhavadhara

7. Madhavadhara

Historical and Cultural Significance
Madhavadhara is believed to be the convergence of three sacred rivers—Ganga, Yamuna, and Sarasvati. Locals hold the belief that these rivers merge here, forming a single spring, which is considered a highly spiritual water source. The spring's name, "Madhavadhara," reflects the divine significance of this union. It is a revered site for devotees who come to perform spiritual bathing and collect water for sacred rituals.

Geographical and Physical Characteristics
Madhavadhara is located near the Madhava Swami Temple, with geo-coordinates at latitude 17.7565°N and longitude 83.256°E. The spring is a blend of water from two significant sources, namely Gomudhara and Chandramukidhara, which converge to form the spring. The discharge rate is approximately 1.5 liters per minute, and the Total Dissolved Solids (TDS) level is around 220 mg/L, indicating moderate mineral content. The spring water is channeled into an open route leading up to the Madhava Swami Temple and is split into two separate channels for male and female devotees for bathing.

Water Usage and Management
The water from Madhavadhara is primarily used for spiritual bathing, with many devotees regularly visiting the spring for this purpose. It is also common for people to collect the water and take it home for use in personal rituals. The temple administration manages the flow of water to ensure its availability for bathing, and the water is considered sacred for the rituals conducted at the temple.

Infrastructure Development and Ecological Impact
An open channel carries water from the spring to the Madhava Swami Temple, with the water flowing in two separate channels at the end for male and female bathing. However, despite the religious significance and high demand for this spring, the discharge rate has decreased over time. The infrastructure in place ensures that the spring's water is efficiently distributed for spiritual purposes, but its reduced flow is a concern for long-term sustainability.

Preservation and Future Outlook
Given the spiritual importance of Madhavadhara and its role in supporting religious practices, it is crucial to focus on preserving the spring's flow and water quality. Addressing the decrease in discharge and ensuring sustainable water management will help maintain its ecological and cultural significance. Preserving the source springs, Gomudhara and Chandramukidhara, is essential for sustaining Madhavadhara as a vital water resource for the temple and the community.


Pulletidhara

8. Pulletidhara

Historical and Cultural Significance

Pulletidhara is a perennial spring that holds cultural and ecological value. Located at the top of a mountain, it is revered by locals and temple devotees. The spring originates from a cave, and its water is believed to flow from various cracks in the cave, with the roots of large trees embedded within these cracks contributing to its discharge. The presence of these roots is significant as they are linked to the spring's water flow, creating a natural network for water distribution.

Geographical and Physical Characteristics

Pulletidhara is situated at the top of a steep hill, approximately 1 km from the base, making access challenging. The geo-coordinates of the spring are latitude 17.758445°N and longitude 83.248571°E. The spring's outlet is connected to a cement circular pipe, and the channel through which the water flows is lined with cement flakes and plastered with cement. At certain points, PVC pipes have been inserted, and the water continues to flow through stone-cut channels. The Total Dissolved Solids (TDS) of the spring water is 50 mg/L, indicating relatively low mineral content.

Water Usage and Management

The water from Pulletidhara is primarily used for irrigation in nearby agroforestry fields. The water is diverted from the spring's outlet through a man-made channel. To improve the efficiency of water distribution, a concrete storage structure has been built at the outlet. This structure collects water for storage and ensures its availability during peak demand times for irrigation. A pipe connection attached to this structure facilitates the transport of water for agricultural use.

Infrastructure Development and Ecological Impact

The path to the spring is a steep climb, but the presence of plant and tree cover makes it manageable for visitors. The cave, from which the spring originates, is a critical point in the spring's functioning, and its water flow is influenced by the cracks in the cave and the tree roots. While the spring's discharge has reduced over time, the channel system is still effective in carrying water from the cave to its final destination. The use of cement and PVC pipes in the infrastructure has minimized losses from seepage, infiltration, and evaporation, ensuring efficient water supply.

Preservation and Future Outlook

Given the natural complexity of the Pulletidhara spring, it is important to maintain its delicate ecosystem. The roots inside and outside the cave play a vital role in sustaining the spring's flow. Ensuring that proper channels are in place will help avoid water loss and allow for better management of water resources. Preservation of the area surrounding the spring, including the large mango and jackfruit trees, is crucial for maintaining its ecological balance. As the discharge of the spring has diminished, maintaining sustainable water management practices and conserving the surrounding flora will be essential for the future health of the spring.


Gottladhara

9. Gottladhara

Historical and Cultural Significance
The true name of this spring remains uncertain, with some locals referring to it as Seethammadhara, though its original name is not clearly identified. The spring holds potential cultural significance, though it is currently underutilized and not well maintained.

Geographical and Physical Characteristics
Located at latitude 17.748657°N and longitude 83.306328°E, Gottladhara is characterized by a discharge rate of 1 liter per second. The spring's water flows from beneath a large stone, and the outlet is connected to a PVC pipe. Despite its potential, the spring suffers from neglect, with the surrounding area being cluttered with debris and garbage.

Water Usage and Management
The water from Gottladhara is used by local villagers for domestic purposes. A small diameter PVC pipe is attached to the outlet to collect the water. However, the infrastructure and maintenance of the spring are insufficient. There is a serious issue of contamination, as the sacred water is being diverted into a drain, and open defecation has been observed near the spring.

Infrastructure Development and Ecological Impact
Currently, the spring's outlet is in a state of disrepair, with the area around it being heavily polluted by garbage and debris. A pond-like structure has been created below the spring, but it is filled with waste that detracts from the spring's sanctity and utility. While a local temple near the spring is maintained by a few villagers, the overall environment around Gottladhara is unhygienic, posing risks to both the ecosystem and public health.

Preservation and Future Outlook
Immediate intervention is required to restore and preserve Gottladhara. The sacred spring water must be protected from contamination, and efforts should be made to clean the area and reduce pollution. Addressing the open defecation and waste management issues around the spring will be crucial for restoring its ecological and cultural significance. Sustainable water management practices, as well as local community involvement in maintaining the spring's sanctity, are essential for ensuring its future health and utility.


Seethammadhara

10. Seethammadhara

Historical and Cultural Significance
The true identity of Seethammadhara remains uncertain due to confusion about its exact location. The presence of the "Ammavaru" stage near the spring site leads some to believe this is Seethammadhara. A significant Hanuman temple has been constructed in front of the spring area, highlighting the site's cultural and spiritual importance.

Geographical and Physical Characteristics
Seethammadhara is located at latitude 17.750022°N and longitude 83.311842°E. This spring is seasonal and is distinct from others in the area due to the unique way its water flows. While most springs discharge water downwards, Seethammadhara's water flows from the downward side, with a wall-type structure built around the spring to store the water. The spring is characterized by fluctuating water levels, with visible changes in the discharge, although the exact flow is not clearly observed.

Water Usage and Management
The water from Seethammadhara is used by the nearby settlements, with the Greater Visakhapatnam Municipal Corporation (GVMC) having constructed two tanks to store water for local usage. The water supply is critical for the local community, though its management could benefit from improvements in infrastructure to handle the seasonal nature of the spring.

Infrastructure Development and Ecological Impact
A wall structure has been constructed around the spring to help store water. The spring's fluctuating discharge may indicate potential issues with water storage or flow regulation, which could affect its long-term sustainability. While the GVMC tanks help manage water for the local community, there is a need to monitor the spring's seasonal variations and ensure that the surrounding ecosystem remains undisturbed.

Preservation and Future Outlook
Seethammadhara requires careful management, especially considering its seasonal nature and fluctuating discharge. Strengthening the water storage infrastructure and monitoring fluctuations will be essential to maintaining the spring’s viability for domestic use. The surrounding area's ecological health should also be protected to ensure that the spring remains a reliable resource for the local community. Further investment in sustainable water management and preservation strategies would help safeguard the spring’s future.


Hanumandhara

11. Hanumandhara

Historical and Cultural Significance
Hanumandhara is a sacred spring that flows beneath the Hanuman temple, with its name derived from its close association with the temple. Devotees visit this spring daily, especially those climbing the hill, and the spring has been a significant part of the spiritual practices in the area. The water from this spring is traditionally believed to be suitable for drinking, enhancing its religious importance.

Geographical and Physical Characteristics
The spring is located at latitude 17.768001°N and longitude 83.246530°E. Initially a perennial spring, Hanumandhara's flow has been severely disrupted due to construction activities in the area, particularly the building of new steps. The spring channel was damaged during this construction, resulting in the disconnection of the water's flow from the main outlet. This has led to a cessation of water flow through the main outlet, and the spring no longer operates as it once did.

Water Usage and Management
Hanumandhara water was historically used by the local community and pilgrims for drinking purposes. Despite the disruption in its natural flow, efforts have been made to provide water to devotees. A tank has been constructed to collect and distribute water, which is supplied to the devotees through taps at various locations around the temple. However, with the changes to the spring's flow, the management and distribution of water need to be monitored and maintained more efficiently.

Infrastructure Development and Ecological Impact
The construction of new steps near the spring has led to significant damage to the natural water channel, disrupting the flow and connection between the spring and its outlet. This damage has affected the spring's ability to function as a perennial water source, with the surrounding soil remaining constantly wet due to the wastewater flowing alongside the spring. This situation could have long-term ecological impacts on the surrounding soil and ecosystem, requiring remedial measures to restore the spring's original functionality.

Preservation and Future Outlook
To preserve Hanumandhara, it is crucial to address the damage caused by the construction activities and restore the natural water flow. Restoring the connection between the spring and its outlet will help bring back its perennial nature and ensure a consistent supply of drinking water for devotees. Additionally, maintaining proper drainage systems to handle wastewater and prevent further damage to the surrounding soil will be necessary. Steps should be taken to protect the spring's ecosystem and its cultural significance for future generations.


Gomukadhara

12. Gomukadhara

Historical and Cultural Significance
Gomukadhara derives its name from the cow head statue that forms its outlet, reflecting its cultural and symbolic importance. Historically, the spring was a perennial source of water, with separate outlets designed for men and women to use for bathing. It holds spiritual relevance due to its connection to the Madhava Swami Temple, which lies nearby.

Geographical and Physical Characteristics
Situated uphill from Madhavadhara at coordinates 17.76822°N and 83.256708°E, Gomukadhara is surrounded by rich vegetation, including Caryota urens (jeeluga trees), mango trees, and jackfruit trees. This spring was once an essential part of the hill's ecosystem but now faces challenges due to its reduced discharge and improper maintenance. The stone cow carving at the outlet is a notable feature of its structure, although it no longer functions effectively.

Water Usage and Management
Previously, Gomukadhara provided a reliable water source for devotees and the local community. The water was accessible through two separate outlets catering to men and women for bathing purposes. Over time, the spring's flow diminished, and its once-significant utility has dwindled.

Infrastructure Development and Ecological Impact
The spring's outlet and channels have suffered from neglect, leading to its current state of inactivity. While the surrounding flora adds ecological value, the loss of water flow has limited its contribution to the area's environmental sustainability.

Preservation and Future Outlook
To revive Gomukadhara, comprehensive maintenance and conservation efforts are required. Restoring the spring's original channels and protecting the surrounding vegetation could help bring it back to its perennial state. Ensuring proper care and sustainable usage can restore its cultural and ecological significance.


Chandramukadhara

13. Chandramukadhara

Historical and Cultural Significance
Chandramukadhara, a seasonal spring, holds local importance due to its association with the sacred Madhava Swami Temple. Though not as popular as other springs in the region, it is known among locals for its good water quality and is regarded as a hidden gem within the forested landscape.

Geographical and Physical Characteristics
Located uphill from the Madhava Swami Temple, Chandramukadhara emerges from beneath a large stone amidst a dry and weed-covered area. The spring's seasonal nature and forested surroundings add to its rustic charm, though these factors also contribute to its inaccessibility and underutilization.

Water Usage and Management
Currently, the spring lacks any structured channel for connecting its water to nearby springs like Gomukadhara, resulting in underutilization of its resources. Local accounts suggest its water quality is good, but the absence of a proper system has limited its practical use.

Infrastructure Development and Ecological Impact
The spring has suffered from neglect, with no maintenance or channel connectivity in place. Weeds and the dry surrounding conditions further emphasize the lack of attention given to this resource. However, no major structural interventions are required; only a basic channel could significantly enhance its utility.

Preservation and Future Outlook
Chandramukadhara requires minimal but effective interventions, such as weed removal and the construction of a water channel to connect it with Gomukadhara. These measures would enable better utilization of its water while preserving its natural setting within the forest.

14. Seekudhara

Seekudhara is a perennial spring located between Seethammadhara and Madhavadhara. It exhibits higher discharge during the rainy season and lower flow in summer. Overgrown bushes and shrubs have made the spring inaccessible, highlighting the need for maintenance to restore its utility and visibility.

15-17. Immandhara, Devidhara, and Anttladhara

These three springs—Immandhara, Devidhara, and Anttladhara—are embroiled in a dispute between private entities and the Simhachalam Temple. The land around the springs has been claimed by private players, restricting public access and visits. Resolution of the legal conflict is essential to restore these springs for communal and spiritual purposes.

18. Ganesh Colony Dhara

Ganesh Colony Dhara is a well-maintained spring effectively utilized by the local community. The water is collected in a concrete tank, and an outlet pipe system supplies it to all nearby households. This spring stands out for its proper utilization and clean surroundings, reflecting the community's active involvement in its upkeep.

Out of the 34 springs identified by the tribal communities, we successfully tracked 18 springs. Among these, 4 springs were found to have two names. However, 9 springs could not be tracked, including Rittlavadhara, Sivitidhara, Musalidhara, Lavvudhara, Vaddaladhara, Solladhara, Venkatarammurtydhara, Mallammadhara, and Guridhara. The dense jungle and lack of available data hindered our ability to locate these springs. Nonetheless, we will continue to make efforts in collaboration with the local tribal communities to track and document these dharas.

Chapter 4: Key Insights from the Temple Administration on Springs

The springs around the Simhachalam Temple are central to its water management system, playing a crucial role in both religious and ecological functions. Here are the key insights from the temple administration regarding the springs:

- Primary Water Sources: The temple's primary water sources are its springs, with Gangadhara serving as the main water source. Other springs such as Anthadhara (Nagadhara) provide water for preparing prasadam, while Saidhara and Chakaradhara are used for temple purposes by pumping water to higher elevations.
- Importance of Spring Conservation: The temple administration recognizes the importance of spring conservation, considering it essential for both spiritual practices and practical needs. The springs provide the bulk of the water needed for temple activities and maintenance.
- Water Usage Breakdown: Approximately 50-60% of the temple's total water needs are met by spring water. 30-40% is sourced from three bore wells within the temple premises, and the remaining 10% comes from alternative water supplies.
- Water Shortages in Peak Seasons: Water availability becomes a major concern during the summer months and times of high devotee influx. To address this, the temple often relies on water tankers from the Greater Visakhapatnam Municipal Corporation (GVMC).
- Ecological Flow and Sustainability: The temple administration emphasizes the need to maintain the ecological flow of the springs, highlighting its significance for the health and sustainability of the Simhachalam hill ecosystem.
- Use in Green Initiatives: A substantial portion of the collected spring water is directed toward maintaining the temple's flower garden located at the base of the hill, supporting its green initiatives.
- Sewage Treatment Plants (STPs): The administration seeks technical assistance to assess and reactivate two non-functional Sewage Treatment Plants (STPs) located at the hilltop and downhill locations.
- Historical Water Connections: Historically, the water from the springs flowed into the temple tank (Pushkarini/Koneru), which is approximately 900 meters from the base of the hill. However, urbanization has disrupted the water channels that connected the springs to the Koneru.
- Water Quality Concerns: There is a growing concern about the water quality in Koneru Lake due to the interruptions in its inlets and outlets, which impact the quality and quantity of water reaching the lake.
- Green Cover and Ecosystem Restoration: The temple administration has undertaken significant efforts to restore the hill's ecosystem through initiatives like Simhagiri Vanasamrakshana Yagnam (SVY), which involves the planting of one lakh trees. The Go Green-Grow Green initiative, in collaboration with Naval Scientific Technological Laboratory (NSTL), uses seed balls made from mango, almond, black berry, and other varieties of fruit, flower, and avenue seeds packed with cow dung. Additionally, the Green Visakha Programme is replacing exotic trees with native species, such as Srigandam, Banyan, Alli, Ankudu, Fig, and Ashoka trees, to enhance the hill's biodiversity and green cover.

These efforts underscore the temple administration's commitment to maintaining the springs and surrounding ecosystem, ensuring both spiritual and environmental sustainability.

Chapter 5: Key Insights from Tribals of the Simhachalam Hills

Hill Village: A population of about five hundred inhabit the village which has grown round the temple proper. Out of the hundred houses of the village, Half of the population consists of the Hill Chiefs (Konda Doras). In fact, Konda Doras are a hill tribe look to the temple for their living. Some of them live by looking after the needs of pilgrims and others by securing leases of plantations, gardens and lands on the hills. Malaria used to be a great scourge to the people; but its severity is greatly mitigated by the anti-malarial operations undertaken by the administration of the temple.

Adivivaram, the village down the hill, which is closely attached to the temple, has a population of about 6,000+. Previously, It is a panchayat village now it's under GVMC with a Rural Health Centre and Hospital maintained by the temple. Most of the people are either employed as the staff of the temple or cultivate lands of the temple. The two gardens of the Lord, the Phool Bagh and the Udyanavanam, the two temple tanks, the Lord's Tank (Swami Pushkarini) and the Boar's Tank (Varaha Pushkarici) are also in this village. Both these tanks are fed by the water from the spring on the hill, the water of which is led down by means of pipes.The Deity descends to the village for the celebration of special festivals like the Floating Festival (Teppotsavamu). the Tree Festival (Sami Puja), the Swinging Festival (Dolotsavamu) and the Hunting Festival (Makaraveta).

Custodians of Traditional Knowledge: The tribal peoples of Simhachalam Hills have deep-rooted knowledge of the ecosystem and have resided in the region for generations, relying on forest activities for their livelihood.

Temple-Centric Lifestyle: The Simhachalam temple, located amidst the tribal village, is central to the community's life, providing economic opportunities through sales to visiting devotees (e.g., water, buttermilk, flowers) and jobs in sanitation and with the GVMC and temple administration.

Water Sources:

- Historically, the tribes relied on natural springs such as Saidhara for drinking and domestic purposes.
- Collecting water directly from the springs was challenging due to their distance.
- Presently, GVMC supplies water through a bore well at the hilltop, distributing water daily at 7:00 AM via two 3,000-liter tanks connected to taps in each colony.

Springs Information:
The community has identified 32 springs in the hills, including Gangadhara, Naagadhara, Saidhara, Aakasadhara, and Pichhukadhara.

Gngadhara: A perennial spring with the highest discharge, located at the right side of the temple. It serves both the temple's bathing rituals and drinking needs.
Naagadhara: A perennial spring flowing from the Nagaswami statue, used exclusively for making prasadam.
Saidhara (Enugudhara): Positioned near the temple steps; its water supports the temple's flower garden through a gravity-fed system.
Aakasadhara: A seasonal spring near the Vinayakaswami statue, creating a waterfall effect through a connected pipe system.

The list of 32 Dhara's in Simhachalam Hills:

1.Gangadhara
2.Naagadhara
3.Saidhara
4.Aakasadhara
5.Pichhukadhara
6.Hanumandhara
7. Devidhara
8.Seethammaadhara
9.Rittlavadhara
10.Zeelikadhara
11.Ganesh Colony Dhara
12.Madhaavadhara
13.Seekudhara
14.Gogidharaa
15.Zedugadhara
16.Pulletidhara
17.Sivitidhara
18.Govidhara
19.Puttidhara
20.Musalidhara
21.Enugudhara
22.Guridhara
23.Lavvudhara
24.Adduludhara
25.Vaddaladhara
26.Solladhara
27.Venkatarammurtydhara
28.Emmanadahara
29.Dhummuldhara
30.Anthaladhara
31.Chandrammadhara
32.Mallammadhara
33.Ananthadhara
34.Kasiganagdhara

Relocation Proposals: Temple authorities have proposed relocating the tribal population downhill and offering land, but opinions are divided. While some families are open to moving, others prefer to stay due to their roots of forest and dependence on temple-based income.

Challenges in Living Conditions:

- Overcrowding is common, with 2-3 families sharing a single house.
- During the rainy season, many homes face water leakage; some have tarpaulin roofs, while others have concrete roofs.
- Restrictions prevent the construction of new homes, even when old ones collapse due to rain or other damage.
- Insufficient bathrooms and inadequate infrastructure, including poor drainage and roads, create significant hardships, especially in the rainy season.
- Tribes receive minimal entitlements such as pensions and rice allocations.
- They are ineligible for government housing schemes as they reside uphill. Relocating downhill would make them eligible for these benefits.

Cultural Beliefs and Practices:

- The temple built houses at a higher elevation(above temple vimanam), but tribes refuse to move there due to the belief that living above the temple brings misfortune (e.g., financial decline or harm to family members).
- Despite challenges, the tribes continue to live at their current locations rather than moving to higher ground.
- Gangadhara spring is considered sacred, believed to contain water mixed with that of the Ganges, known as Kasigangadhara.

These insights reflect the unique relationship between the tribal communities, the natural spring ecosystem, and their socio-cultural dynamics in the Simhachalam Hills.

Chapter 6: Way- forward

This book serves as a foundational document for making informed decisions regarding the conservation of the springs and the surrounding ecosystem of the Simhachalam Hills. It provides a comprehensive understanding of the current state, the challenges, and the intricate relationships between the community, the temple, and the natural resources.

Short-term Conservation Plan:

- Focus on immediate interventions to protect and restore the identified springs, such as addressing water quality issues, preventing encroachment, and enhancing water management systems.
- Strengthen local engagement and education programs to promote awareness among the tribal communities and temple authorities about the ecological importance of the springs.
- Implement measures to mitigate the impact of urbanization on the springs, including restoring traditional water channels and improving infrastructure for better water distribution.

Long-term Conservation Plan:

- Develop a sustainable, community-driven model for spring conservation, integrating traditional knowledge with modern conservation practices.
- Collaborate with local, state, and national stakeholders to secure long-term funding and support for the preservation of the Simhachalam Hills' ecosystem.
- Promote ecological restoration projects to enhance biodiversity, such as reforestation, soil conservation, and the protection of endangered species in the region.
- Work towards improving the living conditions of the tribal communities through relocation, infrastructure improvements, and ensuring access to government benefits.

This document will guide stakeholders in crafting both immediate and strategic actions that not only protect the springs but also ensure the long-term sustainability of the region's ecosystem.

Mainstreaming and convergence of springshed management with other developmental programmes will be required to facilitate greater synergies with government schemes and involving local colleges and universities to continuous research and dissemination of information.

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