# Pre-Project Study Report and Project Proposal For Purachira Pond Biopark & Community Leisure Point

## Poothrikka Grama Panchayath

TROPICAL INSTITUTE OF ECOLOGICAL SCIENCES (TIES)
www.ties.org.in

Poothrikka Grama Panchayath

Report on

# Pre-project study of Purachira Pond Revival Programme

**Purachira Pond**, a pond located Near the Kolencherry –Kakanad State highway, Poothrikka P. O, Kolencherry, Ernakulam District, Kerala, India.

*Study Report & Project Proposal Prepared by:*


**TROPICAL INSTITUTE OF ECOLOGICAL SCIENCES**

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# Preface

Conservation of water bodies are utmost important in India due to increasing demand of water requirements, and water shortage is an emerging scenario especially during summer season. Rivers, lakes, ponds, streams and wells are the sources of freshwater. Ponds are amongst the most diverse fresh water habitats that support many species including more uncommon, rare and even threatened species. Furthermore, pond is an ecosystem itself and it is formed from the cohabitation of plants, animals, micro organisms and its surrounding environment. Apart from the water requirements for domestic purposes, most of the manufacturing is also heavily depended on water. Many of the small water bodies in our surrounding have already disappeared leading to water shortage and biodiversity loss in the region. Therefore, initiatives must be undertaken to protect the existed ponds to safeguard the environment as well as the human well being.

Poothrikka Panchayath Committee approached Tropical Institute of Ecological Sciences (TIES), Kottayam, to perform a Proposal to retrieve Purachira pond in Puthupanam Ward, Poothrikka Panchayat and to propose specific pond management activities that will ensure sustainable conservation of the Purachira pond. As upon the request, a one month research study has been conducted, and this report contains detailed information on history, geography, biodiversity and environmental issues of the Purachira pond. A sustainable conservation approach to retain the cultural, social, and ecological significance of Purachira pond through transforming the pond bank as a wayside eco-tourism spot and biodiversity Garden with the participation of local community is also proposed in the report.

# Acknowledgement

We would like to express our deepest gratitude to Poothrikka panchayath, for entrusting Tropical Institute of Ecological Sciences (TIES) with the responsibility of conducting the Pre-Project study and proposal preparation of Purachira Pond Revival Programme. TIES take this opportunity to individually thank Mr. Dheepu Dhivakaran , Secretary Poothrikka Panchayath, Mr. Paul Vettikadan, Member 4th ward poothrikka panchayath and Ms. Shiji Ajayan, President Poothrikka Panchayath, for their continuous assistance in carrying out the pre-project study. Additionally, we convey our sincere gratitude to Poothrikka Grama Panchayat Officials and biodiversity management committee Members(BMC).

Finally and most importantly, we would like to extend our sincere gratitude to all local community members including residents, farmers, traditional livelihood communities, prominent socio-religious members, and Kudumbashree units for their willingness to take part in the Purachira Pond experiences with regards to the pond.

We have great pleasure to acknowledge the timely help and monitoring of the project by the Kerala State Biodiversity Board, Thiruvananthapuram.

We highly appreciate each and every individual contribution to the study, and we expect your continued support in the future.

# Table of Contents

# 1. INTRODUCTION

Ponds are the simplest surface water bodies which are closest to the heart of human being and of considerable ecological, social and cultural significance in every locality. On a world scale, ponds and small lakes dominate both the area of freshwaters and the number of basins too. Collectively, they have an overwhelmingly greater significance in human affairs than large lakes, and contribute greatly to the freshwater storage of organic matter (Gioria, Margherita and Feehan, John. 2009).

Ponds are built in the past to hold water for agriculture and domestic uses. These water bodies not only provide drinking water, support livelihoods and biodiversity but also control runoff and act as natural rainwater recharging structures (Khanna, *et.al*. 2011).

Most of the surface water in India faces vast quantity and quality threat. Many ponds have been degraded or lost, mainly due to anthropogenic activities such as change in agricultural activities, expansion of urban areas and pollution. Ponds have become more eutrophic owing to excessive nutrient additions and as a result they have often changed from macrophyte dominated and clear water states to turbid states, dominated by phytoplankton or floating water hyacinth or *Salvinia* (Gioria *et al.,* 2009).

With about 1.2 billion people having no access to drinking water and about 2.4 billion lacking basic sanitation, the symptoms of emerging global water crisis are too obvious. It is projected that the population under water stress will rise from 450 million at present to 2.7 billion by 2025 and Indian subcontinent is already being classified as the 'water stressed' region, meaning that water needs exceed its availability (CPHEEO, 2013).

Historically, these water bodies have met water demands of the population for centuries and a community management system had sustained them for a long period of time. However, now water crisis is very severe in highly populated urban areas, and rural areas also witness water shortage during summer season.

These small water bodies are an intrinsic part of the eco system. A lake or pond is the water body which holds certain volume of water generally in all seasons of the year. They have traditionally served the function of fulfilling the water requirements of the

local community for drinking, household uses like washing, agriculture, and fishing and also for religious and cultural purposes. Moreover, they also host a wide variety of flora and fauna (The Waterpage. N.D)

Therefore, it is significant to protect and conserve water bodies such as ponds, streams, lakes *etc.* not only to meet the water demands of human beings but also to protect endemic and endangered biodiversity depend on these water bodies. It is the time to initiate efforts to restore, conserve, manage and maintain water bodies in our region.

## 1.1. Significance Of Conservation Of Ponds

A pond ecosystem is a fundamental unit in ecology that is formed from the cohabitation of plants, animals, microorganisms, and a surrounding environment. It refers to a community of freshwater organisms largely dependent on each other for surviving and maintaining a life cycle (The Waterpage. N.D). Ponds are an important part of our culture also; partly because of their intrinsic historical value. Their sediment records can reveal us about our ancestors' way of life. Ponds are 'local water bodies' and play a crucial role in maintaining and encouraging the link between people and wildlife. They also provide many opportunities for education and experimental research across a wide range of subjects (Khanna, *et.al*. 2011).

Ponds are vital for many rare and endangered species, both at regional and national levels. The networks of ponds support meta-populations of many aquatic species, including amphibians, invertebrates and wetland plants. Ponds are particularly important at the landscape scale: they have shown to contribute as much as to regional biodiversity as rivers or lakes, and they provide stepping-stones and increased connectivity between other freshwater habitats (Khanna, *et.al.* 2011).

Purachira pond is located at Puthupanam Ward($4^{th}$ ward), Poothrikka Panchayat in Ernakulam district, Kerala. It was a major source of water to the local community, especially for agricultural and domestic purposes, till a few decades back. The water body had greater ecological and cultural significances in the past. However, it has lost its original ecology and pristine form due to invasive aquatic weed growth and accumulation of wastes. To conserve the pond, the community members as well as the Panchayath has conducted pond cleaning drive several times in the past in various

years; however, most of them were found unsuccessful as a sustainable solution. The present condition of the pond is worse, and is at verge of destruction.

Fig. 1.1. Purachira Pond

## 1.2. OBJECTIVES

This pre-project study aims at finding out information on Purachira pond regarding its geographical details, history, cultural heritage, biodiversity and major environmental threats to propose a sustainable conservation of Purachira pond. The study objectives are specified as follows:

- To conduct a land survey of the Purachira pond and its surrounding area (only public land) and to generate geographical data of the pond
- To study the quality of water in the pond and also of the fauna and flora
- To conduct a community survey to explore various stakeholders of the pond
- To study the history, past and present usage pattern of the pond
- To study the nature of pollution of the pond and its sources
- To propose a detailed project for the retrieval and maintenance of the pond with a sustainable management and governance plan

# 2. METHODOLOGY

## 2.1. STUDY PERIOD

The study was conducted for a period of one month from 1st January 2020 to 31st March 2020. Due to Covid restrictions field studies have not been conducted in time. It was completed only by September, 2020.

## 2.2. METHODOLOGY

**Land survey:** Using Total station, contours, depth and size of the pond, nature of the bottom of the pond and relevant maps were generated.

Fig. 2.1. Collecting water sample for analysis by scientist from TIES

**Water quality studies**: The quantity of water in the pond was estimated using data from the Total station and manual measurements of depth. The complete analysis (physico-chemical and biological characteristics) of the pond water was conducted at

TIES' Water quality Analysis Laboratory, at Velloor, Kottayam. The following parameters were tested for four samples collected in two schedules within a period of one months; Chemical: pH, alkalinity, Total Dissolved Solids (TDS) salinity, chlorinity, iron, conductivity, inorganic carbon; Physical: colour, odour, turbidity; Microbiological: MPN (Most probable number of Coliforms); FC (faecal coliforms); TC (Total coliforms) etc. using standard procedures. Procedures used are as prescribed by American Public Health Association – APHA standards (APHA, 2000).

**Biodiversity Studies:** The pond area and its adjoining areas were thoroughly explored for floral diversity and recorded. Regular and repeated observations did in this area for a period of 2 weeks continuously, for the faunal diversity studies.

Fig. 2.2. Survey of the pond area using Total station

**Community survey**: A survey was conducted among the local residents and other stakeholders in order to explore the history, usage pattern, other interests *etc*. using a structured interview sheet (Appendix – I).

# 3. Results And Discussion

## 3.1 History Of Purachira Pond

### 3.1.1 Origin of Purachira pond

Ponds are vital habitats and provide essential resources for a wide range of species (both terrestrial and aquatic organisms), including humans. Ponds are also known as lentic systems which are a set of diverse inland freshwater habitats. The current study was conducted over the Purachira Pond of Poothrikka Panchayth as part of its revival project.

A community survey was conducted among the community, which includes the local residents and the stakeholders, to gather the information regarding the pond, which includes the flora, fauna, history, and other allied details which was known to the community through a questionnaire survey. 30% of the population says that the pond has been originated about 100 years ago, and another 21% percentage of the community says that it has been originated 300-400 years ago. An article supporting to this was published by Mathrubhoomi Newspaper, which says that the pond has an originated 400 years ago. It is clear from that the pond is supporting the locality for more than 100 years, which means a century above.

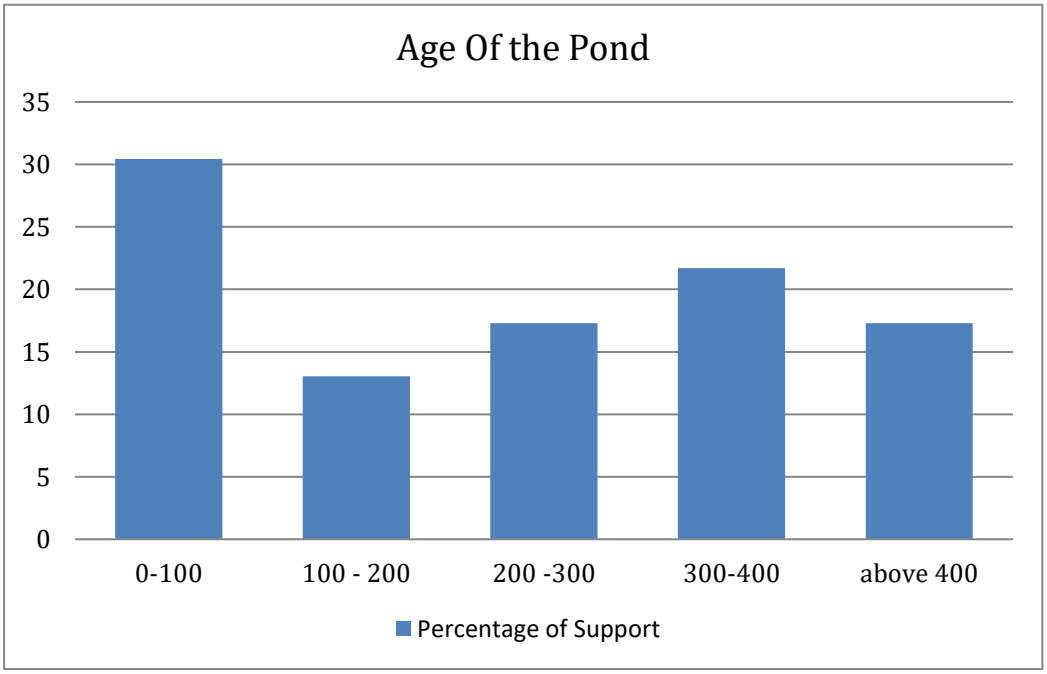


Fig. 3.1. The age of the pond opined by stakeholder communities

During olden times, the pond was owned by a community called *Karthakkanmar* related to *Vemopolinadu* Royalty, who were the ruling community. Historical data shows that

*Karthakkanmar* ruled the community about 400 years back. They were also authorized by the King to receive complaints and petitions and resolve fishing conflicts. The stakeholder survey also showed that agriculture was practiced in the surrounding area of the pond before 25 years. At earlier times, the agriculture as well as the community in the surrounding area was highly depended on this pond for various purposes like: irrigation, bathing, washing clothes and utensils, etc. Thus the pond played an important role in the lives of the community to fulfil their basic needs. Even during the summer season the water level in the pond was maintained by the Periyar Canal Project, which even provided sufficient water for their agricultural and community usage. Besides these, we cannot exclude the role played by this pond in the hydrological cycle. Despite of its confirmed age, the pond was of a great help to the local community for halting, refreshing, and its natural divinity.

### 3.1.2. ETIOLOGY OF THE "PURACHIRA"

No one has given any clue or stories regarding the origin of the name Purachira. As part of the project a stakeholder survey was conducted in the nearby areas, however no one could gave any valid stories on the origin of the name. However it can be assumed that the name 'Purachira' means outer bund , as the pond was a *Thalakulam* (Pond at the head position) which caters water for a large area of paddy fields or crop fields.

## 3.2. PHYSICAL FEATURES OF THE POND

Initially the surrounding areas of the pond were used for agriculture purposes along with other basic needs of the community. As time progressed drastic changes occurred in the physical, chemical and biological conditions of the pond. Studies show that freshwater systems are more imperilled than marine and terrestrial ones. And this pond too is an example for that. Earlier this was one of the major lives supporting component for the community, but now the condition changed to `a threatened situation of the pond and which is due to the increased human activity driven by the greed of human beings.

Pond is now under the ownership of Poothrikka Panchayath. A retaining wall was build along the three boundaries of the pond; east, west and northern sides, by the funds of District Panchayath five years before. Thereafter no major constructions or other protective measures were taken. During earlier times there were two outlets for the

pond. One was in the South-eastern side and the other in the North-eastern side. But the development activities removed the north eastern outlet and also the people claims that the developmental activities decreased the area of the pond.

## 3.3. Livelihoods and other usages Existed Based On Purachira Pond

The major livelihood activities associated with Purachira pond were agriculture, fishing, bathing and laundry activities. To irrigate the nearby agriculture farmlands the people was highly depended on this pond, which makes it as a major source of water at earlier times. Fishing was also a past time livelihood activity based on the pond. Angling fishes in the pond was one of the activities happened in pond but now it has been vanished.

The main uses of the pond in the past were agriculture, bathing, washing, and fishing now it has totally abandoned. This is mainly due to the tar factory nearby, which depleted the water quality and now the pond is also in a stage of neglect. This pollution has affected the livelihoods of the community in the sense the fish diversity became very less, the water is filled with pollutants from the tar factory and even the basic needs of community cannot be fulfilled by this pond now.

## 3.4 Environmental problems related to the pond

As per the opinion of the stakeholder community pollution of the water body is the main issue of the pond and the main reason for that is the nearby tar factory. The effluents from the tar factory deteriorated the quality of water drastically which was eventually affected the community who were dependent on that freshwater source. Even though the pond water is highly depleted, the labours from the factory and the residents of the nearby colony, named "*Patham mile colony*", is still using the pond for bathing. Plastic pollution is also a reason for the water quality depletion and it is used due to the soap and detergent covers, cloth waste, etc.

From the community survey 67% opined that the major threat faced by the pond is the pollution caused by the effluents from the tar factory. 29% has a claim that eutrophication is the major threat, and a small percentage says that water quality degrdation and biodiversity loss are the threats. The effluents from the factory, the

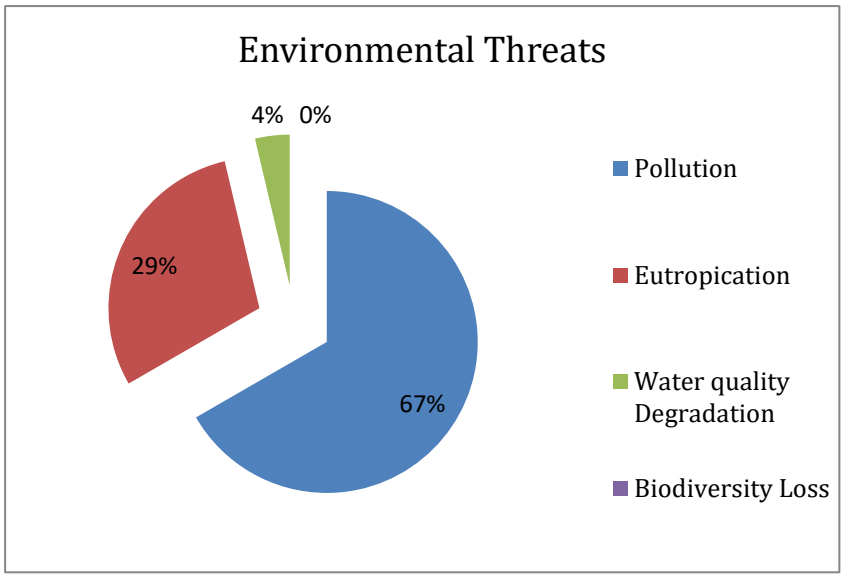


Fig.3.2. Major Environmental issues associated with the pond

plastic waste, detergents and soaps, etc. poses threat to the pond and which may lead to eutophication, water quality degradation, bidoiversity loss, thus all became interconnected. Eutrophication is mainly driven by the increasing anthropogenic nutrient loading and is an accelerating issue in the area. And the management of these problems requires broad ecosystem approach that acknowledges the complex interaction that exists between socio-economic and environmental parameters. The overload of nutrients (specially phosphorus and nitrogen) in the water body also leads to algal bloom, which is the rapid increase in the population of algae in the aquatic system. Excessive nutrients causes algal blooms and that use up the dissolved oxygen in the water, leading to a condition called hypoxia and that on the other hand kill fishes and other plants, leading to the loss of the pond ecosystem. The proliferation of algal blooms can also be resulted by a combination of environmnetal factors like, nutrient loading, sunlight, ecosystem disturbance, water flow , and other physico-chemical parameters of water (pH, conductivity, salinity, etc.). People has also stated that now-a-days the pond is becaming a centre for some anti-social activities. Increased growth of planktons leads to plankton turbidity, which is caused by a high population of these plants, this on the other hands reduces the amount of sunlight that penetrates into the water and thereby the oxygen content of the pond, depleting and diminsging the growth of fishes.

## 3.5. GEOGRAPHY

### 3.5.1. GEOGRAPHICAL DETAILS


Fig.3.3. Site plan of Purachira

## 3.6. Water Quantity And Quality

### 3.6.1. Water Quantity

Purachira Pond is mainly a rain water harvesting source in the region. Mostly the water in the pond is stagnant though there is a outlet in the South - Eastern side that flows towards the Agricultural field and then leads to another stream. This is connected to a big canal and it joining to the Periyar River. However because of its location as a head pond, the surface and ground water flow towards lower gradient line reaches the pond and that may be the reason for its perennial nature. Also the water near the canal is increase the water level of pond during summer season.

Purachira pond is a perennial source of water in that area. Among the survey respondents, all of them said that there is No water level fluctuation in the pond. It is because of the continuous flow of water through the outlet during the Monsoon season and presence of water during summer season in the nearest canal.

### 3.6.2. Water Quality

Purachira Pond is known for its pristine environment and pure water, till recent times. Local people used the pond for bathing, swimming and agricultural purposes mainly. But later with the abandonment of paddy cultivation pond was neglected. A tar mixing factory neighbouring the pond makes pollution in the pond and surrounding area.

As part of this study water samples were collected from the pond from different levels and regions of the pond and the results are given in Table 3.2. All the samples showed excess level of Coliform bacteria, indicating severe faecal contamination. The presence of *E.coli* in all the tested samples also denotes heavy levels of faecal matter in the water. The phosphate levels are also high which is due to the effluents from the factory as well as other chemical contaminants like soap, detergents, etc., which favours the growth of algae's. The dissolved oxygen level of the pond is diminished due to increased algal growth

| Sr. No. | Parameter | Sample 1 | Sample 2 | Sample 3 | Sample 4 | Sample 5 | Sample 6 | Sample 7 | Sample 8 | Desirable limits as per IS:10500-2012 |
|---|---|---|---|---|---|---|---|---|---|---|
| 1 | pH | 5.3 | 5.6 | 5.6 | 5.4 | 5.6 | 5.2 | 5.5 | 6.3 | 6.5 – 8.5 |
| 2 | Conductivity | 45.0 | 42.0 | 42.0 | 44.0 | 55.0 | 42.0 | 43.0 | 37.0 | 1476 µS |
| 3 | Total Dissolved Solids | 64.0 | 62.0 | 64.0 | 67.0 | 79.0 | 64.0 | 63.0 | 58.0 | 500 mg/L |
| 4 | Salinity | 0.036 | 0.034 | 0.036 | 0.038 | 0.043 | 0.036 | 0.035 | 0.033 | 3 ppt |
| 5 | Acidity | 10.0 | 6.0 | 14.0 | 6.0 | 6.0 | 12.0 | 8.0 | 12.0 | 200 mg/l as $CaCO_3$ |
| 6 | Alkalinity | 24.0 | 16.0 | 14.0 | 20.0 | 20.0 | 20.0 | 16.0 | 20.0 | 200 mg/l as $CaCO_3$ |
| 7 | Chlorinity | 66.6 | 62.9 | 66.6 | 70.3 | 79.6 | 66.6 | 64.8 | 61.1 | 250 mg/l as $CaCO_3$ |
| 8 | Total Hardness | 32.0 | 58.0 | 54.0 | 38.0 | 74.0 | 42.0 | 72.0 | 48.0 | 300 mg/l as $CaCO_3$ |
| 9 | $Ca^+$ ions | 8.0 | 8.0 | 10.0 | 14.0 | 6.0 | 14.0 | 20.0 | 10.0 | 75 mg/l as $Ca^+$ |
| 10 | $Mg^+$ ions | 24.0 | 50.0 | 44.0 | 24.0 | 68.0 | 28.0 | 52.0 | 38.0 | 80 mg/l as $Mg^+$ |
| 11 | Fe+ ions | 0 | 0.01 | 0.07 | 0 | 0 | 0 | 0.04 | 0.05 | 0.3 mg/l as Fe |
| 12 | Fluoride | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 1 mg/l as F |
| 13 | Sulphate | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 200 mg/l as $SO_4$ |
| 14 | Nitrate | 0.9 | 0.7 | 0.7 | 1.1 | 0.6 | 0.2 | 0.1 | 0.2 | 45mg/l as $NO_3$ |
| 15 | Chloride | 2.0 | 2.0 | 4.0 | 4.0 | 8.0 | 4.0 | 6.0 | 4.0 | 250 mg/l as Cl |
| 16 | Phosphate | 40.0 | 12.0 | 42.3 | 0 | 11.0 | 9.0 | 11.0 | 39.2 | 0.1 mg/l |
| 17 | Organic carbon | 59.9 | 61.2 | 73.04 | 59.6 | 49.4 | 52.3 | 85.8 | 89.8 | 4.0 mg/l |
| 18 | Oil content | 55.2 | 58.9 | 76.2 | 78.3 | 82.5 | 68.4 | 63.9 | 45.0 | 0.5 mg/l |
| 19 | DO | 0.71 | 2.13 | 1.42 | 1.42 | 1.42 | 0.95 | 0.95 | 1.19 | >5.0 mg/l |
| 20 | BOD | 20.11 | 20.28 | 40.22 | 39.88 | 20.19 | 59.19 | 19.85 | 19.60 | <1.0 mg/l |
| 21 | MPN Count | 2400+ | 2400+ | 1100 | 1100 | 1100 | 2400+ | 1100 | 1100 | 0/100ml |
| 22 | FC Count | 1100 | 1100 | 460 | 460 | 210 | 460 | 460 | 460 | 0/100ml |
| 23 | *E. coli* | 7 | 8 | 5 | 7 | 9 | 5 | 7 | 7 | Absent |

Table.3.1. Water quality test results of Purachira Pond *(coloured rows shows excess values)*

The turbidity caused by the increased plankton growth reduces the sunlight penetration and the light only penetrates to shorter distance. This in turn reduces the level of oxygen in the water. The most important gas dissolved in water is oxygen ($O_2$) and the dissolved oxygen is required by the living organisms for their respiration. The oxygen is dissolved in the water from two sources: atmospheric oxygen and photosynthesis. Oxygen levels gradually decreases as water depth increases and light levels diminish. Turbid water suppresses the penetration of light into the water. Biochemical oxygen demand (BOD), measures the amount of oxygen consumed by microorganisms in decomposing organic matter.

Fig. 3.4 Water collecting for quality analysis

The BOD levels in the pond is higher than the desirable limit and this leads to low dissolved oxygen causing stress and suffocation for the aquatic organisms. The rate of oxygen consumption in a stream is affected by a number of variables: temperature, pH, the presence of certain kinds of microorganisms, and the type of organic and inorganic material in the water.

The test results shows that the organic carbon content and oil content are extremely higher than the desirable limits. Oil is a collective of hydrogen and carbon and oil in water are applications of storm water runoff, hydrocarbon storage facilities, ground water reclamation sites, power plants, oil reclamation systems. The presence of excess organic carbon content and oil is attributed to the seepage from a nearby tar (bitumen) mixing factory, which also poses severe air pollution in the area, according to the community. The high levels of BOD,TOC and Oil is the indication of organic pollution in the pond and results in economic, environmental and social consequences. Organic pollution occurs when an excess of organic matter enters the water and when it's content rises the number of decomposers will increase and they use a great deal of oxygen for their growth. This leads to the depletion of oxygen and which can kill the aquatic organisms. Oil can affect the aquatic life and make water unable to be used for community needs, directly or indirectly reaches humans through food chain. Moreover due to the immiscible nature of oils with water, it forms the slick on the water surface which affects the gaseous exchange through the air- water interface and which in turn decreases the light penetration into the water affecting phytoplankton photosynthesis.

The phosphate levels are also high in the Purachira ponds, which is also an indicative of organic pollution. High levels of nutrients cause an overgrowth of plants and algae and as these plants and algae dies, the organic matter level increases in the pond which inturn lowers the oxygen level. And this process is called *eutrophication*. A sign of this is the excess algae in the pond. The sources of phosphorous cane are from fertilizers, manure, organic waste in sewage and industrial effluent. Soil and bank erosion can also be source of phosphorous. Eventhough it is essential element for plant life, when there is too much of it in the water can speed up eutrophication.

Faecal pollution of water can lead to health problems because of the presence of infectious microorganisms. It can be derived from human or animal sources. According to WHO, faecal contamination can cause gastrointestinal infections following ingestion or infections of the upper respiratory tract, ears, eyes, nasal cavity and skin. Purachira pond has high levels of faecal bacteria. *E.coli* (*Escherichia coli*) bacteria's, found in the intestine of animals and humans are found in this pond water higher than the desirable limits. The presence of *E.coli* in the pond water is a strong indication of sewage or animal waste contamination. The presence of E. coli may be indicative of contamination with other bacteria, viruses or protozoa that can make a person sick.

Thus it is clear from the water quality analysis that the pond is highly contaminated mainly due to anthropogenic reasons. The local peoples are supportive for the biodiversity park project. But the majority of the stakeholders stated that there is no use to implement the project without controlling the factory pollution. A cultural club, named *Mukkulam*, was working in connection with pond a few years back.

## 3.7 Biodiversity Estimation

Biodiversity indicates the soundness of ecosystem and ecosystem services. The biodiversity in and around the pond is estimated through direct observation and participatory research method. In order to make it more clear, the total biodiversity are categorized separately as biodiversity in the aquatic system and around the pond. This estimation gives an overall idea of biodiversity around the Purachira Pond. By a general observation and interviews, biodiversity in the aquatic system is identified. It is noticed that overall biodiversity within the study area is moderately rich including in and around the pond.

### 3.7.1 AQUATIC Biodiversity Of The Pond

| **Malayalam Name** | **Common Name** | ***Scientific Name*** |
|---|---|---|
| Muzhi | Valencienne'c clarid | *Clarias dussumieri* |
| Kaari | Stinging Catfish | *Heteropneustes fossilis* |
| Varal | Striped Snake head | *Channa striata* |
| Karippidi | Climbing Perch | *Anabas testudineus* |
| Thilapia | Thilapia | *Oreochromis mossambica* |
| Manathu kanni | panchax | *Aplocheilus lineatus* |
| karingana | Spiketail paradise fish | *Pseudosphronemus dayi* |
| Vazhakavarayan | Melon Barb | *Puntius fasciatus* |
| Koyma | Green Striped barb | *Puntius vittatus* |
| Malinjin | Indian Mottled eel | *Angullia bengalensis* |

Table. 3.2. List of major fishes found

| **Malayalam Name** | **Common Name** | ***Scientific Name*** |
|---|---|---|
| Mullen Payal | Hydrilla | *Hydrilla verticillata* |
| African Payal | Salvinia | *Salvina molesta* |
| Kulavazha | Water hyacinth | *Eichhornia crassipes* |

Table. 3.3. List of aquatic Plants in the pond

Ponds are amongst the most diverse freshwater habitats and support different types of species such as plants, fishes, birds, reptiles, frogs, insects, mammals etc. In the study, we have mainly studied on aquatic plants and fishes in the pond. In ponds plants either grow entirely underwater or partially on the surface.

## 3.7.2 TERRESTRIAL BIODIVERSITY OF THE POND

| **MALAYALAM NAME** | **COMMON NAME** | ***SCIENTIFIC NAME*** |
|---|---|---|
| Thondi | Hairy fig | *Ficus hispida* |
| Choriyanam | Climbing Nettle | *Tragia Involucrata* |
| Communist Pacha | Eupatorium | *Chromolaena odorata* |
| Erumapullu | Buffallo Grass | *Bouteloua dactyloides* |
| Ezhilam Pala | Devil tree | *Alstonia scholaris* |
| chela | Ficus | *ficus tsjahela* |
| Karuka | Bermuda Grass | *Cynodon dactylon* |
| Keezharnelli | Hurricane Weed | *Phyllanthus amarus* |
| Kudakan | Indian Pennywort | *Centella asiatica* |
| Kurunthotti | Country Mallow | *Sida rombifolia* |
| Maavu | Mango tree | *Mangifera indica* |
| Mukkutti | Little Tree Plant | *Biophytum sensitivum* |
| Thengu | Coconut Tree | *Cocos nucifera* |
| Seemakonna | Gliricida | *Gliricidia sepium* |
| Thazhuthama | Spreading Hog-Weed | *Boerhavia diffusa* |
| Thottavadi | Touch me not | *Mymosa pudica* |
| Koonan pala | Tabernaemontana | *Tabernaemontana heyneana* |
| Thekku | Teak | *Tectona grandis* |
| Kumizhu | White teak | *Gmelina arborea* |
| Edana | Rose sandal wood | *Olea dioica* |
| Elantha | Ziziphus | *Ziziphus trinervia* |

| | | |
|---|---|---|
| Choonda pana | Toddy palm | *Caryota urens* |
| chethi | Ixora | *Ixora coccinea* |
| Manja mula | Bamboo | *Bambusa vulgaris* |
| Erumanakki | Hairy fig Tree | *Ficus hispida* |
| Aanjili | Wild Jack | *Artocarpus hirsutus* |
| Muyalcheviyan | Emilia | *Emilia sonchifolia* |
| Menthoni | Malabar Glory Lilly | *Gloriosa superba* |
| Keezharnelli | Hurricane Weed | *Phyllanthus amarus* |
| Poovamkurundhal | Vernonia | *Vernonia cinerea* |
| Peringaram | Hill glory Bower | *Clerodendrum infortunatum* |
| Cherula | Mountain Knot | *Aerva lanata* |
| Kanijiram | Poison Nut | *Strictus nux vomica* |
| eucalyptus | Eucalyptus | *Eucalyptus globulus* |
| Vetti | Aporosa Tree | *Aporosa lindleyana* |
| *Therakam* | Brahmans Banyan | Ficus exasperata |
| Eendhu | Cycas | *Cycas circinalis* |
| Marotti | Hydnocarpus | *Hydnocarpus pentandra* |
| Dritharashtrapacha | Mikania | *Mikania micrantha* |
| Vellila thali | Mussanda | *Mussanda glaberatta* |
| Communist pacha | Chromolaena | *Chromolaena odorata* |
| Kurumulaku | Black Pepper | *Piper nigrum* |
| Kunnikuru | Rosary Pea | *Abrus precatorius* |
| Kattu chembu | Coco Yam | *Colocasia esculenta* |

Table. 3.4. List of flora in the pond area

Terrestrial biodiversity plays pivotal role maintaining the ecological balance of the pond. Terrestrial ecosystem of a pond support and homes to different species of flora and fauna.

| Malayalam Name | Common Name | *Scientific Name* |
|---|---|---|
| Balikkakka | Large-Billed Crow | *Corvus culminatus* |
| Mannathi pullu | Oriental Magpie-Robin | *Copsychus saularis ceylonesnsis* |
| Madatha | Common Myna | *Acridotheres tristis* |
| Kulakozhi | White-Breasted Waterhen | *Amaurornis phoenicurs* |
| Pena Kakka | House Crow | *Corvus splendens protegatus* |
| Kalimundi | Cattle Egret | *Bubulcus ibis coromandus* |
| Kutturuvan | White-Cheeked Barbet | *Megalaima virdis* |
| Meenkothichathan | White-throated Kingfisher | *Halcynon smyrnensis* |
| Karupan thenkuruvi | Purple sunbird | *Cinnyris asiaticus* |
| Kulamundi | Indian Pond Heron | *Ardeola grayii* |
| Kuyil | Asian Koel | *Eudynamys scolopaceus* |
| Chambhan nath | Jungle Owlet | *Glaucidium radiatum* |
| Oolenjali | Rufous Treepie | *Dendrocitta vagabunda* |
| Nattumaramkothi | Black rumped flameback | *Dinopium benghalense* |
| Uppan | Greater coucal | *Centropus sinensis* |

Table. 3.5. List of birds observed in the pond area

| BUTTERFLIES | | |
|---|---|---|
| **Malayalam Name** | **Common Name** | ***Scientific Name*** |
| Aralishalabham | Common Indian Crow | *Euploea core* |
| Chocolate Shalabham | Chocolate Pancy | *Junonia iphita* |
| Manjapappathi | Common Grass Yellow | *Eurema hecabe* |
| Manjathakaramuthi | Common Emigrant | *Catopsilia Pomona* |
| Narakakkali | Common Mormon | *Papilio polytes* |
| Pottuvellatti | Psyche | *Leptosia nina* |
| Thavidan | Common Bush Brown | *Ypthima huebneri* |
| Varayan kaduva | Striped Tiger | *Danaus genutia* |
| Neela kaduva | Blue Tiger | *Tirumala limniace* |
| Pondhachuttan | Common Sailor | *Neptis hylas* |

Table 3.6 List of Butterflies observed in the pond area

| ***DRAGONFLIES*** | | |
|---|---|---|
| **Malayalam Name** | **Common Name** | ***Scientific Name*** |
| Pandan Vayaltheyyan | Greater Crimson Glider | *Urothemis signata* |
| Shalabhathumbi | Common Picture Wing | *Rhothemis variegata* |
| Swami thumpi | Pied Paddy Skimmer | *Neurothemis tullia* |
| Theekari Muthan | Scarlet Marsh Hawk | *Aethriamanta brevipennis* |
| Nattu kaduva | Common clubtail | *Ictinogomphus rapax* |
| Makudivalan thumbi | Trumpet tail | *Acisoma panorpoides* |
| Mathil thumbi | Granit ghost | *Bradinopyga geminata* |
| ***DAMSELFLIES*** | | |
| Vella pulchinnan | White Dartlet | *Pseudagrion microcephalum* |
| Kanalvalan chathupan | Orange tailed marsh dart | *Ceriagrion cerinorubellum* |
| Chenkali Paalthumbi | Blue Bush Dart | *Copera vittatta* |
| Karimpacha chathupan | Rusty marsh dart | *Ceriagrion olivaceum* |

Table.3.7. Odonates of the pond area

However, majority of survey respondents claimed that the fish diversity in the Purachira Pond decreased significantly compared to the past .This was also due to the pollution from the Surrounding tar factory. Earlier the fishes were captures by local people but now they are very few and nobody wants to catch it for food.

The biodiversity survey of the area shows that the area is still in flora and fauna but it is under severe threat. The rejuvenation of the pond will bring more diversity and more conservation culture among the stakeholders.

## 3.8 Environmental Threats And Reasons For The Destruction Of The Pond

In Kerala, unfortunately water bodies are nowadays considered as the best place to release sewage and dump solid wastes. The abandonment of water bodies and development as a waste dumping site happens simultaneously. If the water body is on the sides of a road, people will make it as a habit to throw their household wastes into it or wastes get blown away into the pond by wind. There are lot of reports available on such types of waste dumping including that of slaughter house wastes. However, Purachira Pond is saved from such a habit of the passerby community, till this time. The pond area has minor pollution only from community. The main pollution is from the Tar factory Near the pond. The dust and chemicals from the factory cover whole area when they are working. The next pollutants are plastic and cloths from the peoples who are used pond to bathing and washing. However the water quality of the pond is found deteriorated mainly due to the pollutants from tar factory. The pollutant from the tar factory is very serious threat to the pond and surrounding biodiversity of the pond.

**99% of the surveyed community, the major environmental threats associated with Purachira pond is the pollution from Tar factory and Algal growth.**

**The following suggestions were raised by various groups:**

1. The all four sides of the pond should be constructed
2. The pond premises should be made beautiful.
3. The water should be kept clean. Bathing and swimming for children should be allowed.
4. There will be no use of rejuvenating the Pond as the pond is severely contaminating by the surrounding factory.
5. Panchayat should implement the project, and then only it will be maintained properly.

# 4. CONCLUSIONS

The major conclusions of the study are:

- Purachira pond is one of the oldest ponds of the area. It was a head pond and earlier it had been used to provide water for the paddy fields surrounding the pond.
- During the course of changing land use pattern where paddy fields became human habitations and remaining area abandoned in an inundated situation, then pond also became neglected.
- Several attempts have been made periodically by the local bodies and community to rejuvenate and conserve the pond, but no sustainable results reported.
- Local residents want to restore the purity and hygiene of the pond so they can use it again for swimming, bathing *etc*.
- Most of the stockholders like to convert the pond as a Biodiversity garden and eco tourism spot.
- But there is no use of rejuvenating the Pond as the pond is severely contaminating by the surrounding tar factory.
- Local community and peoples representatives are expressed their wholehearted support and assured to conserve the rejuvenated pond themselves. A local management committee will be formed including local body representatives, local residents, merchants, and representatives of the educational institutions of the area in order to ensure sustainable and proper management of the pond.

# PART II

# PROPOSAL FOR PURACHIRA CONSERVATION AND SUSTAINABLE DEVELOPMENT:

# PURACHIRA BIO PARK & COMMUNITY LEISURE POINT

## 5.1. BACKGROUND

The management and conservation of freshwater resources has traditionally focused upon running water and larger water bodies. In comparison small water bodies, such as ponds, have long been over-looked. Recently, however, there has been growing realization that these small patches are highly important not only for the biodiversity but also for the range of socio-economic activities linked to them. Ponds play a critical role in the global carbon cycle. Furthermore, they host a high and unique biodiversity particularly significant at the regional scale, when compared to other freshwater systems. Ponds have significant ecological functions and are recognized social and economic uses, this arises the need for their conservation.

Purachira Pond is an ancient pond in Poothrikka Grama Panchyath, Ernakulam district, Kerala. Till recent years, local people used it regularly for bathing, swimming, and laundry purposes and also for irrigating the nearby paddy fields. But later with the abandonment of paddy cultivation the pond was totally neglected. The major source of pollution in the area was the Tax Mixing Factory which works in the nearby region of the pond. But even in such a dilapidated condition the water level of the pond remained almost same throughout the year, without flooding in the rainy season and drying in the summer season, which maintained its perennial nature.

As part of biodiversity enhancement and ecological restoration programmes of Poothrikka Panchayath, a study was conducted on March 2020 in order to propose a full-fledged plan to make the pond as a model for conservation of traditional water resources in a participatory manner and develop the location as an informal environmental education centre. Panchayath assigned the task to Tropical Institute of Ecological Sciences (TIES) and TIES conducted extensive studies covering various ecological, cultural and social aspects. The study revealed that the local community is

very much attached to the pond and their lone wish is to re-establish the pond to its original legacy and beauty. Public unanimously demanded to restore the pond to its past glory which will provide the erstwhile services again to the local community. Scientific studies were conducted to keep the ecological significance of the pond and developed detailed plan including civil constructions and biodiversity conservation programmes. Thus the present proposal is developed.

## 5.2. AIM

To conserve Purachira Pond as a sustainable model for conservation of surface water resources and develop as a leisure spot through active community participation.

## 5.3. OBJECTIVES

- To conserve the pond as a sustainable model for conserving natural resources especially surface water resources and local biodiversity, ensuring all its traditional uses
- To develop the location as a leisure point with community participation
- To promote the pond as an informal environmental education hub for natural resource conservation and sustainable life style practices

## 5.4. PROPOSALS

The proposals are developed imbibing the principles of sustainable development, minimizing the resource utilization, ensuring sustainability with least energy inputs and low maintenance cost (natures' way!!) and benefitting local community at large and catering a larger community with natural rustic experiences.

**Pond Conservation:** Cleaning and maintaining water quality; conserving aquatic and neighbouring terrestrial biodiversity; waste management provisions; renewable energy resources (solar lamps, biogas *etc.*); bathing, swimming provisions; retaining provisions of water usage for agricultural purposes; and ensuring self-maintenance of water quantity and quality.

**Leisure Point:** Participatory and without harming pond environment in any manner, but conserving local biodiversity, culture, and social needs. Provisions for spending evenings for just watching the pond and surroundings or butterflies and birds (benches *etc.*).

Environmental Education Centre: The location will function as a centre for informal environmental education. Information boards will serve as the informal education tools.

## Schedule of activities Proposed

- Availing required permissions and sanctions
- Cleaning pond –removing clay, silt and Aquatic weeds
- Landscaping pond and its surroundings- pavement areas; gardens; lawns etc.
- Civil works- construction of proposed structures
- Implementing a butterfly garden near the pond
- Making provisions for waste management

# A. Conservation of Pond and the Local Biodiversity

## i. Pond conservation and Water quality improvement

The Purachira pond which is an important water resource of the area should be protected as a model productive system for conservation of traditional natural resources, especially as a rural rain water harvesting systems of Kerala. The full available area of water surface should be retained. The clay and silt should be removed and sand should be retained.

## ii. Physical Protection and Infrastructure Improvement

- **Retaining Walls:** The retaining wall of the pond is damaged at several locations and it will be repaired. New retaining wall is built in western side.
- **Fencing:** Fencing will be done in the entire pond area.
- **Pavements:** It is proposed to provide tiling for the pathways around the pond in 3 feet width, which starts from the road.
- **Seat:** Five seats made using stone slabs supported on used tyres will be placed around the pond.
- **Waste bin:** 5 waste bin placed different positions for waste management's.

- **Signage for environmental awareness:** 5 to 6 big board's and name boards for every plant will be placed which includes its local name, scientific name.
- **Over bridge –** A bridge is built above the outlet of the pond. It will connect the East and Southern side of the pond.
- **Fences along pathway and road:** Fences made from GI Pipe will be placed around the pond, and a walkway is made available from the road to the pond.
- **Solar lights:** Solar powered overhead lamps and lamp posts will be placed around the pond.
- **Bund making :** bund making using coconut pole stump in the two sides of inlet of the pond
- **Entrance arch:** beautiful arch is made in front of the pathway of the pond. It will attract the community to the pond.

## iii. Biodiversity Enhancement Programmes

- **Butterfly Garden:** A butterfly garden will be constructed in front of the Bathing ghat at the land available in between pond and boundary of the factory. The butterfly garden acts as a centre for informal education by placing signages on butterflies and host plants. Implementing such a garden will enhance the aesthetic beauty of the area as well as reduces pollution levels and also supports other species of organisms. (Butterflies are indicators of healthy environment and ecosystem; more butterfly more pollination). Butterflies also act as biological pest control
- **Wild /Flowering/Fruit Tree garden. –** A tree garden is maintained around the pond. It includes wild trees, flowering trees and fruit trees native to that area. It will increase the diversity of the pond and provide shade for visitors too. Name boards will be kept for the entire tree; it acts as an informal education tool for the visitors. Also it enhances the beauty of the Area. Trees promotes health and social well-being by: reducing pollution levels, stress, temperatures, shelter for many animals and birds thus enriching the biodiversity, provides shade and fresh air, mange storm water, etc.,

- **Aquatic flowering plant Garden:** An aquatic flower garden is maintained in the pond. Different type of Native aquatic flowering plants like Lotus, Water Lilly, and Crested Floating Heart etc. will be planted in the pond.
- **Medicinal Plant Garden:** Medicinal garden is created on the Western side of the Pond with 30 species of herbal plants in earthen pots. Most of the herbs grow well in pots and many are very adaptable to climates and types of soil. Informative boards will be placed with its common name, botanical name and uses to educate visitors informally on the importance of medicinal plants and its conservation.
- **Bamboo Belt:** A biological belt would be created at the Southern Boundary of the pond using native bamboos. It will enhance the aesthetic beauty of the campus.
- **Bio Fencing**: Native Climbers are used to make the Bio fencing for the pond. The climbers are planted close to the chain link fencing in five meter distance.

## List of plants proposed for planting

- ### Wild, Fruit Flowering Trees

| Scientific Name | Malayalam Name | English Name |
|---|---|---|
| *Annona squamosa* | ആത്തച്ചക്ക | Custard Apple |
| *Adenanthera pavonina* | മഞ്ചാടി | Circassian Tree |
| *Holarrhena pubescens* | കുടകപ്പാല | Holarrhena |
| *Terminalia bellarica* | താന്നി | Belliric Myrobalan |
| *Cassia fistula* | കണിക്കൊന്ന | Golden Shower Tree |
| *Saraca asoca* | അശോകം | Asoka Tree |
| *Lagerstroemia speciosa* | മണിമരുത് | Gaint Crape Myrtle |
| *Baccaurea courtallensis* | മുട്ടിപ്പഴം | Baccaurea |
| *Ficus racemosa* | അത്തി | Cluster Fig Tree |
| *Mesua ferrea* | നാങ്ക് | Iron Wood Tree |
| *Ficus benghalensis* | പേരാൽ | Banyan Tree |
| *Ficus microcarpa* | ഇത്തി | Indian Laural |
| *Spondias pinnata* | അമ്പഴം | Wild Mango |
| *Aegle marmelos* | കൂവളം | Bael Tree |
| *Terminalia arjuna* | നീർമരുത് | Arjun Tree |
| *Aporosa lindleyana* | വെട്ടി | Aporosa Tree |
| *Anthocephalus cadamba* | കടമ്പ് | Burflower Tree |
| *Mangifera indica* | മാവ് | Mango Tree |
| *Madhuca longifolia* | ഇലിപ്പ | Indian Butter Tree |
| *Cinnamomum verum* | കറുവ | Cinnamon |

| | | |
|---|---|---|
| *Careya arborea* | പേഴ് | Wild Guava |
| *Hopea parviflora* | തമ്പകം | Malabar Ironwood |
| *Symplocos cochinchinensis* | പാച്ചോറ്റി | Laurel Sapphire Berry |
| *Pterocarpus santalinus* | രക്തചന്ദനം | Red Sandal |
| *Artocarpus hirsutus* | ആഞ്ഞിലി | Wild Jack |
| *Citharexylum spinosum* | പാരിജാതകം | Fiddle Wood |
| *Mimusops elengi* | ഇലഞ്ഞി | Bullet Wood |
| *Syzygium cumini* | ഞാവൽ | Black Plum |
| *Phyllanthus acidus* | അരിനെല്ലി | *Star Gooseberry* |
| *Garcinia Gummi-gutta* | കുടംപുളി | Malabar Tamarind |
| *Couroupita guianensis* | നാഗലിംഗമരം | Cannon Ball Tree |
| *Stereospermum chelonoides* | പാതിരി | Indian Trumpet Tree |
| *Elaeocarpus sphaericus* | രുദ്രാക്ഷം | Bead Tree |
| *Dysoxylum malabaricum* | അകിൽ | White Cedar |
| *Holoptelea integrifolia* | ആവൽ | Indian Elm |
| *Schleichera oleosa* | പൂവം | Ceylon Oak |
| *Vitex altissima* | മയിലെള്ള് | Peacock Chaste Tree |
| *Actinodaphne bourdillonii* | മലവിരിഞ്ഞി | Actinodaphne |
| *Santalum album* | ചന്ദനം | Sandal |
| *Elaeocarpus tuberculatus* | ഭദ്രാക്ഷം | Warty Marble Tree |

Table 5.1 proposed wild, fruit, flowering trees

- Medicinal plants

| Scientific name | Malayalam name | Common name |
|---|---|---|
| *Acorus calamus* | വയമ്പ് | Sweet Flag |
| *Adathoda beddomei* | ആടലോടകം | Malabar Nut |
| *Asparagus racemosus* | ശതാവരി | Asparagus |
| *Desmodim gangeticum* | ഓരില | Desmodim |
| *Piper longum* | തിപ്പലി | Indian Long Pepper |
| *Holostemma ada* | അടപതിയൻ | Holostemma Creeper |
| *Pseudarthria viscida* | മൂവില | Pseudarthria |
| *Biophytum sensitivum* | മുക്കുറ്റി | Biophytum |
| *Hemidesmus indicus* | നറുനീ ി | Indian Sarsaparilla |
| *Rauwolfia serpentina* | സർപ്പഗന്ധി | Indian Snakeroot |
| *Indigofera longiracemosa* | നീലയമരി | True Indigo |
| *Gloriosa superba* | മേന്തോന്നി | Gloriosa |

| | | |
|---|---|---|
| *Aloe vera* | കറ്റാർവാഴ | Aloe |
| *Plumago rosea* | ചെത്തികൊടുവേലി | Fire Plant |
| *Plumago capensis* | നീലകൊടുവേലി | Blue Plumbago |
| *Ocimum sanctum* | കൃഷ്ണതുളസി | Sacred Basil |
| *Vitis quadrangularis* | ചങ്ങലംപര | Veldt Grape |
| *Premna serratifolia* | മുഞ്ഞ | Headache Tree |
| *Vetiveria zizanioides* | രാമച്ചം | Vetiver |
| *Ocimum basiicum* | രാമതുളസി | Sweet Basil |
| *Tylophora asthmatica* | വള്ളിപാല | Indian Ipecac |
| *Costus pictus* | ഇൻസുലിൻ ചെടി | Spiral Ginger |
| *Centella asiatica* | കുടങ്ങൽ | Indian Pennywort |
| *Glycosmis pentaphylla* | പാണൽ | Gin Berry |
| *Emilia sonchifolia* | മുയൽചെവിയൻ | Emilia |
| *Gloriosa superba* | മേന്തോന്നി | Malabar Glory Lilly |
| *Phyllanthus amarus* | കീഴാർനെല്ലി | Hurricane Weed |
| *Tottea siliquosa* | അൽപ്പം | Chakrani |
| *Vernonia cinerea* | പുവാംകുറന്തൽ | Vernonia |
| *Crotalaria retusa* | കിലുക്കി | Devil-Bean |
| *Abelmoschus moschatus* | കസ്തൂരിവെ | Musk Mallow |
| *Sida rhombifolia* | കുറുന്തോട്ടി | Common Sida |
| *Embelia ribes* | വിഴാൽ | False Black Pepper |
| *Melastoma malabathricum* | കദളി | Malabar Melastome |
| *Mimosa pudica* | തൊട്ടാവാടി | Sensitive Plant |

Table 5.2 proposed Medicinal Plants

- Host plants For Butterfly Garden

| Scientific name | Malayalam name | Common name |
|---|---|---|
| *Citrus spp* | നാരകം | Citrus |
| *Murraya koenigii* | കറിവേപ്പില | Curry Tree |
| Mussaenda philippica | മുസാ | Mussanda |
| *Calotropis gigantea* | എരുക്ക് | Gaint Milkweed |
| *Ricinus communis* | ആവണക്ക് | Castor Bean |
| *Tottea siliquosa* | അല്പം | Tottea |
| *Tylophora indica* | വള്ളിപ്പാല | Tylophora |
| *Bryophyllum pinnatum* | ഇലമുളച്ചി | Air Plant |
| *Aristolochia tagala* | ഗരുഡക്കൊടി | Indian Birthwort |
| *Cassia tora* | തകര | Sickle Senna |
| *Cinnamom malabatrum* | വയന | Cinnamom |
| *crateva magna* | നീർമാതളം | Garlic Pear |
| *Bamboo spp* | മുള | Bamboo |
| *Bryophyllum pinnatum* | ഇലമുളച്ചി | Bryophyllum |

| | | |
|---|---|---|
| *Calotropis gigantea* | എരുക്ക് | Giant Milk Weed |
| *Ricinus communis* | ആവണക്ക് | Castor |
| *Hygrophilas chulli* | വയൽചുള്ളി | Hygrophilas |
| *Tylophora indica* | വള്ളിപ്പാല | Tylophora |
| *Hydnocarpus pentandra* | മരോട്ടി | Wood Apple |
| *Passiflora spp* | പാഷൻ ഫ്രൂട്ട് | Passion Fruit |
| *Flacourtia montana* | വയ്യങ്കത | Flacourtia |
| *Cleome viscosa* | ആര്യവേള | Cleome |
| *Nerium oleander* | അരളി | Oleander |
| *Saraca asoca* | അശോകം | Asoka Tree |
| *Glycosmis arboraea* | പാണൽ | Gin Berry |
| *Pongamia pinnata* | ഉങ്ങ് | Pongamia |
| *Polyalthia longifolia* | അരണമരം | Polyalthia |
| *Cinnamom malabatrum* | വയ്യന | Cinnamon |
| *Curcuma longa* | മഞ്ഞൾ | Turmeric |
| *Palm spp* | പന | Palm |
| *Aegle marmelos* | കൂവളം | Aegle |
| *crateva magna* | നീർമാതളം | Crateva |
| *cassia fistula* | കണിക്കൊന്ന | Golden Shower Tree |
| *Xylia xylocarpa* | ഇരുൾ | Xylia |

Table 5.3 proposed Host Plants for butterfly Garden

- Nacterine plants for Butterfly garden

| Scientific name | Malayalam name | Common name |
|---|---|---|
| *Clerodendrum paniculatum* | കൃഷ്ണകിരീടം | Pagoda flower |
| *Crotalaria retusa* | കിലുകിലുക്കി | Rattle weed |
| *Ixora coccinea* | തെച്ചി | Ixora |
| *Cuphea hyssopifolia* | കുഫിയ | Cuphea |
| *Tridax procumbens* | കമ്മൽപൂ | Coat buttons |
| *Duranta erecta* | മാണിക്യച്ചെമ്പഴുക്ക | Duranta |
| *Zinnia linnearis* | സീനിയ | Zinnia |
| Leea indica | ചൊറിയൻതാളി | Bandicoot berry |
| *Tagetes erecta* | ചെ ുമല്ലി | Mari gold |
| *Lantana camara* | അരിപ്പൂച്ചെടി | Lantana |
| *Stachytarpheta jamaicensis* | നരിവാലൻ | African blue spike |

- Table 5.4 proposed Necterine Plants for butterfly Garden

- Bamboo species for Bamboo Belt

| Scientific name | Malayalam name | Common name |
|---|---|---|
| *Bambusa vulgaris* | മഞ്ഞമുള | Yellow bamboo |
| *Bambusa bamboo* | ഇല്ലി | Common bamboo |
| *Ochlandra travancorica* | ഈറ്റ | Ochlandra |
| *Pseudoxytenanthera ritcheyi* | ഈറൻകോൽ | Small Bamboo |
| *Thrysostachys oliveri* | ലാത്തിമുള | Solid Bamboo |
| *Dendrocalamus brandisii* | ബിലാത്തിമുള | Dendrocalamus |
| *Dendrocalamus stocksii* | ഒയി | Dendrocalamus |

- Table 5.5 proposed Bamboos for bamboo belt

- Aquatic Water Plants

| Scientific name | Malayalam name | Common name |
|---|---|---|
| *Nelumbo nucifera var.* | താമര | Indian Lotus |
| *nymphaea caerulea var.* | ആമ്പൽ | Water Lilly |

- Table 5.6 proposed Aquatic flowering plants


Fig 5.1. Map Showing Project Plan

## iv. Purachira Project Management : Sustainable Mechanisms

Purachira is a public property hence many stakeholders have interest in its running and a proper co-ordination and management system is essential. A self-maintained system, both economic and ecological, is visualised for the management of pond including all stakeholders identified through the survey. A network of stakeholders will ensure the sustainability of the pond.

### I. Governance

A special committee will be formed for the operation and management of the project including representatives of all stakeholder groups - *i.e*, Poothrikka Grama Panchayath, Kudumbasree, Harithakeralam mission, Biodiversity board, Local community and implementing agency.

#### *Structure*

A suggested structure for this committee, which consists of 11 members, is given below:

1. Chairman (from Panchayath)
2. Vice Chairman (From Community)
3. Secretary - (From Panchayath)
4. Committee members- 8 members
    - One from Panchayath - one will be the treasurer
    - Four from Community (who have a passion to the pond and Eco friendly traditions)
    - One representing Biodiversity Board
    - One representing Haritha keralam Mission
    - One representing Technical Consultants

#### *Functions*

The committee will be responsible for governing the whole project including decision making at the policy level to the management of day to day affairs. The appointment of the caretaker and managing day-today financial income and expenditures are the other major functions of the committee.

### *Meetings*

The committee shall convene regular meeting at least once in a month. If necessary at any time on a 24-hour notice secretary can convene meetings. The quorum of the committee will be 6.

### *Venue of the meeting*

The venue of the meetings shall be decided by the secretary, considering convenience of the majority of members.

### *Account maintenance*

A joint account should be opened in the name of Secretary and Treasurer of the committee.

### iv. Educational Programmes (both informal and formal)

The pond site shall be developed as a centre of informal environmental education especially on water conservation and traditional ways of natural resource protection.

# 5.5. BUDGET

## 5.5.1Fund Raising Options

The fund for the project is raised through community participation or donation. It may be an individual, an institution, commercial establishment, corporates, business groups, an NGO etc. The donors will be acknowledged through displaying their support on a common board as Supporters of the project. Donors can claim Carbon Credit or other benefits too. Donation can be done for full project or in part or for a component like Bio fencing, hand rail and sign boards. The one year maintenance cost of trees and the area also shall be sponsored.

## 5.6 Maintenance Protocol

- A local managing committee will be set up including representatives of all stakeholders. They will be responsible for monitoring and maintenance activities of the area.
- After the initial establishment not much maintenance is needed. By a period of one year the system becomes self-sustainable. However, one part time care taker is essential for daily caring, watering plants etc. There are two options to raise fund for care taker: one is through sponsorship by business group; in return a provision for an advertisement board may be provided. Second option is to fix an entry fee for the area. It is good to have a caretaker in order to restrict anti social activities also.
- Weeding and Periodic cleaning should be done to maintain the health and hygiene of the area should be done periodically with the help of MNRGES.
- Plastic waste and food waste is strictly prohibited inside the area.

## 5.7 WEB REFERENCES

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## SECONDARY DATA SOURCES

Purachira Land Area Sketch from Poothrikka Panchayath.

# APPENDIX I

TROPICAL INSTITUTE OF ECOLOGICAL SCIENCES

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**SURVEY ON ENVIRONMENTAL AWARENESS**
**(Purachirakulam – Bio Park Project)**

## Ponds Historical Survey

**Field Record Sheet** Date of the survey: _____

**Personal Details of the Interviewee:**

1. Name :
2. Age:
3. Female/Male:
4. Contact Details:
5. Employment:

**Pond Historical Survey:**

6. What do you know about the origin of the pond, especially regarding its age, history and management (when, why, and who made it)?

7. Have you heard of any stories regarding the origin of the name of the pond?

8. Are there any differences in the physical features and surrounding of the pond from the past (such as pond size, depth etc.), and why?

9. What are the main inlets and outlets of the pond?

10. i) What were the main uses of the pond in the past?

    a) Agriculture/Irrigation
    b) Bathing
    c) Laundry
    d) Showering Animals
    e) Others (specify):

    ii) What are the present uses of the pond?
    a) Agriculture/Irrigation
    b) Bathing
    c) Laundry
    d) Showering Animals
    e) Others (specify):

11. i) Does the pond experience seasonal water level fluctuation, especially between rainy and summer season?
    a) Yes
    b) No

    ii) If yes, the drawdown height (in summer season)?
    a) Below 1 foot
    b) 1 foot
    c) 3 foot
    d) 5 foot
    e) Above 5 foot

12. Have you heard of any other stories, poems, myths, beliefs, rituals, and customs associated with the pond or other nearby ponds?

13. Who owns the pond and the surrounding land? In your knowledge, does the ownership have changed at any time in the past?

14. Do you think the pond experiences any of the mentioned environmental threats?

    a) Pollution
    b) Eutrophication /covered with plants and weeds
    c) Water Quality Degradation
    d) Biodiversity Loss
    e) Others (specify):

15. Have you noticed any of these pollutants in or around the pond?

    a) Sewage
    b) Plastics
    c) Slaughtering Wastes
    d) Other Solid Wastes (specify):

16. What are the major pollution sources?

    a) Local Community
    b) Vehicular Passengers
    c) Sewage Pollution
    d) Others (specify):

17. i) Did any livelihood exist in the region based on the pond?

    a) Yes
    b) No

    ii) If yes, specify:
        a) Agriculture
        b) Fishing
        c) Laundry
        d) Cattle Raising (a source for drinking water and showering of animals)
        e) Others (specify):

18. Fish species in the pond (past and present):

19. Does the fish diversity in the pond has reduced or changed?

a) Yes
b) No

20. Whether any establishments existed nearby Purachira pond, eg: agricultural market? If yes, specify:

21. History of any development projects occurred in the region, if any. Was the project successful? If not, why?

22. **Other Water Bodies:** Are there any other ponds in the region near to this pond? What is its size? What are their conditions?

23. What is the significance of this pond in the region?

24. What do you think as the main reason which led to the pollution and abandonment of the pond?

25. How do you want to see the pond in future?

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