



Rejuvenation Status Of Urban Ponds And Its Level Of Significance In Payyanur Municipality, Kannur District, Kerala Using Geoinformatics

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Abstract

Ponds are lentic water bodies (still- standing water bodies) most probably occupied by freshwater & in exceptional cases occupied by saltwater/brackish water. The study beholds its relevance on the fact that Payyannur Municipality, Kannur district, Kerala state is an urban centre expanding and evolving over years which did have a serious impact on its natural resources especially water resources. To state the issues and challenges faced by pond in Payyannur municipality, geotagged photo interpretation and weighted ranking method were used on the 9 selected parameters. The findings and suggestions as an outcome of this research have its scope on Urban Planning, Water Management Planning, Land Use Planning, Water Conservation Planning, Rejuvenation, New Manmade Pond Construction and Modification, Conservation of ecosystem etc. by serving itself as an exemplary reference material.

KEYWORDS: Rejuvenation, Embankment, Water Quality, Environmental Conservation

1. INTRODUCTION

Ponds serves by providing water for agricultural, livestock communities, helps in retrieving habitat restoration, serving as breeding grounds for local & migratory species & supporting the organismal ecosystem of varying degrees. The role of ponds in serving the mankind is vast enough that it may range from the small- scale individual consumption to industrial consumption. Since, ponds are naturally harvested by rainwater and serves as the water table indicator, serves in irrigational activities, fishing grounds, domestic consumption & associated with religious, social & cultural rituals. Some even serves as the life blood for many villages. Commercialization as implied in case of every other field, has its impact on ponds & it's ecosystem as the range of utilization of ponds moved into a diverse & vast horizon. With the extensive transition of human intervention & utilization of ponds, the basic existentiality of the ponds are

adversely affected and the necessity for conserving the ponds becomes the need of the hour, not only for safeguarding the existence of the organisms but also for reviving the pond as the natural resource. Conservation of ponds is significant especially during the current period, for solving the water scarcity & groundwater depletion. It is even relevant as recent studies indicate that small surface water resources like ponds have great role in mitigating climate change. The spatial distribution study of pond aids in identifying vulnerable area of ponds, problematic area of pond, and degradation and possibilities of ponds etc. it can help in to appropriate management and conservation planning. It is even important that the study area is urban in nature which provides a scope of studying how the urbanisation has its effect on natural water resources. Thus, monitoring the present situation of ponds in Payyannur municipality is very important for the present fresh water availability of this region and also it help to future urban planning and development. There are many studies conducted in Payyannur municipality region related to pond and their ecosystem, but there is no proper study conducted that dealt with pond rejuvenation.

2. STUDY AREA

Payyannur municipality is at the northern end of the Kannur district, north Malabar region, state of Kerala, India (Fig. 1). This municipality consists of three administrative villages: Vellur, Koram and Payyannur. Other villages are Annur and Kokkanissery. Payyannur municipality lies between 12°4' N to 12° 10' N latitude and 75° 17' E to 75° 18' E. Municipality is bounded by Karivellur- Peralam and Kankol - Alappatambu in North, Eramam - Kattoor in North East, Kadannappally - Paanappuzha in East, Cheruthazham and kunzhimangalam in Southeast, Ramanthali in South and Arabian sea in west. The municipality has an area of 52.63 sq. km. Total population is 72132 (2011 census), among them 38699 are female population and 33432 male population. Kaniyeri, Kizhakkumbad, Vellur East, Echilam Vayal, Kandoth, Korom North, Korom Central, Korom South, Muthiyalam, Kanayi North, Maniyara, Kanayi South, Paravanthatta, Kokkot, Chitharikovval, Perumba, Hospital Ward, Kokkanissery, Town Ward, Mavinchery, Kandangaly North, Kandangaly South, Punjakkad, Kotty, Mambalam, Padolly, Temple Ward, Gramam East, Gramam West, Kolloth South, Kolloth North, Kavvayi, Thayineri West, Thayineri East, Muchilott Ward, Annur South, Annur East, Kizhakke Kavval, Shanthi Gramam, Kara, Annur West, Karammel West, Karammel East & Vellur West are the 44 wards under the Payyanur Municipality. It has an average of 16-meter elevation. Payyanur Municipality belongs to the Fifth sector of Northern Midland region under the 13 agro climatic zones in Kerala. Payyanur Municipality is dominantly occupied by alluvial, laterite & red soil.

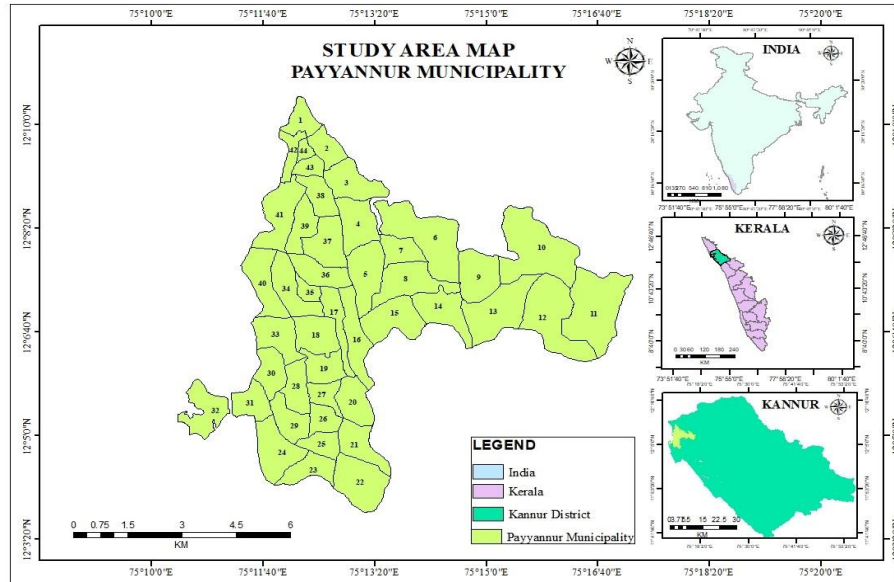


Fig.1 Location map of Payyannur Municipality

3. DATA SOURCES AND METHODOLOGY

This study is primarily based on primary data, collected through field visit and survey. Payyannur municipality provided basic data source for the purpose of analysis. Google earth and satellite images were used in delineating municipal boundary and locate the pond. Field photos were used for Image interpretation and analysis. The present research work is a part of a combined research work on developing an inventory of ponds in Payyannur Municipality. As this was a pilot study conducted during short span of time, the field survey was the main method of data collection. The field visit was carried out in April during the period of water shortage in Payyannur municipality. Field survey sheets were prepared and field schedule were planned according to which field visit were conducted. Geotagged photos of the 173 identified ponds were taken, direct and telephonic interview were conducted with local residents as well as officials in Payyannur Municipality. The main two method of analysis used here are photo interpretation methods using geotagged photos and waited ranking methods for assessing the status of ponds based on selected parameters. The parameters like embankment, water level, algal content, water quality, siltation, invasive vegetation density, substance accumulation / waste disposal, utilization status & prone to deterioration in future were used to assess the status of each pond which were ranked according to their condition which was noted during field visit. Each parameter was categorized into 6 categories considering the level of suitability. Later for each pond ranks for each variable were added and total values were categorized into Nil, Extremely Low / Poor, Low / Poor, Moderate, High / Good & Extremely / High / Good. Due to lack of available secondary data related to water quality of ponds the physical characteristics was assessed. The main advantage of the present research work was that it was carried

out in a time when all water sources were almost dry and if there is any chance of water availability it was visible in geotagged photos.

4. RESULT

Hydrological and environmental statuses of the 173 ponds identified were assessed as a basis for considering the rejuvenation status of the ponds. Location, Ownership, Shape, Size / Extension, Embankment / Boundary, Source of Recharge, Nature of Ponds, Freshwater / Salt water intruded, Depth, Water Level, Water Quality, Utilization Status, Geology, Topography, Slope & Soil, Siltation, Substance Accumulation, Permeability, Capillary Action, Chemical Components, Nutrient Content & Biological Oxygen Demand, Associated Drainage & Catchment Area, Accessibility & Attentive Nature of the Ponds were considered for assessing the hydrological status of ponds whereas Location, Biotic Wealth & Layer of Ecosystem, Presence of Algae, Water level, Water Quality, Siltation, Invasive Species Density, Availability of Nutrients & Compounds for the Sustenance of the Organisms, Substance Accumulation and Eutrophication were considered to assess the environmental status of the ponds with limited application of sophisticated and scientific techniques.

4.1 Rejuvenation of Ponds in Payyannur Municipality

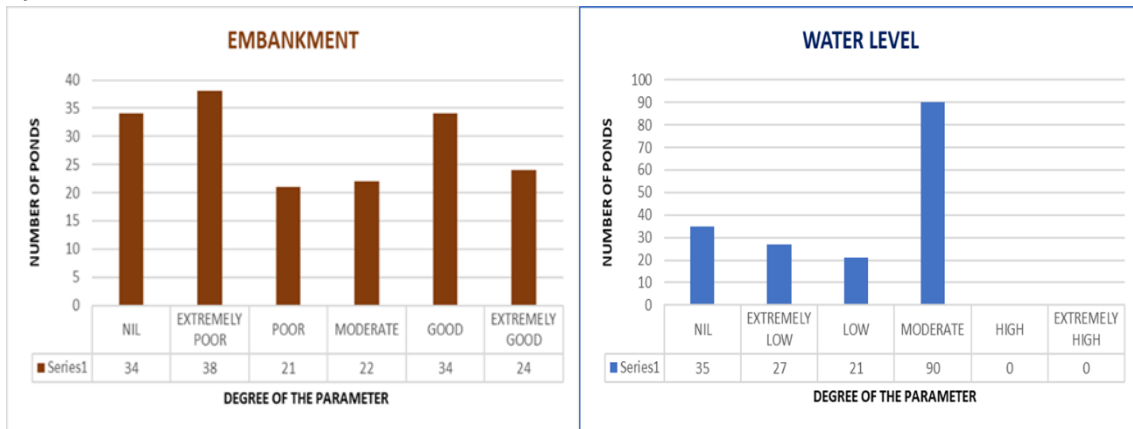
These 173 ponds under the administrative boundary of Payyannur Municipality were located and the hydrological & environmental status of them were addressed & analysed. Analysing the characteristic conditions of the ponds regarding the structural, environmental & social factors on the context of rejuvenation of ponds were carried out based on 9 parameters:

1. Embankment
2. Water Level
3. Algal Content
4. Water Quality
5. Siltation
6. Invasive Vegetation Density
7. Substance Accumulation / Waste Disposal
8. Utilization Status
9. Prone to Deterioration in Future

The existing conditions regarding the parameters throws light on the relevance of rejuvenation of the ponds & provides suggestions in restoring them. Each of the ponds were categorized in 6 scales based on their conditions regarding the parameters as follows:

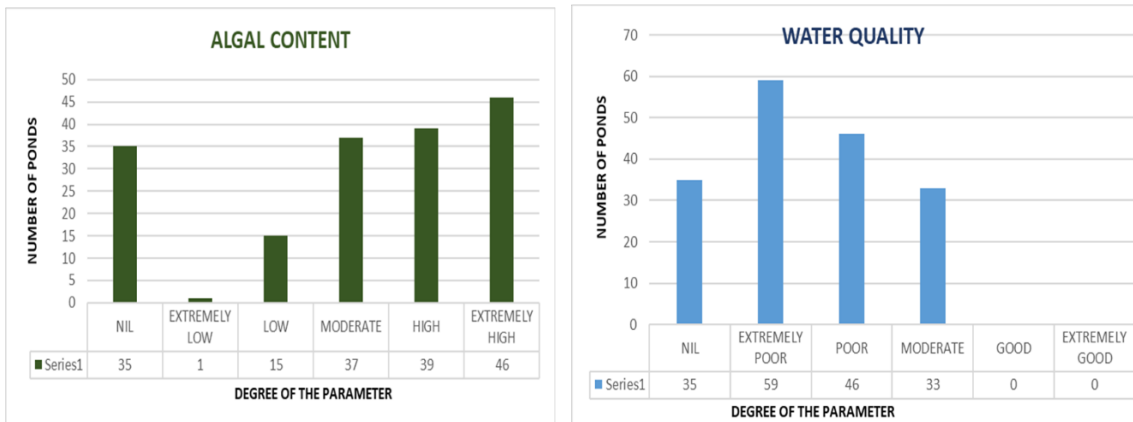
- a) Nil
- b) Extremely Poor / Low
- c) Poor / Low
- d) Moderate
- e) Good / High
- f) Extremely Good / High

Based on the scalar degree, parameters on the 173 ponds were observed as follows (Fig. 2)



(A) Embankment

(B) Water Level

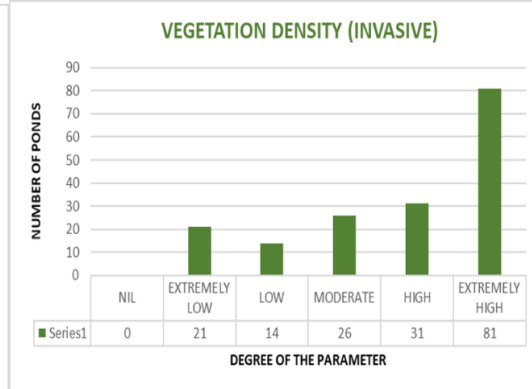


(C) Algal Content

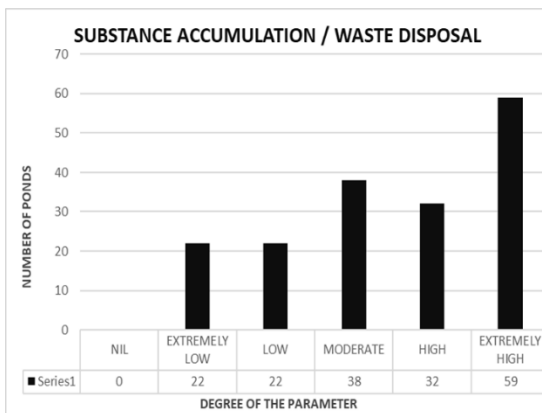
(D) Water Quality



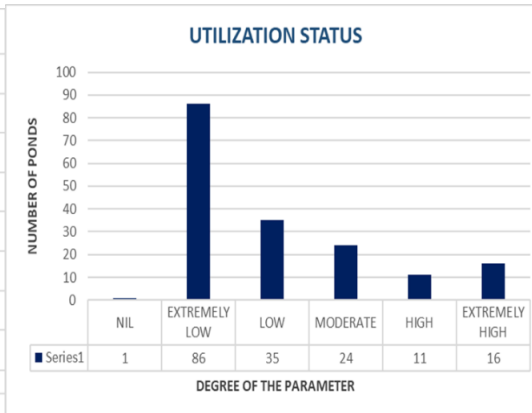
(E) Siltation



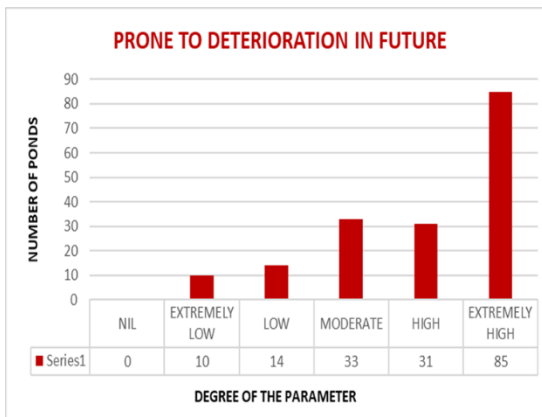
(F) Invasive Vegetation Density



(G) Substance Accumulation



(H) Utilization Status



(I) Prone to Deterioration in Future

Fig.2 Status of ponds based on nine parameters

The categorization of the ponds based on the 9 parameters on the 6 scalar degree was followed by ranking the scales into numerical based on the possibility of consideration on the context of the degree of rejuvenation. The conditions that are likely to be more attended for rejuvenation tends to have the highest value – 6 in this case, as there are 6 scalar degrees

for each parameter. The hierarchy of the values tends to decrease from the worst conditioned ponds to the fairly good conditioned ponds. It is to be noted that:

- The numerical ranking for ponds on parameters embankment, water level, water quality & utilization status based on the 6 scalar degrees of Nil, Extremely Poor / Low, Poor / Low, Moderate, Good / High & Extremely Good / High are 6,5,4,3,2 & 1 respectively.
- In the case of parameters siltation, invasive vegetation density, substance accumulation / waste disposal & prone to deterioration in future, the numerical rankings for Extremely Good / High, Good / High, Moderate, Poor / Low, Extremely Poor / Low & Nil are 6,5,4,3,2 & 1 respectively.
- Algal Content is scaled numerically as 6,5,4,3,2 & 1 for Nil, Extremely High, High, Moderate, Poor / Low & Extremely Low. The case is exceptional for the scale of 'Nil' as it is not in a positive way - it depicts the absence of water level thereby absence of algae.

The aggregate values of ranks for each pond with respect to the 9 parameters degree were observed to be ranging from the lowest value of 18 to the highest value of 53. 13 ponds were identified to have highest frequency of rank values of 43 followed by 10 ponds each in case of rank values of 52 & 30 respectively (Fig. 3). Ponds with least frequency of 1 were identified with rank values of 32, 21 & 18.

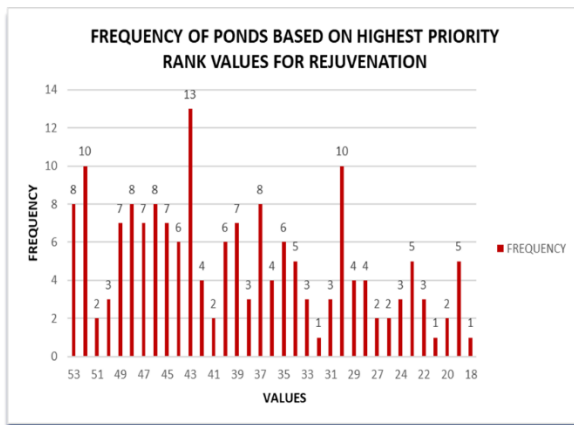


Fig.3 Ponds of highest priority for rejuvenation

5. DISCUSSIONS

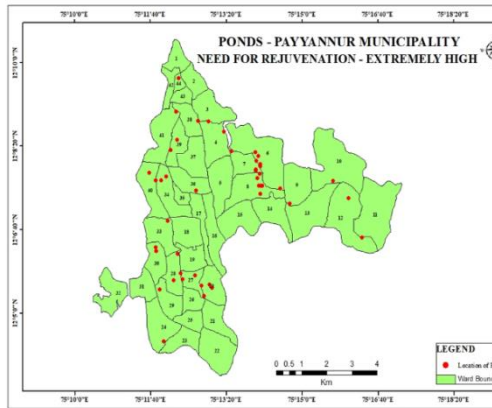
The values obtained are in a sequential order and it can be categorized into 5 categories of need for rejuvenation as:

- Extremely High
- High
- Medium
- Low

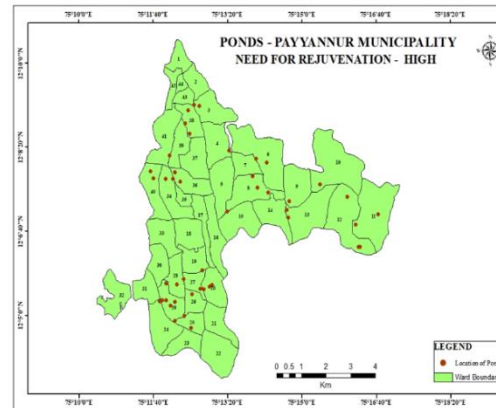
e. Extremely Low, with 7 rank values in each category.

Based on the parametric analysis & ranking of ponds, it was estimated that 46 ponds fall under the category of Need for Rejuvenation – Extremely High, 47 ponds fall under the category of Need for Rejuvenation –High, 37 ponds fall under the category of Need for Rejuvenation –Moderate, 27 ponds fall under the category of Need for Rejuvenation –Low and 21 ponds fall under the category of Need for Rejuvenation – Extremely Low (Fig.4).

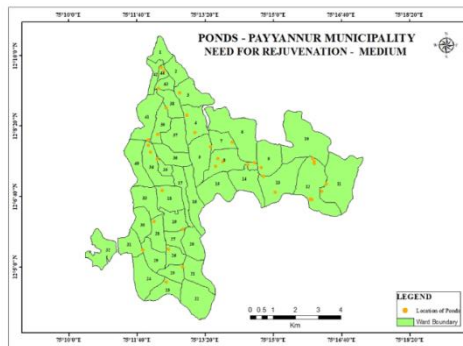
The spatial location of ponds with respect to their rejuvenation status were located as follows:



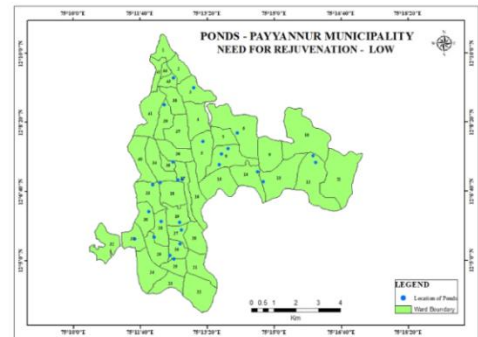
(A) Need for Rejuvenation – Extremely High



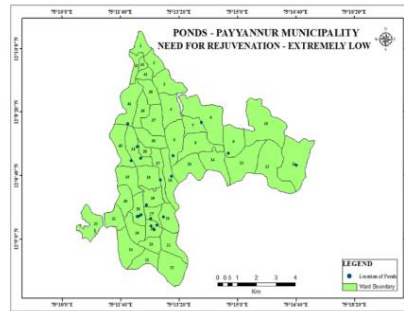
(B) Need for Rejuvenation – High



(C) Need for Rejuvenation – Medium



(D) Need for Rejuvenation – Low



(E) Need for Rejuvenation – Extremely Low

Fig.4 Spatial distribution of urban ponds and their risk level

6. ACKNOWLEDGEMENT

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7. CONCLUSION

Resource depletion, especially that of water resources is a counterpart effect of the current developmental and anthropogenic interventions which threatens its existence thereby posing survival crisis for the biotic as well as the abiotic realms. In varying degrees and dimension water resources are exploited and extinct and the current focus of this research focus on the same over the smallest or grass root level, i.e, pond. The study focuses on the administrative division of the Payyannur Municipality in Northern part of Kannur district, Kerala. This area was selected for this research work because this is a fast-growing urban centre thereby having the influence or effects of urbanisation over its natural resources and there is a research gap on the current topic over the study area. It addresses the issues faced by the ponds by analysing the existing conditions & provides suggestions in restoring it. After the analysis of 173 ponds, which was far too more compared to the identified or documented ponds by the Municipality records, it was assessed that the spatial location of very high- and high-risk prone ponds are scattered. This result reveals that here ponds are contaminated not only because of the urbanization impact mainly waste deposit, but also because of the location character and ownership of ponds. Plastic waste is the major contaminated material in ponds. Ponds in very high urban risk prone area are situated in the core of the municipality region. Some ponds in core area of municipality are in good condition, because those ponds are properly maintained using well defined embankment by temple authorities. So, it revealed that the importance of proper maintenance and conservation of the pond. Human approach towards pond is the main factor which decides the hydrological and environmental status of ponds in an urban area. It means that human consider the pond water in temple pond is used for holy purposes and protect it whereas public pond being a public property are treated with least care and at last when it becomes dormant are either filled with mud or

used as waste dumping site. The human interventions are threatening the natural ecosystem of the ponds. Improper usage of pond water, waste dumping, and other activities directly or indirectly affect the pond environment. It is negatively affected by water quality, nutrient content, floral and faunal diversity etc. Urbanization also affects the pond ecosystem where changes in smaller degree might create severe impact on the environment. Thus, adopting proper conservation and management plans are necessary to protect the fresh water resource, biodiversity and all the biotic and abiotic phenomena that are directly or indirectly related to it.

REFERENCES

- Farm-Pond Based Watershed Development: A Mechanism for Ecosystem and Socioeconomic Rejuvenation: A case study from Adihalli-Myllanhalli villages in Hassan District, Karnataka, India: Water International: Vol 28, No 4. (n.d.). Retrieved July 24, 2021
- G. Karthik, R. Mysooru, Y. Putty, and K. C. Manjunath, (2005). 21-Hydrological status of a few tanks in Mysore—A study using GIS & remote sensing [Technical Report]. National Institute of Hydrology.
- S. Praharaj (2014). Rejuvenation of Water Bodies (Kunds) and Restoring Active Community Spaces in The Cultural Capital of India: Varanasi.
- T. V.Ramachandra, D. Mahapatra, M. D. Chandran, S. Varghese, , K. S. A. Rao, R. Mukri, (2015). Rejuvenation & Sustainable Management of Gokarna Temple Pond - Kotiteertha.
- M. Ravichandran, T. M. Iyyappan, Krishnaveni, M., and K. Karunakaran, (2005). 49-Hydrological study for the rehabilitation of Chetpet Tank Chennai [Technical Report]. National Institute of Hydrology.
- Review: Toward management of urban ponds for freshwater biodiversity—Oertli—2019—Ecosphere—Wiley Online Library. (n.d.). Retrieved July 24, 2021
- R. Siva, T. Kumar, V. Mishra, , K. Bhalla, A. Srivastava, and M. Piplani, (2019). Rejuvenation of Lakes in Indian Cities: A Case Study for the Betterment of Wetlands in Bangalore.
- Transfer of Technology for Youth Civic Engagement in Pond Restoration: An Intervention Study Using the Social Group Work Method | The British Journal of Social Work | Oxford Academic. (n.d.). Retrieved July 24, 2021
- Water Conservation through Rejuvenation of Pond with Participatory Community Engagement | TERI. (n.d.). Retrieved July 24, 2021