# MASTER PLAN

# IRRIGATION MUSEUM

## Cheruthoni, Idukki

Water Resources Department
Government of Kerala

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## IRRIGATION MUSEUM

**CENTRE FOR MANAGEMENT DEVELOPMENT**
**Thiruvananthapuram**

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# 1. Introduction

The proposal for an Irrigation Museum in Idukki district stems from the need for recognition of the Irrigation Department's pivotal role in shaping Kerala's food security, landscape maintenance and reduced dependence on monsoons. The Honorable Minister for Water Resources, Government of Kerala, initiated this project to highlight the monumental efforts in water management and to foster public understanding of this critical sector. Idukki district was selected as the project site due to its profound association with water resources and power generation in Kerala. It supplies approximately 66% of the state's hydroelectric power needs, primarily from the Idukki Hydroelectric Project. The district's mountainous terrain, dense forests, and major rivers like the Periyar and Pamba underscore its hydrological significance. This natural endowment, coupled with its status as a prominent tourist destination, offers a unique opportunity to attract diverse visitors year-round, integrating education with tourism. The museum is envisioned to cater to various age groups, offering community engagement, research facilities and a platform for learning new skills in irrigation and water resources.

# 2. About the Irrigation Department of Govt. of Kerala

Irrigation Department is subdivided into 6 different wings i.e. Irrigation & Administration, Investigation & Design, Projects-I, Projects-II, Inland Navigation & Kuttanad Package, and Mechanical Wing respectively. The Head Quarters of Irrigation Department is located in Public Office Complex, Thiruvananthapuram, and is under the control of Chief Engineer, Irrigation & Administration. Irrigation & Administration wing deals with the Major & Minor Irrigation works across the state, Flood Control & Coastal Zone Management, Salt Water extrusion apart from the general administration of the department.

The ***vision*** of the department is to Conserve and manage Water Resources in a sustainable, scientific and equitable manner to provide Irrigation facilities for agriculture development.

***Mission***

- To Harness, Protect and Regulate the State's Water Resources by formulating effective Plans through the principles of Integrated Water Resources Management, Agricultural water management and Disaster risk management.
- Construction, Operation and Maintenance of irrigation structures for the conservation, storage, abatement of pollution in water resource, providing irrigation facilities, flood control and coastal protection.
- Judicious usage of water for irrigation by ensuring farmers participation.
- To build a team of water experts.

# 3. Project Background

The Irrigation Department has been instrumental in formulating and implementing irrigation polices for improved food security, better maintenance of landscapes and reduced dependence on monsoons. In this regard, the Honourable Minister for Water Resources, Government of Kerala, had proposed the development of an Irrigation Museum in Idukki district. The project site is situated in Idukki district, Kerala. Idukki is one of the 14 districts of Kerala state in India. It is geographically known for its Mountainous Hills and Dense Forests and is mainly associated with power Generation. About 66% of the State's Power needs come from the Hydroelectric Power Projects in Idukki. It has a vast forest reserve area; more than a half of the district is covered by forests. The urban areas are densely populated whereas villages are sparsely populated. Idukki is also known as the spice garden of Kerala.

## *3.1. Geographical and Topographical Profile*

Idukki district came into existence on January 26, 1972, and is the largest district in Kerala by geographical area, encompassing 4,358 square kilometers, which constitutes approximately 11.2 percent of the state's total landmass. Despite its expansive area, Idukki maintains the lowest population density among Kerala's districts, a reflection of its predominantly mountainous and forested landscape. The district is geographically defined by its mountainous hills and dense forests, with an impressive 96 percent of its total area characterized by rugged mountains, undulating hills, and deep valleys. More than half of the district is designated as reserved forests and wildlife sanctuaries, highlighting its ecological importance. The high ranges within Idukki exhibit significant altitude variations, ranging from 600 meters to over 1600 meters above Mean Sea Level (MSL), a topographical diversity that supports a rich array of flora and fauna. The northern part of the district forms a distinct sub-plateau, situated at a higher elevation than the rest of the region. This area is home to some of the highest peaks, including Anamudi, which at 2,695 meters, is the tallest peak in India south of the Himalayas. Other significant areas within this sub-plateau include Munnar, Pallivasal, Kanthalloor, Vattavada, and Mankulam.

Idukki is also the source of several major rivers that are vital to Kerala's hydrology and water supply. The Periyar River, the largest river in Kerala, originates and flows through the district, carving deep gorges and valleys. The Pamba River, the Thodupuzhayar and the Thalayar are other important rivers that trace their origins to Idukki. These river systems are fundamental to the state's water infrastructure, supporting both irrigation and hydroelectric power generation. The district also features a rain shadow region on the eastern side of the Western Ghats, encompassing areas such as Marayur, Kanthalloor, Vattavada and Thalayar.

**Figure 1: Anamudi Peak, Idukki**

These areas receive significantly less rainfall, with annual precipitation as low as 1500 cm, compared to the district's average of 3500 mm. This climatic variation further underscores the diverse hydrological challenges and opportunities within Idukki.

The unique mountainous and forested topography of Idukki, coupled with its role as the origin of major rivers like Periyar and Pamba, renders it inherently critical for Kerala's water resources and hydroelectric power generation. This geographical reality directly necessitated the construction of large-scale water infrastructure, such as the Idukki and Cheruthoni Dams, which are central to the state's energy needs.

### *3.2. Climatic Conditions*

Idukki's climatic profile is characterized by a tropical monsoon pattern, which brings abundant rainfall during the monsoon season, typically from June to September. However, the district also experiences frequent drought-like conditions during the dry months, from December to May, due to the rapid runoff of monsoon waters. The average annual rainfall is approximately 3500 mm, though this can vary significantly across different parts of the district, with some areas receiving up to 7000 cm and rain shadow regions as little as 1500 cm. This variability underscores the challenges in water availability and management throughout the year.

Ecologically, Idukki is an integral part of the Western Ghats, a globally recognized biodiversity hotspot and a UNESCO World Heritage Site. This designation highlights the region's immense ecological value and the imperative for its conservation. The Idukki Wildlife Sanctuary, established in 1976, is a prime example of this ecological richness. Spanning approximately 77 to 105 square kilometers, the sanctuary is

strategically located near the Idukki and Cheruthoni Dams, forming a crucial part of the larger Periyar Tiger Reserve area. The sanctuary is characterized by diverse forest types, including tropical evergreen, semi-evergreen, moist deciduous, montane, and Shola forests, which are unique high-altitude grasslands with patches of dense vegetation.

These varied habitats support a wide array of flora, including valuable trees like teak, rosewood, and ebony, along with numerous medicinal plants, many of which are endemic to the region. The fauna is equally diverse, featuring significant populations of mammals such as elephants, tigers, leopards, bison, and various deer species, alongside a rich avian, reptilian, and amphibian life.

### *3.3. Socio-Economic Profile: Agriculture, Spices, Tourism and Power Generation*

Idukki's socio-economic fabric is intricately woven with its natural endowments, primarily agriculture, spice cultivation, hydroelectric power generation and a burgeoning tourism sector. These pillars collectively define the district's economic identity and provide significant opportunities for growth and development.

*Agriculture and Spice Cultivation:* Idukki is widely recognized as the "spice garden of Kerala". The district's unique climate and topography are ideal for the cultivation of a wide array of spices, including cardamom, pepper, tea, coffee and cinchona. Historically, large-scale tea plantations were established in areas like Munnar by British pioneers in the late 19th century, transforming vast tracts of dense forest into productive estates. These plantations continue to be a significant economic activity, managed by major companies like Tata Finlay Ltd. The district's agricultural output also includes various food crops, with irrigation playing a crucial role in ensuring successful cultivation, particularly during dry periods. The Irrigation Department's efforts in providing assured irrigation facilities and promoting micro-irrigation systems directly support the agricultural sector, enhancing yield and farmer profitability.

*Hydroelectric Power Generation*: For the people of Kerala, Idukki is synonymous with power generation. The district is the powerhouse of the state, contributing approximately 66 percent of Kerala's total hydroelectric power needs. This immense contribution is primarily due to the Idukki Hydroelectric Project (IHEP), the largest hydroelectric project in Kerala. The IHEP comprises three major dams: the Idukki Arch Dam, the Cheruthoni Dam and the Kulamavu Dam, which together form the vast Idukki reservoir. The Idukki Arch Dam, Asia's largest arch dam, is an engineering marvel constructed across the Periyar River between the 'Kuravan' and 'Kurathi' hills. The water impounded by these dams is diverted through a 2027-meter long power tunnel and pressure shafts to the powerhouse located at Moolamattom, which has an installed capacity of 780 MW. The project, an Indo-Canadian collaboration, was commissioned in 1976 and significantly boosted Kerala's power generation capacity. This critical infrastructure not only meets a substantial portion of the state's energy demands but also provides tailwaters for irrigation purposes in the Muvattupuzha Valley.

*Tourism*: Idukki is a strategically ideal destination for tourism development, boasting abundant natural beauty, favorable climatic conditions, and a diverse range of attractions. It hosts some of Kerala's most popular tourist destinations, including Munnar, Thekkady and Peerumedu. Munnar, a renowned hill station, attracts thousands of tourists with its serene beauty, tea plantations and cool climate, making it a preferred honeymoon destination. Thekkady offers unique wildlife experiences, with opportunities to witness elephants and other animals in their natural habitat. Other attractions include the Idukki Arch Dam itself, which offers captivating views and boat cruises on the reservoir, and various wildlife sanctuaries like Idukki Wildlife Sanctuary and Chinnar Wildlife Sanctuary. The district also offers eco-tourism and adventure tourism opportunities, such as trekking, paragliding (Vagamon), and jeep safaris.

### *3.4. Rationale for the Irrigation Museum*

The Irrigation Department, Government of Kerala, has historically been instrumental in shaping the state's agricultural landscape, ensuring food security, and managing its water resources. Over decades, it has formulated and implemented policies and projects that have reduced Kerala's dependence on seasonal monsoons and improved the maintenance of its diverse landscapes. The proposed Irrigation Museum serves as a vital extension of this legacy, aiming to document, preserve, and communicate this rich history of water management.

The rationale for the museum's establishment is multifaceted:

- **Educational Imperative:** There is a growing need to foster a deeper public understanding of water resources, their scientific utilization, and sustainable management. The museum will serve as a dynamic medium to popularize these concepts, inculcating a sense of inquiry and scientific temperament among various segments of society. It will provide research facilities for students in the fields of irrigation and water resources, acting as a knowledge hub.
- **Preservation of Heritage:** Kerala possesses a long history of water harvesting systems, from ancient traditional methods like check dams, 'ooru' wells, and 'kulams' to modern large-scale dam projects. The museum will preserve traditional irrigation tools and showcase the evolution of water engineering, ensuring that indigenous knowledge systems and the monumental efforts that shaped Kerala's water infrastructure are not lost.
- **Public Engagement and Awareness:** The museum will explore the intricate relationship humans have had with water over time, from agricultural practices to responses to natural disasters like floods and droughts. By featuring interactive displays, scale models of major dams (like Idukki and Cheruthoni) and the Moolamattom powerhouse, and even depicting dramatic events such as the 2018 floods, the museum aims to inform and emotionally engage the public

with urgent themes of water conservation and disaster preparedness. This is particularly relevant given Kerala's vulnerability to climate-induced hazards.

- **Economic and Tourism Development:** Located in Idukki, a district already renowned for its natural beauty and tourist attractions, the museum is strategically positioned to enhance regional tourism. Its unique educational and recreational offerings are expected to attract tourists throughout the year, thereby increasing income inflow for local communities and supporting local livelihoods through employment and promotion of local crafts.
- **Sustainability and Community Empowerment:** The project is deeply rooted in sustainability, both ecological and cultural. It aims to develop a sustainable balance between the ecosystem and local communities, promoting environmentally friendly practices, renewable energy sources, and effective waste management. Community engagement is a priority, involving local residents in planning and operations, fostering shared ownership and promoting inclusive development.

This comprehensive rationale positions the Irrigation Museum not merely as a repository of artifacts but as a living, evolving institution that inspires a sustainable and water-conscious future for generations to come.

### *3.5. Strategic Alignment with State Development Goals*

The proposed Irrigation Museum aligns seamlessly with several overarching development goals of the Government of Kerala, particularly those related to water security, disaster resilience, sustainable development and cultural tourism.

- **Water Security and Integrated Water Resources Management (IWRM):** The museum directly supports the Irrigation Department's vision to conserve and manage water resources sustainably and scientifically. By promoting awareness about water resources and responsible water use, it contributes to the judicious management of this precious resource. This aligns with the state's broader IWRM objectives, which seek to balance competing demands for water across agriculture, industry and domestic use, while also protecting water bodies from pollution.
- **Disaster Risk Reduction and Climate Resilience:** Given Kerala's vulnerability to floods and droughts, the museum's focus on disaster preparedness is highly pertinent. It serves as a platform to educate the public on climate resilience strategies and the importance of robust water infrastructure in mitigating disaster impacts. This directly supports the state's efforts to enhance its disaster risk management capabilities, which were severely tested during recent extreme weather events.
- **Sustainable Development and Environmental Stewardship:** The museum's design philosophy, emphasizing vernacular architecture, local materials,

renewable energy integration (solar PV), rainwater harvesting, greywater reuse and on-site composting, embodies principles of ecological sustainability. This aligns with Kerala's broader commitment to environmental protection, particularly in ecologically sensitive areas like the Western Ghats. By minimizing its ecological footprint and promoting green practices, the project will serve as a model for future infrastructure development in sensitive landscapes.

- **Tourism Promotion and Local Economic Empowerment:** The project is explicitly designed to increase the tourism scope of Idukki district and boost the income inflow of local natives. By offering a unique educational and recreational experience, it diversifies Idukki's tourism offerings beyond traditional nature-based attractions. The emphasis on community engagement, creating livelihood opportunities and promoting local crafts ensures that the economic benefits are inclusive and directly impact the local population. This contributes to the state's strategy of leveraging tourism for regional economic development.
- **Knowledge Hub and Capacity Building:** The museum is envisioned as a knowledge hub, supporting research and awareness programs on water resource management and climate resilience. This aligns with the state's broader goals of fostering scientific inquiry and building a team of water experts within the Irrigation Department. By showcasing advanced technologies and traditional practices, it facilitates knowledge transfer and capacity building for future generations of water professionals and the general public.

The proposed Irrigation Museum thus represents a strategic investment that not only celebrates Kerala's water heritage but also actively contributes to its future resilience, sustainability and socio-economic prosperity. Its multifaceted objectives are deeply interwoven with the state's critical development priorities, making it a project of significant public value.

## 4. Scope of Work

The successful realization of the Irrigation Museum project in Cheruthoni, Idukki, is structured into distinct phases, from conception to implementation. The first phase of the process is the conceptualization and master planning which has been entrusted with the Centre for Management Development (CMD) by the Water Resources Department vide G.O.(Rt)No.248/2023/WRD dated 08.03.2023. The activities in this phase were structured as follows:

- **Detailed Concept Note Preparation:** This initial activity involved articulating the core vision, objectives and thematic framework of the museum. It included defining the museum's narrative, target audience and the overall visitor experience.
- **Master Plan Preparation:** Building upon the concept note, this involved developing a comprehensive plan for the development of the project.

# 5. Approach & Methodology

CMD has conducted a series of activities designed to achieve the project's objectives in line with the defined scope of work. This section elaborates on these activities, providing a deeper understanding of the processes involved.

## *5.1. Activities Carried out and Execution Strategy*

The approach and methodology for the Irrigation Museum project were structured around a series of sequential and interconnected steps, ensuring a thorough and data-driven development process.

1. **Discussions with Water Resources Department (WRD) Officials and Other Relevant Government Authorities, Review of Available Documents with respect to Project:** This initial step was foundational, focusing on comprehensive information gathering and stakeholder alignment. It involved direct engagement with key personnel from the Water Resources Department to understand their vision, expectations and any specific requirements for the museum. Beyond WRD, consultations extended to other relevant government authorities whose mandates intersect with the project, such as tourism, environment, and local self-government bodies. This ensured a holistic understanding of the regulatory landscape, policy frameworks and inter-departmental synergies. Concurrently, a meticulous review of all available project-related documents, including previous studies, reports and internal communications, were undertaken. This review was crucial for gaining accurate information about potential projects, specifications, licenses and permits.
2. **Topographic Survey, Site Investigation, Site Area Measurements:** This phase involved a detailed physical assessment of the proposed project site near Cheruthoni Dam. A comprehensive topographic survey was conducted to map the terrain details.
3. **Land Use, Regulations & By-laws, Preparation of Conceptual Layouts, Master Plan:** This step translated the gathered data and initial discussions into a strategic spatial framework. The project site, previously unused and covered with natural vegetation, offered a "clean slate" for planned, sustainable development. A thorough review of applicable development control regulations and building bylaws was also done. Based on the site analysis and regulatory review, conceptual designs were developed, leading to the master plan.
4. **Built-up Area Calculations, Cost & Estimation:** This final step in the preliminary methodology focused on quantifying the project's physical and financial scale. This involved determining the total constructed space of all proposed buildings for pricing. A preliminary cost estimate was then prepared for all project components.

# 6. Site Context

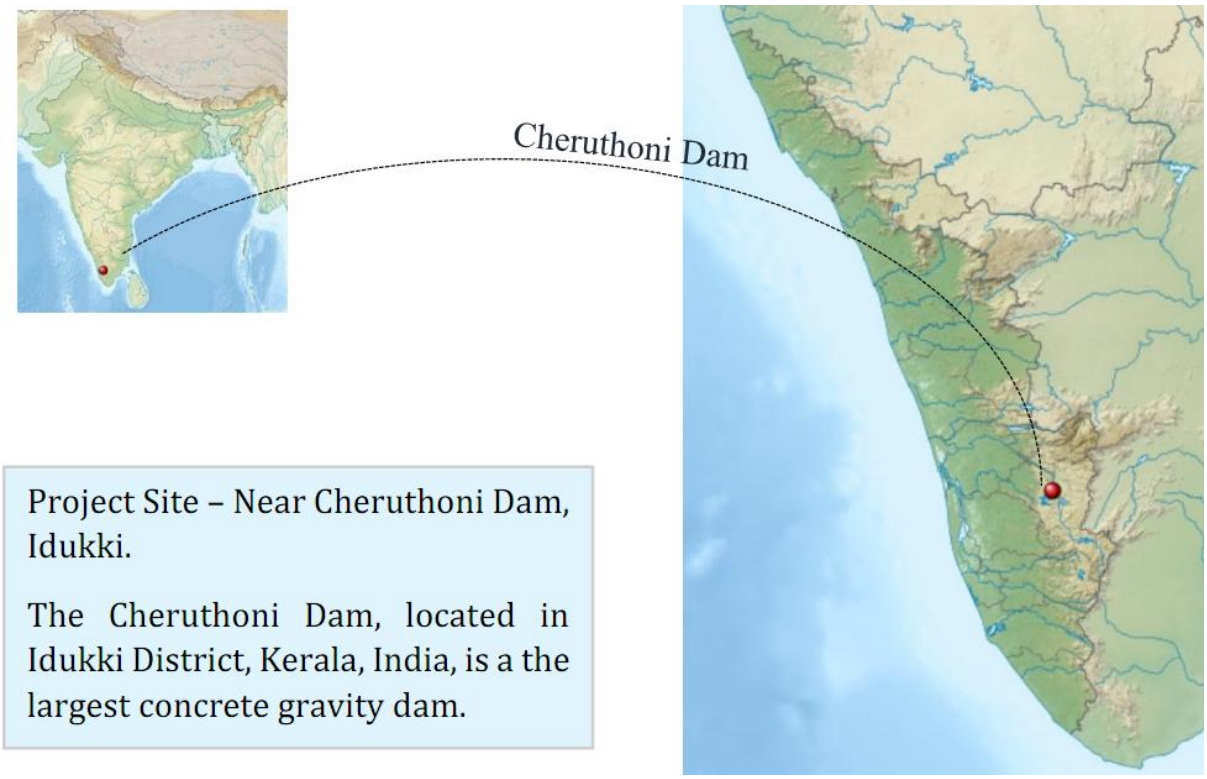



**Figure 2: Location Map**

The proposed Irrigation Museum is strategically located in Cheruthoni, Idukki, a site chosen for its unique geographical features, its integral role within Kerala's energy infrastructure and its potential for integrated tourism development. A detailed understanding of the site's context, including its potential and constraints, was crucial for effective project planning and execution.

## *6.1. Location and Accessibility*

The project site is situated approximately 1.0 kilometre from Cheruthoni town, specifically near the Cheruthoni Dam. Cheruthoni Dam is a vital part of the Idukki Hydro Electric Project, forming a collective reservoir with the Idukki Arch Dam and Kulamavu Dam. The spillway of this expansive reservoir is located at Cheruthoni Dam, making the site directly associated with a major hydrological feature. The proposed Irrigation Museum occupies a 25-acre site, strategically positioned near the Cheruthoni Dam. The site benefits from direct accessibility via National Highway 185, ensuring smooth regional connectivity to nearby towns such as Kattappana and Thodupuzha. It lies within 6 kilometres (approximately 10 minutes) of the Idukki District Administration Centre, which facilitates administrative ease and logistical convenience.

Despite its high-range location, the site enjoys good connectivity from major transit points. The nearest international airport, Cochin International Airport, is approximately 110 kilometres away, with a travel time of around 3 hours by road.

The nearest major railway station, Ernakulam, is situated at a distance of 76 kilometres, reachable in about 2 hours and 45 minutes. While internal access road to the specific site parcel require improvement, the existing highway and regional road network ensure that external connectivity does not pose significant constraints to project execution or future operations.

The site's surroundings are characterized by scenic landscapes, including forested hills, reservoirs and agricultural land, offering a culturally and environmentally rich setting for the museum. Its proximity to popular tourist attractions such as the Idukki and Cheruthoni Dams, Hill View Park and Kalvari Mount positions it as a key node within Kerala's eco-cultural tourism circuit.

**Figure 3: Cheruthoni Dam**

### *6.2. Existing Infrastructure and Site Conditions*

A thorough assessment of the existing scenario and current site conditions revealed both opportunities and challenges for the proposed development. The site, largely undeveloped and in a natural or semi-rural state, offers a blank slate for environmentally sensitive and sustainable development.

*Existing Service Lines:* The proposed project site currently lacks established service infrastructure, including dedicated water supply, electricity, sewage and stormwater drainage systems. This absence necessitates the new planning and integration of all essential utility lines and support systems as part of the DPR preparation. While this presents an initial challenge, it also offers a significant opportunity to design and implement self-sufficient and integrated utility systems from the ground up, aligning with the project's sustainability goals.

*Water Sources:* The site has access to multiple water sources, ensuring a reliable supply for both construction and operational needs. This is a critical advantage, particularly in a region where water management is paramount.

**Figure 4: Site Photographs**

*Power Connectivity:* Power connectivity is available along its boundaries, indicating that integrating with the existing electrical grid will not pose significant challenges. This simplifies the provision of electricity for construction and future operations, although specific connection approvals from KSEB will be required.

*Solid Waste Management:* For solid waste management, a robust collection, disposal and processing system will need to be implemented by the project implementation agency in coordination with the relevant Local Self Government Authorities. This approach aligns with national initiatives promoting waste segregation, recycling and sustainable disposal methods in public spaces. On-site composting facilities for organic waste, recycling and waste segregation units and educational integration of

waste management practices shall be crucial elements of the project's sustainability strategy.

*Built Structures:* There are no established built structures either within the site boundary or in its immediate surroundings. The area was previously unused and covered with natural vegetation, primarily dense shrubbery and wild growth typical of the region. Recently, this vegetation has been cleared to facilitate site access and initial development activities. This unencumbered state provides maximum flexibility for architectural design and site planning, allowing for a harmonious integration with the natural landscape and terrain.

*Soil Testing & Investigation:* Soil testing and geotechnical investigation are not included within the current scope of work for this report. These critical activities are planned to be undertaken during the Detailed Project Report (DPR) preparation stage. This phased approach ensures that site-specific structural and foundation requirements are appropriately addressed during the detailed design and execution phases, minimizing risks associated with the undulating terrain and potential seismic activity in the region.

In conclusion, the preliminary site survey and contextual assessment indicate that the proposed site near Cheruthoni Dam presents a promising and strategic location for the Irrigation Museum. Its excellent regional connectivity, natural setting and largely undeveloped landscape provide an ideal backdrop for a project that integrates heritage, ecology and sustainable design. The absence of existing major infrastructure, while requiring new development, allows for the implementation of integrated and self-sufficient utility systems, aligning perfectly with the project's sustainability goals.

### *6.3. Site Potential and Constraints*

The selection of Cheruthoni as the site for the Irrigation Museum is underpinned by a careful assessment of its inherent potential and the identifiable constraints that must be addressed for successful project realization.

*Site Potential*

The site offers numerous advantages that contribute significantly to the project's viability and strategic importance:

- **Integration with Critical Infrastructure:** Located within the Idukki Hydroelectric Project, the site is intrinsically linked to a critical part of Kerala's energy infrastructure. This association provides immediate visibility and significance, allowing the museum to highlight the engineering marvel of the Idukki Arch Dam system and its role in power generation.
- **Natural and Scenic Beauty:** The site is surrounded by hilly terrain and boasts the rich biodiversity characteristic of the Western Ghats region. This natural setting offers immense potential for eco-tourism, educational tourism and

nature-based recreation, providing an ideal backdrop for viewpoints, nature trails or interpretive centers. The captivating views of the Cheruthoni River and surrounding hills further enhance its aesthetic appeal.

- **Proximity to Major Water Bodies:** Direct proximity to a major dam (Cheruthoni Dam) and its spillway offers unique opportunities for water-centric research, hydrology education and public awareness programs related to water conservation and renewable energy. The two-hour cruise between Kulamavu and Idukki, coupled with views of sunrise and sunset, will provide an amazing tourist experience, which the museum can complement.
- **Educational and Research Hub:** The proposed museum can serve as a research facility for students in the field of irrigation and water resources, fostering community engagement and learning new skills. It presents a unique opportunity to showcase the evolution of water engineering, including traditional irrigation tools, scale models of Kerala's major dams & irrigation networks and interactive displays demonstrating the monumental efforts that shaped the state's water infrastructure.
- **Tourism Enhancement:** Coupled with its proximity to prominent tourist destinations in Idukki, the museum has the chance to attract tourists throughout the year, catering to various age groups. This will significantly enhance the regional tourism landscape and serve as a key public education centre, contributing to local income generation.

*Site Constraints*

Despite its considerable potential, the site also presents several constraints that require careful planning and mitigation:

- **Environmental Sensitivity:** The site's proximity to ecologically fragile zones of the Western Ghats, a UNESCO World Heritage Site, necessitates strict adherence to environmental impact norms. Care must be taken to minimize disturbance to the native flora and fauna, and construction activities must comply with regulations for ecologically sensitive areas.
- **Seismic and Structural Safety:** Given its location within a hydroelectric project area, activities around the dam and reservoir must ensure that there is no impact on dam integrity. Soil testing and geotechnical investigations, planned for the DPR stage, will be crucial to inform structural planning and foundation design in this context.
- **Infrastructure Development Needs:** The site currently lacks existing service infrastructure, including water supply, electricity, sewage and stormwater drainage systems. All essential utility lines and support systems will need to be newly planned and integrated, requiring substantial investment and coordination. While power connectivity is available nearby and multiple water

sources are accessible, the development of robust waste management systems in coordination with local authorities is essential.

- **Transportation and Logistics:** While regional connectivity is good, the transportation of construction materials or managing large visitor flows may require upgrades to internal access roads and careful planning in coordination with local authorities.

Overall, the site holds significant potential for the envisioned development, offering a unique blend of natural beauty, strategic location and educational relevance. However, realizing this potential requires meticulous ecological planning, robust infrastructure provisioning and design sensitivity to navigate the inherent environmental and safety constraints. With proper mitigation strategies, the site can indeed evolve into a nationally relevant cultural and environmental landmark.

# 7. Benchmarking

## *7.1. Osaka Prefectural Sayamaike Museum, Japan*

The Osaka Prefectural Sayamaike Museum in Japan, designed by the renowned architect Tadao Ando, serves as a significant international benchmark for water-themed museums. Its design philosophy offers crucial lessons in integrating architecture with its natural surroundings and conveying a thematic message through minimalist aesthetics.

- *Design Philosophy and Harmony with Nature:* Located a few meters from Sayamaike Lake, the museum is designed to introduce the history of water control, irrigation and reclamation. Ando's approach emphasizes simplicity and minimalism, playing masterfully with geometry, light and space. The complex, composed of a large rectangular box and a small cuboid surrounded by rectangular water sources, is built in harmony with its surroundings. Water is not just a subject but a main design element, with the building's reflection in water creating a quiet and melodic atmosphere. This "ode to raw minimalism" perfectly connects the rhythm of materials with different spaces.
- *Thematic Focus:* The museum's core theme revolves around the history of water control, irrigation and reclamation, a direct parallel to the Cheruthoni Irrigation Museum's focus on water management in Kerala.
- *Architectural Integration:* The Sayamaike Museum demonstrates how architecture can be a powerful tool for thematic expression and environmental integration. Its design, where water is an active element, offers a model for how the Cheruthoni museum can visually and experientially communicate the concept of "living with water" by incorporating water features and reflecting the surrounding landscape.

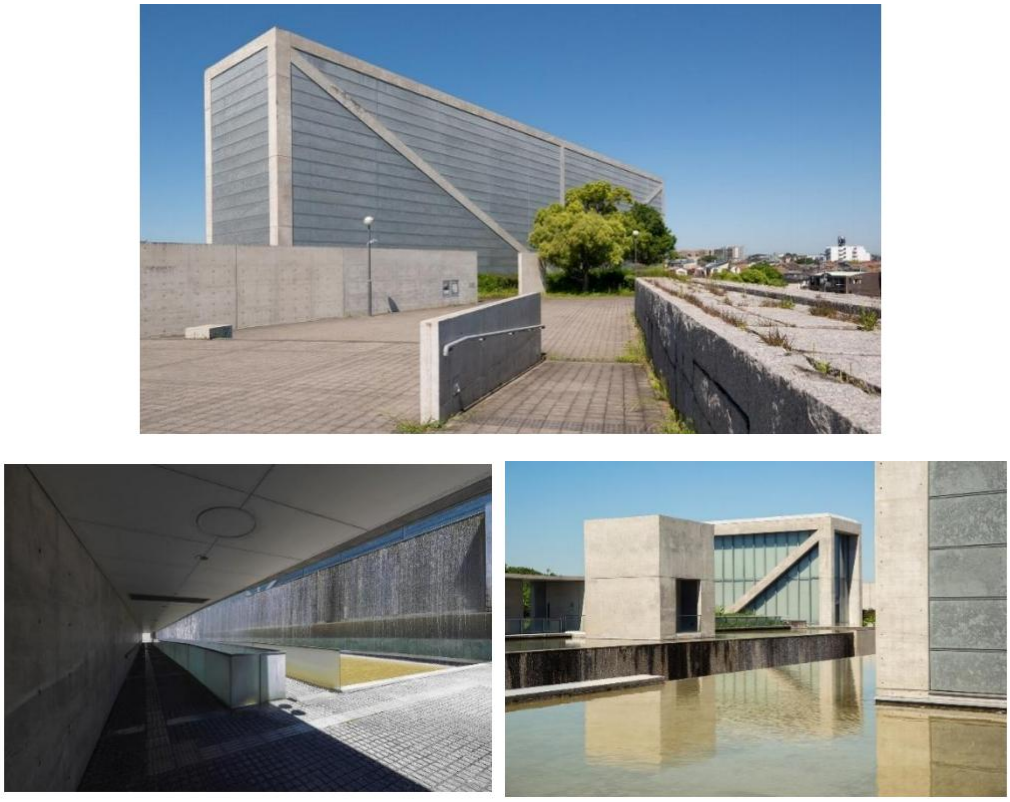


**Figure 5: Osaka Prefectural Sayamaike Museum, Japan**

### *7.2. The Water Resources Museum, Kerala*

Within Kerala, the Water Resources Museum provides a relevant local benchmark, offering insights into popularizing scientific water management and engaging diverse audiences.

- *Objectives:* The Water Resources Museum was established with clear objectives: to serve as a dynamic media for effective communication in popularizing the scientific utilization and management of water resources, and to inculcate a sense of inquiry and scientific temperament in the minds of people from different cross-sections of society on various aspects of water resources.
- *Activities and Exhibits:* The museum displays research findings from the Centre for Water Resources Development and Management (CWRDM) and other institutions. It prepares models/exhibits on various aspects of water resources development and management, collects, conserves and documents equipment/materials used for hydrometeorological studies, and gathers traditional and modern water lifting devices, documenting their principles and advantages. It also conducts exhibitions and its attractions include a butterfly garden, a demonstration plot for soil and water conservation and a medicinal garden.
- *Thematic Scope:* The museum depicts traditional ways local people used water and references important water projects in Kerala, highlighting water's role in their realization.

These benchmarks were analysed to refine the architectural design for the proposed Irrigation Museum, thematic content and visitor engagement strategies, ensuring it becomes a world-class institution that effectively communicates the importance of water management while harmonizing with its unique Idukki context.

**Figure 6: The Water Resources Museum, Kerala**

## 8. Project Vision and Concept

The proposed Irrigation Museum at Cheruthoni is conceived as a transformative institution, aiming to redefine public engagement with water resources. Its vision and underlying concept are deeply rooted in a philosophy of sustainability, cultural resonance and community integration.

**Vision: "Living with Water"**

The proposed Irrigation Museum at Cheruthoni, an initiative by the Irrigation Department, Government of Kerala, envisions itself as a landmark institution. Its core vision is to document, preserve and communicate the history and future of water management in Kerala, fostering a deeper public understanding of the concept of "living with water". This theme is particularly poignant in Kerala, a state intimately shaped by its abundant yet sometimes volatile water resources.

Located near the Cheruthoni Dam in the ecologically sensitive and historically significant Idukki district, the museum will be developed over a 25-acre site. It aims to explore the intricate relationship humans have had with water over time, encompassing a spectrum from traditional irrigation systems and agricultural

practices to large-scale dam projects and responses to natural disasters such as floods and droughts.

The museum will feature a wide range of exhibits designed to engage and inform. These include traditional irrigation tools, scale models of Kerala's major dams and irrigation networks and interactive displays that demonstrate the evolution of water engineering. Key highlights will be detailed models of the Idukki and Cheruthoni dams, as well as the Moolamattom powerhouse, providing visitors with insights into the monumental efforts that shaped Kerala's water infrastructure. The exhibits will also educate visitors on dramatic events associated with water management, such as the opening of all five Cheruthoni dam shutters during the devastating floods of 2018, aiming not only to inform but also to emotionally engage the public with urgent themes of water conservation and disaster preparedness.

The vision for the museum is profoundly rooted in sustainability, encompassing both ecological and cultural dimensions. Careful attention shall be given to designing the space in harmony with the surrounding landscape, incorporating nature trails, water-wise landscaping and low-impact architectural interventions. The project also prioritizes community engagement by involving local residents in the planning and operational phases, thereby creating livelihood opportunities and a sense of shared ownership. Beyond being a cultural and educational destination, the museum is also envisioned as a knowledge hub, supporting research and awareness programs on water resource management, climate resilience, and sustainable development. Positioned near one of Kerala's most visited dam sites, which has already demonstrated success in attracting tourists, the museum is expected to enhance the regional tourism landscape and serve as a key public education centre. Ultimately, the Cheruthoni Irrigation Museum aspires to be more than a static display of the past; it seeks to be a living, evolving institution—a space where the lessons of history inspire a sustainable and water-conscious future for generations to come.

### *8.1. Key Objectives*

The project's overarching vision is supported by a set of clearly defined key objectives:

- *Promote awareness about Water Resources:* To educate the public on the importance, scarcity and sustainable use of water.
- *Showcase the technology being leveraged by the Department in improving Irrigation Systems:* To highlight the advancements and engineering prowess in water management within Kerala.
- *Showcase technology being developed globally in irrigation systems which are proposed to be adopted in Kerala:* To present cutting-edge innovations and future directions in water technology, including smart irrigation, AI for water quality monitoring, and advanced desalination.

- *Promote awareness about responsible use of water:* To encourage water conservation practices among visitors and the wider community.
- *Increase the tourism scope of Idukki District:* To enhance Idukki's appeal as a tourist destination by offering a unique cultural and educational experience.
- *Increase the income inflow of the natives:* To generate economic benefits and livelihood opportunities for local communities through tourism and related activities.
- *Preserve the water reserve:* To contribute to the conservation of water bodies and their ecosystems.
- *Ecological balance:* To ensure that the project's development and operations contribute positively to the local ecosystem and biodiversity.
- *Overall development of the land:* To foster holistic development that integrates environmental, social, and economic aspects.

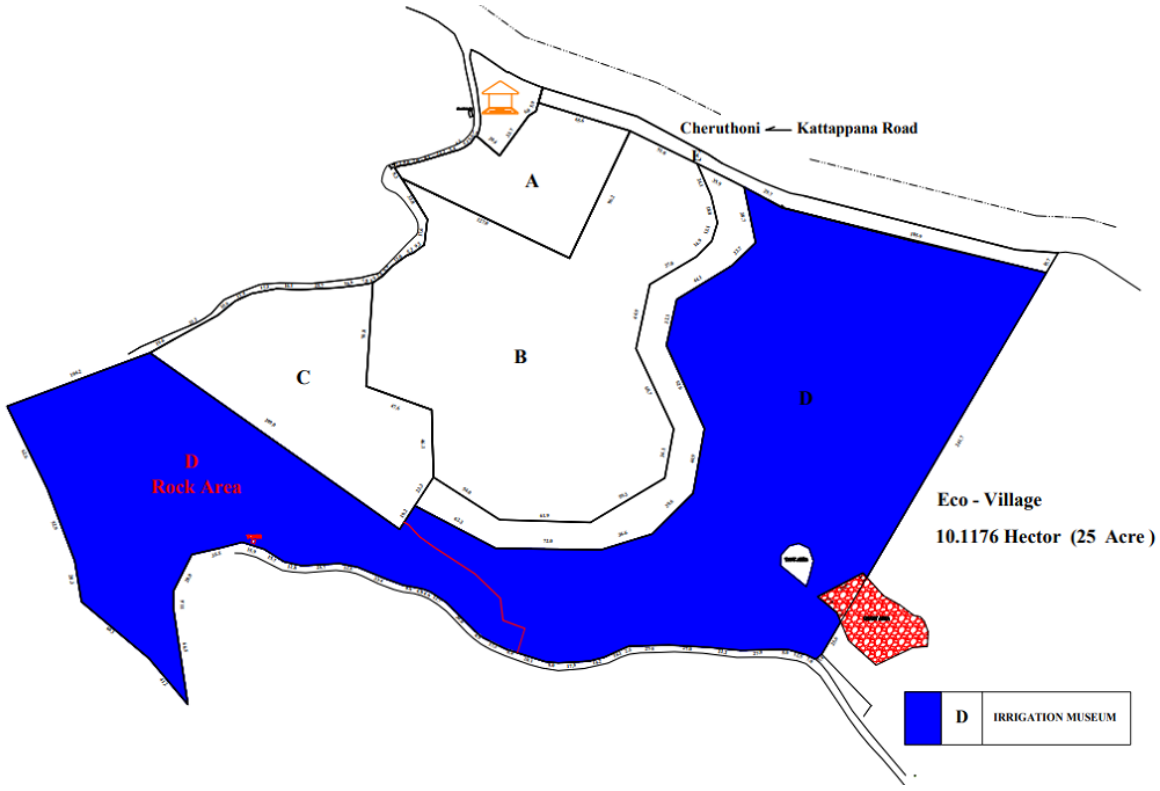



**Figure 7: Project Site**

## *8.2. Project Concept: Vernacular Construction and Sustainability*

The project concept for the Irrigation Museum at Cheruthoni is deeply rooted in principles of vernacular architecture and comprehensive sustainability, aiming to create a space that is both culturally authentic and environmentally responsible. This approach is designed to harmonize with nature, draw from local traditions and become a beacon of sustainable development and inclusive tourism.

*Vernacular Architecture*

At the core of the design philosophy is the revitalization and promotion of vernacular architecture, an approach that values building traditions rooted in local materials, cultural relevance and climatic responsiveness. This framework allows the project to maintain a low ecological footprint while reinforcing the authenticity and rootedness of the space.

- **Local Material Utilization:** The museum structures will be constructed using regionally sourced materials such as mud, stone, laterite, and bamboo. These materials reflect the tactile and visual identity of Kerala, particularly echoing the architectural heritage of agrarian settlements and historic water structures. Their use also supports the local economy and minimizes embodied energy in construction.
- **Climatic Adaptability:** Informed by Kerala's tropical monsoon climate, vernacular strategies will be incorporated to enhance user comfort without heavy reliance on mechanical systems. This includes features such as sloped roofs for efficient water drainage, extended eaves and shaded verandahs to protect from sun and rain, 'jaalis' (perforated walls) for filtered light and airflow, internal courtyards for natural light and ventilation, and cross-ventilation techniques to ensure air circulation. Thick walls of mud or stone will provide thermal insulation, moderating indoor temperatures.
- **Cultural Continuity:** Architectural elements like traditional tiled roofing, carved wooden joinery and earth-toned finishes will reflect the aesthetics of regional Kerala, fostering a deeper understanding and respect for the community's heritage.

*Energy Independence and Climate Positivity*

The Irrigation Museum is envisioned as an energy-independent, climate-positive campus that operates with minimal reliance on external utilities.

- **Renewable Energy Integration:** The project will incorporate solar photovoltaic (PV) panels on suitable roofscapes and canopies to power the core functions of the museum. Storage systems and smart energy management tools will be integrated for reliability, aiming to offset the building's total annual operational energy needs. India has a high solar potential, with abundant clear and sunny days, making solar PV a primary renewable energy solution for net-zero energy buildings.
- **Passive Design Strategies:** Thoughtful site planning, building orientation, and material selection will enable passive heating, cooling, and lighting. Use of thermal mass (e.g., thick walls), natural daylighting, and landscape buffers will significantly reduce energy consumption. This approach aligns with traditional Indian architectural principles that harmonize with nature to achieve thermal comfort.

*Zero-Waste Ecosystem*

Creating a zero-waste ecosystem is central to the museum's sustainability strategy. The campus will demonstrate and implement best practices in solid and organic waste management.

- **On-Site Composting Facilities:** Organic waste generated from canteens, landscape maintenance, and visitor areas will be composted using aerobic or vermicomposting systems. This decentralized approach to waste management is crucial for large institutions and can contribute to resource recovery.
- **Recycling and Waste Segregation Units:** Strategically placed stations will encourage visitors and staff to sort waste at the source. Recycled materials may also be creatively upcycled as part of exhibitions or temporary installations, promoting circular economy principles.
- **Educational Integration:** Waste management will be treated as part of the visitor learning journey, with demonstrations, signage and interactive installations promoting responsible behaviour and community participation.

This strategic positioning of the museum, located in proximity to established tourist circuits such as the Idukki Wildlife Sanctuary, Hill View Park, and Kalvari Mount, will boost the commercial and cultural vibrancy of Idukki district. By emphasizing vernacular architecture, renewable energy, ecological stewardship and community engagement, the Cheruthoni Irrigation Museum aspires to be far more than a static collection of artifacts. It will serve as a model for future cultural and institutional projects in sensitive landscapes, instilling a renewed respect for water as a life-sustaining force and encouraging principles of resilience, coexistence and stewardship in everyday lives.

# 9. Site Survey & Investigations

## *9.1. Topography Survey with Contour Details.*

CMD appointed a team for total survey of the proposed site. The area of the site according to the survey report is 9.2 Hectares. As per the survey report, the land is found to be undulating. The survey plan can be referred from figure 7 below.

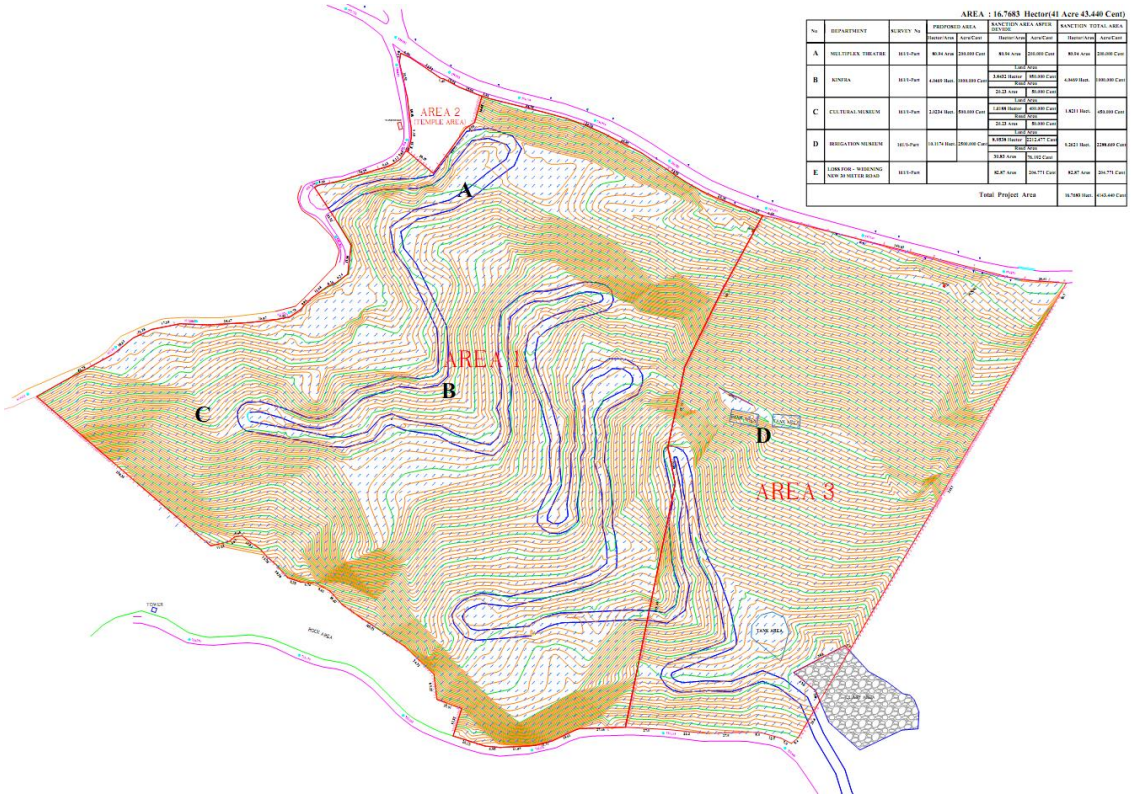



**Figure 7: Site Contours**

**Table 1: Total Project Area**

| No | DEPARTMENT | SURVEY No | PROPOSED AREA | | SANCTION AREA ASPER DEVIDE | | SANCTION TOTAL AREA | |
|---|---|---|---|---|---|---|---|---|
| | | | Hector/Ares | Acre/Cent | Hector/Ares | Acre/Cent | Hector/Ares | Acre/Cent |
| A | MULTIPLEX THEATRE | 161/1-Part | 80.94 Ares | 200.000 Cent | 80.94 Ares | 200.000 Cent | 80.94 Ares | 200.000 Cent |
| B | KINFRA | 161/1-Part | 4.0469 Hect. | 1000.000 Cent | Land Area<br>3.8432 Hector<br>Road Area<br>20.23 Ares | 950.000 Cent<br><br>50.000 Cent | 4.0469 Hect. | 1000.000 Cent |
| C | CULTURAL MUSEUM | 161/1-Part | 2.0234 Hect. | 500.000 Cent | Land Area<br>1.6188 Hector<br>Road Area<br>20.23 Ares | 400.000 Cent<br><br>50.000 Cent | 1.8211 Hect. | 450.000 Cent |
| D | IRRIGATION MUSEUM | 161/1-Part | 10.1174 Hect. | 2500.000 Cent | Land Area<br>5.9498 Hector<br>Rock Area<br>3.0039 Hector<br>Road Area<br>30.83 Ares | 1470.199 Cent<br><br>742.278 Cent<br><br>76.192 Cent | 9.2621 Hect. | 2288.669 Cent |
| E | LOSS FOR - WIDENING NEW 30 METER ROAD | 161/1-Part | | | 82.87 Ares | 204.771 Cent | 82.87 Ares | 204.771 Cent |
| | | | | | Total Project Area | | 16.7683 Hect. | 4143.440 Cent |

## *9.2. Existing Service Lines*

The proposed project site currently lacks existing service infrastructure, including water supply, electricity, sewage and stormwater drainage systems. As a result, all

essential utility lines and support systems will need to be newly planned and integrated as part of the development.

### *9.3. Index Map and Location Sketches*

The proposed Irrigation Museum is strategically located on a 25-acre site near the Cheruthoni Dam in the Idukki district of Kerala, a region known for its rich ecological and hydro-infrastructural significance. It is well connected to nearby towns such as Kattappana and Thodupuzha and lies amidst scenic landscapes that include forested hills, reservoirs and agricultural land—offering a culturally and environmentally rich setting for the museum. Despite its remote high-range location, the site enjoys good accessibility from major transit points. Surrounded by popular tourist attractions such as the Idukki and Cheruthoni Dams, Hill View Park and Kalvari Mount, the site holds immense potential to serve as a key node within Kerala's eco-cultural tourism circuit.

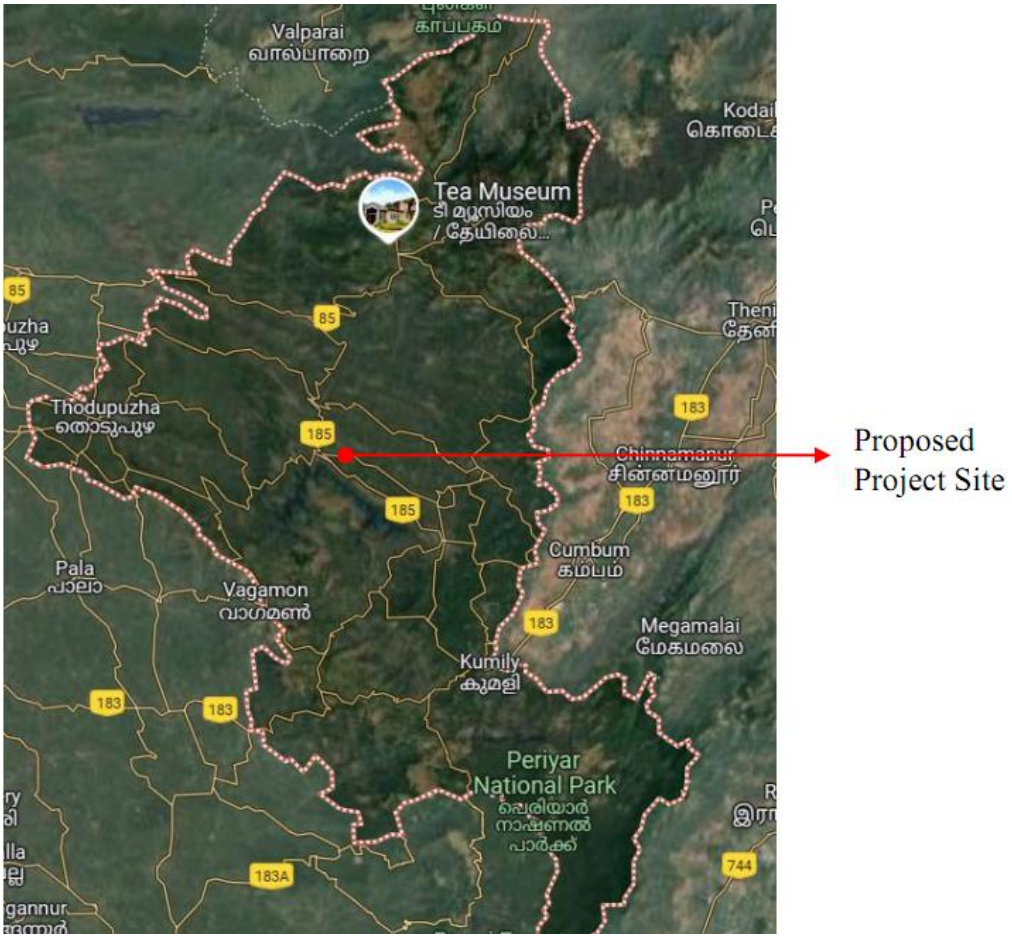



**Figure 8: Location Map**

### *9.4. Connectivity with Respect to Transportation and Existing Roads*

The proposed project site has moderate to good connectivity in terms of regional transportation and existing road access. It is strategically located adjacent to National Highway 185 (Cheruthoni–Kattappana Road), ensuring direct vehicular access to nearby towns such as Kattappana, Thodupuzha, and Adimali. The site lies

within 6 km (approximately 10 minutes) from the Idukki District Administration Centre, facilitating administrative ease and logistical convenience.

In terms of long-distance connectivity, the nearest international airport is Cochin International Airport, located about 110 km away, with a travel time of approximately 3 hours by road. The nearest major railway station is Ernakulam, situated at a distance of 76 km, reachable in around 2 hours and 45 minutes. Though internal access roads to the specific site parcel need improvement, the existing highway and regional road network ensure that external connectivity does not pose any significant constraints to project execution or future operations.


**Figure 9: Connectivity Map**

### *9.5. Existing Utility Infrastructure*

The proposed project site has access to multiple water sources, ensuring a reliable supply for construction and operational needs. Power connectivity is available either at the site or along its boundaries, indicating that integrating with the existing electrical grid will not pose significant challenges. For solid waste management, a robust collection, disposal, and processing system will be implemented by the project administration agency in coordination with the relevant Local Self Government Authorities, ensuring sustainable and efficient waste handling.

### *9.6. Entry*

The entry to the proposed site will be through the by-road from Alichuvadu junction in NH 185. The road starts adjacent to the Sree Krishna temple and is of approx. 1.1. km length till the entrance to the proposed site for Irrigation Museum.


**Figure 10: Site Entry and Surrounding Map**

### *9.7. Built Structures in the Site*

There are no established built structures both within the site boundary and in its immediate surroundings. The area is largely undeveloped and remains in a natural or semi-rural state, offering a blank slate for environmentally sensitive and sustainable development. This absence of infrastructure, presents an opportunity to design and implement self-sufficient systems from the ground up.

### *9.8. Soil Testing & Investigation*

Soil testing and geotechnical investigation are currently not included within the present scope of work. These activities are planned to be undertaken during the Detailed Project Report (DPR) preparation stage, ensuring that site-specific structural and foundation requirements are addressed appropriately during the design and execution phases.

## 10. Land Use

The 25-acre project site was previously unused and covered with natural vegetation, with no history of residential, agricultural, or commercial activity. The land remained in a natural state, featuring dense shrubbery and wild growth typical of the region. Recently, the vegetation has been cleared by CMD to facilitate site access and initial development activities. As a vacant and non-encroached parcel, the site offers a clean slate for planned, sustainable development aligned with the project's institutional and eco-tourism objectives.

## 11. Conceptual Layout

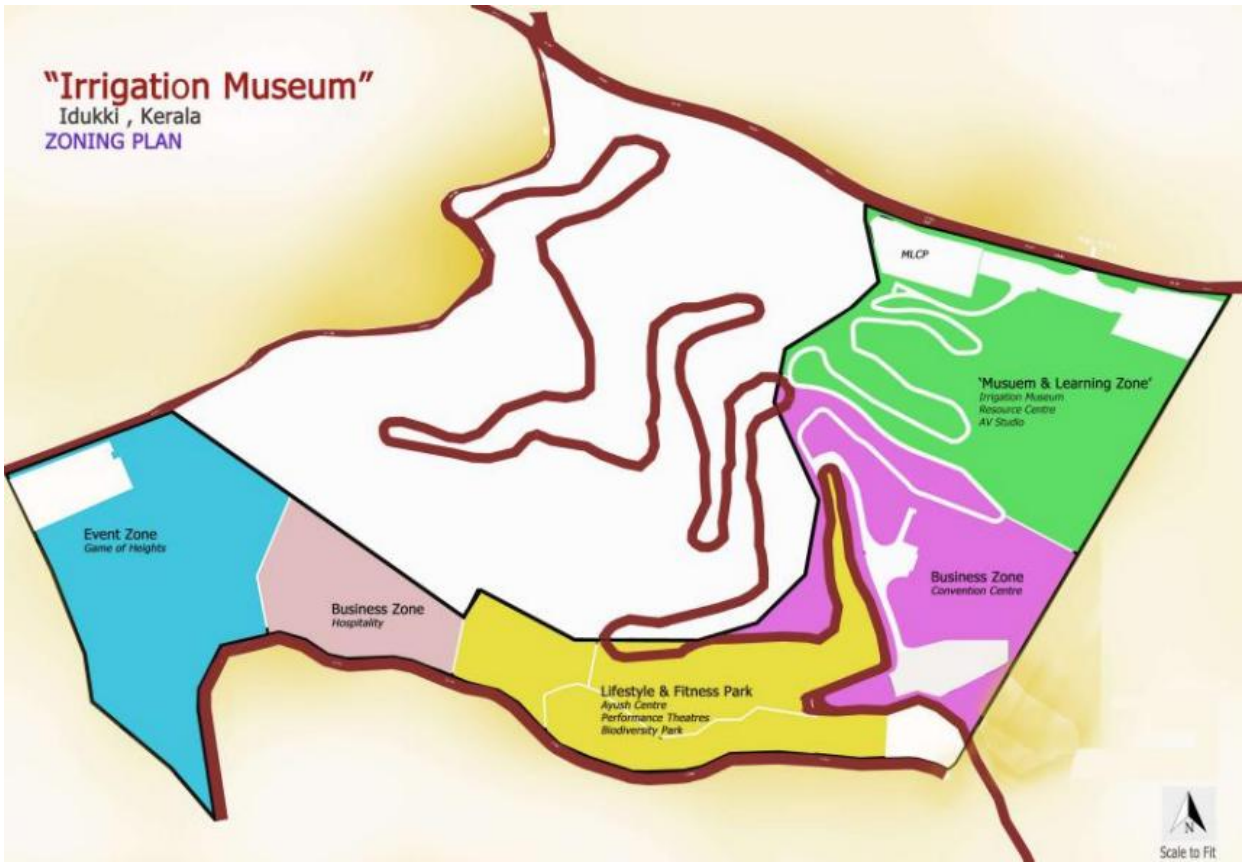



**Figure 11: Zoning Plan**

The conceptual layout for the proposed Irrigation Museum at Cheruthoni is a meticulously planned masterplan that integrates cultural, educational, recreational and commercial functions within a sustainably designed framework. Spread across 25 acres of undulating terrain, the layout organizes the site into distinct functional zones, each offering a unique visitor experience while ensuring ecological sensitivity, accessibility and economic viability.

### *11.1. Zoning Plan and Master Plan Overview*

The masterplan for the Irrigation Museum is designed to optimize visitor flow, enhance experiential learning and promote sustainable development. The site's curvilinear contours are intentionally left open as a natural spine, allowing free

movement, buffering zones and offering landscape-based interventions like trails and green corridors.

The key functional zones identified in the zoning plan are:

- **Museum & Learning Zone:** Serving as the core attraction, this zone houses the Irrigation Museum, a Resource Centre and an AV Studio. Its primary focus is on educating visitors about Kerala's irrigation heritage and water management practices through immersive and interactive displays.
- **Multi-Level Car Parking (MLCP):** Strategically located close to the main entry, the MLCP ensures efficient vehicular management and ease of access for visitors.
- **Business Zone – Convention Centre:** Positioned to the south of the museum zone, this area is envisioned as a space for conferences, exhibitions, and knowledge-sharing events, strengthening the site's institutional value and creating opportunities for academic and professional gatherings year-round.
- **Event Zone – Game of Heights:** Located in the western section, this zone is designed for high-adrenaline outdoor recreational activities, performances or seasonal festivals, capitalizing on the dramatic terrain and scenic views.
- **Hospitality-focused Business Zone:** Adjacent to the Event Zone, this area supports the visitor experience with accommodation and food services, enhancing stay duration and comfort.
- **Lifestyle & Fitness Park:** Running along the southern edge, this unique offering includes an Ayush Centre, Performance Theatres, and a Biodiversity Park. This green zone promotes health, wellness, and cultural expression while preserving and showcasing the site's natural ecology, forming a crucial buffer and experiential link between active and passive zones.

This thoughtful separation and integration of zones ensure smooth circulation, diversified programming and year-round functionality, transforming the museum into a dynamic public space for education, recreation and cultural engagement. Master planning principles for integrated tourism and cultural complexes emphasize creating memorable visitor experiences, a visitor-centric view and integrating planning into broader economic, social, environmental and cultural objectives.

### *11.2. Proposed Components and Amenities*

The proposed Irrigation Museum will feature a diverse range of zones and amenities, each designed to contribute to the overall visitor experience and project objectives.

***1. Museum/Research Zone***

At the heart of the development, this zone is envisioned as a knowledge-rich, interactive learning environment, serving as a cultural and educational hub. It will showcase the evolution of irrigation systems, traditional water practices, and modern innovations in water management.

- **Museum Complex:** Strategically nestled within a biodiverse and topographically varied landscape, the Museum Complex will house interactive exhibits and artifacts illustrating both ancient and modern irrigation systems. The design will be deeply responsive to Kerala's tropical climate, incorporating natural ventilation, shaded structures, passive cooling and rainwater harvesting systems, utilizing vernacular architecture and local materials for environmental harmony and cultural relevance. It will feature functional models of traditional irrigation systems, allowing visitors to engage with recreated water channels and check dams.
- **Irrigation Research Centre:** Dedicated to cutting-edge research in water and irrigation technologies, this facility will house workshops, prototype development labs and dedicated research cells. It aims to support scientific inquiry, innovation and field application, engaging with universities and water authorities on water conservation and smart irrigation.
- **Knowledge Centre:** Designed as an educational space for students, scholars, and researchers, this centre will feature miniature models, interactive learning displays and integrated demonstration farms showcasing endemic crops and spice plantations. This hands-on component will offer a dynamic representation of how traditional systems can be blended with modern techniques for improved efficiency and sustainability.
- **Library/Resource Centre:** An essential academic complement, the library will house books, journals and digital archives on global irrigation systems and water resource management, serving as a rich repository of technical and historical knowledge for researchers, professionals and students.

***2. Lifestyle & Fitness Park***

This zone is designed to celebrate and preserve the region's native flora and fauna while promoting wellness and cultural immersion.

- **Biodiversity Park:** The Biodiversity Park will consist of curated planting zones, eco-habitats and interpretive trails, promoting ecological awareness and encouraging interactive exploration through walking and biking paths. This green space will also serve as a tranquil transition zone between various development clusters, contributing to the site's ecological balance. Design standards for biodiversity parks in India emphasize spatial organization, recreational facilities, external linkages, access, internal circulation and sustainable landscape strategies.
- **Performance and Wellness Zones:** Facilities such as the Ayush Centre, performance theatres and fitness trails will promote physical wellness and cultural immersion. These areas are planned to be integrated within the natural topography, creating a relaxing, nature-based recreational space.

***3. Event Zone ("Game of Heights")***

Conceptualized as a recreational and public engagement space, this zone aims to bring energy and diversity to the site.

- **Motor Adventure Park (Rock Motor Ride):** Featuring custom-built tracks for off-road biking and four-wheeler experiences, this will cater to thrill-seekers.
- **Amphitheatre and Performance Space:** Designed for cultural programs, seasonal festivals and public events, this area will provide a venue for large gatherings.
- **Open Lawns and Flexible Gathering Areas:** Suitable for large crowds, these areas will make the zone a destination for both leisure and community activities, enhancing the museum's appeal to a wider audience by blending education with entertainment. Space planning for adventure parks typically considers accessibility, natural features and designated zones for different activities like zip lines, rock climbing and water sports, while also incorporating relaxation, dining and retail areas.

***4. Business Zone (Hospitality)***

The Hospitality section will feature a Wellness & Ayush Rejuvenation Centre, designed to provide guests with a serene retreat in a resort-like atmosphere.

- **Wellness & Ayush Rejuvenation Centre:** This 2-3 acre centre will offer in-house accommodations that blend luxury with holistic wellness, allowing visitors to unwind and rejuvenate in comfort. This centre aims to create an enriching experience that harmonizes health, relaxation and cultural exploration for all who visit.
- **Convention Centre:** Envisioned as a space for conferences, exhibitions and knowledge-sharing events, this component strengthens the site's institutional value. It creates opportunities for academic and professional gatherings, ensuring year-round engagement beyond tourism. Convention centres typically include a main auditorium, multiple conference rooms, a grand ballroom, VVIP areas, cafeterias and administrative offices, with built-up areas varying based on capacity.

These proposed components are designed to create a holistic destination that not only celebrates the history and science of irrigation but also supports local tourism, livelihoods, ecological preservation and community participation.

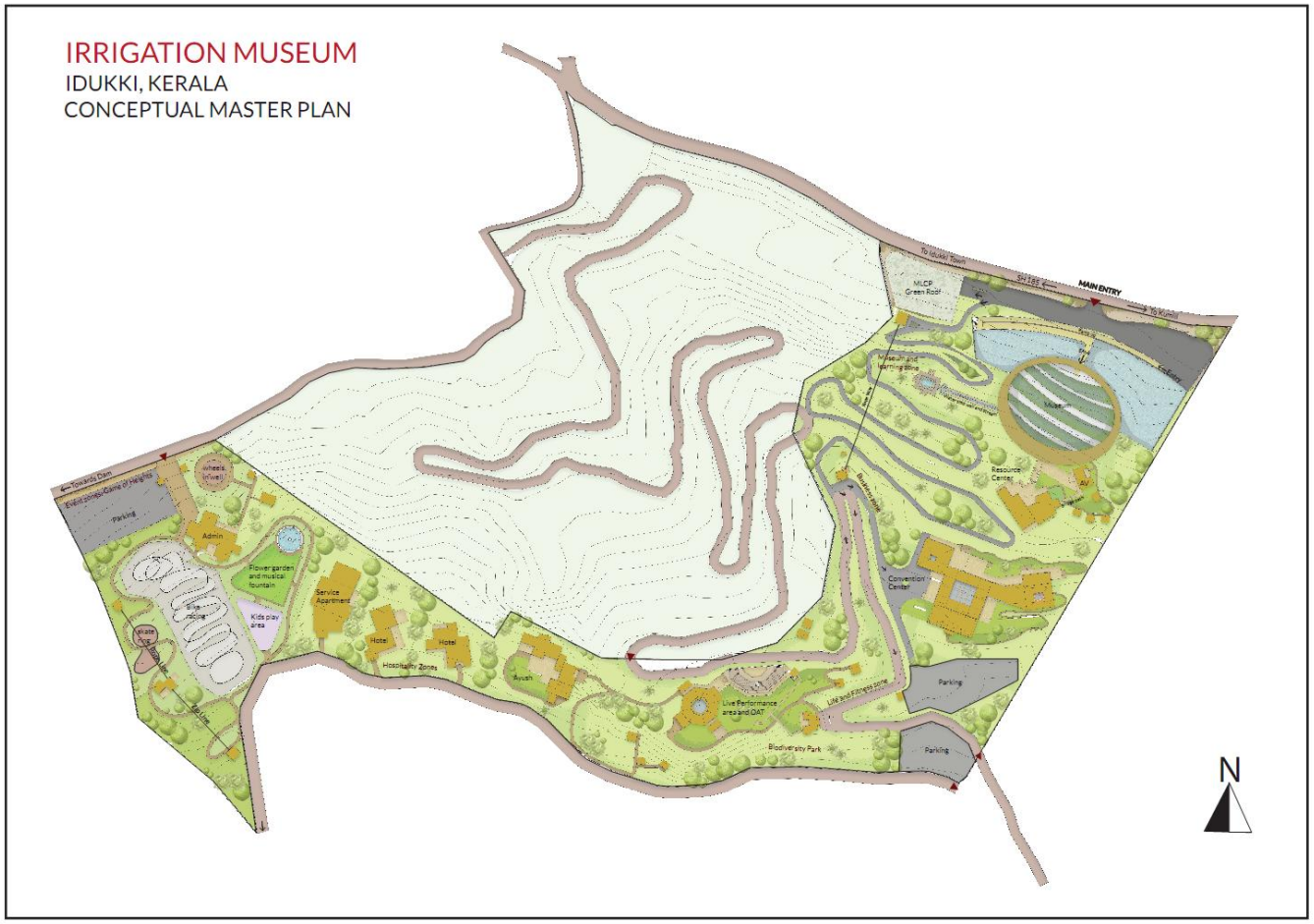



**Figure 12: Concept Master Plan**

### *11.3. Area Statement*

The detailed area statement provides a breakdown of the proposed built-up areas and open spaces within each zone, offering a quantitative overview of the project's physical footprint. This is crucial for planning, cost estimation, and regulatory compliance.

**Table 2: Proposed Area Statement for Irrigation Museum, Cheruthoni**

| Zone/Sub-Zone | Components | Detail | Level 1 (sqm) | Level 2 (sqm) | Level 3 (sqm) | Total Built-Up Area (sqm) |
|---|---|---|---|---|---|---|
| **EXPERIENCE ZONE** | | | | | | |
| **Museum and Learning** | Lift and Entry area | | | | | 75 |
| | Stairway | | | | | 182 |
| | Irrigation Museum Building | 900-1500 | 531 | 1272 | 1097 | 2900 |
| | Resource Centre (Learning & Research) | 300-1500 | 683 | 466 | 200 | 1349 |
| | AR/VR Theatre (Audio – Visual /3D enabled) | 1000-1500 | 150 | 150 | | 300 |
| | Water Body /Step well stream | | | | | 180 |
| | Step Well Area | | | | | 150 |
| | Deck 1 (terrace of lower lvl) | | | | | 191 |
| | Deck 2 (terrace of lower lvl) | | | | | 270 |
| | Entry Road till uphill connecting with proposed main road | | | | | 4217 |
| | MLCP | 6 floors | 1880 | | | 11280 |
| | Parking open | | | | | 1660 |
| | Pathways | | | | | 200 |
| | Connecting wooden bridges | | | | | 75 |
| | Ornamental landscaping | | | | | 300 |
| **Life & Fitness** | Performance area | 482 | 320 | 320 | | 1122 |
| | Bio Diversity Park | 1 acre | | | | 4000 |
| | Open Air Theatre | | | | | 382 |
| | Open air theatre and connecting pathways | | | | | 270 |
| | Services and other utilities structures spread across the zone | | | | | 150 |
| | Pathways | | | | | 200 |
| | Wooden bridges | | | | | 123 |
| | Admin | | | | | 120 |
| | Ayush | 760 | 535 | | | 1295 |
| | Live performance areas (different buildings) | 1500 | | | | |

| Zone/Sub-Zone | Components | Detail | Level 1 (sqm) | Level 2 (sqm) | Level 3 (sqm) | Total Built-Up Area (sqm) |
|---|---|---|---|---|---|---|
| **Fun & Adventure Village ("Game of Heights")** | Admin and reception area/ticketing area (inc. café, shop, common washroom, pharmacy) | 500 | 500 | | | |
| | Parking | | | | | 2052 |
| | Entry and total pathway in the zone | | | | | 1400 |
| | Security | | | | | 16 |
| | Bungee Jumping (Built- L-Tower and tower base, equipment room, toilet) | 76 | | | | 76 |
| | Rope walking (Built- NA) | | | | | 50 |
| | Wheels in Well (Wall of death) (Built area of well of death) | | | | | 171 |
| | Shaded standing area | | | | | 280 |
| | Washroom, security, etc. | | | | | 120 |
| | Bike racing area | 2660 | | | | 2660 |
| | Fencing perimeter | 278 m | | | | |
| | Children Fun Park (toddlers to school age) garden, fun area, paths etc. | | | | | 1600 |
| | Musical Flower fountain with 3D laser show | | | | | 150 |
| **BUSINESS AND HOSPITALITY ZONE** | | | | | | |
| **Resorts & Serviced Homes** | 4/3 Star hotels | | | | | |
| | Serviced Luxury stay Homes | | | | | |
| **Eco-Friendly Convention Centre** | Main building | 2000 – 4000 | 1382 | 1732 | 704 | 3818 |
| | Exhibition Hall/Mall | 362 | 362 | 362 | 362 | 1086 |
| | Path | | | | | 160 |
| **Event Zone** | Parking open | | | | | 1704 |
| | Internal road | | | | | 300 |
| | Rope pay room | 40 sqm X 2 | | | | 80 |
| | Utilities | 150 sqm | | | | 150 |

This detailed area statement, forms the basis for subsequent design, cost estimation and regulatory compliance checks. It outlines the distribution of built-up areas across multiple levels and the allocation of significant open spaces for various recreational and functional purposes.

## 12. Applicable Development Control Regulations / Building Bylaws

The project will be developed in strict conformance with the **Kerala Municipality Building Rules (KMBR), 2019**. These rules provide comprehensive guidelines for various aspects of construction, including:

- **Land Use:** Ensuring that the proposed activities align with the designated land use zones for the area.
- **Floor Area Ratio (FAR):** Adhering to the maximum permissible built-up area on a given plot, which is crucial for managing density and ensuring adequate open spaces.
- **Building Height:** Compliance with specified height restrictions, particularly relevant in a sensitive ecological zone.
- **Setbacks:** Maintaining mandatory distances from roads and plot boundaries to ensure proper ventilation, light, and access, as well as for future road widening.
- **Environmental Safety:** Integrating measures to minimize environmental impact, in line with the broader environmental protection goals of the state.

As a public institutional and tourism-based facility, all structures will also follow specific guidelines:

- **Hill Area Construction Guidelines:** Given Idukki's mountainous terrain, specific rules for construction in hilly regions will be meticulously followed to ensure stability and minimize ecological disturbance.
- **Universal Accessibility:** Provisions for universal accessibility will be integrated into the design, ensuring that the museum is accessible to all visitors, including those with disabilities.
- **Parking:** Adequate parking facilities, including the Multi-Level Car Parking (MLCP), will be designed in compliance with local norms for institutional buildings, which typically specify parking space per unit of covered area.
- **Fire Safety:** Robust fire safety systems and measures will be integrated into the design, adhering to the Kerala Fire and Rescue Services Department's approval processes, which include site clearance certificates and final fire safety clearances based on building height and type.
- **Drainage Systems:** Efficient drainage systems will be integrated to manage stormwater, particularly given the region's heavy monsoon rainfall and the site's proximity to the Cheruthoni Dam spillway.
- **Minimal Terrain Disturbance:** The design will prioritize minimal disturbance to the natural terrain, aligning with the project's sustainability and ecological balance objectives.

Necessary approvals from local authorities need to be obtained during the implementation stage. This includes securing building permits and plan approvals from the Local Self Government Department (LSGD), consent to establish and operate from the Kerala State Pollution Control Board (KSPCB) and environmental clearances for projects with potential environmental impacts. Water supply and sewage connections will also require approvals from the Kerala Water Authority (KWA) and electricity connections from the Kerala State Electricity Board (KSEB). This comprehensive approach to regulatory compliance ensures that the project proceeds with full legal and environmental adherence.

## 13. Block Cost Estimate

The block cost estimate below provides a preliminary financial overview of the proposed Irrigation Museum project, outlining the estimated investment required for each major component. This estimate is crucial for initial financial planning and for assessing the overall scale of the project.

**Table 3: Block Cost Estimate for Irrigation Museum, Cheruthoni**

| Project Component | Estimated Investment (in Rs. Crore) |
|---|---|
| Irrigation Museum (Building, Interior Fitting and Artefacts) | 13 |
| Internal Roads, Drainages, Public Facilities in Museum Area | 10 |
| Bio Diversity Park | 5 |
| External Infrastructure (power & water) | 5 |
| Land Development & Landscaping | 5 |
| AV Theatre/Musical Fountain/Laser Show | 20 |
| Fun and Adventure Village | 40 |
| Convention Centre | 40 |
| Resorts/Serviced Homes/Hotels including Ayush Centre | 100 |
| Parking Area/MLCP - Development & Management (200 vehicles) | 10 |
| **TOTAL** | **248** |

The total estimated investment for the Irrigation Museum project is ₹248 Crore. This block cost estimate provides a high-level approximation, with more detailed cost breakdowns to be developed during the Detailed Project Report (DPR) stage.

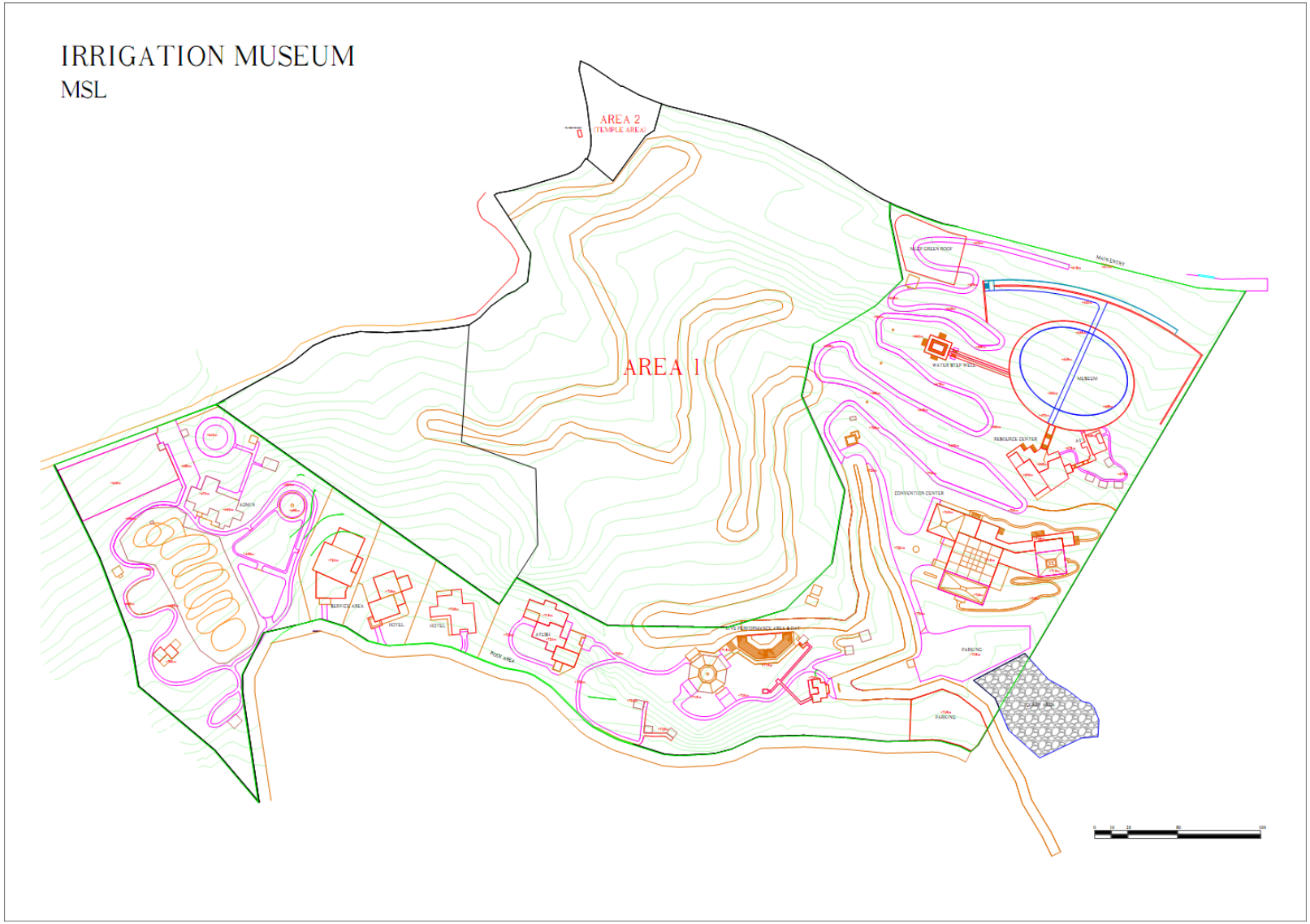
**Context of Major Cost Components:**

- **Irrigation Museum (Building, Interior Fitting and Artefacts) - ₹13 Crore:** This component covers the core museum structure, its internal finishes and the acquisition/development of exhibits. For context, the Museum Grant Scheme provides financial assistance up to ₹15 Crore for Category I museums, and 80-90% of total project cost for Category II & III museums, indicating that a ₹13 Crore allocation for the core museum is within a reasonable range for a significant new institution.
- **Fun and Adventure Village - ₹40 Crore:** This substantial allocation reflects the development of a recreational zone with high-adrenaline activities. The ₹40 Crore budget suggests a comprehensive and diverse range of attractions.
- **Convention Centre - ₹40 Crore:** The cost for a convention centre is influenced by its capacity and the complexity of its facilities. A ₹40 Crore allocation for this component suggests a substantial facility, potentially with multiple halls and amenities.
- **Resorts/Serviced Homes/Hotels including Ayush Centre - ₹100 Crore:** This is the largest single component, reflecting the significant investment in hospitality infrastructure. Resort and wellness centre construction cost may vary based on luxury level, area and type of construction, which are to be finalized in consultation with Concessionaire during the implementation stage.
- **Parking Area/MLCP - Development & Management (200 vehicles) - ₹10 Crore:** A ₹10 Crore budget for a 200-vehicle MLCP suggests a modern and well-equipped facility. However, the cost may vary depending on the type of system (mechanical, hydraulic, automated) and capacity augmentation, if any, at the implementation stage.

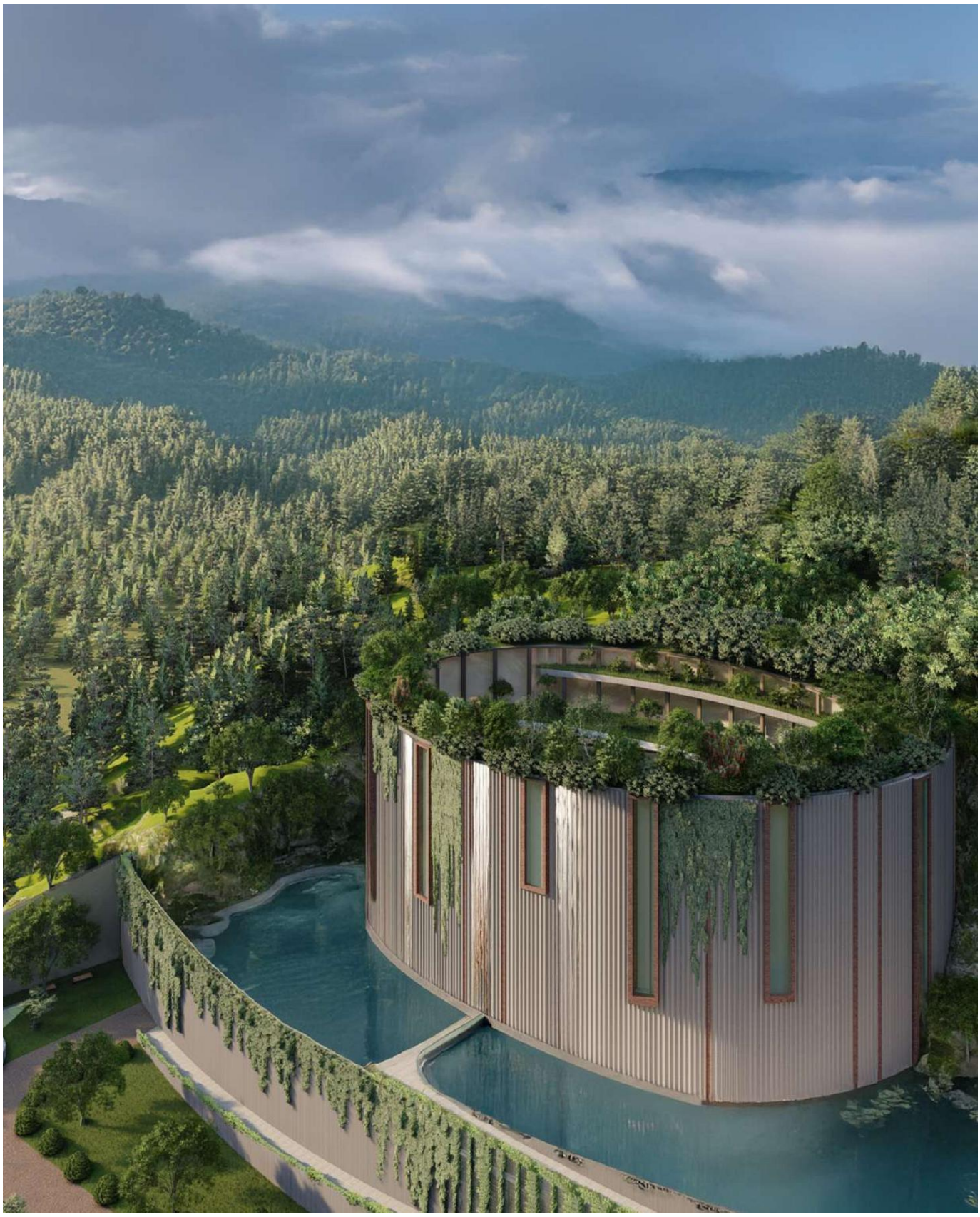
It is important to note that block cost estimates are preliminary and include a contingency factor to account for unforeseen expenses and price fluctuations. The detailed project report (DPR) phase will refine these estimates, incorporating more precise technical specifications and market rates, along with a comprehensive risk analysis and mitigation plan.

## 14. Annexure A – Irrigation Museum Dimensions

## 15. Annexure B – Irrigation Museum MSL



# 16. Annexure C – Concept Views of Irrigation Museum Main Building




**CENTRE FOR MANAGEMENT DEVELOPMENT**

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