

BRIEF DOCUMENT OF KAYAMKULAM AND PULLIKKAL KAYAL

State / Union Territory : Kerala

Name and address of person(s) compiling this information :

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Section 1: Identification, Location and Jurisdiction

1.1 Name of the Wetland (Alternative names, including in local language should be given in parenthesis after official name) : Kayamkulam and Pullikkal Kayal wetland complex

1.2 Name of the Village(s) , Tehsil(s), Municipal area (s) :

Villages : Kandallur , Karthikappally, Krishnapuram, Keerikkad, Puthuppally, Thrikkunnapuzha, Alappad, Ayanivelikulangara, Clappana, Karunagappally, Kulasekharapuram, Panmana, Vadakkumthala

Grama Panchayats : Kulasekharapuram, Panmana, Clappana, Alappad, Thrikkunnapuzha, Devikulangara, Krishnapuram, Karthikappally, Kandallur, Arattupuzha

Municipality : Karunagappally, Kayamkulam

Tehsil : Karthikappally, Karunagappally

1.3 District(s) in which wetland complex is located: Alappuzha, Kollam

1.4 Geographical coordinates (Latitude and Longitude, to degree, minutes and seconds):

Latitude: From 9°0'48.847"N to 9°15'33.963"N
Longitude: From 76°24'51.767"E to 76°32'35.723"E

1.5 Name of the Department/Agency which has jurisdiction over the wetland /wetland complex

: Local Self Governments, Kerala Coastal Zone Management Authority and State Wetland Authority Kerala (SWAK)

Section 2: Site Characteristics

2.1 Area of wetland / wetlands category (ha) : 1961.13

2.2 Wetland type (Please tick appropriate categories and sub-categories)

Category	Subcategory
<input type="checkbox"/> Natural (Inland)	<input type="checkbox"/> Permanent lakes <input type="checkbox"/> Seasonal/ intermittent lakes <input type="checkbox"/> Permanent streams/ creeks <input type="checkbox"/> Seasonal/ intermittent streams/ creeks <input type="checkbox"/> Oxbow <input type="checkbox"/> River floodplain <input type="checkbox"/> Permanent freshwater marshes <input type="checkbox"/> Seasonal/ intermittent freshwater marshes <input type="checkbox"/> Shrub-dominated wetlands <input type="checkbox"/> Tree-dominated wetlands <input type="checkbox"/> Geothermal wetlands <input type="checkbox"/> Karst and other subterranean hydrological systems
<input checked="" type="checkbox"/> Natural (Coastal)	<input type="checkbox"/> Coastal lagoon <input checked="" type="checkbox"/> Estuary <input type="checkbox"/> Intertidal mud, sand or salt flats <input checked="" type="checkbox"/> Mangroves <input type="checkbox"/> Coral reefs
<input type="checkbox"/> Human-made	<input type="checkbox"/> Aquaculture pond <input type="checkbox"/> Tank <input type="checkbox"/> Saltpan <input type="checkbox"/> Dam / Reservoir

2.3 Depth (m) : Average : 0.9 Maximum : 3

2.4 Elevation (m above mean sea level) : 0 to 1860 m (including Zone of Influence)

2.5 Water regimes

a) Main source of water (tick all applicable)

- Rainfall Groundwater Catchment runoff Direct / indirect inflow from river
 Others, please specify_____

b) Water permanence

- Mostly permanent Mostly intermittent

c) Destination of water from wetland

- Feeds groundwater To downstream catchment To river To sea

d) Water pH

- Acid (< 5.5) Circumneutral (5.5 – 7.4) Alkaline (> 7.4) Not known

e) Water salinity

- Fresh (< 0.5 g/l) Brackish (0.5 – 30 g/l) Euhaline (30- 40 g/l) Hypersaline (>40g/l) Not known

f) Nutrient in water

- Eutrophic Mesotrophic Oligotrophic Not known

2.6 Climatic setting

- a) Annual Rainfall (mm) : 3610 mm
b) Temperature (°C) : Minimum 28.2°C , Maximum 29.7 °C
c) Humidity (%) : Not known

2.7 Area of zone of influence (in ha) : 164953.87 ha

2.8 Major land use within zone of influence (provide as approximate % of catchment area)

- Forests : 31.29
Plantation : 1.60
Agriculture : 22.49

Settlements (Rural) and (Urban)	: 42.51
Water body	: 2.04
Industrial	: 0.07

2.9 Map of wetland complex and zone of influence (Annexure I &II)

Section 3: Biodiversity

3.1 Notable plant species present in wetland

Mangroves: *Acanthus ilicifolius*, *Acrostichum aureum*, *Avicennia marina*, *Bruguiera cylindrica*, *Excoecaria agallocha*, *Lumnitzera racemosa*, *Rhizophora mucronata*

Phytoplanktons: *Pleurosigma sp.*, *Navicula sp.*, *Nitzhia sp.*, *Biddulphia sp.*, *Oscillatoria sp.*, *Oedogonium sp.*, *Fragilaria sp.*, *Gyrosigma sp.* and *Anabena*

3.2 Notable animal species present in wetland

Fishes: *Ambassis ambassis*, *Ambassis gymnocephalus*, *Anguilla anguilla*, *Anguilla bicolor*, *Parambassis thomassi*, *Parambassis dayi*, *Terapon jarbua*, *Siganus javus*, *Scatophagus argus*, *Glossogobius giuris*, *Mystus gulio*, *Lutjanus kasmira*, *Elops machnata*, *Caranx ignobilis*, *Nematolasa nasus*, *Etroplus suratensis*, *Etroplus maculatus*, *Leiognathus brevirostris*, *Oreochromis mossambicus*, *Gazza minuta*, *Thyrssa mystax*, *Leiognathus dussumieri*, *Cynoglossus cyniglossus*, *Lutjanus russelli*, *Sardinella longiceps*, *Horabagrus brachysoma*, *Hyporhamphus xanthopterus*, *Hypselobarbus curmuca*, *Mystus malabaricus*

3.3 Species of conservation significance (rare, endangered, threatened, endemic species)

Anguilla anguilla (CR), *Anguilla bicolor*, *Mystus malabaricus* (NT), *Oreochromis mossambicus*, *Horabagrus brachysoma*, *Hyporhamphus xanthopterus* (VU), *Hypselobarbus curmuca* (EN)

3.4 Major plant invasive alien species

Alternanthera philoxeroides, *Azolla pinnata*, *Ceratopteris thalictroides*, *Colocasia esculenta*, *Eichhornia crassipes*, *Hygrophila schulli*, *Ludwigia perennis*, *Marsilea quadrifolia*, *Nelumbo nucifera*, *Persicaria barbata*, *Pistia stratiotes*, *Salvinia molesta*, *Dryopteris formosana*, *Lemna minor*, *Utricularia aurea*

3.5 Major animal invasive alien species

No records found

Section 4: Ecosystem services

Importance	Relevant for the site (please tick yes or no)	If Yes, Details (up to 50 words for each category)
Source of drinking water for people living in and around	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
Source of water for agriculture	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
Fisheries	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Local fishers depend on the fish resources from the wetland. The livelihood of more than 300 fishers depend on the bivalve resources in the estuary. Different clam species are also collected from the wetland for the livelihood of the nearby communities.
Cultivation of aquatic food plants	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
For buffalo wallowing and use of domesticated animals	<input type="checkbox"/> Yes <input type="checkbox"/> No	Not known
Medicinal plants	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	-
Is a site for recreation and tourism	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	This wetland complex is one of the listed sites for tourism and recreational purposes. The national waterway passes through this wetland complex which connects Ashtamudi Estuary to Cochin backwaters. Several hotels and resorts are supporting the stay for tourists.
Buffering communities from extreme events such as floods and storms	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Not assessed quantitatively
Groundwater recharge	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Not assessed quantitatively
Water purification	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Not assessed quantitatively
Acts as a sink for sediments	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Not assessed quantitatively
Has significant cultural and religious values	<input type="checkbox"/> Yes <input type="checkbox"/> No	No sufficient data
Supports noteworthy plants species	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Supports 7 mangrove species and 9 phytoplankton species as given in section 3.1

Supports noteworthy animal species	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Supports noteworthy animal species mentioned in section 3.2 & 3.3
Site of high congregation of migratory water birds	<input type="checkbox"/> Yes <input type="checkbox"/> No	No data
Supports life cycle of fish or amphibians	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Supports life cycle of significant fish species mentioned in section 3.3
Mining	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	Sand mining near the barmouth of Kayamkulam Estuary has been reported. Quantitative data not available
Any other, please list		

Section 5: Pre-Existing Rights and Privileges

Nature of right and privilege	Relevant for the site (please tick yes or no)	Does this negatively impact the wetland's ecological health?	Brief description (up to 50 words for each category)
Community Fishing (without any lease or permission from government department)	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not assessed	Local fishers use the fishery resources for their livelihood.
Fishing under lease from government department	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	-
Harvest of plants (without any lease or permission from government department)	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	-
Harvest of plants under lease from government department	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	-
Agriculture or horticulture within wetland	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	-
Grazing	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	-
Religious practices	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	-

Nature of right and privilege	Relevant for the site (please tick yes or no)	Does this negatively impact the wetland's ecological health?	Brief description (up to 50 words for each category)
Withdrawal of water for domestic use	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not assessed	-
Withdrawal of water for agriculture or fisheries	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	
Bathing or wallowing of domestic animals	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	
Plying of boats	<input checked="" type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input checked="" type="checkbox"/> No <input type="checkbox"/> Not assessed	Local country boats, passenger boats and other tourist boats are operated here since the national waterway passes through the wetland complex
Any other, please list here	<input type="checkbox"/> Yes <input type="checkbox"/> No	<input type="checkbox"/> Yes <input type="checkbox"/> No <input type="checkbox"/> Not assessed	

Section 6: Present and Potential Threats

Threat	Degree	Present or Potential	Additional information, if any
Changes in water inflow and outflow	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> Present <input type="checkbox"/> Potential	No data available
Pollution	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> Present <input type="checkbox"/> Potential	Analysis of heavy metals in water samples indicates the levels of arsenic, cadmium, copper, lead and mercury from different sites exceeded the limits specified by the international authorities. The hardness values and Sodium Absorption Ratio (SAR) values obtained from the estuary show that the water is not suitable for outdoor bathing and for irrigation
Unsustainable harvest of biological resources	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> Present <input type="checkbox"/> Potential	The rich mussel bed at the estuary was exploited indiscriminately without leaving sufficient mussel stock to perpetuate for

Threat	Degree	Present or Potential	Additional information, if any
			ensuring the fishery in the coming years. The local clam fishers have strong conflicts with fishermen coming from other parts of the district, who rely on the clam grounds in Kayamkulam Lake during the clam fishing ban period at Ashtamudi Lake.
Mining	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> Present <input type="checkbox"/> Potential	There is intense sand mining near the barmouth of Kayamkulam Estuary which destroys the clam bed of that region.
Siltation	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> Present <input type="checkbox"/> Potential	No data available
Encroachment	<input type="checkbox"/> High <input type="checkbox"/> Medium <input type="checkbox"/> Low	<input type="checkbox"/> Present <input type="checkbox"/> Potential	No data available
Spread of invasive species	<input type="checkbox"/> High <input type="checkbox"/> Medium <input checked="" type="checkbox"/> Low	<input checked="" type="checkbox"/> Present <input type="checkbox"/> Potential	Introduction of exotic species to the wetland has been reported. Species wise list is not available.
Sand dune creation and land reclamation	<input type="checkbox"/> High <input checked="" type="checkbox"/> Medium <input type="checkbox"/> Low	<input checked="" type="checkbox"/> Present <input type="checkbox"/> Potential	After the tsunami, 2004, fishers reported the creation of huge sand dunes in the areas where the subsistence fishery existed previously. The land reclamation and deepening of the Kayamkulam Lake at the barrage area for construction of a new harbour is another threat faced by the clam fishers.

Section 7: Activities Proposed to be prohibited (other than those listed in Rule 4(2) of Wetlands Rules)

Activity	Prohibited within wetlands or zone of influence	Details of specific area wherein activity is prohibited	Name of department / agency responsible for regulation	Additional information, if any
	<input type="checkbox"/> Wetland / Wetlands			

	complex boundary <input type="checkbox"/> Zone of influence			
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Section 8: Activities Proposed to be regulated

Activity	Place a tick mark if relevant	Regulation within wetlands or zone of influence	Level of regulation (in terms of people, restricted area or any other)	Name of department / agency responsible for regulation	Additional information, if any
Fragmentation / impoundment/diversion or any other hydrological intervention	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Wetland / Wetlands complex boundary <input type="checkbox"/> Zone of influence	Within the wetland complex boundary	Wetland Management Unit, SWAK, Irrigation Department	Prior permission is required from the Wetland Management Unit/SWAK for this activity to ensure that the activity will not hamper the hydrological integrity and ecosystem health of the wetland complex
Discharge of treated sewage/effluent / wastewater	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Wetland / Wetlands complex boundary <input type="checkbox"/> Zone of influence	Applicable within the wetland only	Wetland Management Unit, SWAK, PCB	Prior permission from the Wetland Management Unit/SWAK is required for this activity to ensure that the parameters of the treated effluents are within permitted limits as per the CPCB standards
Construction of boat jetties, and facilities for temporary use as pontoon bridges	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Wetland / Wetlands complex boundary <input type="checkbox"/> Zone of influence	Applicable within the wetland only	Wetland Management Unit, SWAK, PCB	Prior permission from the Wetland Management Unit/SWAK is required to ensure that the activity will not hamper the wetland ecosystem health
Aquaculture, agriculture and horticulture	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Wetland / Wetlands	Applicable within the wetland only	Wetland Management Unit, SWAK,	Prior permission from the Wetland Management

Activity	Place a tick mark if relevant	Regulation within wetlands or zone of influence	Level of regulation (in terms of people, restricted area or any other)	Name of department / agency responsible for regulation	Additional information, if any
activities within the wetland boundaries		complex boundary <input type="checkbox"/> Zone of influence		Fisheries Department, Agriculture Department	Unit/SWAK is required to ensure that the activity will not hamper the wetland ecosystem health
Large scale sand mining and silt removal	<input checked="" type="checkbox"/>	<input checked="" type="checkbox"/> Wetland / Wetlands complex boundary <input type="checkbox"/> Zone of influence	Applicable within the wetland only	Wetland Management Unit, SWAK, Revenue Department, LSGs	Prior permission from the Wetland Management Unit/SWAK is required to ensure that the activity will not hamper the wetland ecosystem health
Any other, please list	<input type="checkbox"/>	<input type="checkbox"/> Wetland / Wetlands complex boundary <input type="checkbox"/> Zone of influence			

Section 9: Activities Proposed to be permitted

Activity	Place a tick mark if relevant	Within wetlands or zone of influence	Additional information, if any
	<input type="checkbox"/>	<input type="checkbox"/> Wetland / Wetlands complex boundary <input type="checkbox"/> Zone of influence	
	<input type="checkbox"/>	<input type="checkbox"/> Wetland / Wetlands complex boundary <input type="checkbox"/> Zone of influence	

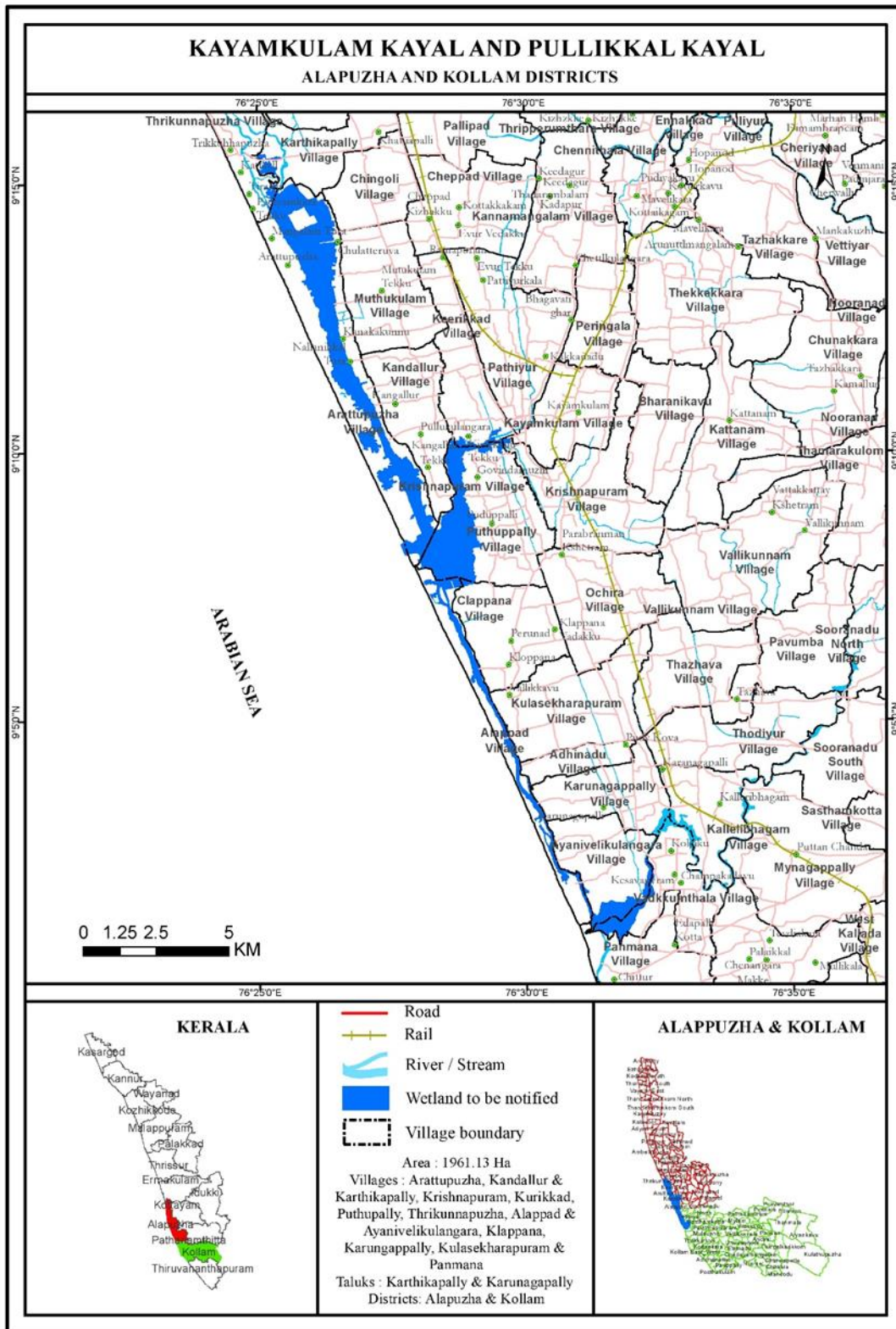
Section 10: Listing of Available Scientific Resources Used

1. Remya, L., Sarathkrishnan, S., Nazar, A.A. and Surya, S., 2016. Bivalve fishery in the Kayamkulam Lake of Kerala. *Marine Fisheries Information Service; Technical and Extension Series*, (229), pp.8-11.
2. Kumary, K.S.A., 2016. Comparative ecology of backwater and mangrove environments of Kayamkulam Lake, Kerala. *J Aquac Res Development*, 7(438), p.2.
3. Remya, R and Amina, S., 2017, Biodiversity Status of Fishes from Vettathukadavu, Kayamkulam Backwater, Kerala, *International Journal of Recent Research in Life Sciences*, Vol. 4, Issue 2, pp: (6-10).
4. Krishnan, R. and Jaya, D.S., 2013. Impact of industrial effluents on the hydrochemical characteristics of Kayamkulam estuary, south west coast of India. *I Control Pollution*, 30(1).
5. Molly, B. and Amina, S., 2017. Effects of heavy metal on the physical and chemical parameters of Kayamkulam backwater, Alappuzha District, Kerala, *International Journal of Current Research*, Vol. 9, Issue, 05, pp.50143-50146.

CHECKLIST

- Responsible agency has been clearly identified and details of contact person included
- Wetland/ wetlands complex boundary has been delineated using GIS and firmed up by adequate ground truthing
- Wetland/ wetlands complex map has been provided at required scale
- Zone of influence has been delineated and included in wetland map or a separate map
- Wetland zone of influence is sufficient to manage all activities
- Site's importance have been listed, and for major categories, justification is provided
- Site's biodiversity values are listed, and for major categories, justification is provided
- List of pre-existing rights and privileges is provided
- Consistency or inconsistency of pre-existing rights and privileges is indicated to be best of available knowledge
- Threats to site are listed, and for major categories details are provided
- Activities prohibited, beyond those already listed in Rule 4(2) have been mentioned
- List of activities to be regulated within wetlands and zone of influence is provided
- List of activities to be permitted is provided

Annexure I : Location map of Lake



Annexure II : Zone of influence Map

