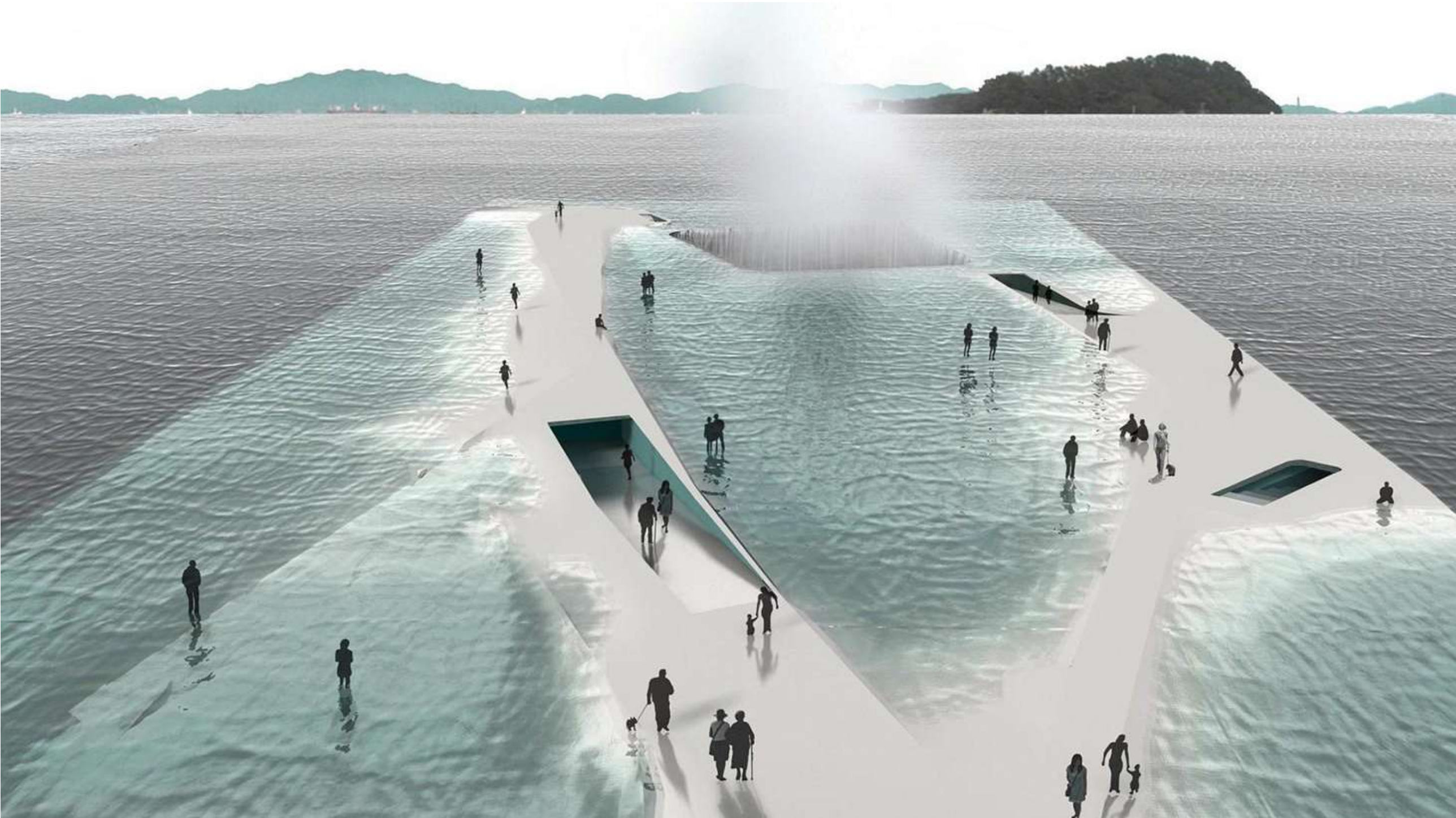
WATER, EXPERIENCE AND ARCHITECTURE

Hesarghatta Lake, Bengaluru.

GUIDE : **P**ROF. **F**ATHIMA **S**AMANA

LOCHAN **A**RADHYA **M** – 1AA16AT048

REVIEW – 2 05-11-2020



Case Study: Water Pavilion - Daniel Valle Architects

LOCATION: **Yeosu, South Korea**

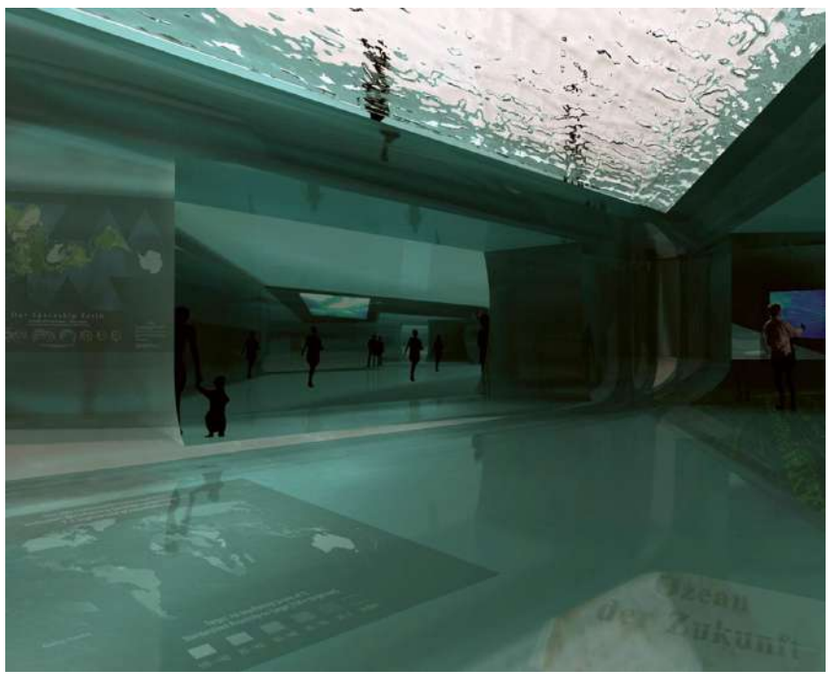
CLIENT: **Yeosu EXPO 2012**

AREA: **30,000 sqm**

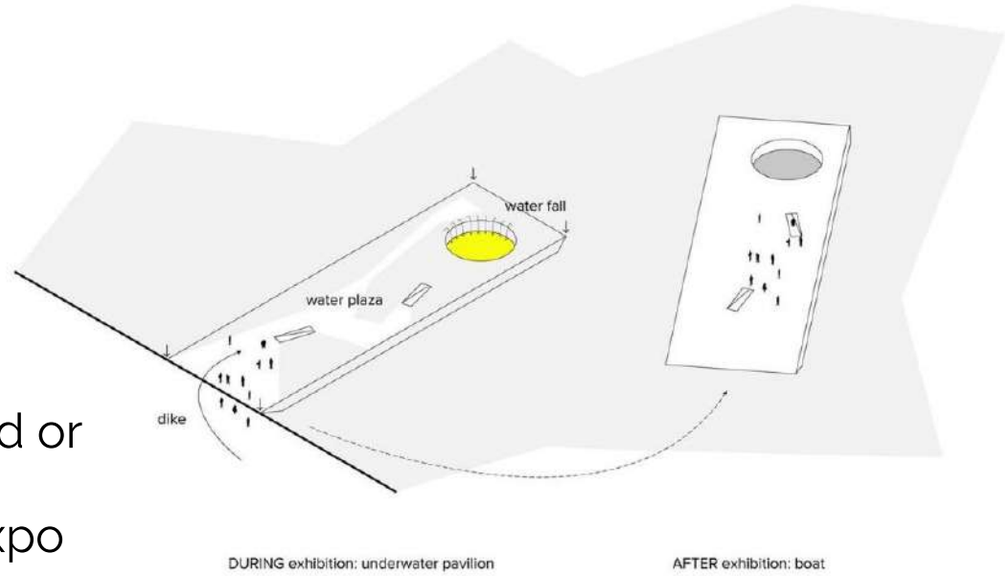
STATUS: **Competition**

Year: **2009**

The proposal for the Water Pavilion for the Yeosu EXPO 2012 explores various water principles and the translation into an architectural experience. The notion of fluidity, buoyancy and constant change are principles for our proposal. The pavilion stands on the unstable limit of sea level, changing its configuration (buoyant configuration) according to various uses during the expo. Sometimes the pavilion is entirely underwater allowing few entrance ways where other times the pavilion rises and “dries” its surface allowing larger events happening in the roof deck.

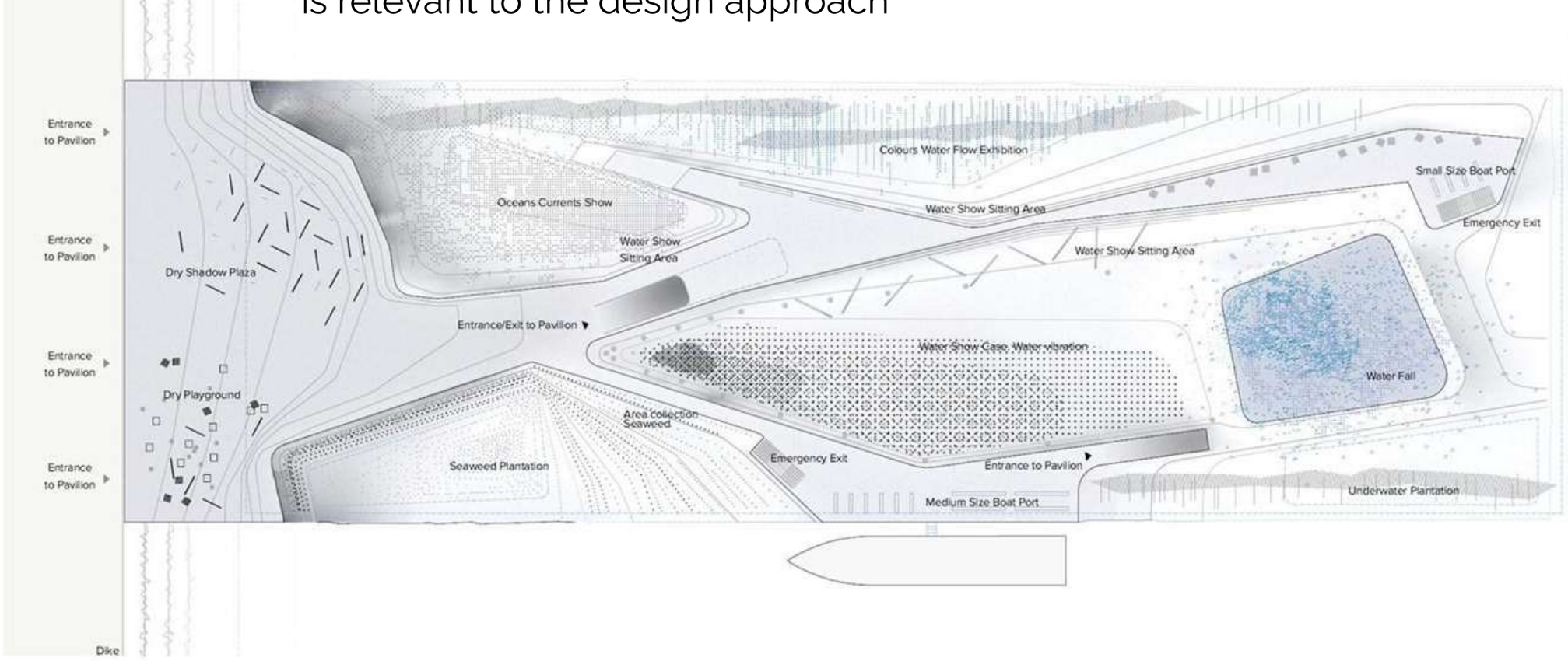


The design of the Thematic Pavilion aims to raise people's attention on the ocean and coastal environment. The relationship with the water is intentionally solved in an unstable equilibrium.

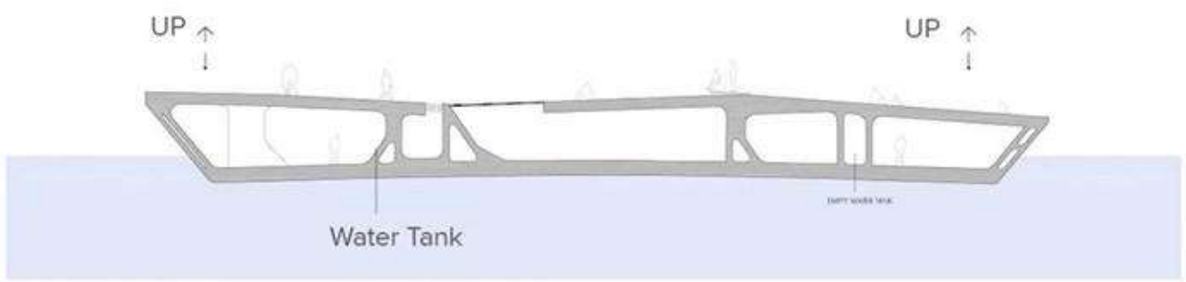


Temporality

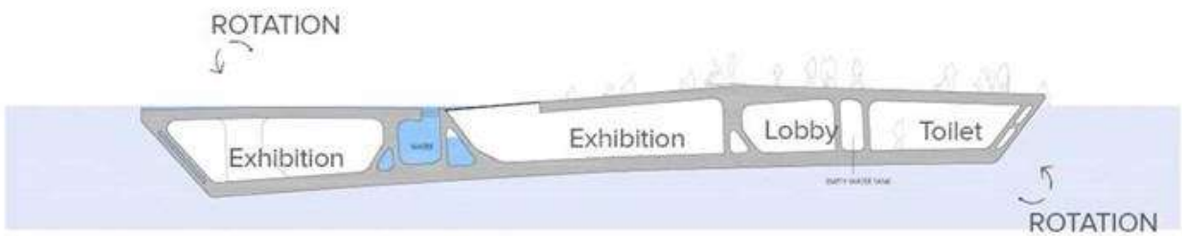
Universal Expo Buildings are commonly abandoned or underused after the exhibition comes to an end. A proposal pavilion that has a prosperous life after Expo is relevant to the design approach



entrance level plan

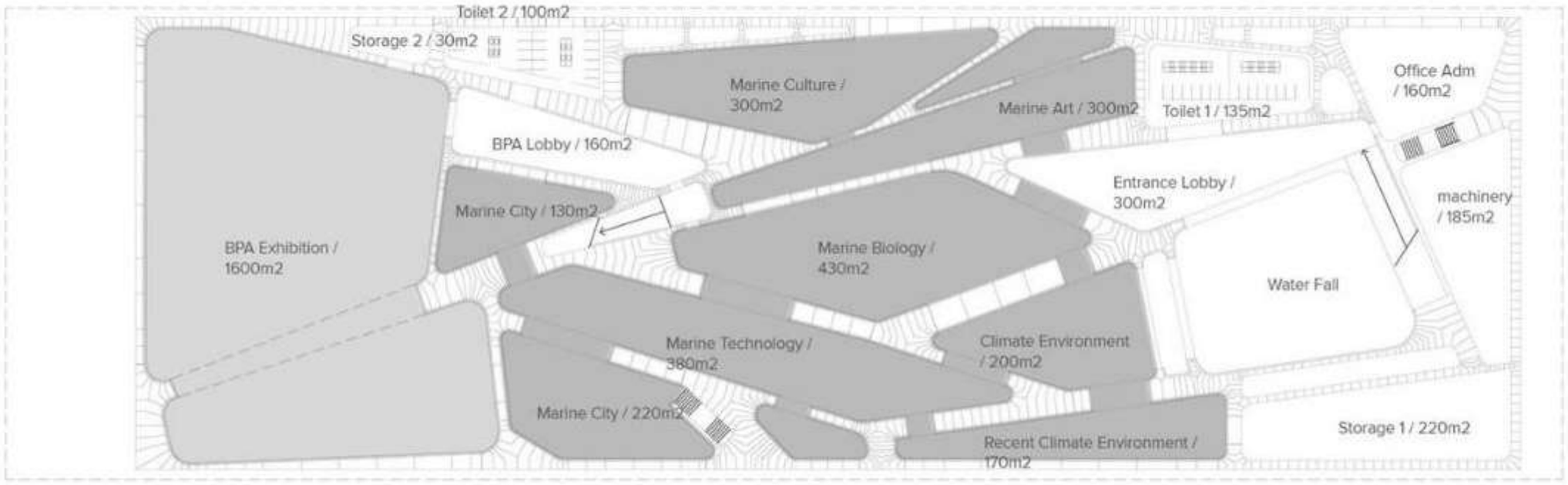


After Expo / Loading during Expo / Typhoon

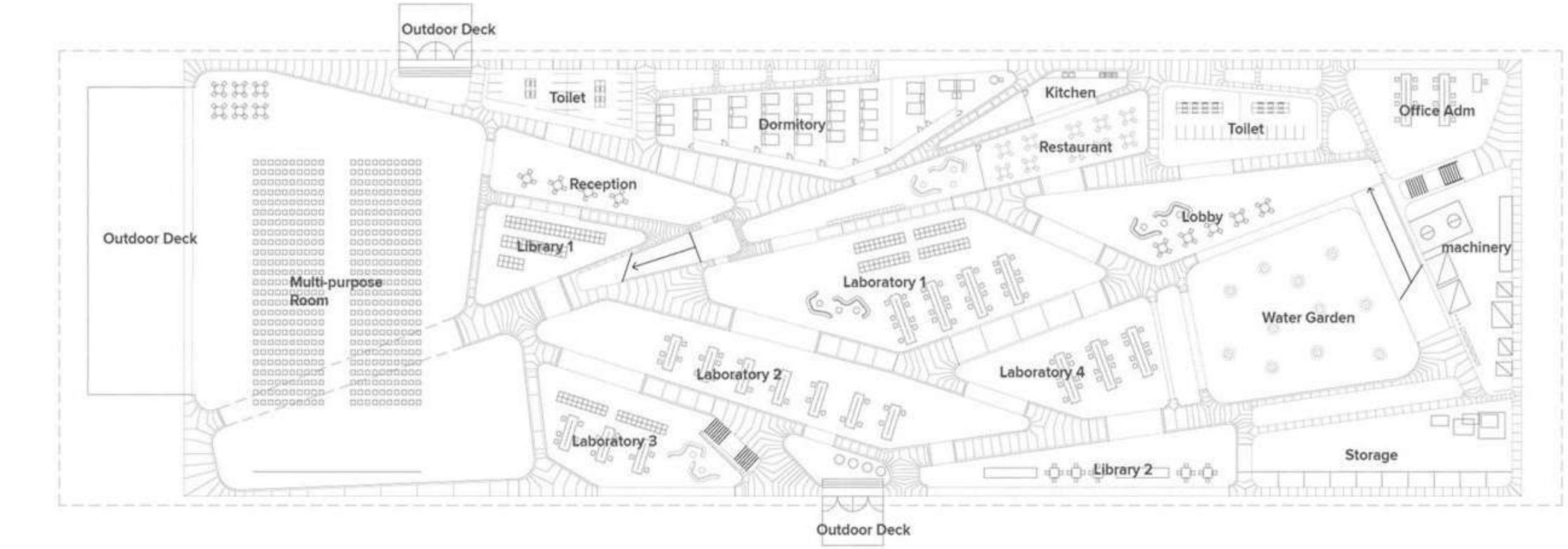


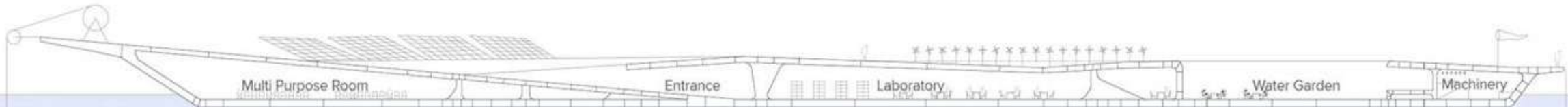
Pavilion tilted level during Expo for water show

DURING EXPO



AFTER EXPO

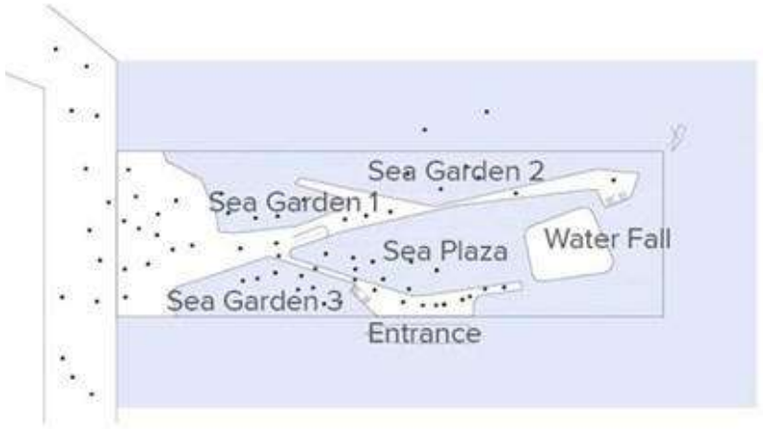




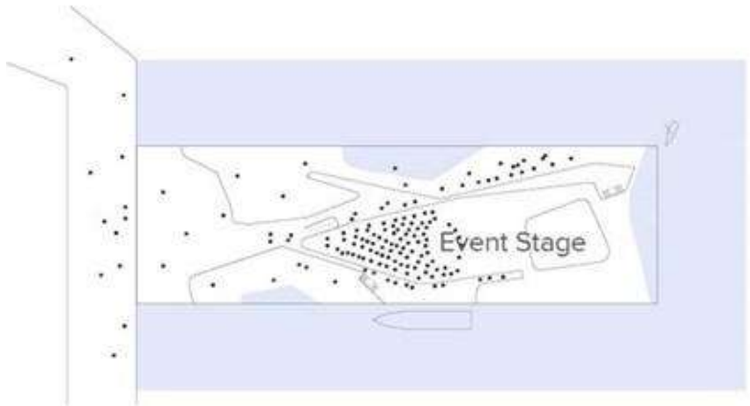
WEAK EQUILIBRIUM

The design of the Thematic Pavilion aims to get people's attention on the ocean and coastal environment crisis .The relationship with the water is intentionally solved In an unstable equilibrium The Pavilion is between submerged and emerged level - as submarines do-defining a sensible state of equilibrium between dry and wet. This aims to represent the real risk that many coastal areas around the world will face by the ocean level consequence of global warming

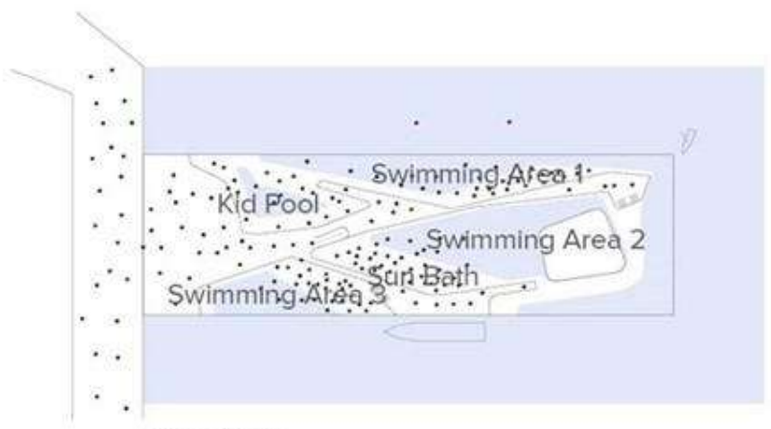
The visitor will experience certain uneasiness when visiting the pavilion, a state of mood suitable to enter the exhibition space where information is displayed. The architecture contributes to the Expo Theme on facilitating the state of mind nor moodiness of visitors prior to information display



1 Sea Gardens

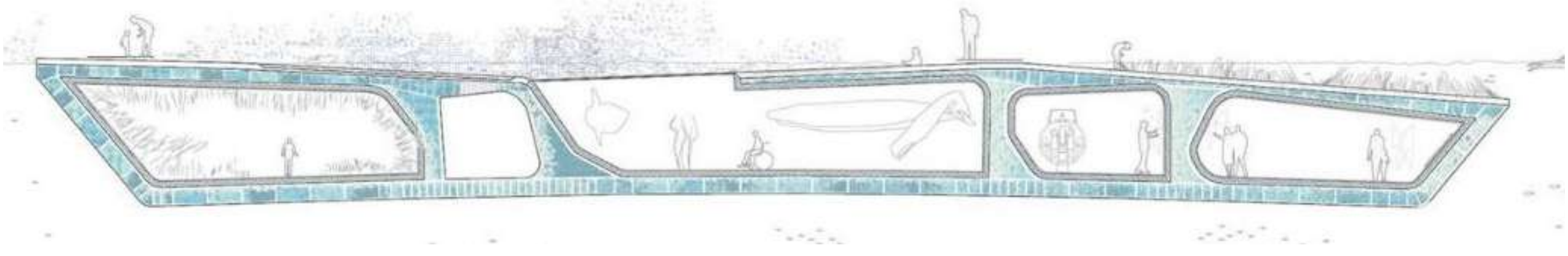


3 Event Plaza



2 Sea Park


Natural water fall | Water scape of dam | Artificial water jump



Water Pavilion
Studio *Edwin van der Heide*

Music: **Edwin Van Der Heide & Victor Wentink**

Generative **Composition And Spatialization Concept: Edwin Van Der Heide**

Architecture: **Freshwater Pavilion Nox, Lars Spuybroek**
Saltwater Pavilion Oosterhuis Associates

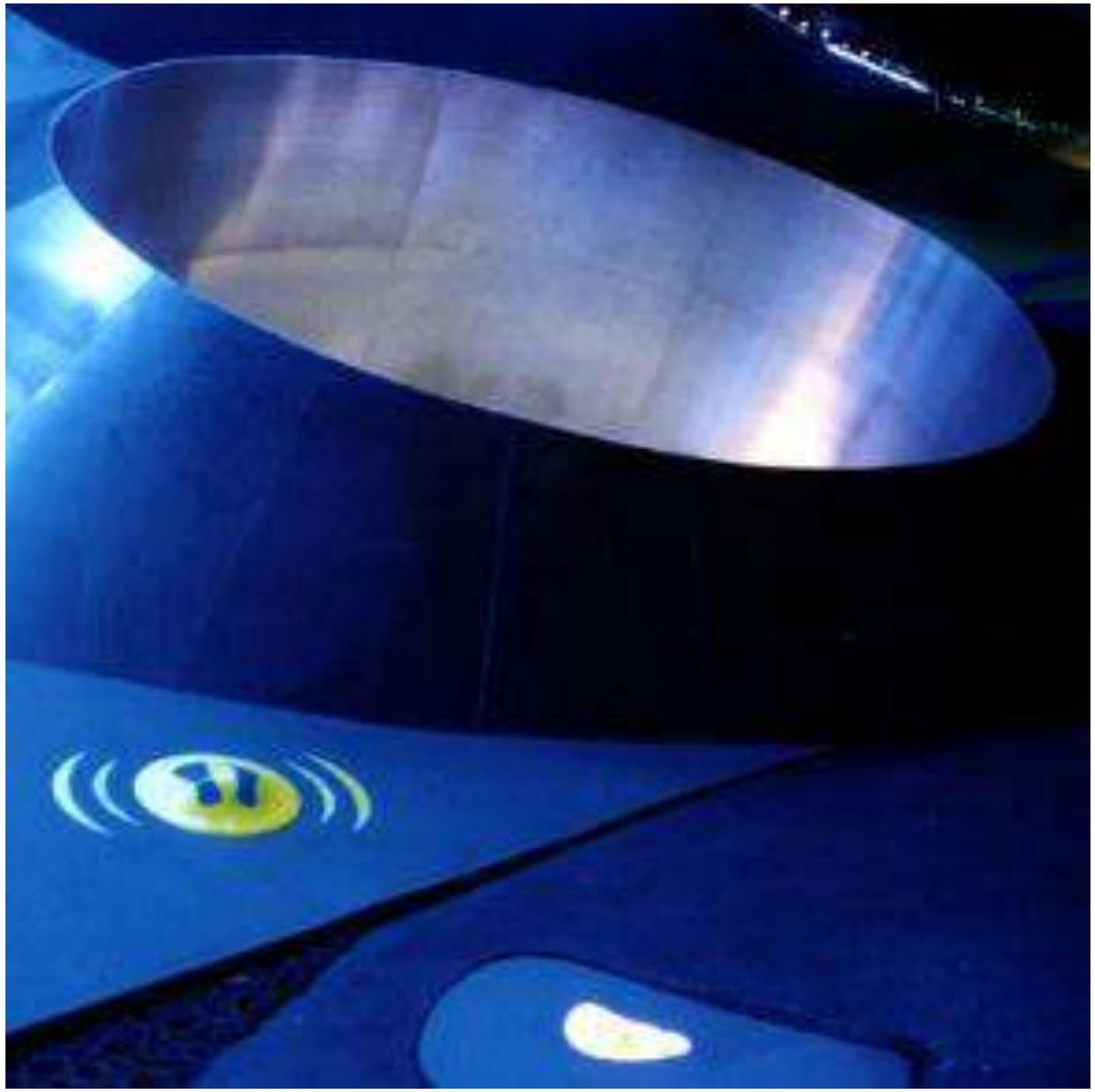
Software Development: **Arjen Van Der Schoot & Edwin Van Der Heide**

Software: **Opcode Max, Supercollider**

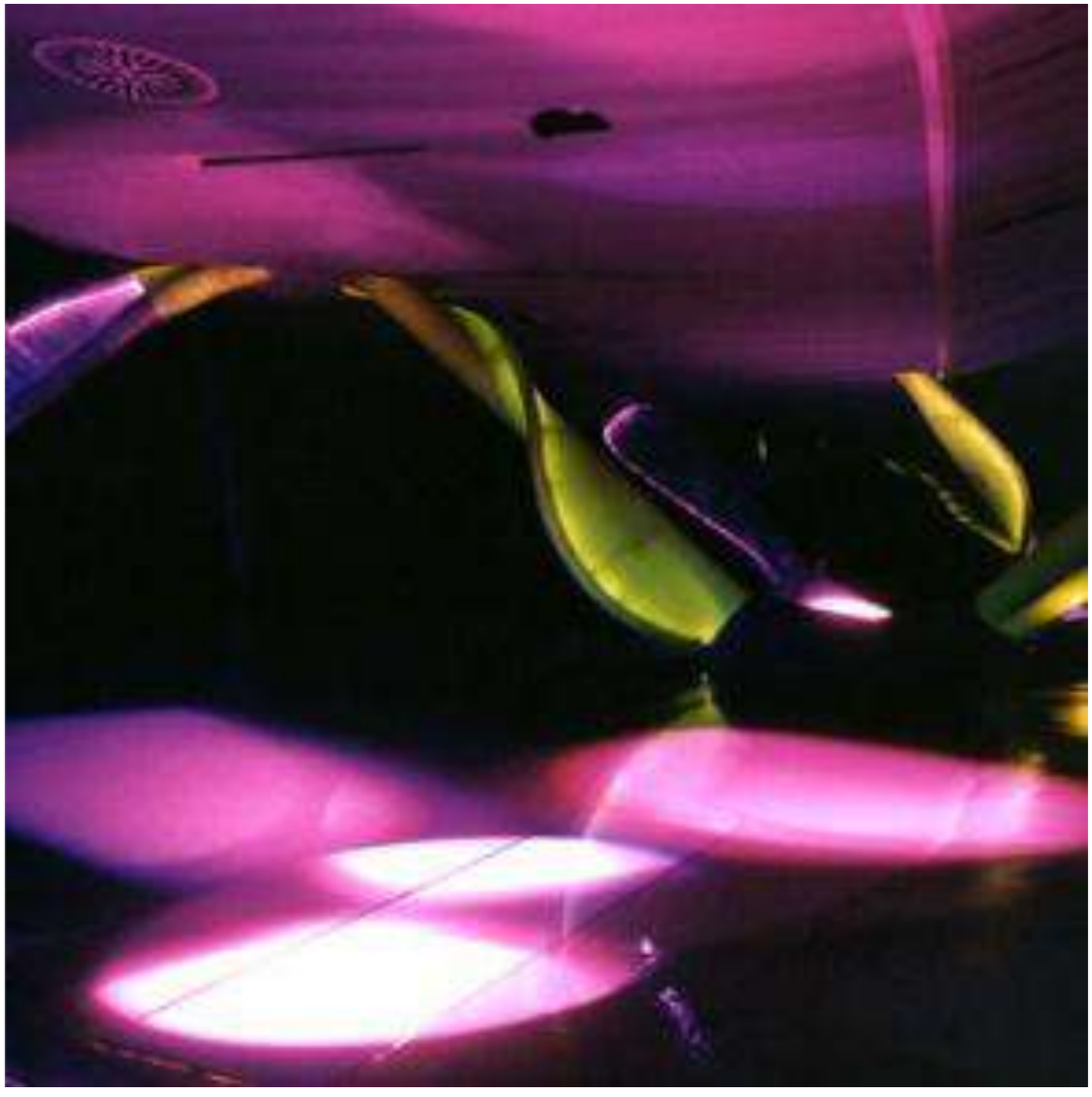
The concept of the water pavilion is based on the idea of creating a communicating architectural environment. It's an environment where the building, light, projected images, water and sound form one complete experience. The behavior of the environment is based on literal processes and metaphors about water. The fluid structure of the inside of the building is a shell for a continuously flowing and transforming world of water realized both with real water and virtual environments.

All the sounds are electronically produced. The speakers are placed in such a way that you experience a sounding building instead of sound in a building. There are 60 speakers distributed over the whole building. Each individual sound has its own character of movement and speed over the speakers.

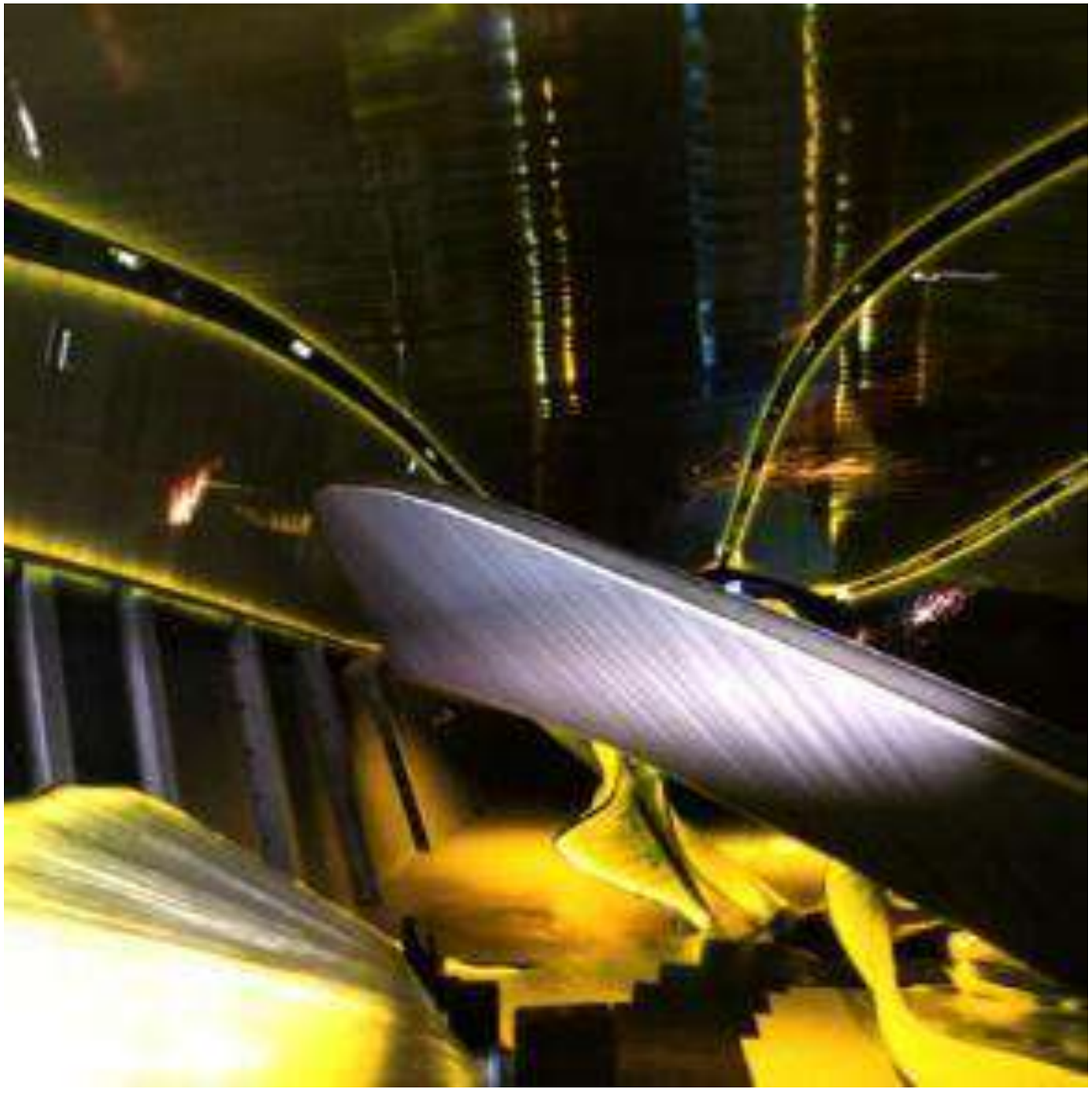
The building consists of two interconnected pavilions: the Freshwater Pavilion and the Saltwater Pavilion. Each pavilion has its own sound environment. The sound environment of the freshwater pavilion is based on metaphors of a river, a water source and a darker underwater space. The saltwater pavilion is inspired by virtual sounding sky, the water surface of the sea and a hydra traversing these. It's presenting metaphors of different weather conditions.



The music in the two different spaces is not a fixed composition but has a generative approach to it and is therefore composed on the moment itself. The rules for how sounds can be combined are predefined; the actual decision of what sounds is made in real-time. This way the music will always be different. Partly the visitors can influence the processes via sensor based interfaces in the building. Furthermore the weather conditions outside of the building are used to control part of the compositional parameters.

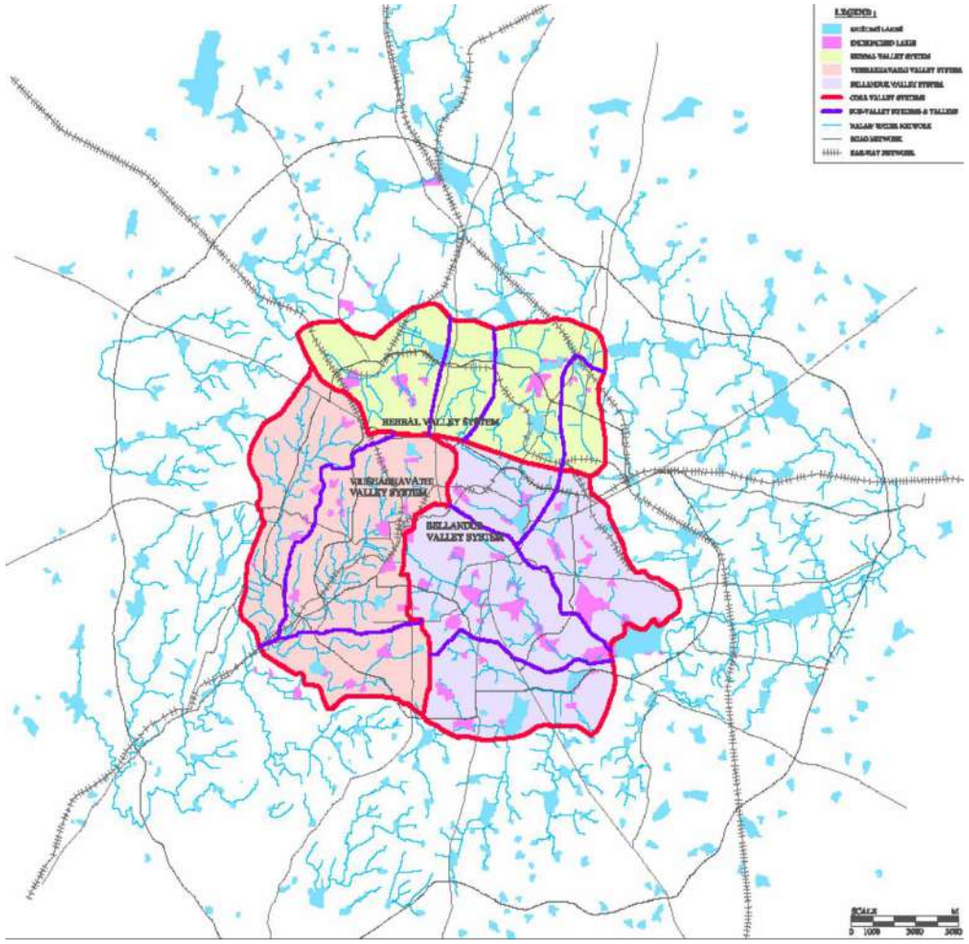


While a traditional concert often aims for a uniform experience of the audience, the Water pavilion has the opposite approach. It's part of the concept to promote individual experiences. Two persons visiting the building can have different experiences and when visiting the Water Pavilion a second time this can lead to again another experience.

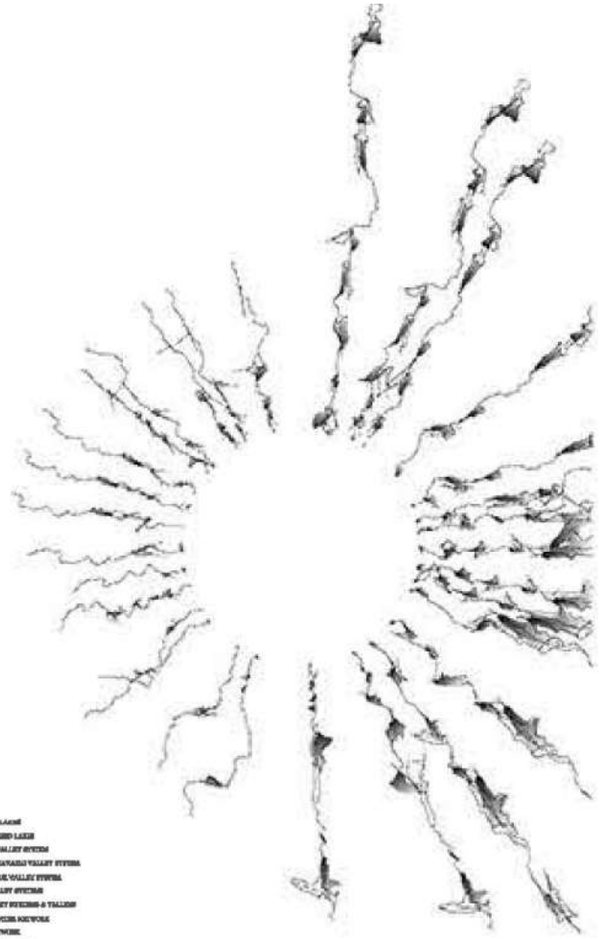


Bangalore and Tanks

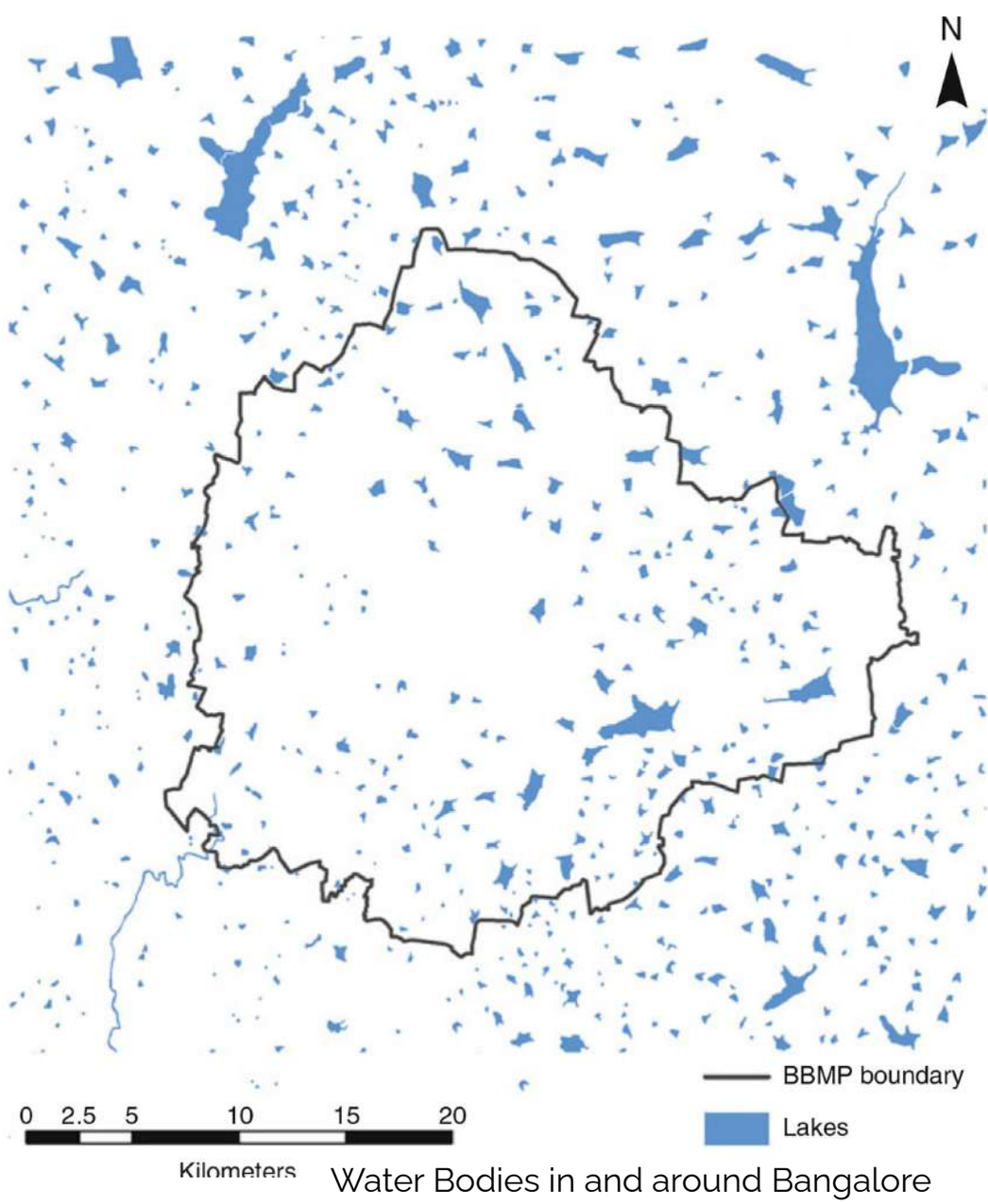
Bangalore is located in the Deccan plateau, in the South Indian peninsula. The Deccan plateau is bound by Vindhyas to the North, Ghats to the East and the West and Nilgiri hills to the South. At the regional level, Nandi Hills formed the apex of the ridge, from where water would flow in different directions



Three Valley and River basin in Bangalore



Central Ridge, as Nandi hills where Slope is towards east and has more water bodies than the west.



Water Bodies in and around Bangalore

In Bangalore, the main ridge-line runs North-west and South-east direction dividing the city into two river basins –Arkavathi river basin and Pinakini river basin. The Arkavathi river basin is to the west with steep slope and undulating terrain. But the Pinakini river basin is to the east with gentle slopes and valleys.

CONTEXT OF BANGALORE:

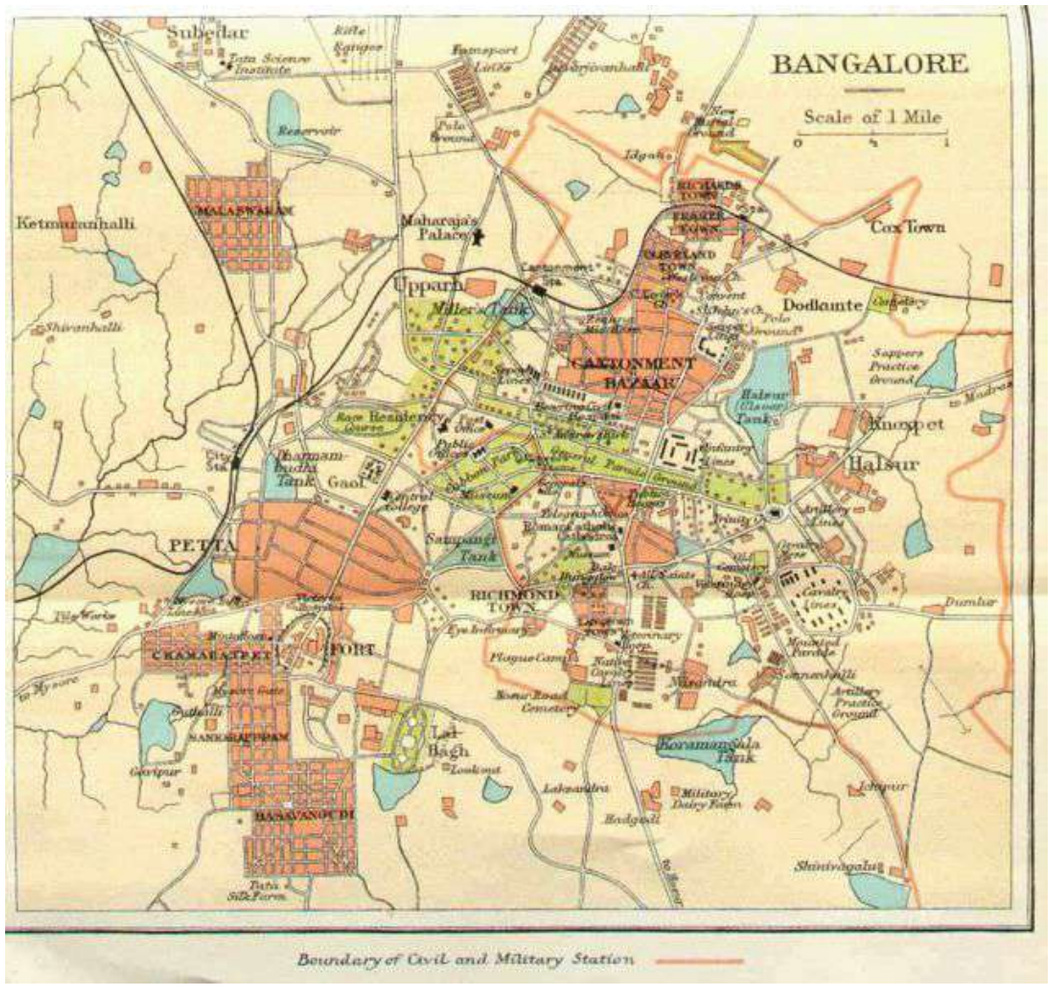
- Radial topography pattern - Apex of the ridge – High Grounds
- Tanks constructed, identifying the natural valley systems in the region
- Nalas (valleys) fed the tanks with surface run-off water, during rains
- Tanks provided water for drinking & agriculture, during lean periods

HISTORY AND FORMATION

- The earliest history of creation of lakes in and around the city is traced to the founders of Bangalore or Bengaluru –the **Kempe Gowda**– in the Sixteenth century and later by the **Wodeyars of Mysore Kingdom** and the **British.**

- Most of the lakes and tanks were man made for purposes of **drinking water, irrigation and fishing needs** and they have also favorably influenced microclimate of the city. The lakes have also served to replenish ground water resources in the vicinity, which are tapped through wells for drinking water.[

- In the **1960s** the number of tanks and lakes was **920** and less than **580 in 1993**.



Old map with Lakes before encroachment

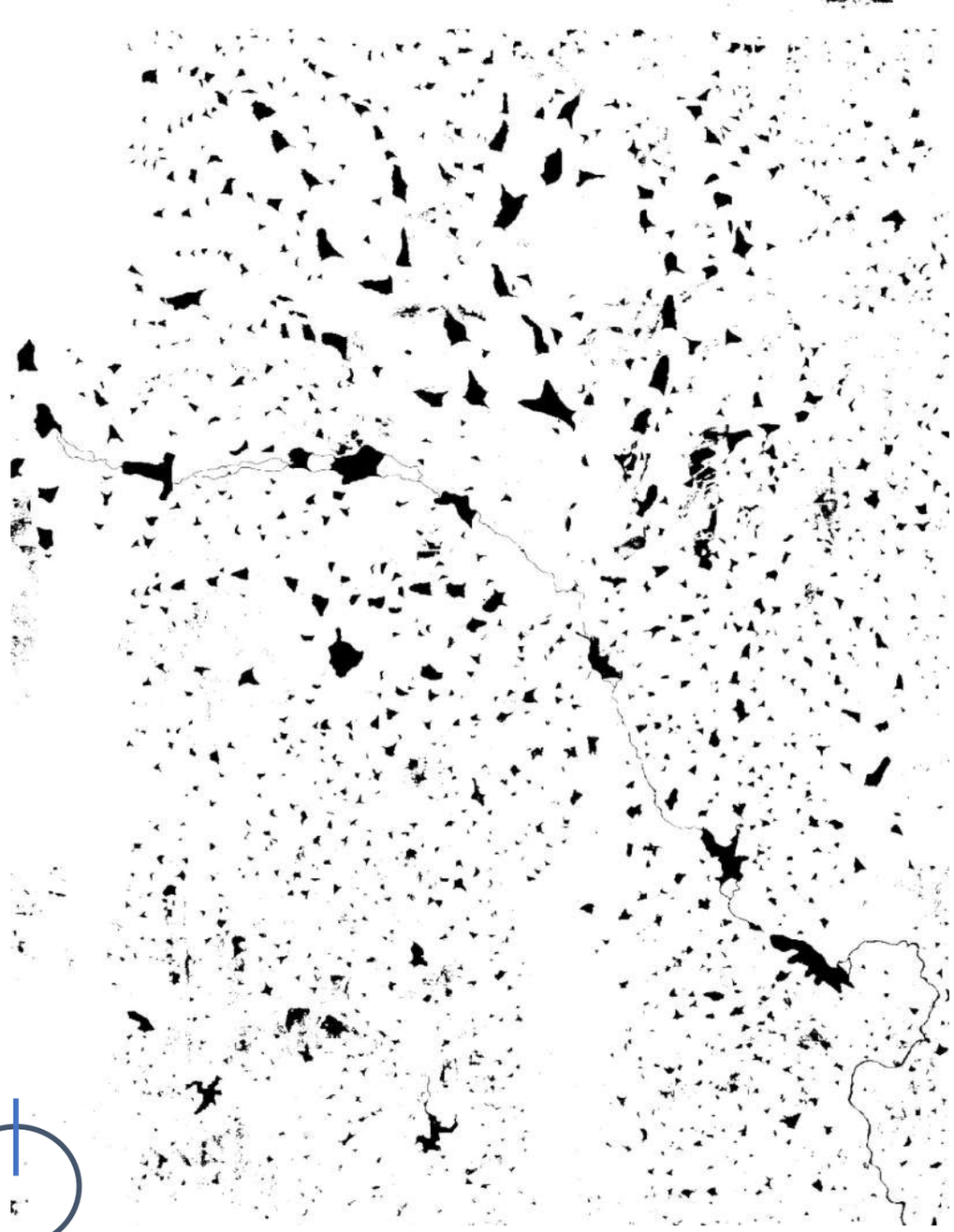


Illustration of Thousand Tanks in Bangalore

•WORKING PRINCIPLE OF TANK SYSTEM:

- Tank System worked on the **"Principle of Cascading"**
- Principle of cascading:
  - Tanks, situated in the same catchment area, formed chains
  - Tanks depended on surplus water from the tanks at higher eleva & the run-off from their own catchment
- Tank system of Bangalore, drained the city effectively & prevented flooding within the city

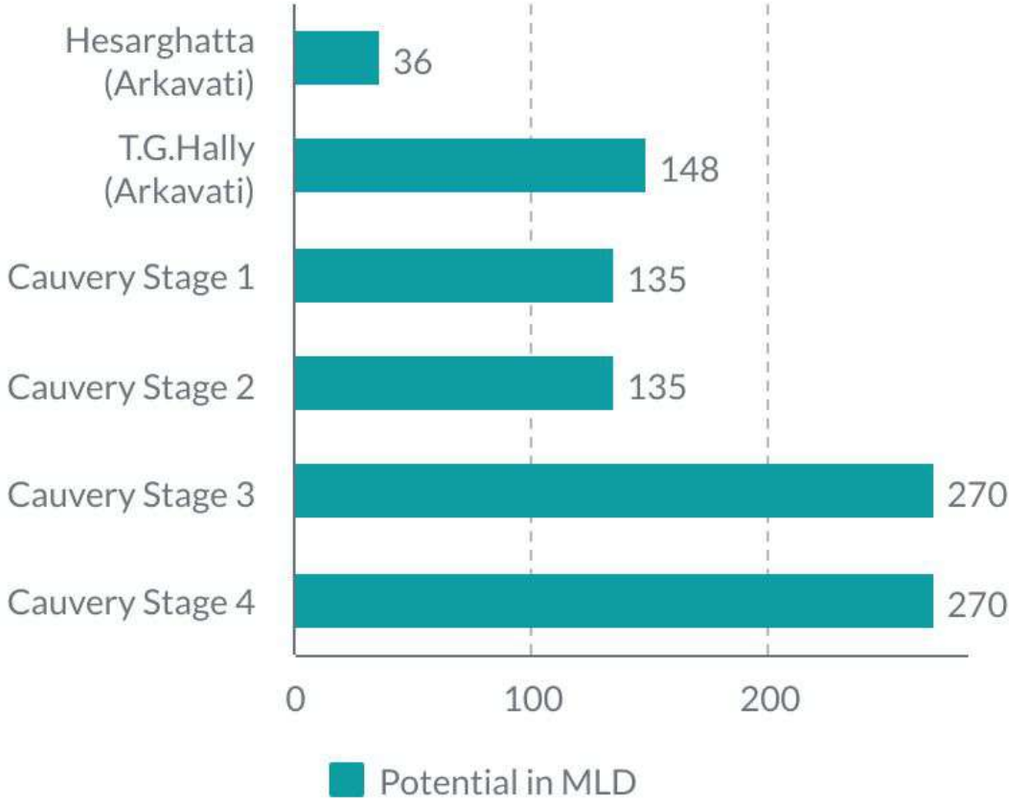
Source of Water

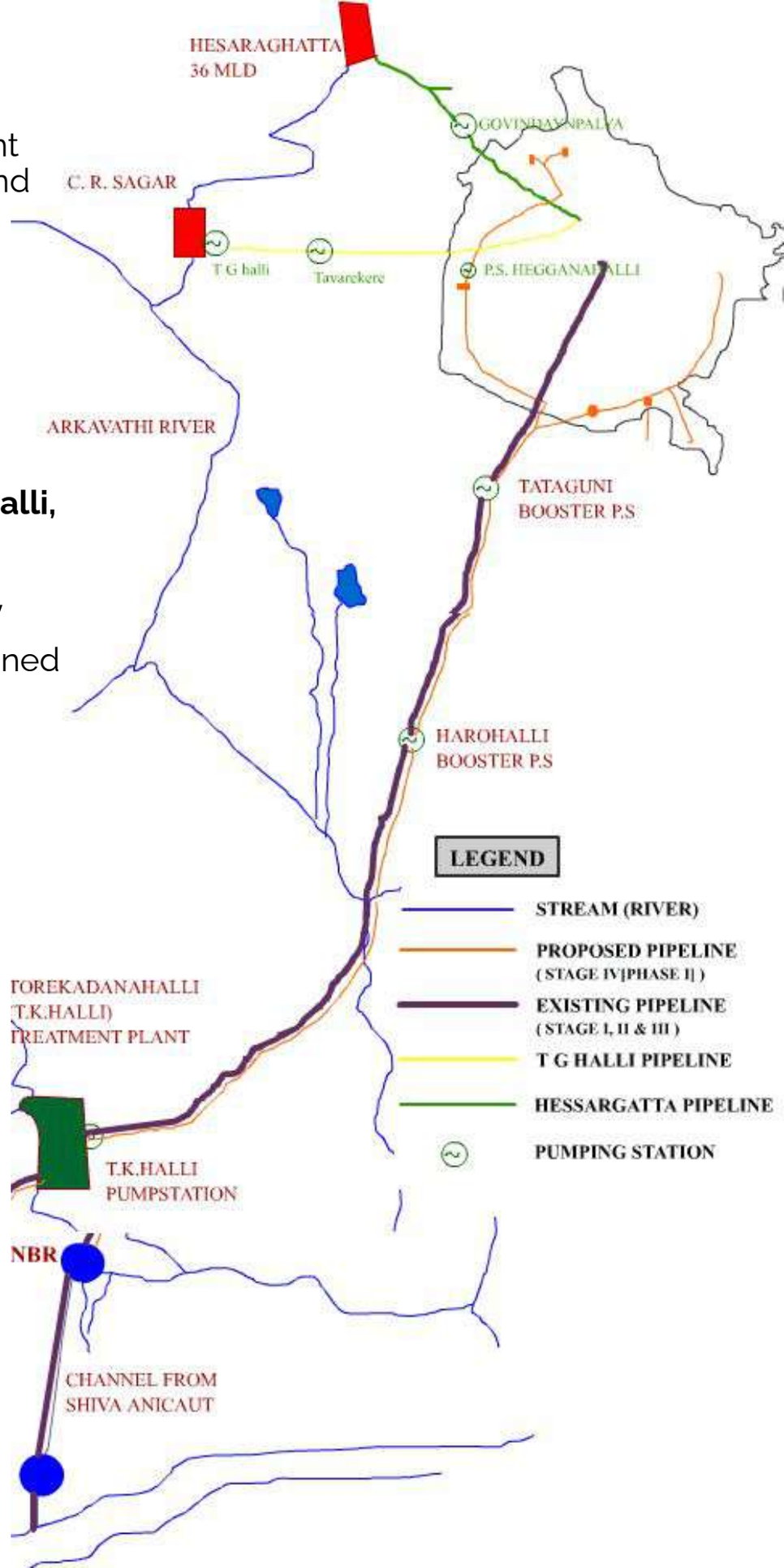
- Until 1895 unfiltered water was supplied from tanks viz., **Dharmambudi**, (present day Majestic bus stand), **Sampangi, Ulsoor** etc. supplemented by local wells and Ponds.

- In the year **1894**, the first protected water supply scheme **"Chamarajendra Water Works**" was started **by Sir.K.Seshadri Iyer**,
  The source of water was **Hesarghatta lake on Arkavathi River.**

- In the year **1925,** Hesaraghatta lake started drying up. A reservoir was commissioned on river Arkavathi by building a dam **(Chamaraja Sagar) at TG Halli,** downstream of Hesaraghatta lake.

- During **1969**, based on recommendations of an Expert Committee, **Cauvery Water** Supply Scheme I Stage Project was started. The same was commissioned in 1974.. Subsequently Stage II, Stage III and stage IV projects have alsobeen commissioned.





Encroachment

Rapid urbanization has transformed many lakes into urban utilities. Most of the lakes have vanished due to encroachment and construction activity for urban infrastructure expansion.
The city once had 280-285 lakes of which

7 cannot be traced,

7 are reduced to small pools of water,

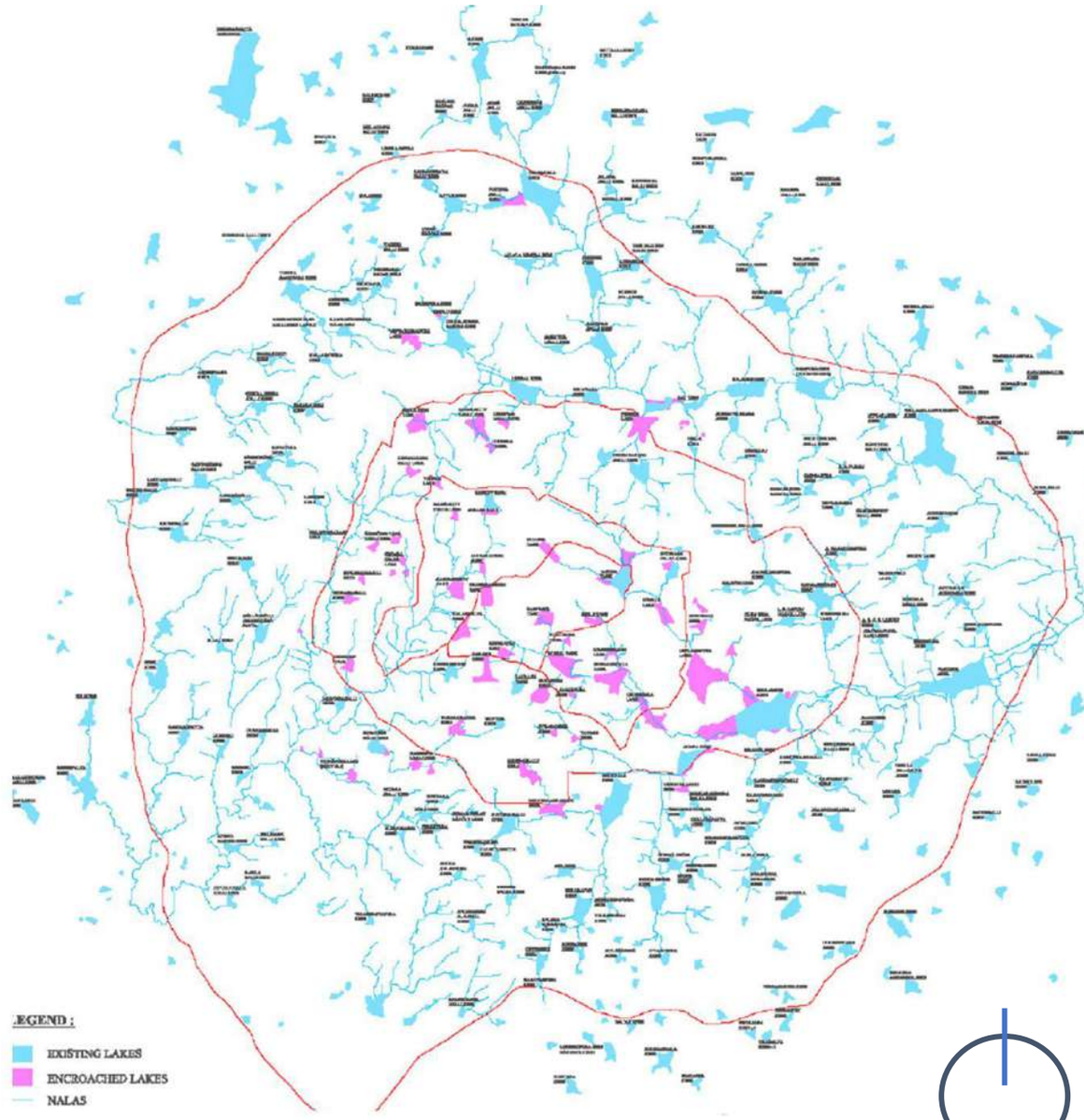
18 have been unauthorizedly encroached by slums and private parties,

14 have dried up and are leased out by the Government.

28 lakes have been used by the Bangalore Development Authority to distribute sites and build extensions for residential areas. The remaining lakes are in fairly advanced state of deterioration.

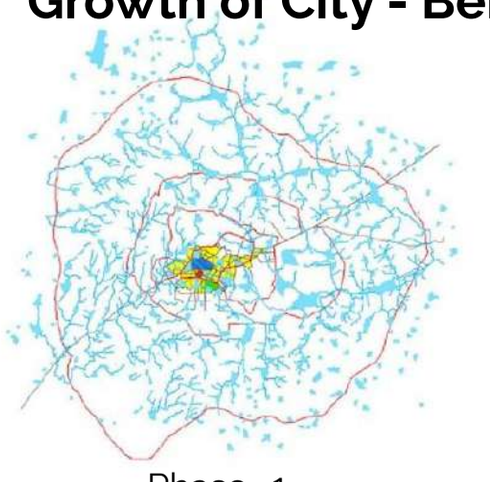
Encroachment of tanks in Bangalore

- Challaghatta lake changed to Karnataka Golf Association
- Dharmambudhi tank changed to Majestic bus stand
- Koramangala lake changed to National Games Complex in Ejipura
- Siddikatte Lake has now become KR Market
- Karanji tank is the Gandhi Bazar area
- Kempambudhi is now a sewerage collection tank
- Nagashettihalli lake changed to Space department
- Kadugondanahalli lake changed to Ambedkar Medical College

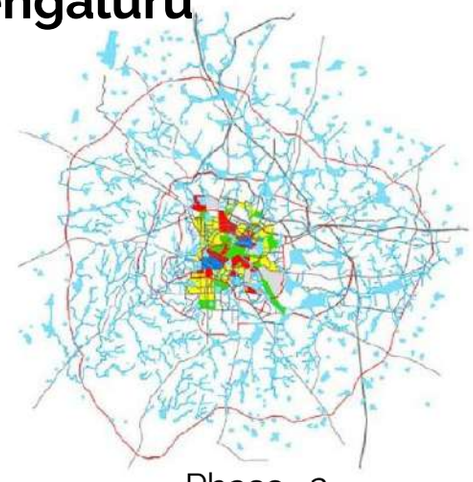


Lakes Encroached in Bangalore

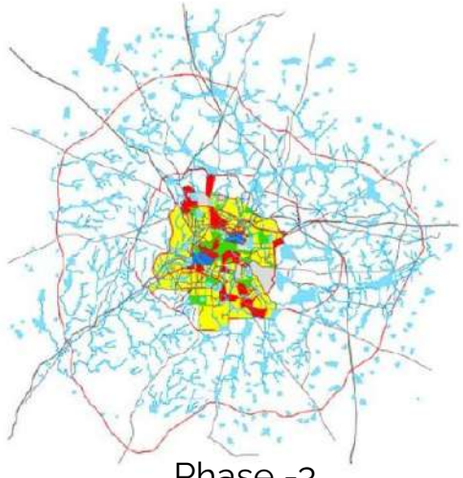
Growth of City - Bengaluru



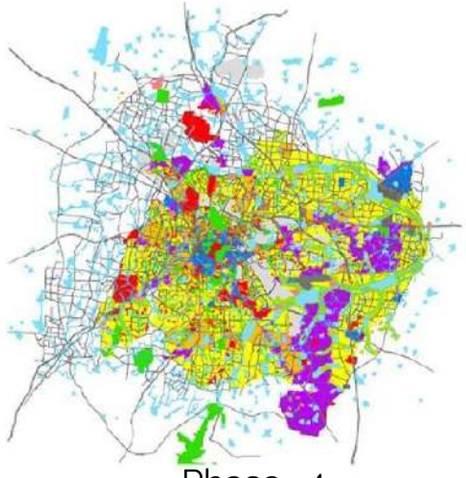
Phase -1
Pre- Colonial Period
After 1537



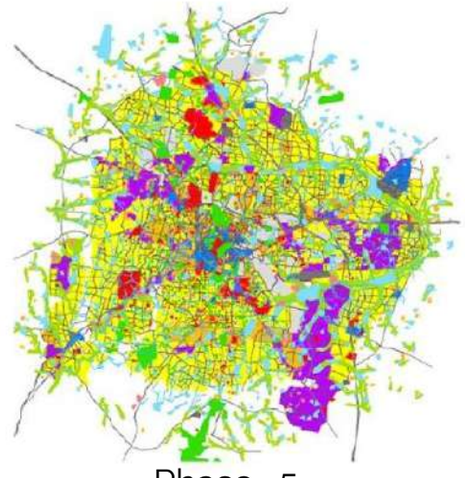
Phase -2
The Colonial Period
After 1809



Phase -3
Pre- Independence
After 1925

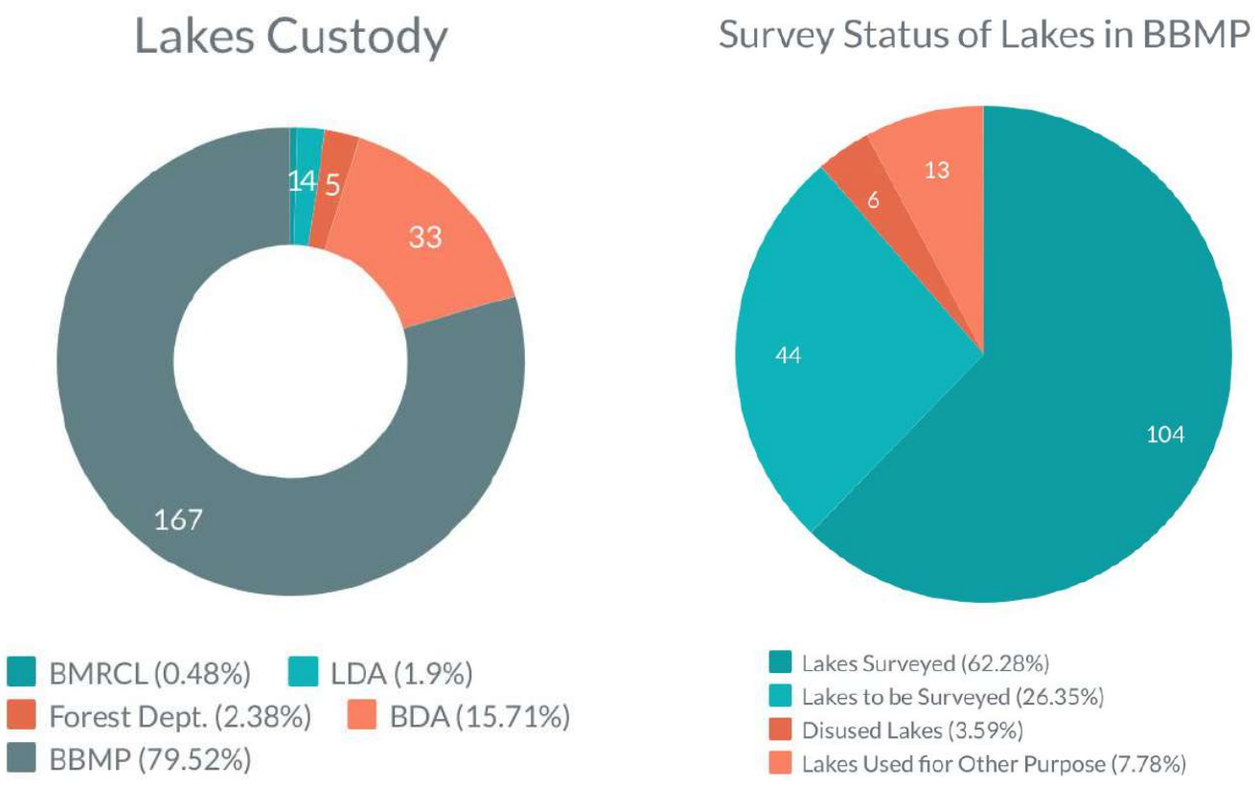


Phase -4
Post - Independence
After 1950



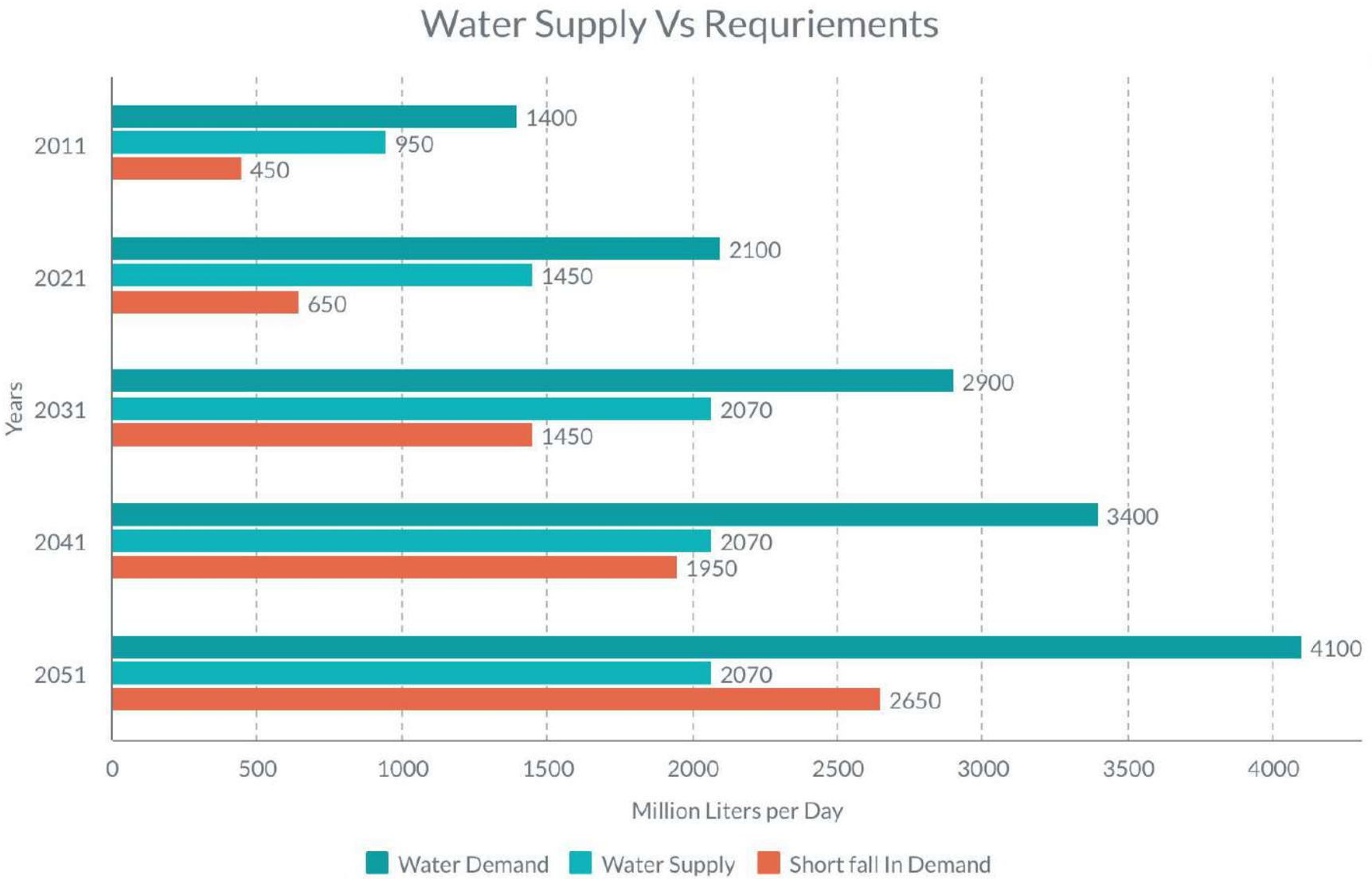
Phase -5
The Current Period
After 2000 to Present

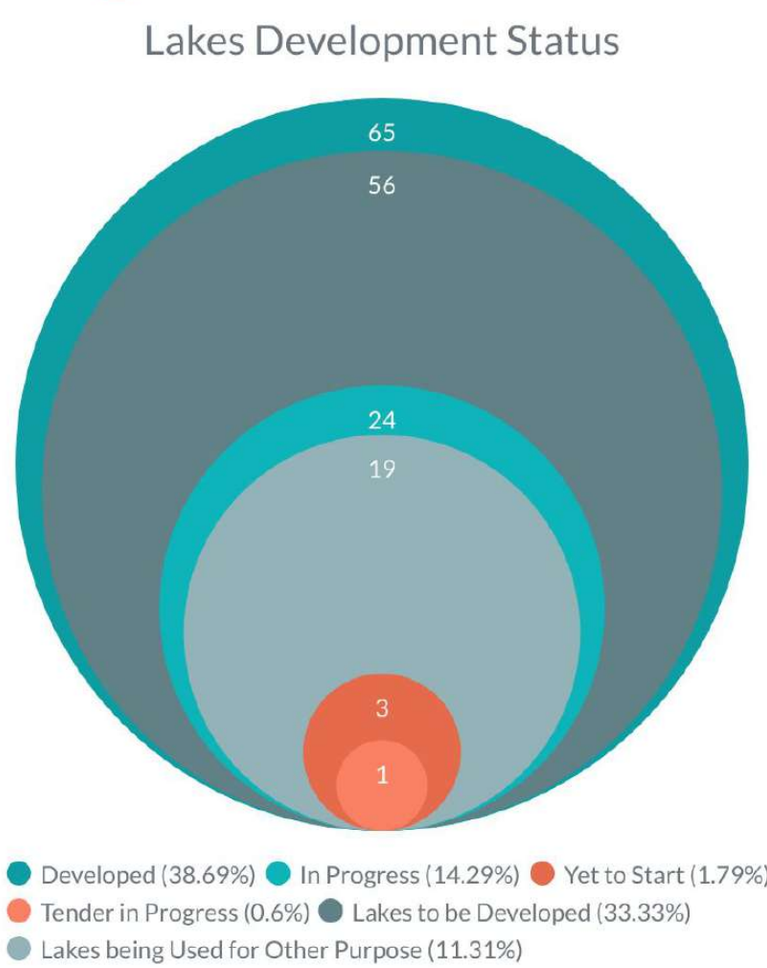
- Domlur lake changed to BDA layout
- Millers lake changed to Guru Nanak Bhavan, Badminton Stadium
- Subhashnagar lake,Kurubarahalli lake, Kodihalli lake, Sinivaigalu lake, Marenahalli lake, Shivanahalli lake, Bagalagunte hosa-kere to residential layout
- Chenamma tank changed to a burial ground, Banashankari 2nd Stage
- Puttennahalli tank changed to J.P. Nagar 6th Phase
- Jakkarayanakere has been converted into a sports ground
- Kamakshipalya Lake is converted into a sports ground
- Baalayyana Kere (kamakshipalya) is converted into a sports ground
- Dasarahalli tank is converted into Dr. B.R Ambedkar Stadium
- Bagalagunte Hale-kere in sY No.113 encroached partly, all th side of lake
- Kacharkanahalli lake is the newest encroached Lake
- Jaraganahalli lake very close to sarakki signal. The lake has been completely encroached.

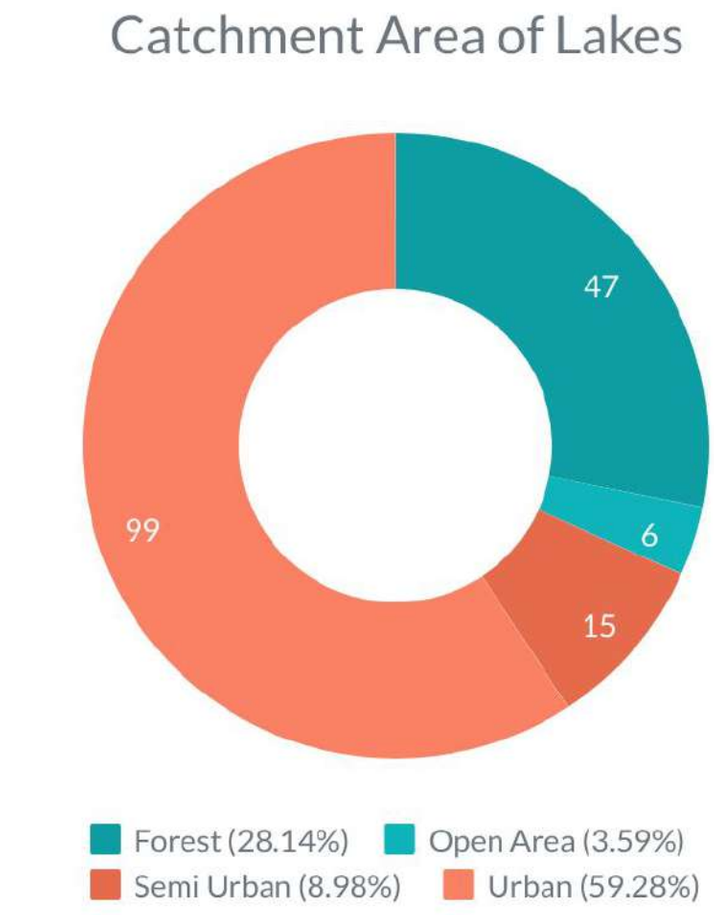


THREATS FACED BY LAKES/TANKS

- Encroachment of lakebed, flood plains, and lake itself;
- Encroachment of rajakaluves / storm water drains and loss of interconnectivity,
- Lake reclamation for infrastructure activities;
- Topography alterations in lake catchment
- Unauthorised dumping of municipal solid waste and building debris,
- Sustained inflow of untreated or partially treated sewage and industrial effluents.
- Removal of shoreline riparian vegetation
- Pollution due to enhanced vehicular traffic;
- Too many para-state agencies and lack of co-ordination among them.
- Different custodians for upstream and downstream lakes in the valley

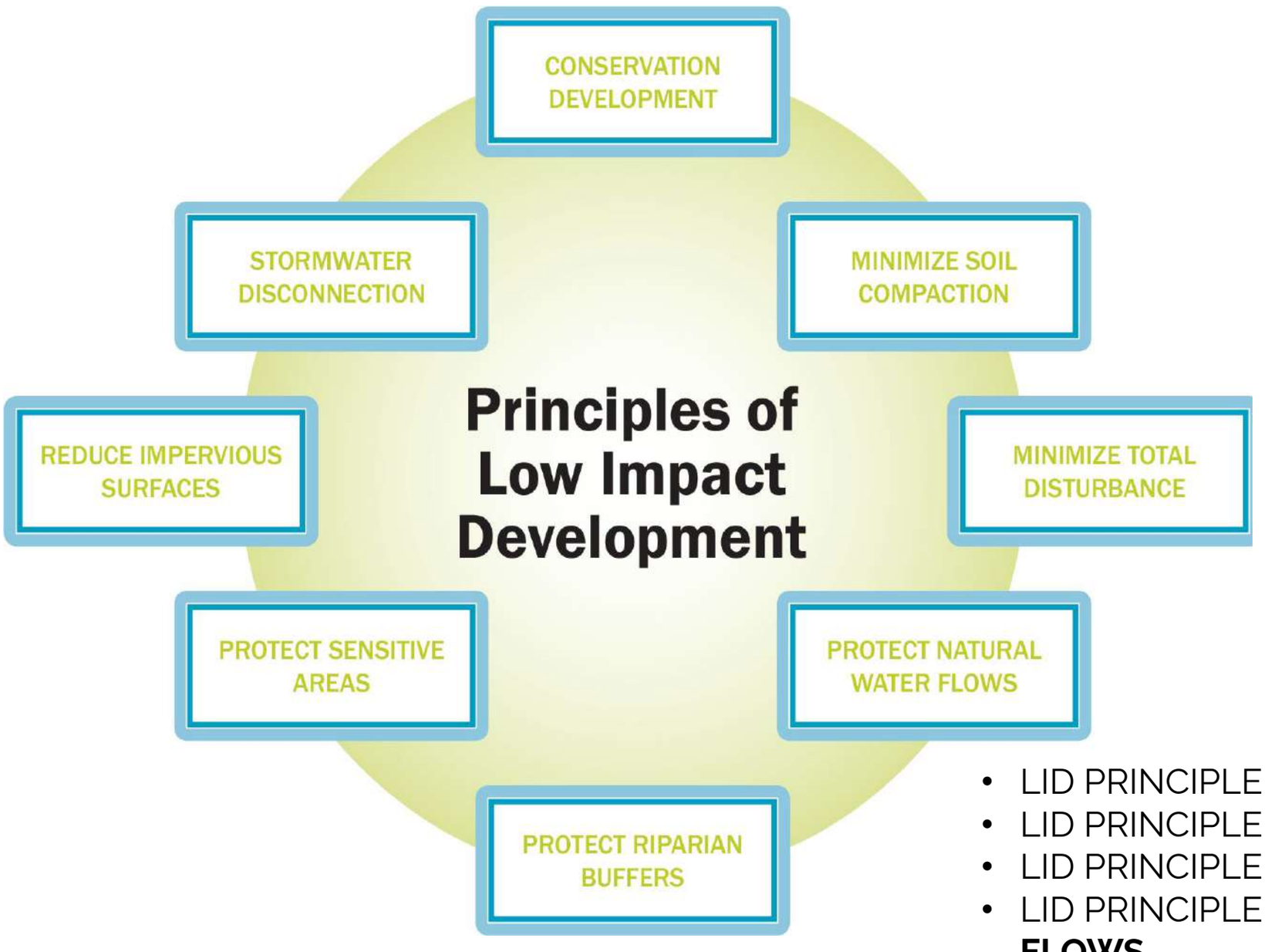






Low Impact Development:

- Low Impact Development (LID) is defined as “an innovative land planning and design approach which seeks to maintain a site’s predevelopment ecological and hydrological function through the protection, enhancement, or mimicry of natural processes



- When these principles are used to plan/ design a new development, they can help avoid potential environmental issues down the road. It is, however, important to note that LID can only go so far. While impacts may be minimized

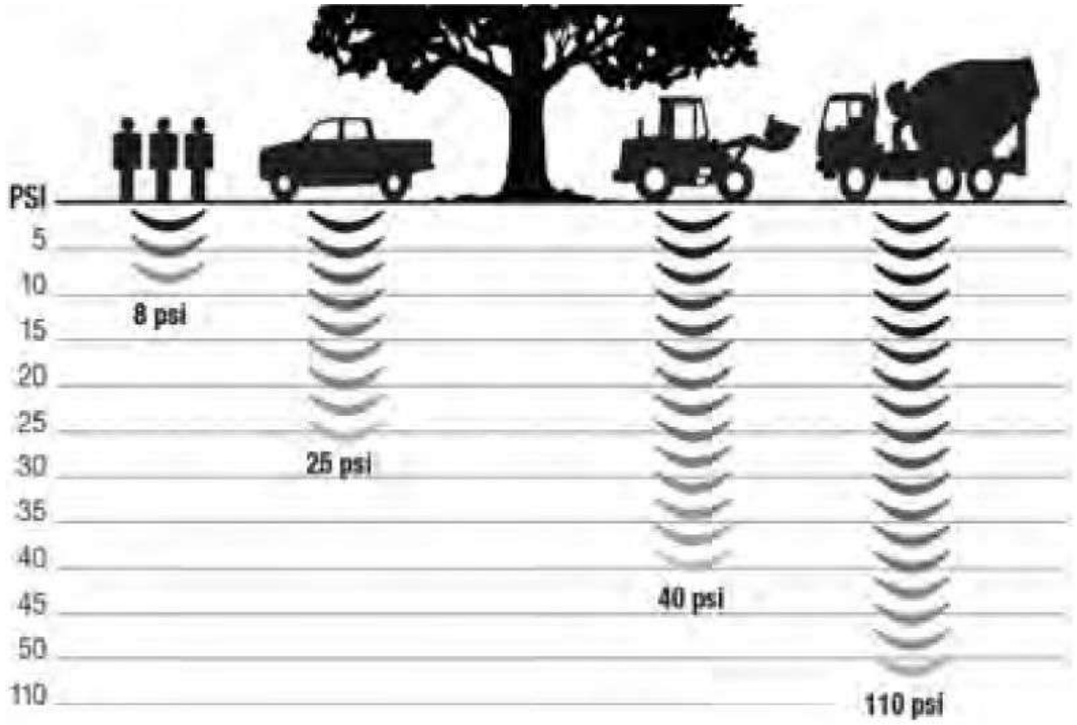
- LID PRINCIPLE #1**: CONSERVATION DEVELOPMENT**
- LID PRINCIPLE #2: **MINIMIZE SOIL COMPACTION**
- LID PRINCIPLE #3: **MINIMIZE TOTAL DISTURBANCE**
- LID PRINCIPLE #4: **PROTECT NATURAL WATER FLOWS**
- LID PRINCIPLE #5: **PROTECT RIPARIAN BUFFERS**
- LID PRINCIPLE #6: **PROTECT SENSITIVE AREAS**
- LID PRINCIPLE #7: **REDUCE IMPERVIOUS SURFACES**
- LID PRINCIPLE #8: **STORMWATER DISCONNECTION**

Conservation Development

Source: Minnesota Stormwater Manual

- Conservation development is a method of planning that seeks to protect the natural environment of an area by preserving open space, protecting wildlife habitats and corridors, and enhancing site features.
- Conservation developments often have a high percentage of open/protected space with development clustered around significant natural features. When done on a large scale, conservation development can result in large networks of interconnected conservation lands that provide a number of environmental, recreational, and aesthetic benefits.
- With a concept plan in place, a designer can then officially begin the design process. It is generally agreed that this is done in sequential order as outlined below:
    - Designate open space, primary, and secondary conservation areas
    - Locate building sites
    - Layout streets, trails, or other transportation routes
    - Delineate lot lines as necessary

Minimize Soil Compaction



Source: Alabama Cooperative Extension

SOURCES OF COMPACTION AND THEIR RELATIVE INFLUENCE ON SOIL IN POUNDS PER SQUARE INCH

- Minimizing soil compaction is the process of protecting a site's existing soils from unnecessary damage during construction. This is usually done by identifying high quality or highly permeable soils during the design phase and setting limits of disturbance during construction.
- Undisturbed soil contains air spaces that have water-carrying and holding capacity. When soils are compacted by heavy equipment, those spaces disappear and the ability of the soil to infiltrate and absorb water is reduced.
- Studies have shown that runoff volumes from vegetated areas with highly compacted soils closely resemble those of impervious areas, especially during large storm events

Minimize Total Disturbance

PLANNING FOR A HOUSE SITE WITH MINIMAL DISTURBANCE.

- Major disturbances on a site occur through normal construction practices such as grading, cutting, or filling. These practices can quickly damage the ecological integrity and hydrology of a site by denuding vegetation, compacting soil, and altering water flows.
- This is particularly an issue when the footprint of the construction area extends well beyond what is necessary. Minimizing total disturbance specifically focuses on limiting the extent of vegetation removal, grading and other site altering activities to only what is needed.
- The intent is to allow for the development of a site while maximizing existing ecological, hydrological and aesthetic function.

Protect Natural Water Flows

SUSTAINABLE URBAN DRAINAGE

Source: http://www.susdrain.org

Source: http://www.thecherokeescout.com

ALTERED HYDROLOGY ON A STEEP SLOPE

- The purpose of protecting natural water flows is to reduce erosion and downstream impacts such as increased flooding. Under natural conditions, surface runoff will often move in a slow, dispersed fashion across the landscape.
- Vegetative cover, soil permeability and landscape roughness (unevenness) ensure that surface flows are naturally managed in a controlled fashion. Drainage areas are often fragmented and few opportunities for channelization of flows exist.
- Traditional development practices drastically alter this natural management regime, resulting in increased stormwater runoff, soil erosion, degraded water quality, and a greater frequency of flooding. During the design and construction phase of site development, it is imperative to recognize and maintain natural drainage patterns and characteristics.

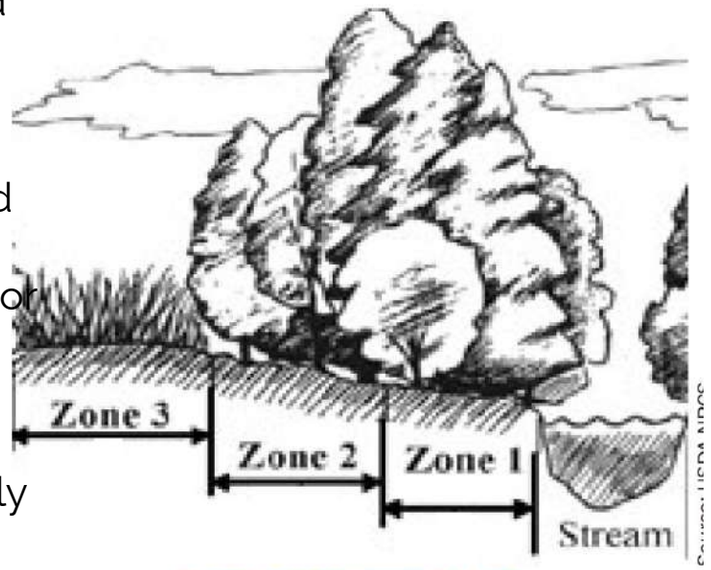
Protect Riparian Buffers

A WELL BUFFERED STREAM

AN UNBUFFERED STREAM

- Riparian buffers are vegetated ecosystems that grow along the banks of rivers, lakes and streams and serve to buffer a water body from the effects of runoff by providing filtration, bank stability, recharge, attenuation, volume reduction, and shading. In the process, buffers reduce pollution, minimize erosion, control flooding, enhance aesthetic quality, and provide aquatic and terrestrial habitat.
- For these reasons, riparian buffers are extremely important and any effort to protect them, whether through zoning bylaws, permitting or better site design, should be encouraged

- Zone 1 Provides stream bank and channel stabilization, soil loss and sedimentation reduction, quality habitat, and shade to cool the water surface.
- Zone 2 Removes, transforms, and stores nutrients, sediments, and other pollutants flowing as sheet or sub-surface flow.
- Zone 3 Provides the first stage in managing upslope runoff so that runoff flows are slowed and evenly dispersed into Zone 2.



THE THREE BUFFER ZONES

Protect Sensitive Areas

A NATURALLY FUNCTIONING WETLAND

AN IMPACTED WETLAND

- Protecting sensitive areas is the process of identifying and avoiding certain natural features during development. These features include floodplains, wetlands, prime habitat blocks, steep slopes, riparian buffers, and well drained soils.
- Sensitive areas are particularly prone to degradation from development and often provide ecological and hydrological functions that cannot be easily replaced due to their complexity. Such features should be preserved in their natural condition to the fullest extent possible.

A HEALTHY WETLAND

A ROBUST RIPARIAN BUFFER

Reduce Impervious Surfaces

ASPHALT PARKING LOT

POROUS CONCRETE PARKING SPACES

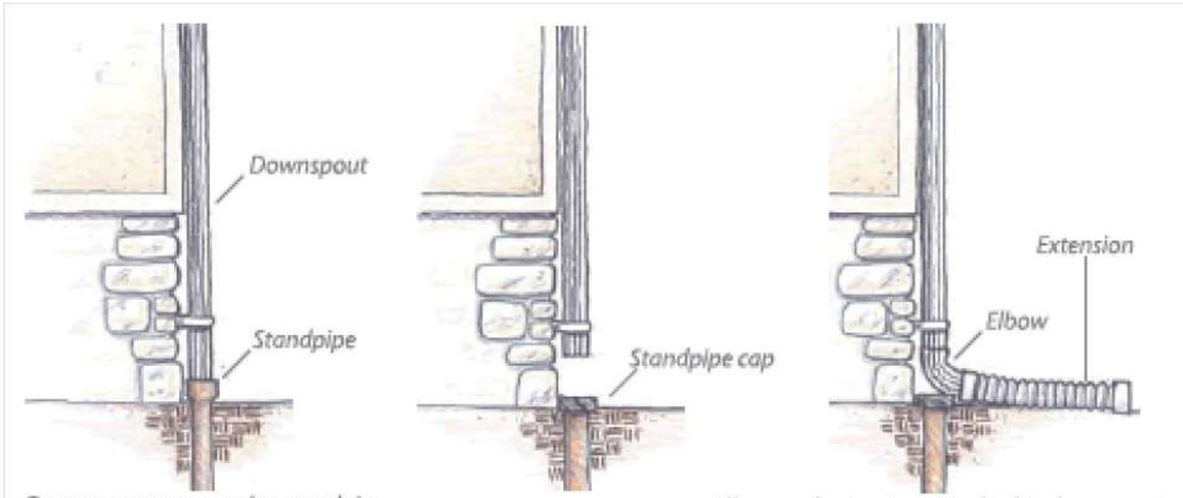
- An impervious surface is an area on the earth that impedes or prevents the flow of water into the soil. Impervious surfaces increase runoff volume, velocity, temperature, and pollutant loads. Some impervious surfaces, such as bedrock outcrops and clay soils, occur naturally.
- More often, however, they are a result of human development. Rooftops, parking lots, severely compacted soils, and even gravel roads are all considered impervious surfaces. Studies suggest that noticeable degradation to water bodies begins when watersheds reach just 10% imperviousness.
- Reducing impervious surfaces involves the minimization of rooftops and pavements, the use of permeable surfacing, the protection of natural conditions, the use of disconnection practices and the application of LID principles
  - Cluster development using conservation design principles
  - Consider roadway and path design
  - Use permeable materials Go vertical Multi-story parking structures or underground parking
  - Use a green roof Green roofs
  - Disconnect stormwater

Stormwater Disconnection

Source: Blue Water Baltimore

ONE FORM OF DOWNSPOUT DISCONNECTION

- Stormwater disconnection involves “breaking” direct connections between impervious areas and storm/ sewer systems or adjacent waterbodies. In urban areas, for example, rooftop runoff sometimes flows directly to a storm drain system through a downspout connection.
- A design that incorporates stormwater disconnection might include a modified downspout that directs the runoff towards an adjacent landscaped area where the water can be filtered and absorbed
- . This reduces the amount of ‘effective’ impervious cover in a watershed, reducing runoff volumes in the process.



TRADITIONAL DEVELOPMENT VERSUS LOW IMPACT DEVELOPMENT

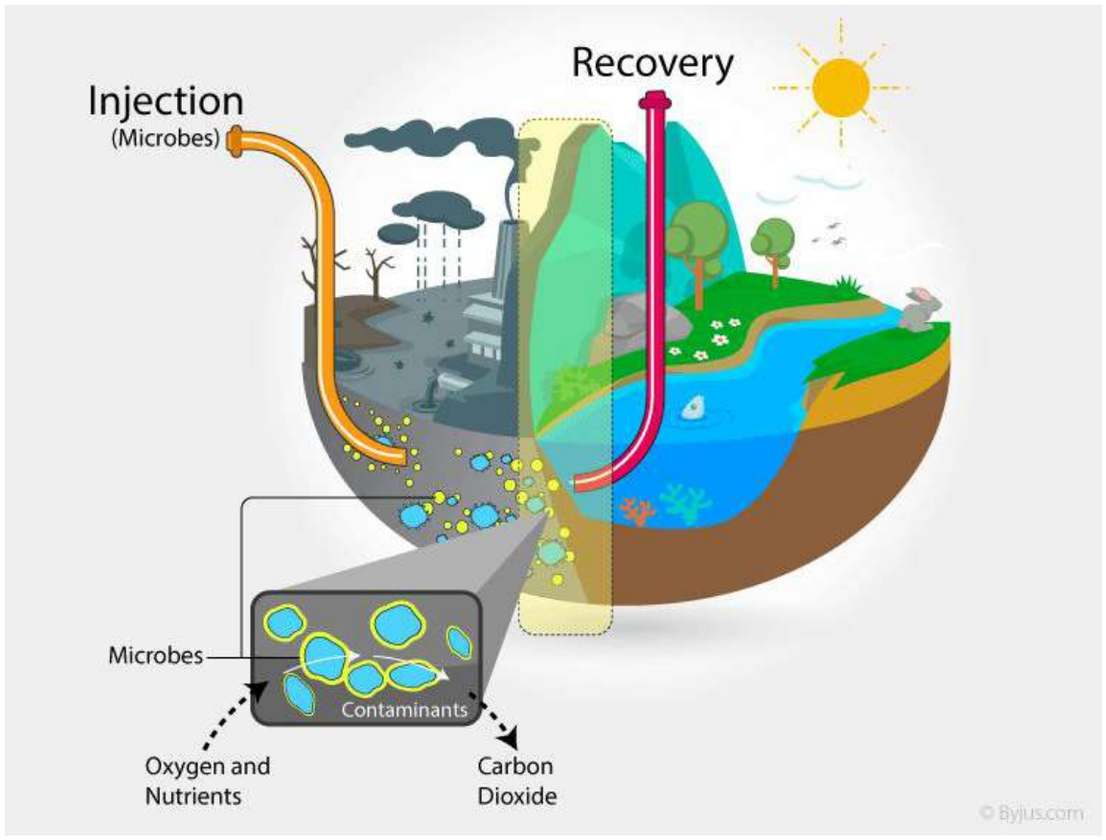
TRADITIONAL DEVELOPMENT	LOW IMPACT DEVELOPMENT
Limited regard for the landscape's natural features or hydrology.	Recognize and value the critical functions and benefits that the natural landscape
Excessively wide roads and expansive parking lots, curbs and catch basins	Functions are balanced with active human use through sustainable planning and design
Maximizing the land area available for active human use.	Extensive site assessment of hydrology, topography, soils, vegetation and water features minimize potential impacts.
Decreased infiltration, lower evaporation and transpiration rates, and increased surface run off	Development that balances human benefit with environmental function
fragmented forest blocks, and straightened stream channels are fairly common occurrences throughout the landscape	Developments often have higher aesthetic and recreational value

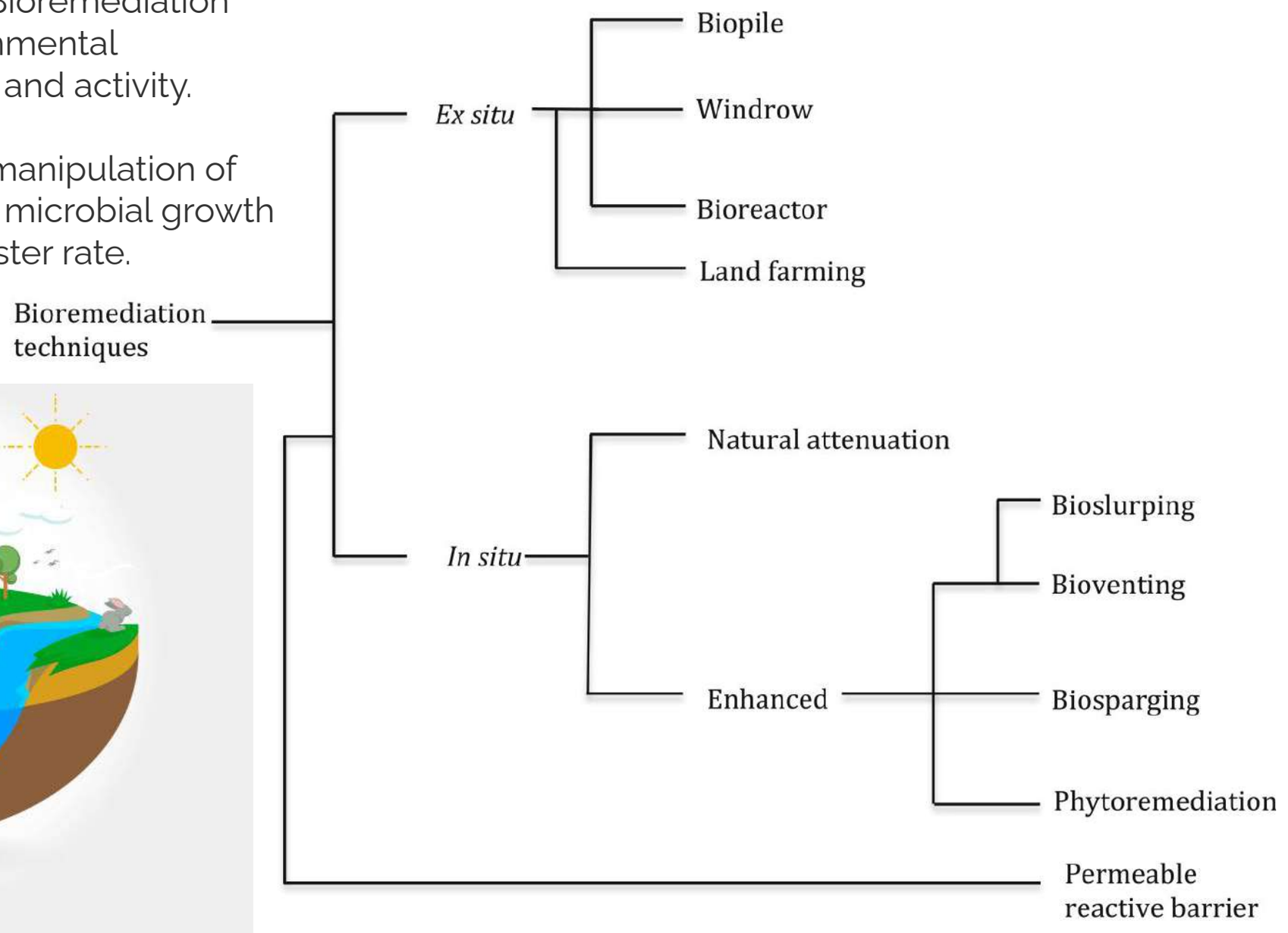
Bioremediation Technology

Bioremediation is the use of living micro organisms to degrade the environmental contaminants into less toxic forms. It uses naturally occurring bacteria and fungi or plants to degrade or detoxify substances hazardous to human health and/or the environment. The micro organisms may be indigenous to a contaminated area or they may be isolated from elsewhere and brought to the contaminated site. Contaminant compounds are transformed by living organisms through reactions that take place as a part of their metabolic processes.

Biodegradation of a compound is often a result of the actions of multiple organisms. Bioremediation can be effective only where environmental conditions permit microbial growth and activity.

The application often involves the manipulation of environmental parameters to allow microbial growth and degradation to proceed at a faster rate.





Salient features

- It is cost effective. No construction or additional infrastructure is required.
- These microbes are effective in controlling odour, reducing TSS, BOD, oil/ grease accumulation in sewage/ polluted water and solids.
- These microbial consortia exhibit growth at wider temperature range
- These strains maintains a satisfactory level of DO and therefore aerators, which consume high power can be avoided or its use can be reduced.
- Control the nutrient level in water thus help in controlling “Eutrophication” process.

Anoxic Bioremediation in Hauz Khaz Lake, New Delhi

Location: New Delhi
Scale: Water body/lake
Implementing organisation: JM Enviro technologies Pvt. Ltd and Delhi Development Authority

Designed Capacity: 128ML
Area: 15 acres
Operational since: 2007-2011
Capital cost: Rs. 5,72,500
O&M: Rs. 2.8 lakhs/ acre / year

The lake receives treated sewage from near by Vasant Kunj Sewage Treatment Plant with a daily flow of 3MLD. The treated wastewater from the STP into the lake becomes a problem when sometimes untreated sewage of STP finds its way into the lake along with the treated one. This situation led to deterioration of lake and strong odour was emanated causing nuisance in the neigbourhood. In order to solve this problem by natural in-situ treatment, Anoxic Bioremediation Technology (ABR) was implemented using selected anaerobic and facultative microbes Persnickety® 713 (a biological product sold under different trade names).

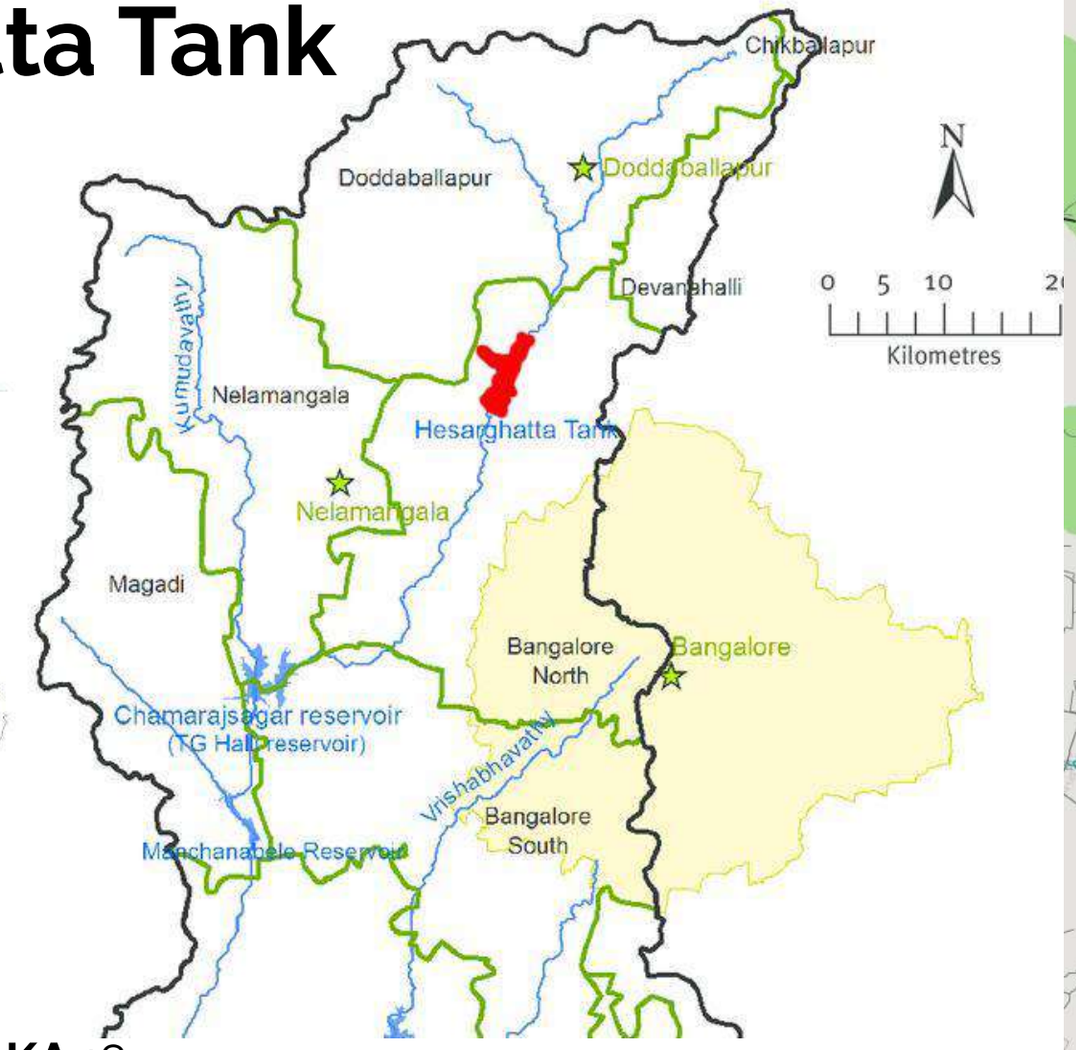
Treatment Process

- Persnickety® 713 is a blend of naturally occurring strict and facultative anaerobic live bacterial strains in liquid form. These bacteria decompose the accumulated sludge flocs and large organic molecules into simpler ones that can be consumed by the bacteria itself.
- This consortium is effective in controlling odour, reducing TSS, BOD, oil/ grease accumulation in sewage/ polluted water and solids. Some of the strains of Persnickety® 713 also helps in increasing the DO level in wastewater.
- Dosing is done at specific points generally closer to the inlet/ starting point of sewage. The treatment is carried out in two phases: initially for few days, high shock doses are given to stabilise the system followed by low dosing once the bacterial strains enter the regeneration phase. 6-24 hours prior to dosing, the concentrate is mixed with activator and diluted in chlorine free water in the ratio of 1:40.

Performance

- The BOD level reduced from 50 mg/l to 14 mg/l and from 70 mg/l to 21 mg/l in two different dosing points after one month of the treatment. pH also reduced from 9 to 8. *(Source: JM Enviro Technologies Ltd., New Delhi)*

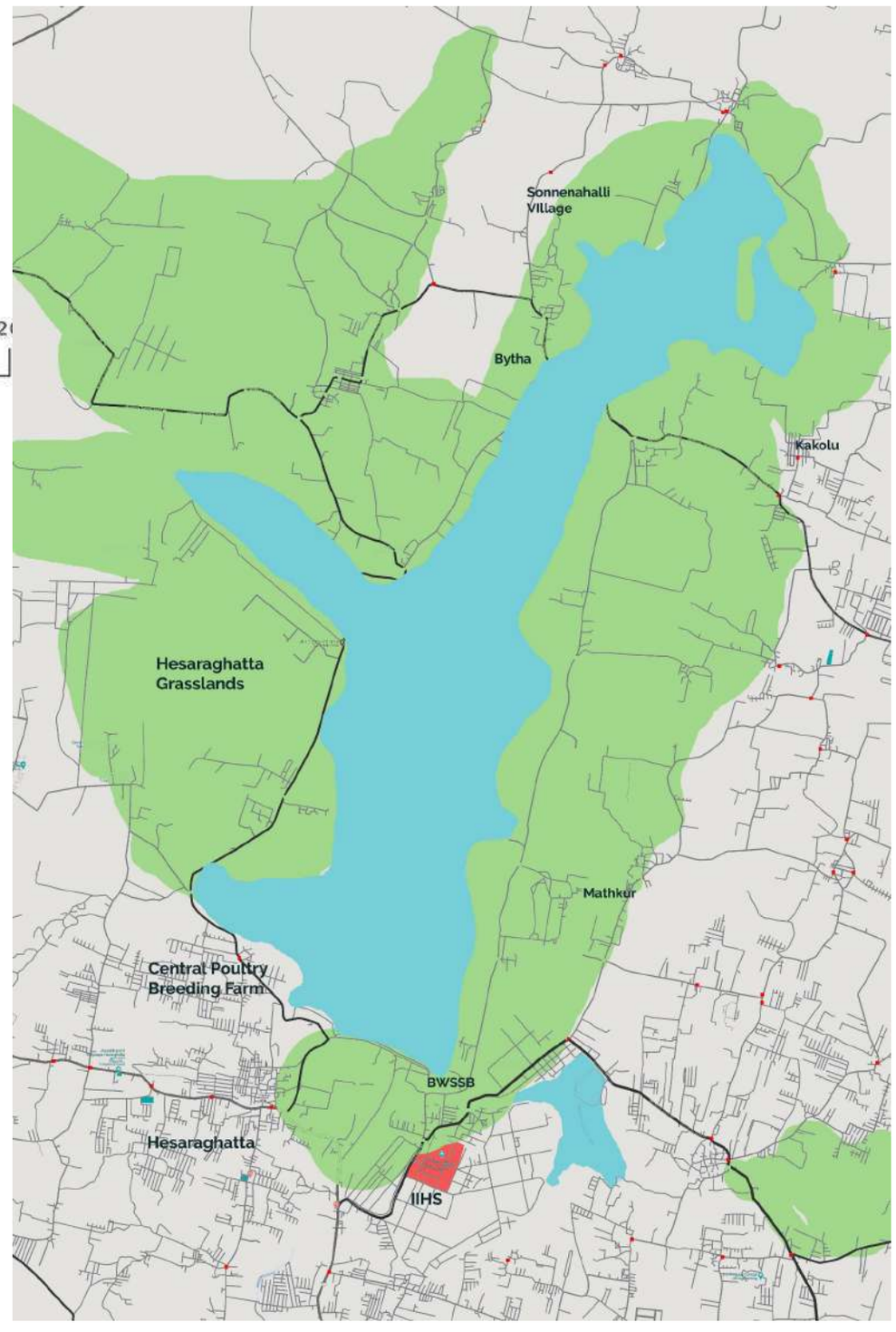
Hesarghatta Tank



Location**: Bengaluru, KA** 18 miles north east of Bangalore
Type**: Freshwater lake**
Primary inflows: **Arkavathy River**
Catchment Area: **73.83 km2 (28.51 sq mi)**
Surface Area: **4.50 km2 (1,110 acres**)
Max. Depth: **27.44 m (90.0 ft)**
Water Volume: **28,240,000 m3 (997,000,000 cu ft)**
Surface Elevation: **861 m (2,825 ft)**

Bund Details

1.	Length	5544 ft
2.	Top width	16 ft
3.	R.L of Top of Bund	R.L 2832.17
4.	F.T.L	R.L 2824.17
5.	Capacity at F.T.L	997 M. Cft
6.	Draw off levels	
	a) Lowest Draw	R.L. 2799.17
	b) Highest Draw	R.L. 2809.17
7.	No of waste weirs	2
8.	Length of left waste weir	300 ft
9.	Length of right waste weir	200 ft



Hessarghatta Tank

Longest side length : **7.36km**
Longest Width : **3.36 km**
Present with water length : **2.9km**
Longest Width : **1.09km**

History

- Sir K. Seshadri Iyer, the then Dewan of erstwhile Mysore state and the then Chief Engineer of Mysuru, M. C. Hutchins, planned to build the scheme called the "Chamarajendra Water Works**" to store a three-years' water supply to the city**
- The total catchment area draining into the Lake **73.84 km2 (2189 mi2**), Direct draining catchment **is 2.68 km2 (6.86 sq mi2).**
- The catchment receives a mean annual rainfall of **859.6 mm**
- The population of Bangalore city was **1,80,000** in **1891** and a tank was designed to supply water to a population **of 2,50,000 with a 57 LPCD.** Population was assumed to increase at **16% per decade**, and, it was anticipated that the infrastructure would be sufficient to meet the city's needs for **3 decades** thereafter
- However, the anticipated population of **2,50,000** was attained by **1922** itself. The inadequacy of supply which had begun to be felt **from 1918** became acute **by 1925**, when Hessarghatta lake went almost dry for a year and a new source had to be thought of by that time.

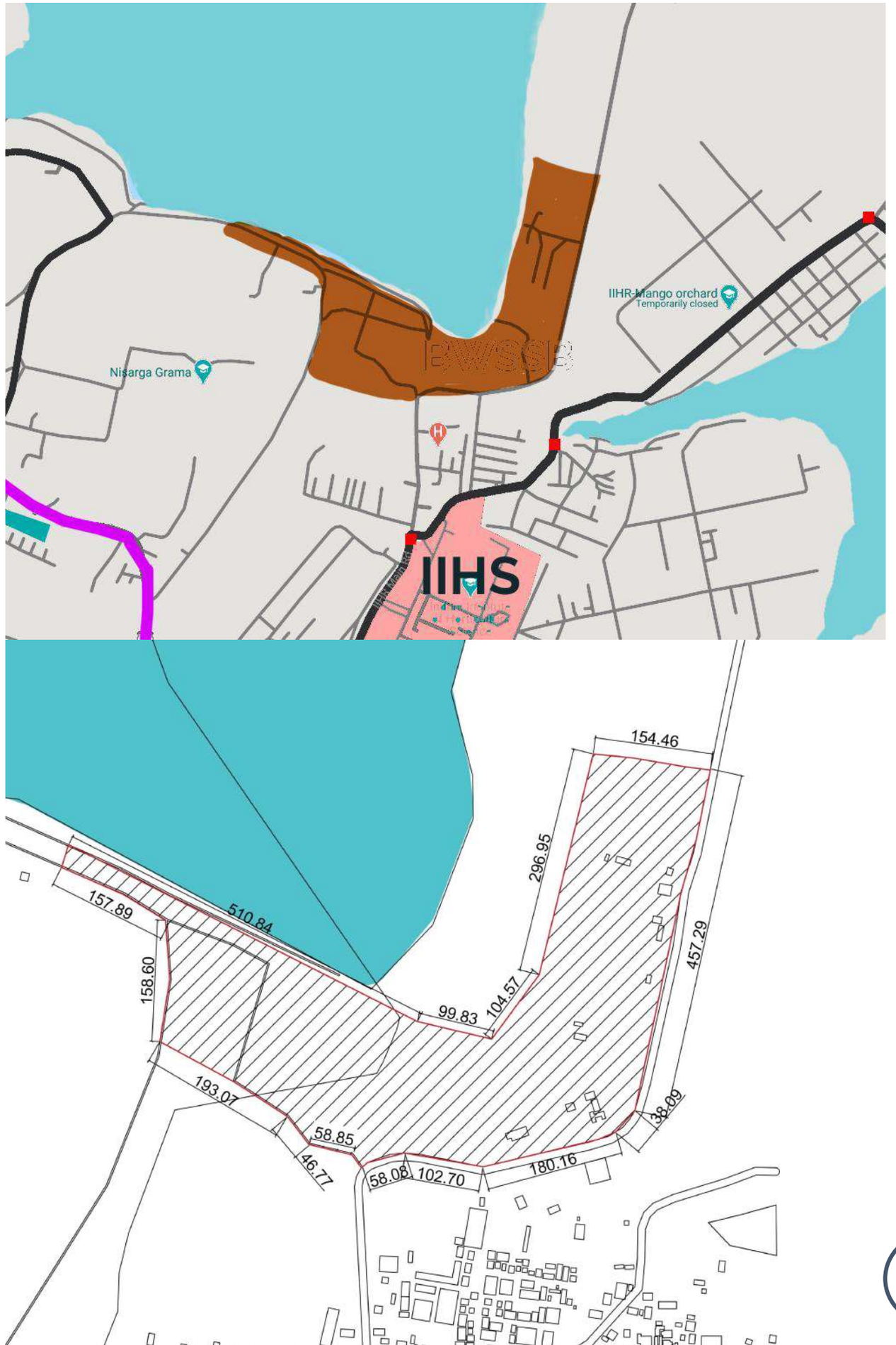
Arkavai River Basin

Sir K. Seshadri Iyer

Hessarghatta Tank

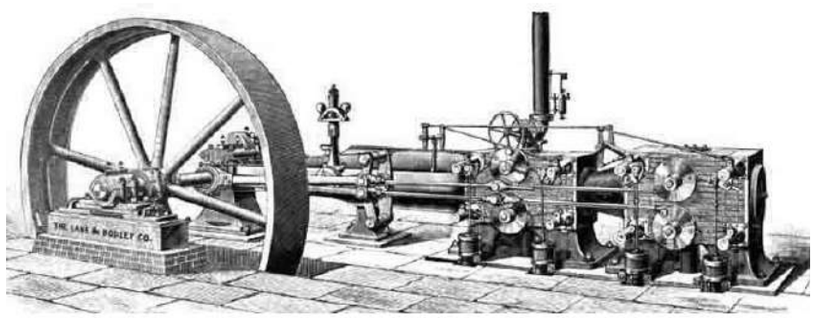
Site of Intervention

Area =189010 m2 (46.7 Acres)



HYDROLOGY AND WATER WORKS

- The Arkavathy River and Kaveri. river meet the water supply needs of Bangalore; The reservoirs created by building dams on the Arkavathy are the **"Hesaraghatta"** and the **"Chamarajasagara" at Thippagondanahalli (TG Halli)** built during the years **1894** and **1933** respectively.
- Water from the reservoir is taken through initially a **1.4 m dia (42" dia)** Hume pipe to the **Soladevanahalli Pumping Station** by gravity and then pumped (using **steam pumps** initially and later changed to electric pumps at Soladevanahalli) against a head of **115 to 135 m to the Combined Jewel Filters (CJF) plant at Malleswaram** for treatment and supply to the consumers in the city.
- When the Hesaraghatta Lake started **drying up in the year 1925,** as an urgent remedial measure, another dam was built to create a reservoir called the **Chamaraja Sagar at TG Halli,** downstream of the Hesaraghatta Lake.



FIRST IN COUNTRY TO USE STEAM ENGINE TO PUMP WATER

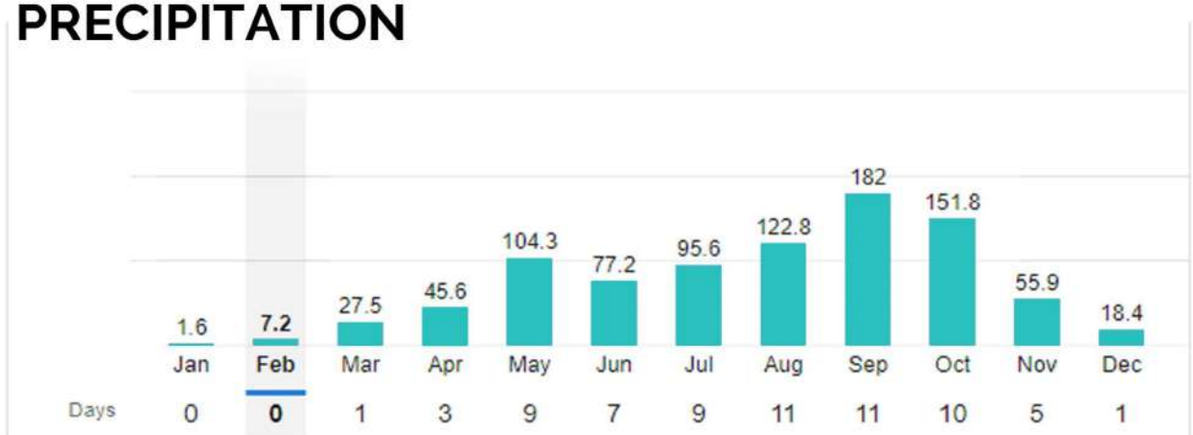
Pump house at Hessarghatta Lake

CLIMATE

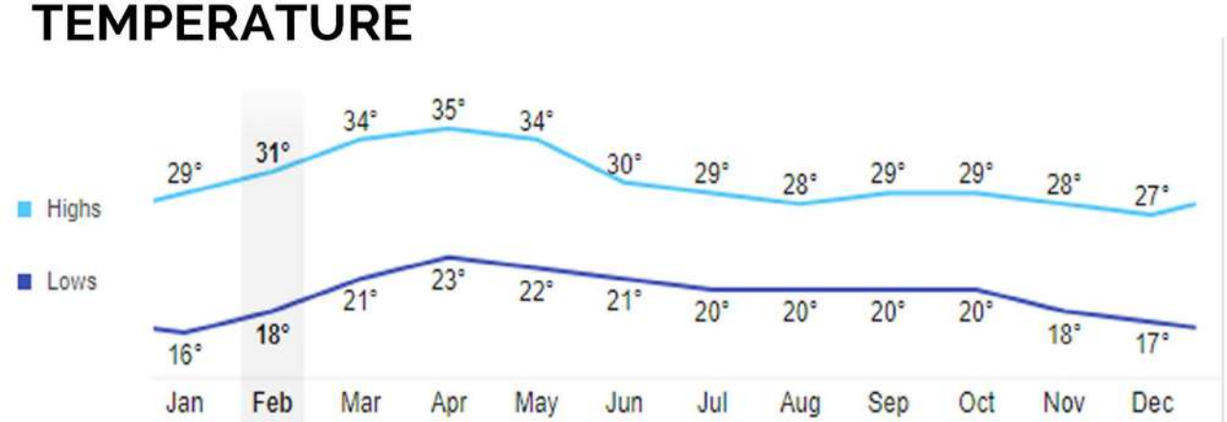
- High Temp: **34 ˚c**
- Low Temp: **16 ˚c**
- Mean Temp**: 25 ˚c**
- Humidity: **66%**
- Dew Point: **17** ˚c
- Wind: **5 Km/h**
- Pressure: **1009 Mbar**
- Visibility**: 7 Km**
- Hottest Month : **April**
- Coldest Month : **December**
- Wettest Month: **September (176.6 Mm** Avg)
- Windiest Month : **July (9 Km/h Avg)**
- Annual Rainfall : **859.6 Mm (Per Year)**

Hessarghatta has **a tropical savanna climate** (köppen climate classification aw) with distinct wet and dry seasons. Due to its high elevation, hessarghatta usually enjoys a more moderate and cool climate due to the presence of lush green and lake throughout the year, although occasional heat waves can make summer somewhat uncomfortable when the lake dries up.

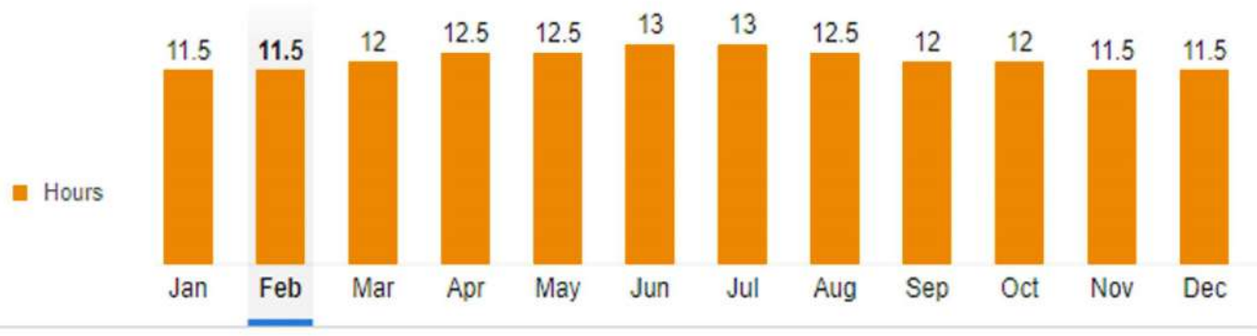
PRECIPITATION



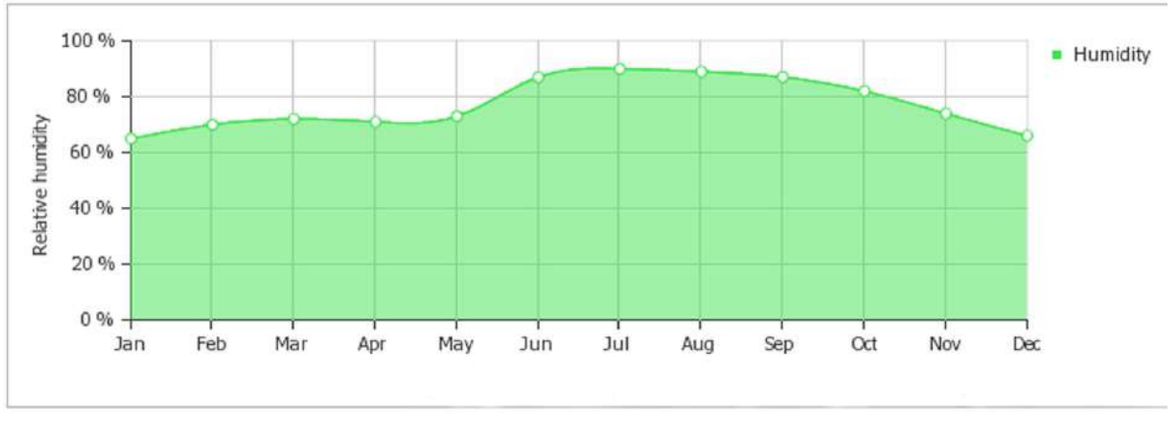
TEMPERATURE



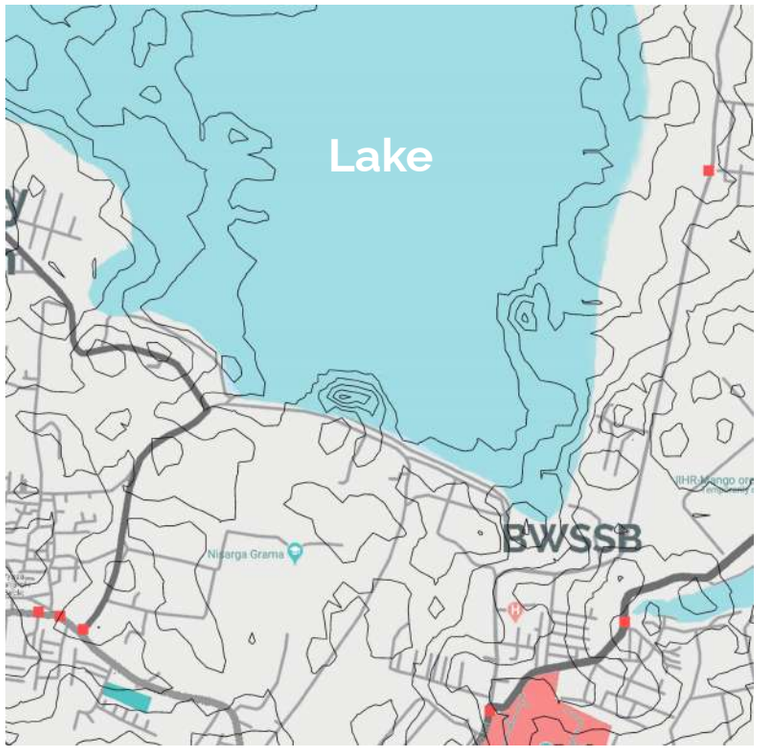
DAYLIGHT



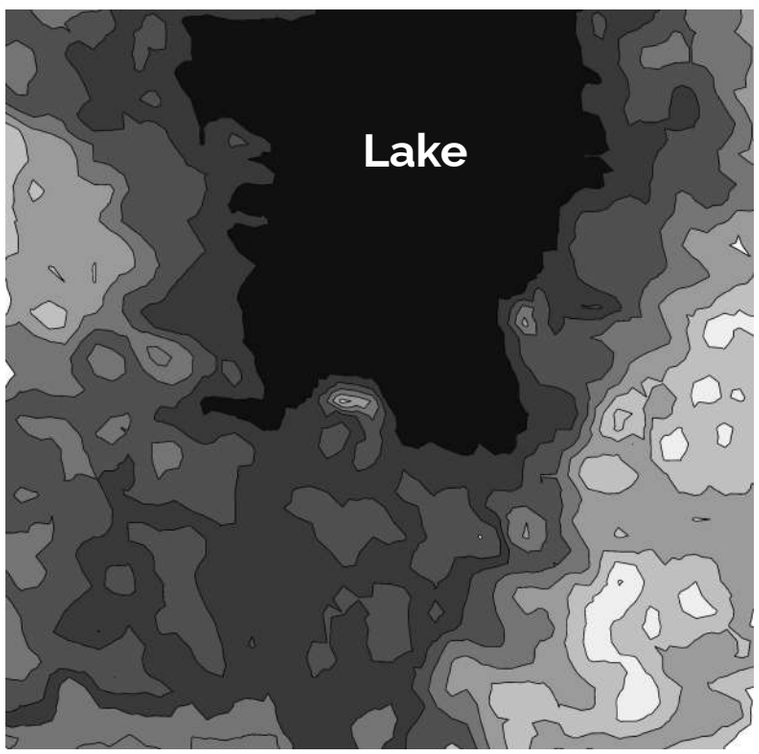
HUMIDITY



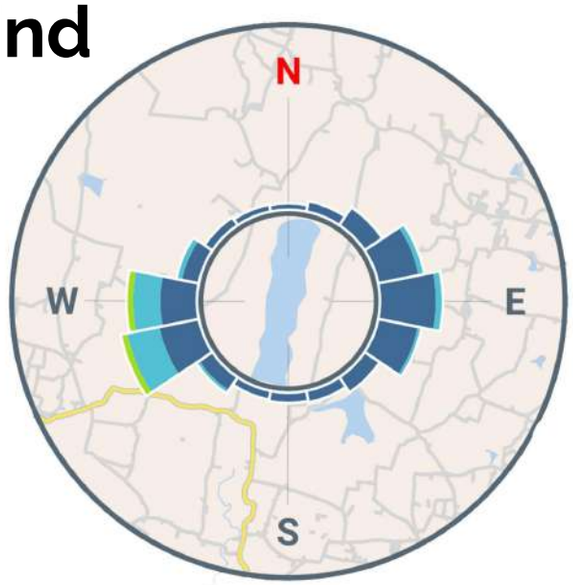
Topograhy



Slope is towards the lake,
The bund forms high land around the lake.
South East of the lake is on higher level than rest od surrounding ground.

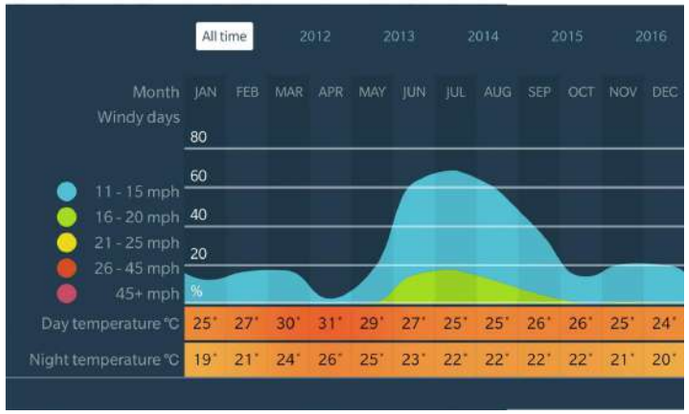


Wind

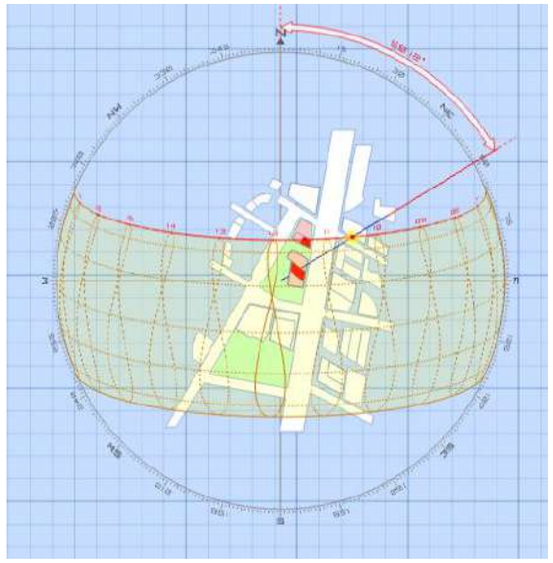


Wind predominantly flows from west ans south –west during April to September.

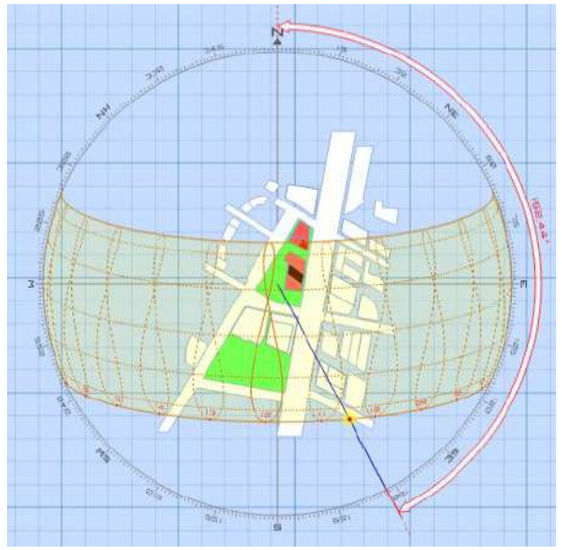
Wind flows from east During rest of the Year



Sun Path

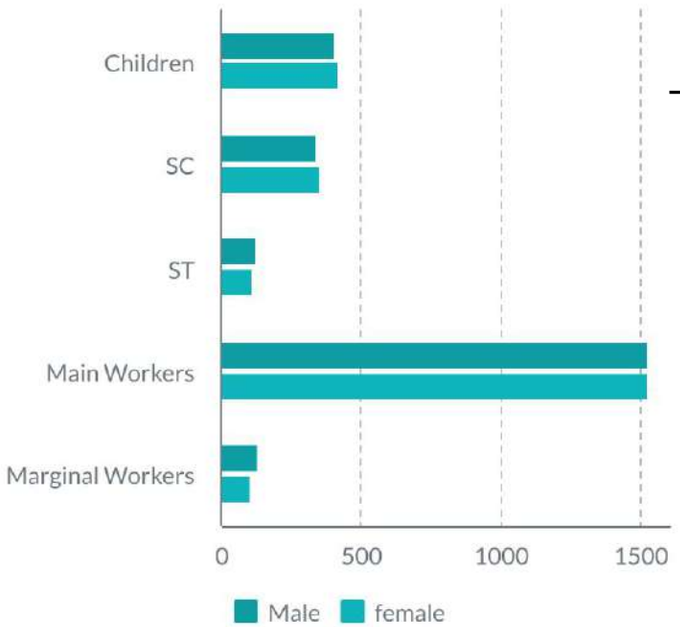


Summer Solstice



Winter Solstice

Population



Total no. of houses

2002

Total Population

8116
M- 4073
F - 4093

Literacy Rate

82.44%
M- 88.65%
F – 76.24%

Vegetation ans Soil

Hessarghatta has deciduous vegetation and Dense Trees planted around the lake and grassland actting as buffer zone for the lake.
It has Red Soil with mixture sandy and alluvial soil

The Trees and vegetation around the lake and in its catchment area stops soil erosion and keeps the micro climate cool.

The Grassland of Hessarghaata is temperate grassland which grows field grass.

The Fertile land and water table around the lake gives wide opportunity for the farmers to grow seasonal crops, fruits, vegetable and flowers..

Green Cover around the lake.

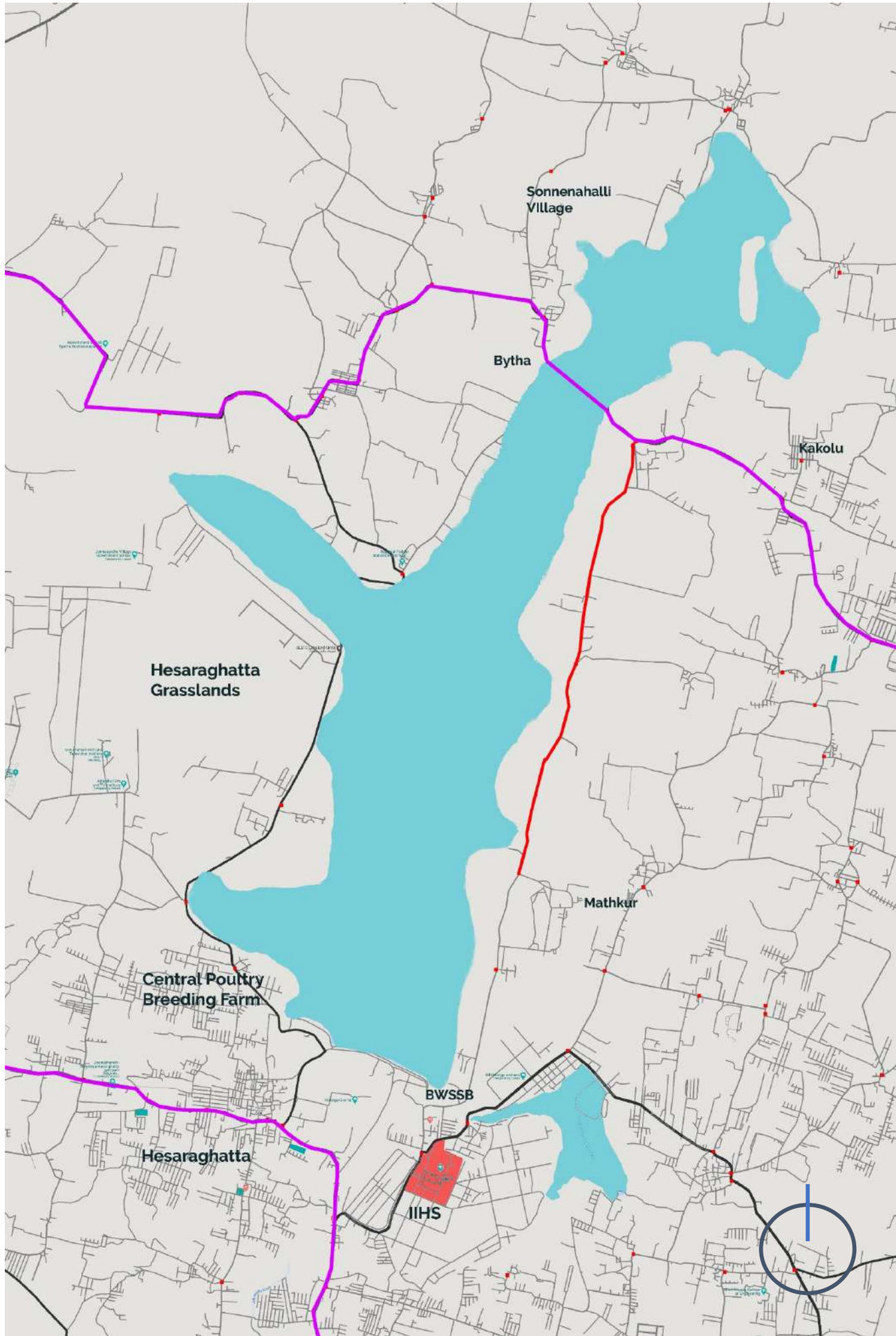
Road System

Primary Roads, -State Highway and Main Road , 15m - 12m width road

Secondary Roads- Connecting Main Roads 10 m width road

Secondary Roads- Restricted Access Roads , 10 m width road

Tertiary Roads –Cross Roads , 8 m – 4 m width road



Transport and Transit

- Intercity Bus Stand : K.R Market, Majestic
- Yeshwanthpur Station-railway Station:
  - Chikbanavara Station
  - Soldevnalli Station
- Kempegowda International Airport
- SH-39 – Hessarghatta Main Road
- Nelamangala – Chikkaballapura SH

DETERIORATION OF THE LAKE

- The reservoir is reported to have filled up last in the **year 1994** and thereafter the lake's **deterioration and drying up started**, reducing its reliability as a water supply source.
- The reasons attributed to the lake's drying up are **erosion in the catchment** and consequent capacity shrinking due to **continuous silting.**
- In recent years, the Hesaraghatta Lake bed has seen an increased number who drive on the lake bed using their cars and SUVs as hides resulting in extensive damage to the grassland habitat
- About **136 hectares** of habitat was either lost or disturbed because of vehicular movement
- Main factors affecting degradation include **sand mining, movement of tractors**,

- Farmers have long used the silt from the lakebed for agricultural purposes. It is, however, the rampant mining for supplying **raw material to brick kilns** that has threatened the lake.
- The digging has led to the formation of about **10-foot-tall vertical walls** at various places along the shoreline, which will collapse and run into the lake during the heavy rain.
- **Ornithologist M B Krishna** said that except for the scientific removal of silt, any digging in the area would affect the ecology of the lake**.**

"As the runoff water carries mud, the water collected in the lake turns turbid and blocks the penetration of of light, affecting aquatic ecology. Similar is the effect of unmonitored movement of vehicles, which will ruin the grass cover that prevents the topsoil from running into the lake," he explained.

Avifauna:

- Even in the deteriorated condition of the lake, birds such as the White-breasted Kingfisher (Halcyon smyrnensis), Magpie Robin (Copsychus saularis), Little Egrets, Common Mynas (Acridotheres tristis), Brahminy Kites, Black Drongos, Bulbuls, greater coucals, purple sunbirds, etc., (some are pictured in the gallery) have been reported in and around the lake periphery.
- Documented records of sighting of 2000 water birds of 29 species have been reported. The lake is also a great place for the winter migrants. Harriers and spotted eagles have been reported on this lake during winter.
- Bird poaching traps, a common sight, are located and removed from the bed of the lake quite often

BYE- LAWS - THE NATIONAL GREEN TRIBUNAL,

In view of our discussion in the main Judgment, we are of the considered view that the fixation of distance from water bodies (lakes and Rajkalewas) suffers from the inbuilt contradiction, legal infirmity and is without any scientific justification.Waterbodies and wetlands shall be maintained as below:-

- **In the case of Lakes, 75m from the periphery of water body to be maintained as green belt and buffer zone for all the existing water bodies i.e. lakes/wetlands**
- 50m from the edge of the primary Rajkulewas.
- 35m from the edges in the case of secondary Rajkulewas
- 25m from the edges in the case of tertiary Rajkulewas

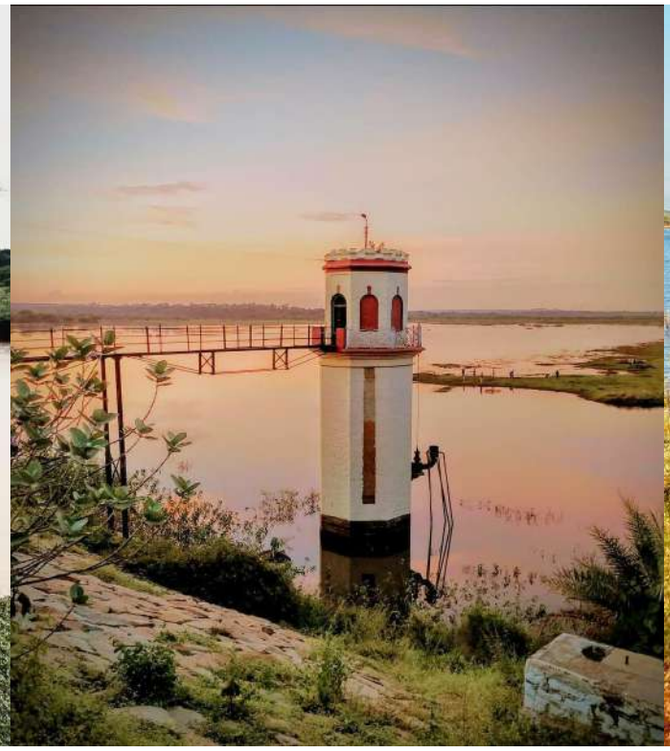
This buffer/green zone would be treated as no construction zone for all intent and purposes. This is absolutely essential for the purposes of 5 sustainable development particularly keeping in mind the ecology and environment of the areas in question.

BYE- LAWS – Lake Regulations, LDA

Buildings in the buffer zone of lakes	In case of water bodies, a 30.0 m buffer of 'no development zone' is to be maintained around the lake (as per revenue records) • As per BDA, RMP 2015 (Regional Master Plan, 2015) • Section 17 of KTCP (Karnataka Town and Country Planning) Act, 1961 and sec 32 of BDA Act, 1976 • Wetlands (Conservation and Management) Rules 2010, Government of India; Wetlands Regulatory Framework, 2008.

Violation of regulatory and prohibitory activities as per Wetlands (Conservation and Management) Rules, 2010; Regulatory wetland framework, 2008	Environment Impact Assessment (EIA) Notification, 2009. **Wetlands (Conservation and Management) rules 2010, Government of India; Regulatory wetland framework, 2008** **Regulated activity** • Withdrawal of water/impoundment/diversion/interruption of sources • Harvesting (including grazing) of living/non-living resources (may be permitted to the level that the basic nature and character of the biotic community is not adversely affected) • Treated effluent discharges – industrial/ domestic/agro-chemical. • Plying of motorized boats • Dredging (need for dredging may be considered, on merit on case to case basis, only in cases of wetlands impacted by siltation) • Constructions of permanent nature within 50 m of periphery except boat jetties • Activity that interferes with the normal run-off and related ecological processes – up to 200 m **Prohibited activity** i. Conversion of wetland to non-wetland use ii. Reclamation of wetlands iii. Solid waste dumping and discharge of untreated effluents

Recent Photos



Program

Water Experince Centre
Instalations Gallery
VR 4d Experince Room
Water Curtain Projections
Virtual Sea Space
Sound Park
Water Sound Hall
Water Play Area
Flooting Pool
Admin Office
Changing Room
Wash Rooms

Healing Center
Admin Block
Threapy Centre
Organic Academy
Healing Spa
Mediation Garden
Yoga Deck
Rooms
Aquatic Workout
Library

Bio- Remedation Centre
Desalination plant
Lab with water tanks
Dry storage
Labs
Library
Equipment lab
Cold storage
Seminar hall
Workstation
Dinning
Testing lab
Office
Staff room
Oat
Outdoor Water Storage Tanks

Admin Block
Lobby
Reception
Executive Cabin
Managers's Cabin
Work Station
Staff lounge
Pantry
Wash Room
Store Room
Conference Room

Recreational Park
Children Activity Area
Play Area for kids with disabilities
Flouriculture House
Bird Watching Zone
Aquaponics Farm
Cafe
Energy Park

Water Pavilion
Interactive Instalations
Information Centre
Gallery
Water Fall
souvernir and retail
Info Desk
Office Space

Parking
Dropoff and Security
E-Bike Parking and Pick-up

Water Prominade
Water Edge Pathway
Sittting Areas
Viewing Decks
Wet Land Archipelago

WATER, EXPERIENCE AND ARCHITECTURE

Hesarghatta Lake, Bengaluru.

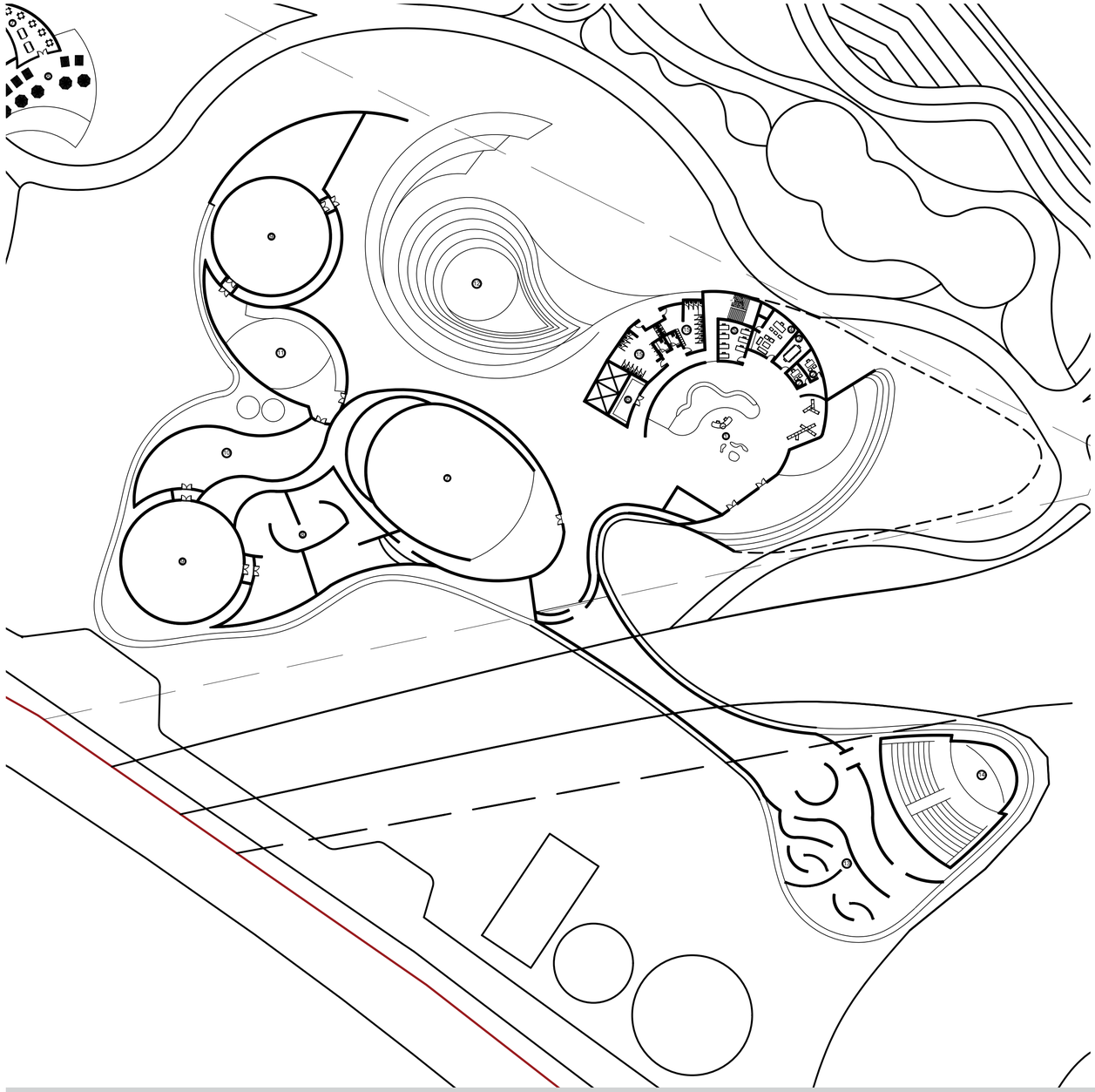
GUIDE : PROF. FATHIMA SAMANA

LOCHAN ARADHYA M – 1AA16AT048

REVIEW – 3 06-01-2021

1. Entrance
2. Admin Office
3. Experience Centre
4. Healing Centre
5. Exhitibiton/ Plaza
6. Bio Remedation Centre
7. Parking
8. Organic Cafe
9, Plaza
10.Water Arcade
11. Rain Water Structures
12 Sound Park
13. View Deck
14. Bridge
15. Water Treatment Plan
16. Water Tanks
17. Relaxing Net
18 Storm water Collectors
19. Water Instalations
20. Fish Breeding

Name: Lochan Aradhya M
Sem : Xth Sec: A
Usn No: 1aa16at048



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Sem : Xth Sec: A
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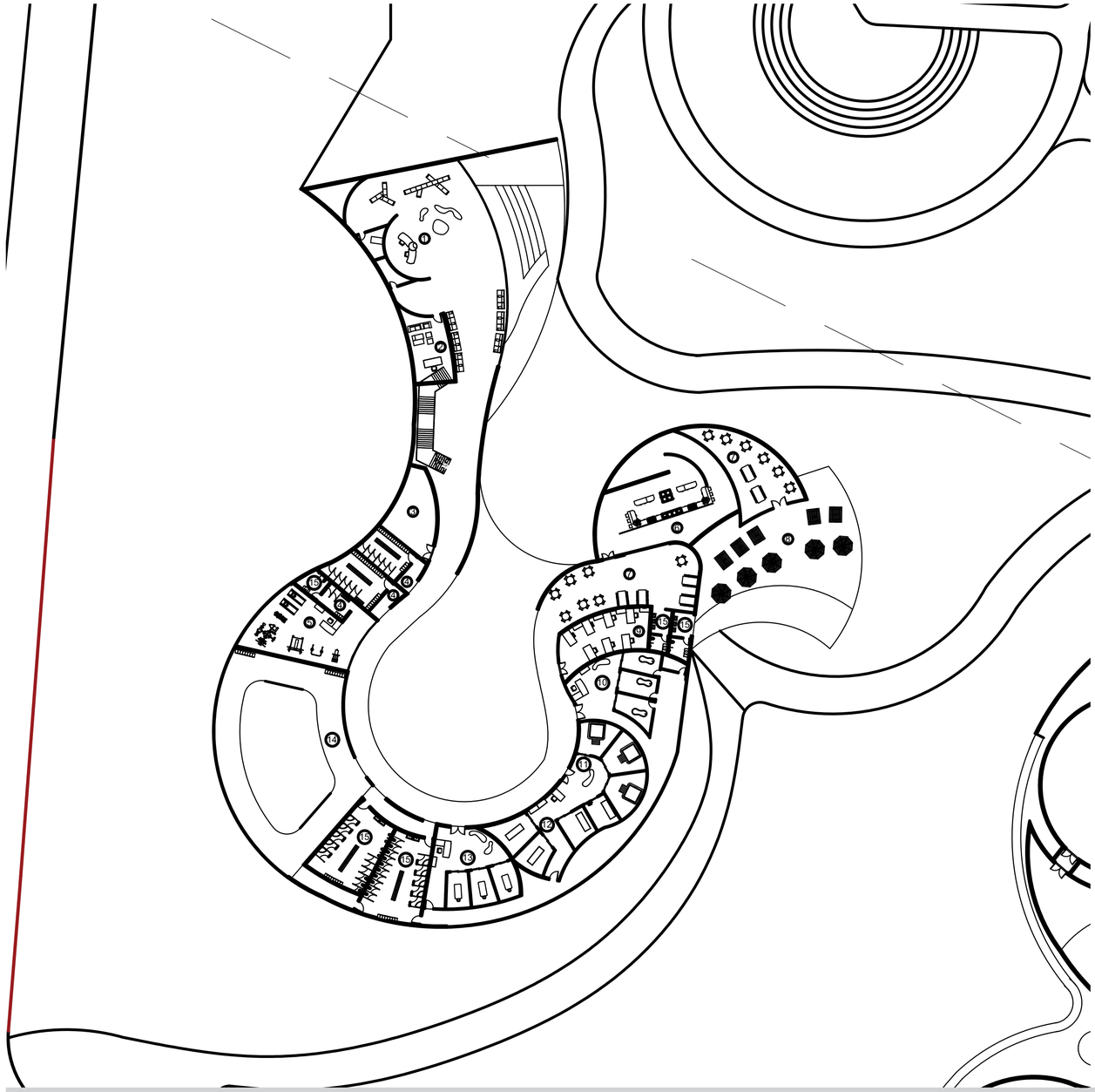

Name: Lochan Aradhya M
Sem : Xth Sec: A
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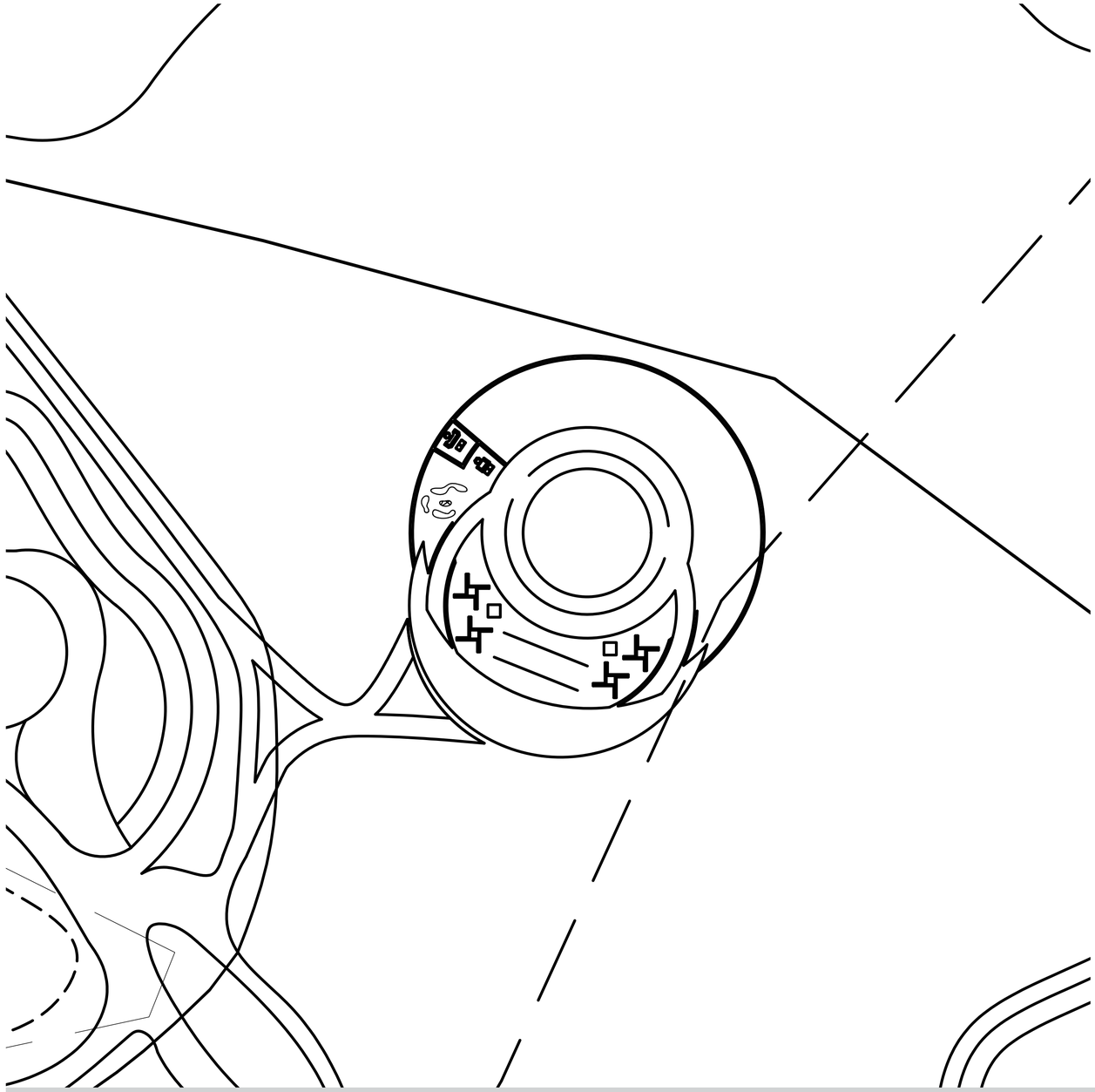

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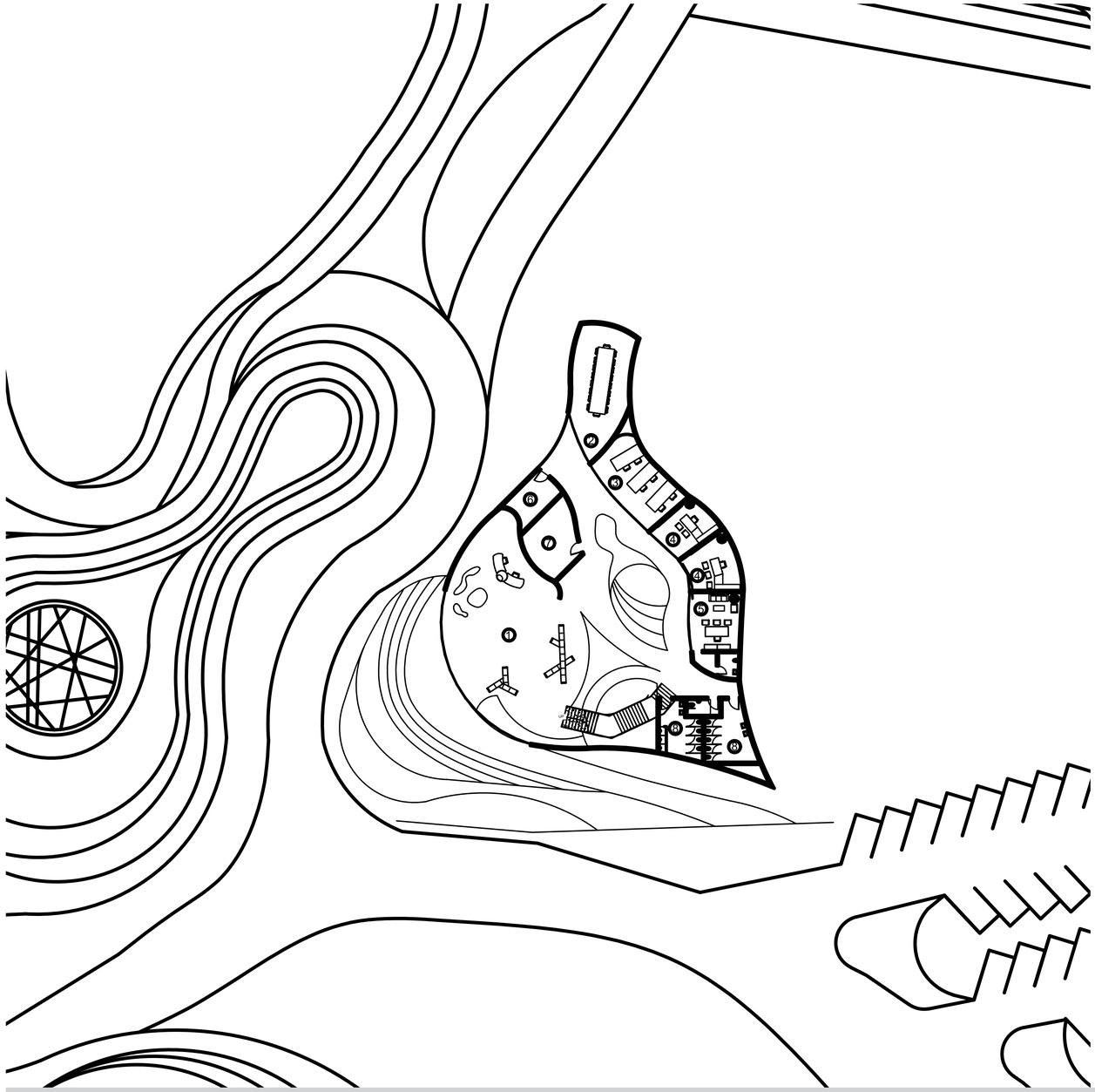

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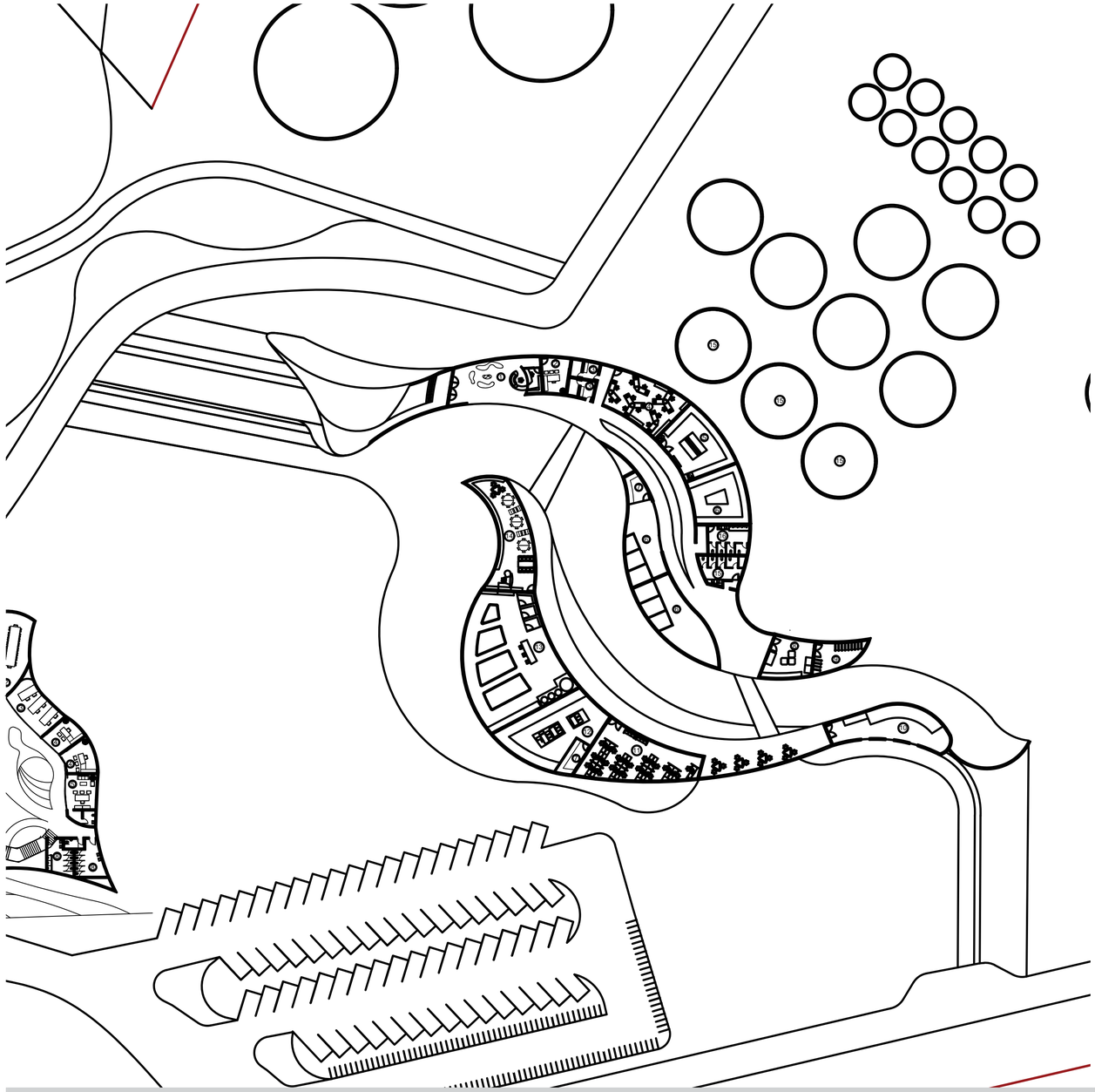

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