Ecological Status of Temporary Wetlands in Central Tamilnadu District, India.

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Abstract

Temporary wetlands (TW) are distinguished by a distinct collection of uncommon and specialised flora and fauna species, modest size, periodical drying, and plentiful water during the flood season. The Indian subcontinent is home to a diverse range of freshwater, saline, and marine wetlands. The bulk of the inward wetlands are manmade or transitory, and they have traditionally been used by regional human groups. Most limnological research in India have focused on large, permanent bodies of water, pond ecosystems, and associated temporary wetlands.Furthermore, numerous Temporary Wetlands (TW) in Tamil Nadu State (TNS) offer significant potential for ecosystem service applications but are not yet well documented. Due to a lack of study, the existing survey explores the Ecological status (ES), distribution of Temporary Wetlands (TW), and individual wetland human disturbance score (HDS) in the Central Tamil Nadu district (CTND) in India. Seventy-five selected wetlands were surveyed using a variety of approaches in three districts: Karur, Namakkal, and Trichy. During the summer, all wetlands were hydrologically separated and parched.The TW size ranged from 1 to 10 acres, with 80 percent located in rural regions, 12 percent in semi-urban areas, and 8 percent in metropolitan areas. Wetland degradation was highest in Trichy district wetlands (TDW) at 76 percent Mid Impact (MI), followed by Namakkal district wetlands (NDW) at 36 percent MI, and Karur district wetlands (KDW) at 20 percent MI. Wetland degradation is often caused by landscape disturbance, buffer zone modification, hydrological alteration, pollution, and ecosystem alteration. The current study provides baseline facts on the biological state and distribution of Temporary Wetlands in CTND, which could help in the creation of provincial wetland management strategy. This method will fit other sections of TW and detect ecological status and human effect on wetlands, which will improve TW conservation and management decisions.

I. Introduction

Wetlands may be found all over the world and range between visible water to wooded environments, otherwise from stable subsurface lakes to transient ponds. (Williams et al., 2004) describe temporary ponds as lentic water bodies (temporary or permanent, combining manmade water bodies) including an area ranging from 25m2 to 2ha. Temporary wetlands branded by frequent aridity (typically completely parched, at least yearly) result in a distinct, highly specialised cluster of prevalent uncommon vegetation and species (Calhoun et al., 2017). Temporary wetlands have been documented across all geographies, including Antarctica (Antarctic liquefy ponds), and in a wide range of terrain contexts; nonetheless, temporary wetlands describe spatial distinctions since varied typologies are abundant in the area (Zedler, 2003; Williams, 2006; Calhoun et al., 2017). According to a global estimate, temporary water enclosed 0.81 million km2 in a recent period (i.e., 2015). In the previous three decades, the movement between perennial to periodic waters was more than the opposite change (72,000 km2 vs. 29,000 km2) (Pekel et al., 2016). Temporary wetlands afford essential ecosystem amenities such as nutrient transport, animal habitation to surrounding ecosystems, inundate maintenance, water filtering, and aesthetic amenities (Turner et al., 2008;Gascoigne et al., 2011; TSSC, 2012). Temporary wetlands are chief landscape elements in locations where persistent water supplies are scarce (i.e., semiarid and dry regions; Williams, 1985). Despite their small size, temporary ponds are crucial for protection since they afford a source of water. a home for many endangered and vulnerable species. Another crucial rationale for their preservation is that, despite their value, these ponds have a high cost of demise and deterioration (Blaustein and Schwartz, 2001; Collinson et al., 1995). Despite their importance, temporary wetlands are rapidly disappearing across the world (Nicolet et al., 2004; Deil, 2005). Verifying the quantity and amount of wetlands is difficult (Jeffries et al., 2016), and worldwide estimates show a downward trend. Temporary wetlands are found all over the world and are designed by various climatic conditions in several ecoregions, resulting in a diverse set of characteristics (Williams, 1985; Williams et al., 2010). Human population increase and the resulting ecosystem cost and deterioration due to urban development, farming, herding (converting temporary wetlands into stable ponds (Beja and Alcazar, 2003; Euliss and Mushet, 2004), water collection, and new human-negotiated consequences on biodiversity, such as sediment deposition (Grillas et al., 2004) and the hazardous substance exposure contaminants, endanger temporary wetlands (Collins et al., 2014). Because transitory wetlands include a wide variety of worldwide waterbody kinds, they have various names to differentiate them (Williams, 2006; Williams et al., 2010; Calhoun et al., 2017). The absence of severity as well as uniformity of statutory regulations for minor aquatic resources is a worldwide phenomenon (Acuna et al., 2017). The cumulative, landscape-wide effects of the destruction of tiny, transitory wetlands are not yet taken into account in legal regimes (Jansujwicz and Calhoun, 2017). Wetland essential services are frequently categorized divided into three sections: supplying, controlling, and cultural services (Carpenter et al. 2009), and provide species diversity provision and improvement of water standard, removing toxins, flood mitigation, carbon sequestration, biofuel production, greenhouse gas reduction, and animal conservation (Bernal and Mitsch, 2012; Liu et al., 2012; Kadykalo and Findlay, 2016; Gill et al., 2017; Main et al., 2017). As per India's Ministry of Environment, Forests, and Climate Change, wetland ecosystems cover about 15 million hectares, accounting for 18.4 percent of the country's land area (MoEFCC, 2014). Temporary wetlands in India are often annually, at least a few months are swamped, particularly during the March to June season or perhaps in early December depending on local precipitation. Temporary wetlands are found all throughout the world and are called by many other names, such as tiny or temporary ponds, ephemeral/seasonal/parched/temporary wetlands, and so on. In Tamil Nadu, a total of 24684 wetlands were mapped at a 1:50,000 scale throughout 30 districts. Rivers and canals, dams, tanks and pools, oxbow creek, beels, brackish water and contaminated water are the many types of internal water assets in India. Lakes/ponds, oxbow pond/cut-off bends, high elevation lakes, riverine wetlands, boggy topography, and waterways are all examples of waterlogged landscape are examples of natural inland wetlands. There are different forms of temporary ponds in India, ranging from tiny ponds to nearly permanent lakes. All types of Indian Waterbodies, in particular, are regarded as one among the popular outstanding and endangered freshwater environments. Small wetlands are improperly known and extremely rare, pervasive anguish deterioration and extinction as land areas under severe farming and urban use expand (Zacharias et al., 2007). There is a scarcity of data on specific wetlands and their alteration at the local level (Gopal, 2013). Few scholars conducted a study on Indian temporary ponds/wetlands (dos Santos Silva et al.,1994; Gopal, B., and Sah, M, 1995; Kulkarni et al.,2015; Sugam et al.,2018). Temporary wetlands, either are underdeveloped in the developed or emerging globe, are under significant growing demands resulting by both direct and indirect human activity, and wetland acreage and quality tend to diminish despite robust legislative protection in many countries (National Research Council 2001; TEEB 2013). Anthropogenic exploitation in and near wetlands is the primary source of deterioration, endangering both human settlements and the ecology (Asha et al. 2016). Wetland degradation is a major problem in India as a result of urbanisation, agricultural development, pollution, high water extraction, salinization, deforestation, invasive species, and aquaculture (MoEF, 2009; Vikas et al., 2012). Universal climate conversion is an important factor to the wetlands destruction in India and worldwide (Kumar, 2012). In Tamil Nadu, there are 32 river systems, 11 large reservoirs, 2,679 canals, and 38, 863 tanks, as well as 31 natural wetlands totaling 58,068 hectares and 20,030 man-made wetlands totalling 2, 01,132 ha (SACON,2006). Surface waters and small ponds are mainly known as Storage water (Ilanzi), Drinking water tank (Oorani), Irrigation tank (Eri), Reservoir (Kammai), Small pond (Kuttai), Large pond (Kuttam), Small pool (Kundai), Pool (Kundu), Bathing tank (Kulam). Wetland areas in Tamil Nadu were assessed using GIS layers on wetland boundaries, water extent, vegetation, and turbidity. In Tamil Nadu, a total of 24684 wetlands were plotted at a 1:50,000 scale throughout 30 districts. The Space Application Centre, Ahmedabad calculated that overall wetland areas in India are 902534 hectares, which is 6.92 percent of the geographical area. Wetland numbers vary by district, ranging from 178 square kilometres (Chennai) to 8162 square kilometres (Erode). Wetlands cover up to 18.05 percent of the geographical area (Ramanathapuram District) and as little as 1.08 percent (Coimbatore). The overall wetland area is greatest in Kancheepuram (80445 hectares, 8.91 percent) and lowest in Chennai (917 ha, 0.10 percent). In almost all districts, the most common wetland forms are lakes, ponds, and tanks. In Namakkal district, Central Tamil Nadu, the wetland area is 7687 hectares, with a proportion of district wetland area of 2.29. Wetland area in Karur district is 16383 hectares, accounting for 5.66 percent of the district's total wetland area. Thiruchirappalli district has 18626 hectares of wetland area, with a proportion of district wetland area at 4.23. (TNSWA, 2020). This is typical in India, where most humans depend on rural waterways for direct and indirect ecological functions(McDonald et al., 2011 and Nagendra 2013). The present study aims are to evaluate the ecological status and distribution, level of human disturbance of TW in the three districts of CTND. The Specific objectives include such as

1. To review the Ecological status and Distribution of TW in the CTND.
2. To identify the Wetland degradation of TW in association with the Human Disturbance score (HDS) derived from the three different districts of wetlands in CTND.
3. To evaluate the native population attitude toward wetland management.

Ii. Methods

STUDY AREA: NAMAKKAL DISTRICT

Namakkal district is known as Transport City or Egg City and is located in the Indian state of Tamil Nadu (N; 11.36, 78.30 East). (Fig. 1) and functioned autonomously after being split from the Salem district with Namakkal town on January 1, 1997. The area is split into two income streams., Namakkal and Tiruchengode, and seven taluks, namely Namakkal, Tiruchengode, Kumarapalayam, Rasipuram, Paramathi Velur, Kolli Hills, and Sendamangalam. Namakkal district was limited to the north by Salem district, to the south by Karur district, to the east by Perambalur, Tiruchirappalli District, and to the west by Erode a region. This district is located in the North Western Agroclimatic Zone. On the east are the taluks of Rasipuram, Attur, and Namakkal, while on the west are the taluks of Salem, Omalur, and Mettur.Tiruchengode taluk is the only one in the Western Agro-climatic zone. Aside from the aforementioned two zones, Kolli and a few isolated hills and ridges strewn over Namakkal, Sendamangalam, Rasipuram, and Tiruchengode, coupled with valleys and undulating hills, make up the locality's distinctive terrain. A total of 34,29,671 hectares are distributed among four taluks: Namakkal, Paramathi, Tiruchengode, and Rasipuram. Namakkal, the district headquarters, has the most comprehensive coverage (1, 767, 75 square kilometres). The Namakkal District covers 3,363 square kilometres and has a population of 14.96 lakhs.Namakkal District has a good forest area and receives moderate precipitation. The total forest area in this region is 512.5 square kilometres, accounting for about 15% of the geographical area under the supervision of the District Forest Officer. The district's climate is hot and dry during the summer (March to May), and chilly and foggy during the winter (November to February). The annual rainfall is around 900 mm, and the temperature fluctuates from 18'C to 40'C. The Namakkal district had grown paddy, sorghum, groundnut, green gramme, black gramme, maize, cotton, and sugarcane.

TRICHY DISTRICT

Trichy area is sited in the central region of Tamil Nadu at latitude 11o 20' N and longitude 78o 10' E, flanked by Perambalur district is located to the north, Pudukkotai district is located to the south, Karur and Dindigul regions are set to the west, and Thanjavur district is located to the east.. The district's overall slope is towards the east. Pachamalai Hill, located in Sengattupatti Rain Forest, is an important isolated hill with a summit of up to 1015m. Ponmalai, Srirangam, Thuraiyur, and Manapparai are the four municipalities that make up this district. Trichy is the only Municipal Corporation that simultaneously serves as the District's headquarters.Trichy district is divided into eight taluks, namely Thottiyam M. Thuraiyur, Lalgudi, Musri, Trichy Allur, Manapparai and Srirangam all have14 blocks, 408 Village Panchayats, and 1590 villages. The Cauvery delta begins 16 kilometres west of the city and is one among Tamil Nadu's river systems. The Ayyar river basin encompasses the taluks of Musiri and Thuraiyur and has an aerial size of 1,167 square kilometres. Cool seasons are December through February, followed by summer period from March through May, the high winds from June through August, and rainy months from September through November. In general, the region has a lengthy period of hot weather followed by a brief period of rain. During the winter months, the maximum temperature was 37.7° C and the lowest temperature was 18.9° C. Rainfall ranged between 778 and 821mm. The majority of the rain fell during the Northeast Monsoon season, which lasted from October to December. The southwest monsoon began in June and continued in full force until the end of August. The Trichy taluk has the most population, accounting for 45 percent of the total. The Trichy district has a total land area of 4, 40,383 hectares. Almost 26% of the areas were classed as fallow fields, while 6% were classified as forest covered. The district had 14,190 hectares of tropical dry deciduous woods with elevations over 350 metres MSL in the Reserve Forests of Thuraiyur, Manapparai, and Veeramalai slope region. The tropical thorn woods had an area of 13,055 hectares and were found in the Manapparai and Thuraiyur taluks.

KARUR DISTRICT

In 1910, the Karur Taluk was amalgamated with the Tiruchirappalli district. The autonomous Karur district was founded on September 30, 1995, by severing the Tiruchirappalli district, and it is flanked by Namakkal district borders on the north, Dindigul district borders on the south, Tiruchirapalli district borders on the east, and Erode district borders on the west. Karur district is sited between latitudes 10°37' N and 11°12' N and longitudes 77°46' E and 78°15' E. The entire forest area in the Karur District is 6187 Hectares. Karur has an elevation of 101 metres on average (331 feet). The town areas include 25% of the overall population. Cyclonic storms from the Bay of Bengal cause precipitation. Rainfall is most common in the Southwest and least often in the Northeast monsoons. The Southwest monsoon rains are erratic, and summer rains are modest. Karur is situated on the Amaravathi River's banks. The area is nearly flat, with little significant biological development. The temperature ranges from 39 degrees Celsius (102 degrees Fahrenheit) to 17 degrees Celsius (63 degrees Fahrenheit). Because Karur is in a rainshadow, the Southwest monsoon, which begins in June and lasts until August, provides little rain.The majority of the rain falls during the The summertime (late April and May) are followed by the North-East monsoon, which arrives in October to December.The average temperature of Karur is 28.7°C, and the annual rainfall is 590–600 mm. March is the driest month, with only 8 mm of rain. The most October sees a mean of 166 mm of precipitation. Except for the Rengamalai hills in the far south of Karur Taluk, the district's topography is mostly flat. Tipasamymalai and Vellimalai hills are located in Kulithalai Taluk. The Cauvery River flows on the northern and eastern limits.

SATELLITE IMAGES

Software (Mapitute Version 2020) was used to make Landsat satellite pictures, and they were gathered terms of quality and visibility (cloud cover 20% less) on 22/12/2020, and 2012 Vavteq India has been used for source image. The map based proportion is one to one million, three hundred thousand, nine hundred thousand (Fig. 1a and.1.b).

B. METHODOLOGY

From June 2019 to April 2020, wetland surveys and questionnaire inquiries were in the community inside one one-kilometer radius of each water body.

Wetland Selection.

We consider that the Temporary wetlands are dried out completely during the summer season (discover by field visit and with the questionnaire survey), an area less than 8 ha, and also included dryness duration per year. Wetlands are defined and classified differently in different countries, owing to their diverse variety of forms, sizes, and dispersion but followed Ramsar classification. There are many definitions of wetlands like water presence at the ground's edge or in the root zone during rainy season or distinct (hydric) soil circumstances distinct from non-wetland areas next to wetland areas and plants suited to continually or intermittently wet seasons (Mitsch and Gosselink, 2007).

Water quality analysis

Collected water samples from all wetland and stored in polythene bottles and then analyzed in the laboratory by using APHA method(APHA, 1985).

HUMAN DISTRUBANCE SCORE

A number of methodologies (interviews, ecosystem services (ES), human disturbance (HD), and physical parameters) were used to calculate the wetland's ecological and biological state. Wetlands are further classified as having a low, medium, or high impact on human disturbance. Water quality is concerned with the physical characteristics of water and the ecological state of wetlands. The Human disturbance score (HDS) protocol approach was used to assess the level of human disturbance to the wetlands (Gernes and Helgen, 2002). Using relevant information with the first cluster interview sessions, benefits produced in each wetland or the ecological services (ES) were secured and tested.

A field survey was carried out to investigate the ground impact of wetlands. Ecosystem Services, and the physical state of the wetlands. The collected data included several quantitative criteria to calculate the human perturbation element.

Factor 1: Critical zone-Disturbance within 50 metres of the wetlands – 0–18 points

Factor 2: Buffer Zone-Disturbance within 500 metres of the wetlands' margin- 0–18 points

Factor 3: Habitat Alteration-Disturbance within 50 metres of the wetlands' edge- 0–18 points

Factor 4: Hydrological Change-Disturbance within 50 metres of the margin of wetlands-0-21 points

Factor 5: Pollution of Chemical disruption within 50 metres of the margin of wetlands-0-21 points

Factor 6: The presence or absence of fish yields a score of 0–4 points.

The standard enumeration method was used to collect information on wetland types, hydrological conditions, land use patterns, ecological state, and habitat evaluation. Finally, each component was rated and classified (ranked) into one of four categories ranging from best to worst, as previously indicated. Each study wetland's human disturbance gradient score (HDS) was calculated by adding all scored values from each element to a total of 100 percent. According to (Gernes and Helgen, 2002), if the category range of a specific wetland's HDS score falls within 0–33, 33–67, and 67–100. It can be categorised as least impacted, somewhat influenced, and most or strongly impacted. Respondents were asked to assign a value to the ES stated for each wetland based on relative relevance, namely socioeconomic variables, wetland importance, and management elements.

WETLAND ECOSYSTEM SERVICE

Household Survey

Wetland provisioning services (WPS), wetland regulatory services (WRS), cultural services (CS), and supporting services (SS) are the ES generated from wetlands (SS). ES was collected from native peoples using questionary survey procedures and field survey observations. A minimum of five household surveys (HHS) were randomly selected from each wetland's surrounding region. This research had 302 participants in all. A questionnaire with twenty questions divided into four sections: 1) The socioeconomic factors were household size, respondent age, respondent level of formal education, and gender. 2) The questionnaire consisted of a list of wetlands-derived provisioning ESS. 3) Attitudes toward wetland protection. 4) Finally, a main source of revenue from households near wetlands. The questionnaire was pre-tested before being delivered in person to 302 respondents. Initial, fast assessment of the wetland survey conducted in two villages that were not included in the sample. The interviewers permitted pre-testing to obtain expertise with the questionnaire and provided an opportunity to implement and analyse the approach. The focus was on determining how defendants interpreted our inquiries and identifying any difficulties encountered in delivering replies. Variations were planned, researched, and incorporated into our final survey. Sum of 302 reliant on wetlands families were polled within those communities using the structured questionnaire. Attempt to cover all of the researcher's questions and have the most senior accessible person in the home survey answer them. The majority of responders were between the ages of 48 and 61, with 57 percent being female and 50 percent being male. The study relies on the ecosystem services that were consumed, people's dependence on them, shift drivers, and their consequences on ecosystem values.

Focus Group Discussion (FGDs)

During the focus group talks, the list of ES collected the results of the household survey was verified. During the survey period, Five public focus group discussions (FGD) were hosted in the villages with 5–10 individuals on median at every cluster. Members of the focus groups were chosen depending on their means of subsistence and reliance on the wetland. To prevent some of the recognised issues with focus debate clusters, we restricted group sizes to 5–10 persons and rated the listed ES throughout group conversations.

Key Informant Interviews

Before the survey, representatives from government agencies, non-governmental organisations, research institutes, and researchers were contacted for a list of the wetland's ecological services. During the interviews, the major questions concentrated on income-generating tactics and the causes of alteration in the wetland ecosystem. During the study, 15 delegates from various organisations were engaged, as key informants to assist us comprehend the arrays of variation and the causes for them. The crucial informants were chosen based on their understanding of wetland resources as well as their reliance on and engagement in wetland management.

2.3. Data Analysis

The statistical data were assessed to use regularity table and the Statistical Set (SPSS 25th Edition) for Social Sciences computer software tool, and the Shannon index approach was used to quantify avian diversity. Assess the dependency of a local population and the consequences of various influences on the wetland environment. Based on the study topics, the qualitative information from interviews was first classified and grouped into topics.; related coded themes were then grouped. The rating of ecological services was carried by utilising participative tools. Participants in focus group talks requested that essential ecosystems available from wetlands be identified. Following the listing of key ecosystem services, Scale of 1 to 10, participants rated the designated ecosystem services. (1 is the least preferred, and 10 is the most preferred).The overall ranking was calculated by dividing the total points for each ecological service by the digit of responders. Equally, the reasons of Qualitative approach were used to expose ecosystem transition (focus group talks) as well as household surveys.

Results

In total, 302 people respondents completed the questionnaire survey. The mean respondent's age in males was 50 yrs and females were 57 yrs. The respondent's occupation in farming (60%), poultry farming (11%), and others (22%) and the ages, overall response rate, and professions standard mean were recorded (Table 1).

Table 1
Description of survey respondents in the Central TamilNadu (CTND).

	Karur wetlands N = 102	**Namakkal wetlands N = 105**	**Trichy wetland N = 95**	**Total N = 302**
Male age	48 yrs	52 yrs	50 yrs	50
Female age	56 yrs	61 yrs	55 yrs	57
Female respondent	60	51	59	57
Male respondent	42	36	36	38
Occupation Farming	19	17	24	60%
Poultry	3	12	1	16%
Others	13	11	22	46%

In CTND, each district 25 wetlands were selected for this study (Table 2). These wetlands were selected based on easy accessibility and availability. Most of the Wetlands in several regions and a height range up to 780 feet. The HDS value of each district's wetlands was mentioned in Table 2. The overall size of ephemeral/seasonal/ dried out wetlands from 1 to a maximum of 10 acres in size was observed in the CTND during this study period. Wetland degradation was categorized into three divisions like Physical changes of wetlands, chemical changes in water and habitat, and Biological changes. In our study, wetlands disturbance was caused by 5 factors in the CTND. According to the small size wetland in a different district, the degradation utmost in the Trichy district wetlands followed by Namakkal and Karur district. Overall factor wise wetland degradation utmost in the form of landscape disturbance, Buffer zone alteration, Hydrological alteration, pollution, and Habitat alteration, and the Average mean, SD, and SE were mentioned in Table 3a.In Karur District (KD),habitat wise, the wetland disturbance in the form of Landscape disturbance, Buffer zone disturbance more or less the same in rural and semi-urban areas followed by Hydrological alteration were the same in all three habitats, Habitat alteration, and very less pollution damage to the wetlands in the rural and semi-urban but high in the urban wetland. The overall wetland size was above 2 acres were recorded.

Table 2
OVERALL AVERAGE MEAN HDS VALUE IN CTND.

KARUR			**TRICHY**			**NAMAKKAL**			
	Mean	**SE**	**SD**	**Mean**	**SE**	**SD**	**Mean**	**SE**	**SD**
Wetland size	4.96	0.53	2.661	4.96	0.70	3.54	3.50	0.54	2.71
Factor1	11.28	0.39	1.990	5.04	0.74	3.74	6.96	0.44	2.24
Factor 2	11.04	0.44	2.245	13.20	0.49	2.44	7.20	0.60	3.00
Factor 3	1.20	0.49	2.449	7.20	0.49	2.44	6.24	0.24	1.20
Factor 4	7.00	0.00	0.000	7.56	0.38	1.93	7.00	0.00	0.00
Factor 5	0.84	0.46	2.322	7.84	0.46	2.32	7.20	0.20	1.00
HDS Score	36.32	1.16	5.811	45.80	1.56	7.83	38.10	1.05	5.25

Table 3

a.THE ANOVA TESTS VALUESIN THE CTND

	KARUR	TRICHY	NAMAKKAL
Buffer zone disturbance	df (9,16) = 0.274; P < 0.001:0.973	df(11, 13) = 1.087; P < 0.001:0.437	dfF(8,16) = 0.339; P < 0.001:0.937
Landscape disturbance	df(9, 16) = 1.043; P < 0.001:0.45	df(11,13) = 1;P < 0.001:0.494	df(8,16) = 1.68; P < 0.001:0.179
Habitat Alteration	df(9, 16) = 0.409;P < 0.001:0.912	df(11,13) = 1; P < 0.001:0.494	df(8,16) = 1.206; P < 0.001:0.355
Pollution	NS	df (11,13) = 0.682; P < 0.001:0.734	df(8,16) = 0.775, P < 0.001:0.63
Hydrology Alteration	NS	df(11,13) = 0.898; P < 0.001:0.566	df(8,16) = 0.564; P < 0.001:0.792

Table 3
b.ECOSYSTEM SERVICE-PROVISIONING SERVICES BASED ON QUESTIONARY SURVEY IN THE ND

Ecosystem Service	**Karur TW**	**%**	**Namakkal TW**	**%**	**Trichy TW**	**%**	**Grand Total**	**%**
Average distance (Km)	2.88		3.0		1.88			
Provision services Agriculture	4	3.9	25	24.5	22	23.1	51	16.8
Fishing	2	1.9	7	6.8	5	2.1	14	4.6
Grazing Grasses	25	24.5	24	23.5	23	24.2	72	23.8
Raw materials	0	0	6	5.8	0		6	1.98
Drinking Water	0	0	9	8.8	7	7.3	16	5.2
Livestock drinking	6	5.8	72	70.5	86	90.5	164	54.3
Irrigation	0	0	25	24.5	32	33.6	57	18.8
Seedlings raised	0	0	4	3.9	9	9.4	13	4.3
Medicinal plants	0	0	2	1.9	6	6.3	8	2.6
Domestic uses	2	1.9	4	3.9	16	16.8	22	7.2
Regulating Services microclimates	0	0	0	0	2	2.1	2	0.6
Flood Migration	2	1.9	11	10.7	7	7.3	20	6.6
Cultural Services Recreation	0	0	2	1.9	7	7.3	9	2.9
Religious Aspects	2	1.9	3	2.9	8	8.4	13	4.3
Pollination	0	0	3	2.9	12	12.3	15	4.9
Management Local Communities Aware	102	100	64	60.9	86	90.5	252	83.4
Rework Interest	32	31.3	56	53.3	44	46.3	132	43.7
Total respondents	**N = 102**		**N = 105**		**N = 95**		**302**	**100**

BUFFER ZONE ALTERATION

In Karur district, Buffer zone alteration disturbance utmost in the form of lack of wetland protection (AM: 10.62, SD: 2.58.0, SE: 0.51), construction of roads (AM: 6.69, SD: 1.96, SE:0.38), wildlife habitat destruction, and cattle grazing had observed in the Karur district. Very few wildlife birds were recorded.

In Trichy district, Buffer zone disturbance utmost in road construction (AM: 6.96, SD: 4.48, SE:0.90) and lack of wetland protection (AM: 5.28, SD: 2.0, SE:0.40) and infrastructure development (AM: 4.08, SD: 2.86, SE:0.57) were observed in the Trichy district. Good birdlife recorded.In Namakkal district Buffer zone alteration disturbance utmost in the form of lack of wetland protection (AM: 11.52, SD: 1.67, SE:0.33), construction of roads (AM: 6.48, SD: 2.96, SE:0.59), and cattle grazing were observed in the Namakkal district. Very few wildlife birds were recorded.

LANDSCAPE DISTURBANCE

Landscape disturbance utmost in lack of protection (AM: 10.62, SD: 2.58.0, SE:0.51), construction of roads (AM: 6.69, SD: 1.96, SE:0.38), wildlife habitat alteration, and cattle grazing were observed. In Trichy district Landscape disturbance utmost in road construction (AM: 6.96, SD: 4.48, SE:0.90), lack of protection (AM: 6.72, SD: 2.0, SE:0.40) and infrastructure development was observed. In Namakkal district Landscape disturbance utmost in lack of protection (AM: 11.52, SD: 1.67, SE:0.33), total roads (AM: 6.48, SD: 2.96, SE:0.59) and livestock grazing were observed. In Trichy District (TD), habitat-wise, the wetland disturbance in the form of Landscape disturbance, Pollution, Hydrological alteration were more or less similar in all rural and semi-urban areas followed by Buffer zone disturbance utmost in the semi-urban wetlands. The overall wetland size was above 4.5 acres were recorded.

HABITAT ALTERATION

In Karur district Habitat alteration utmost in cattle grazing (AM: 5.78, SD: 1.18, SE:0.23) and residential development (AM: 0.92, SD: 2.21, SE:0.43) and waste dumping were recorded. In Trichy district Habitat alteration utmost in commercial building (AM: 6.72, SD: 6.08, SE:1.21), cattle grazing (AM: 5.76, SD: 1.20, SE:0.24), and residential development were observed. In Namakkal district Habitat alteration utmost in commercial building (AM: 7.20, SD: 3.00, SE:0.60), municipal waste(AM: 5.32, SD: 3.05, SE: 0.61), residential development, and waste dumping were observed.

HYDROLOGICAL ALTERATION

In Karur district, hydrological alteration such as water channelization, disposal of waste materials, and long drought whereas in the Trichy district shrinkage and lack of shoreline protection, desiltation, and drought and in the Namakkal district like drought, shrinkage, and desiltation, and algal blooms were observed.

POLLUTION

In Karur, district Pollution is very minimal due to the lack of water availability in the Karur district. In Trichy district Pollution including animal waste (AM: 5.88, SD: 2.62, SE:0.53), waste fire (AM: 4.20, SD: 3.50, SE:0.70), and disposal waste was observed. Body cremation is an important concern all over the wetlands in CTND. In Namakkal district Pollutions including waste fire (AM: 6.44, SD: 1.94, SE:0.38), garbage dumping (AM: 5.32, SD:3.05, SE: 0.61), and body cremation were observed. In Namakkal District (ND), habitat wise the wetland disturbance in the form of Landscape disturbance urban wetlands and Hydrological alteration was the same level in all the habitat, Buffer zone disturbance utmost in rural side wetlands and Habitat alteration more or less similar in all three wetlands were observed. The wetlands sizes were above 2.5 acres in all three wetlands were recorded.

HDS SCORES

The HDS scores were categorized into three types and the scores were computed with the overall scores of a combination of five parameters of the individual wetlands (detailed mention in the methodology section). Individual wetlands total scores were mentioned in Table 2. Overall the wetlands situated on the rural side were the dominant form which contains above 80% of the wetlands category. In Karur district, one urban wetland, three semi-urban and the remaining 21 wetlands were rural side wetlands. The HDS scores range from 28 to a maximum of 36 points and 20 (80%) wetlands were LI category and 5 (20%) were MI categories. In the Trichy district, three wetland urban and four suburban and the remaining 18 wetlands were rural side wetlands and their HDS Scores range from 45 to a maximum of 47 points. The wetland categories like 6(24%) wetlands were LI status and 19 (76%) wetlands were MI categories were noted. In Namakkal district, two urban wetlands, two suburban wetlands, and the remaining 21 wetlands were rural side wetlands. the HDS Scores range from 37 to a maximum of 42 points. The 16 (64%) wetlands were LI status and 9 (36%) of wetlands were MI categories were noted. A comparison of small wetlands in three districts of the CTND was people surveyed evaluated. The generalized linear model was used to assess for differences across locations. statistical methods and F rate (degrees of freedom), impact level, and effect size n2 are all stated. N.S. denotes the absence of statistically significant differences. Table 3a displays the results of ANOVA testing.

ECOSYSTEM SERVICES

Ecosystem services were evaluated and classified as provisioning, cultural, regulating, and supporting. Data from household interviews and cohesive techniques of field observation were evaluated based on ES (Table 3b, Fig. 3). Not that all wetlands give all of the above-mentioned functions all of the time. In total, 302 respondents completed the questionnaire survey by collective methods of field observation, and the respondents were living around the wetland habitat. The Ecosystem Services over the TW at all three districts was mentioned in (Table). Overall the vital source of income from the TW by livestock drinking, Livestock grazing grass, Irrigation, Agriculture, and domestic use purpose. ES from TW in all three districts were not in high values. Karur district was the least ES when compare with Namakkal and Trichy district. Our study recorded the average distance between the wetlands is 1.88km in Trichy district, 2.88 in Karur district, and 3.0 km in the Namakkal district. Wetlands provide a variety of functions depending on their nature, size, and location. In Karur District, the income source of wetlands by livestock rearing contains (100%) followed by the Livestock drinking purpose (71.42%). In the remaining district, the Provisional services from the TW are very few (Table). In the CTND, Agriculture is mostly on a seasonal basis and The availability of water resources. Livestock drinking and livestock grazing grass around the wetland habitat were common in TW. Due to a shortage of grazing ground and quality grass, livestock rearing is around the wetlands were common in India. Rearing livestock is a vital income source in rural areas and livestock survival depends upon their water resources and grazing area. Wetlands are the chief source of providing food and water to the livestock animals to keep them around the wetlands habitat. All districts that had either small or large stock of livestock had based on the wetlands habitat. 83% of respondents were aware of the status of TW, and 43% were not interested in the restoration activity. Wetlands provide several benefits, including cultural, spiritual, aesthetic, and educational qualities, as well as recreation and tourism. It is extremely difficult to recover or rebuild these close links after they have been disrupted or lost.

Discussion

The physical characteristics of the wetlands had categorized into seven parameters for a better understanding of wetlands. In CTND, Physically, there are differences among the wetlands structures had noted. In all the districts, the temperature range from 23° C to 29° according to season. In CTND wetlands, the maximum temperature had noticed during the summer season due to the The wetland site's openness along with the dry weather in the summer season. Overall, 91% of the wetlands were colourless and the remaining wetlands were green in colour due to the presence of Water-rich phytoplankton and algal growth, as well as corrosion and organic pollution, are typically green in colour. The chemical parameters were not done on individual wetlands and the selected wetlands were used for drinking and agricultural purposes. In CTND, small size wetlands had various wetland depths during the flooding period and summer season. The depth of wetlands based on wetland types, locations, hydrology. Our study is supported by the height and time of water in various types of wetlands, which can vary greatly (Rahman Ahidur, 2016). In the CTND, except the Trichy district receive from rainfall during the southwest and northeast rainfall, rivers and dams. In Namakkal and Karur district the water source mostly from the annual precipitation itself. Because of their modest size and ephemeral hydrology, many tiny wetlands continue to be overlooked in terms of biological and environmental relevance (Russell et al., 2002). Wetland size in Trichy and Karur district more or less the same but Namakkal was lesser in size.

Our study revealed that TW (under 10 acres) in the CTND had not been considered due to its size, and water holding capacity during summertime. Also, the wetland conservation projects were carried by the government or private on the LSW wetlands. E.g in CTND only 10 wetlands were selected for priority. In Karur district (Panjampatti lake, Uppidamangalam lake, Vellianai Periyakulam), Trichy(Gundur Big tank, Koothapar big tank, Valavandhankottai tank, Aladhudaiyanpatti lake) and Namakkal district(Pudur lake, Amithrasagaram lake, Oomayampatti lake) was under the State planning commission of TamilNadu state land use research (SPC-TNSLURB) scheme. Small size pools are shallow bodies of water that stay inundated for an extended length of time during the wet season and in summer mostly dried out. In CTND small size of wetlands depend on rainfall. In the Indian subcontinent, the precipitation over a short period from June to September months followed by a warm dry season and a huge variation in precipitation from 20 to 100% had a significant impact on the wetlands' origins. The scale of water from rivers, lakes, and reservoirs had a large variation in seasonal and also annual. The buffer zone landscape highest degraded in the Karur district followed by Namakkal and Trichy district due to construction of buildings and roads, lack of wetland protection, cattle grazing, and pollution is a serious concern for both buffer zone and landscape degradation of the wetlands in CTND.

Extensive buffer areas have a unlike inner form with hot spots for greater nutrient exclusion (Vidon et al., 2010). The wetlands buffer strip had altered due to anthropogenic activities within 10 meters by farming or infrastructure activities, and lack of fencing around the wetlands also a vital factor in a damaged wetland habitat. In the Karur district, almost all wetlands were facing water shortage due to a lack of management activities. Landscape disturbance utmost in the Trichy district followed by Karur and Namakkal district. Urbanization not only a vital issues for the loss of wetland area loss but also increase Residential and business expansion, as well as highway construction projects in urban areas. In add to blatant wetlands degradation, urbanisation impairs operate of a wetland in remnant civic wetlands (Knutson et al. 1999, Lehtinen et al. 1999, Azous and Horner 2000). Urbanization openly influences these outstanding wetlands by altering their waterflow, aggregate surplus of nutrients and effluence, aggregate revelation to familiarized species, and amassed crumbling. The habitat alteration of wetlands was maximum in the Trichy district, followed by Namakkal and Karur district. In Trichy, district alteration is mainly due to the agricultural activity and developmental activity. Our study resembled that the most typically observed stresses include agricultural operations, direct and indirect water removal from ponds, and urban growth. (Brendonck and Williams 2000; Blaustein and Schwartz 2001;Beja and Alcazar 2003). Hydrological alteration maximum in the Trichy district followed by Karur and Namakkal district with the disturbance scores were the same. In the Trichy district due to expansion of agricultural activity is the main cause for the hydrological alteration of wetlands. The depth, length, frequency, and season of floods (including water logging) are the most essential hydrological dynamics that govern all other essential, chemical, and biological individualities of distinct wetlands (B. Gopal & M. Sah.1995). Our study resembled that In CTND, that the hydroperiod's duration and periodicity are the key issues in shaping the faunal preparation and the arrangement of temporary aquatic groups (Boix et al., 2001). In Karur and Namakkal district due to lack of precipitation is the main for prolonging drought during the summer season. The habitat's drying during the dry season has an impact the biota. Species richness typically upturns as the distance of the drowned period in Ponds' duration lengthens (Blaustein and Schwartz, 2001; Boix et al., 2004; Eitam et al., 2004; Nicolet et al., 2004; Rhazi et al., 2004). However, our study showed that prolong drought causes small size ponds where very few avifauna species had been recorded.

In wetlands, small changes in local hydrologic conditions can have a large impact on the biological system of temporary ponds in that area. Also, surface runoff debris can be a substantial deterioration component, and acidification occurs in several circumstances. The human modification of natural habitat within nearby landscapes has a profound impact on temporary wetlands (500 m).In CTND First most familiar risk to habitat is caused by intensive farming around wetland habitat or pollution and other anthropogenic activities. In CTND, the biodiversity aspects showed a very lesser abundance of bird fauna due to the unavailability of the water source. Our study also supported that the water availability is a fundamental factor of species dispersal and ecosystem activities, and it is heavily influenced by climate conditions and human landscape usage.

In CTND, human impacts in and near wetlands have the potential to disrupt wetland functioning and deteriorate wetland habitats, reducing the ecosystem services provided by wetlands. Our study also supported that most of the small size ponds in all the CTND were facing severe anthropogenic activities. Our study resembled that in recent decades, siltation and other anthropogenic activities have been identified as a primary cause of the steady decrease of biological productivity in floodplain wetlands. [Sajinkumar et al., 2017, Deka TK et al., 2005]. There is insufficient knowledge about the dispersion and operation of small kinds of wetlands in Central TamilNadu. Wetland hydrology is an chief parameter to verify the impact of climate change. Our study also supported that the monitoring wetland runoff can also be used to find hidden climate crisis [Schuyt K, Brander L, 2004). Temporary ponds are not significantly influenced by human activities in CTND due to lack of human activity.

Our study showed that in the TW all over the CTND had a lack of Ecosystem Service except livestock grazing and livestock drinking. In the Namakkal and Trichy district, Temporary wetlands provided very few services, but in Karur district absence of ES due to the absence of water all over the year. Wetlands are scratched.favorably by lesser and big animals (Grab and Morris 1997), Pasture is also a conjoint practice of wetlands in the zone (Palmer et al. 2002, Bisaro 2007). Our study also supported that in the Temporary wetlands, Livestock drinking and grazing were common in CTND.

Wetlands provide a variety of functions depending on their nature, size, and location. Rearing livestock is vital income in rural areas and mostly depend upon their water and grazing area around the wetlands were common in India. Either small or large stock of livestock based on the wetlands in all three districts. The livestock availability has based on grazing ground, quality grass but both are very lack in India. Wetlands deliver significant benefits including cultural, spiritual, aesthetic, educational values, recreation, and tourism. It is extremely difficult to recover or rebuild these close links after they have been disrupted or lost the TW wetlandsInfrastructure and unplanned urbanisation expansion ensuing in alteration of mini-topography and ripple pressure the reliability of freshwater environments, interfering with delivering and regulating services (Kumar et al., 2008, Zhao et al., 2006; Bassi et al. 2014). In our study showed that the lack of Ecosystem services from the CTND. Management of TW has nowadays had big tasks due to a lack of awareness about their importance. (In the Karur district, our study showed that most of the respondents were not interested in the restoration of TW due to lack of ES).

Conclusion

This is the first occasion we have polled the 25 wetlands in and around the three different sizes in CTND by utilizing the questionnaire approach in conjunction with field trips. The wetlands had been evaluated using a range of ecological criteria. The scientific consideration for wetland degradation has increased dramatically, but few studies have been conducted on the status of ephemeral wetlands in Central Tamil Nadu. Small wetlands were identified and mapped using remote sensing techniques in this study in

CTND, Tamil Nadu. The maps created during the study will explain notable use and renovation dynamics in tiny wetlands, and they can provide a numerical premise needed to guide and predict future wetland uses as we try to balance greater food market worry about wetlands conservation. The primary goal was to file the ecological status and HDS score, provided that tiny wetlands are slowly being depleted agronomic invention and may vanish excluded. Within the CTND, 3 kinds of wetlands, pre-selected spotss, mainly Urban, semi urban and rural wetlands, were identified. Regarding the ecological status of wetlands HDS, score under (MI) category. In the CTND, The dried out wetlands degraded by various factors in a different district, but the dryness of wetlands was in common during summertime in the ND. Wetland degradation by buffer zone alteration is a major threat all over the district. Individual wetland study will be essential to boost the foundation for management and conservation decisions.In the Karur district (Sorakkapalayam Kulam), Trichy district (Iyaswamykuttai, Karuppuswamy Kuttai, Valliyur Theppakulam, Sengulam Talakadukulam), and In Namakkal district, Pokampalayam Lake and Nallipalayam Pond 2 were facing severe anthropogenic activities nowadays. The maps and HDS score of these surveys will also be important for monitoring the activities and changes that occur in wetlands in order to effectively manage them. Such studies are needed in other districts and abroad, and they should cover bigger regions in order to properly document and monitor Temporary wetland habitats. The findings of such studies will assist in informing and guiding the relevant authorities in creating informed resolutions on the prudent use of wetland resources. The susceptibility of wetlands may also be more properly assessed using baseline knowledge on the number of wetlands, size, position in the landscape, and the effect of nearby human activities employed for wetland functioning. Our study exposed that the size of wetlands has a quantifiable influence on wetlands, and bonus studies are requisite to govern the influence on wetlands.

Declarations

DECLARATION OF COMPETING INTEREST

The authors declare no conflict of interest.

CREDIT AUTHORSHIP CONTRIBUTION STATEMENT

Dr. K.Varunprasath: Supervision, original draft writing, conceptualization, writing review, final analysis, and editing.

Subha M: Data collection, Investigation, Visualization, Formal analysis,

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DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available from the corresponding author upon reasonable request.

ETHICAL APPROVAL

Not applicable

CONSENT TO PARTICIPATE

Not applicable

CONSENT TO PUBLISH

Not applicable

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Figures

Fig: 1A.

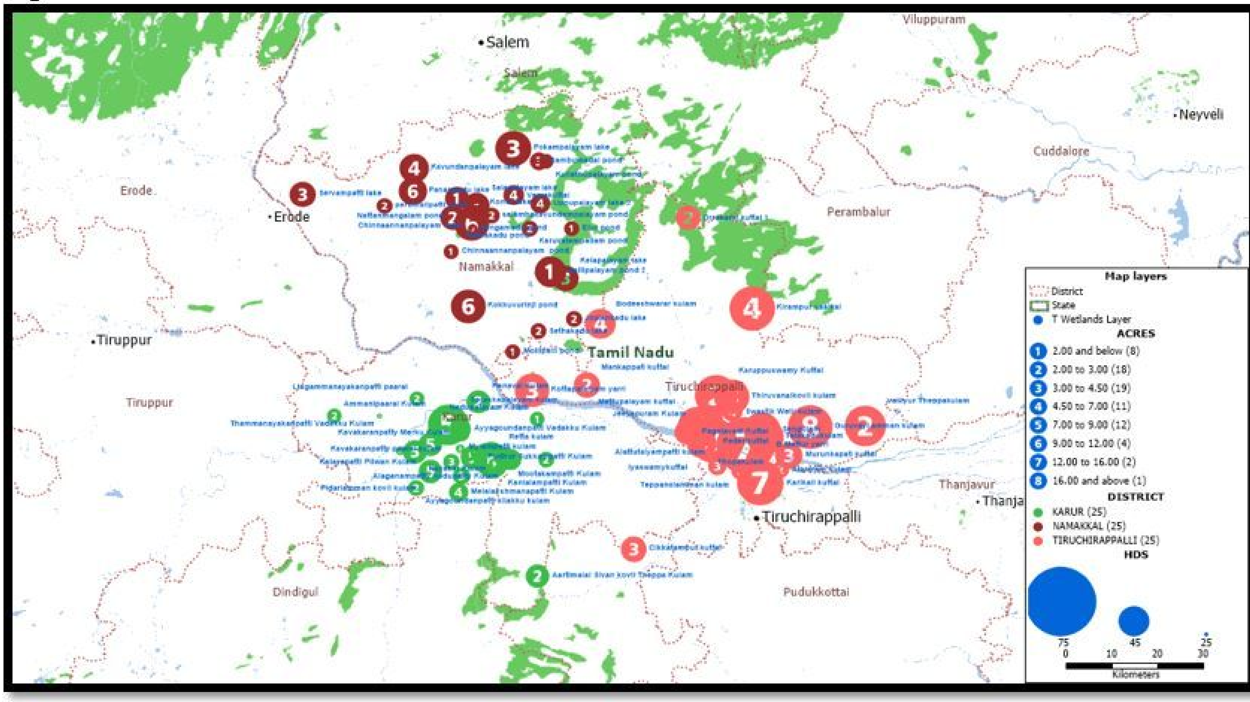

Fig: 1.b.

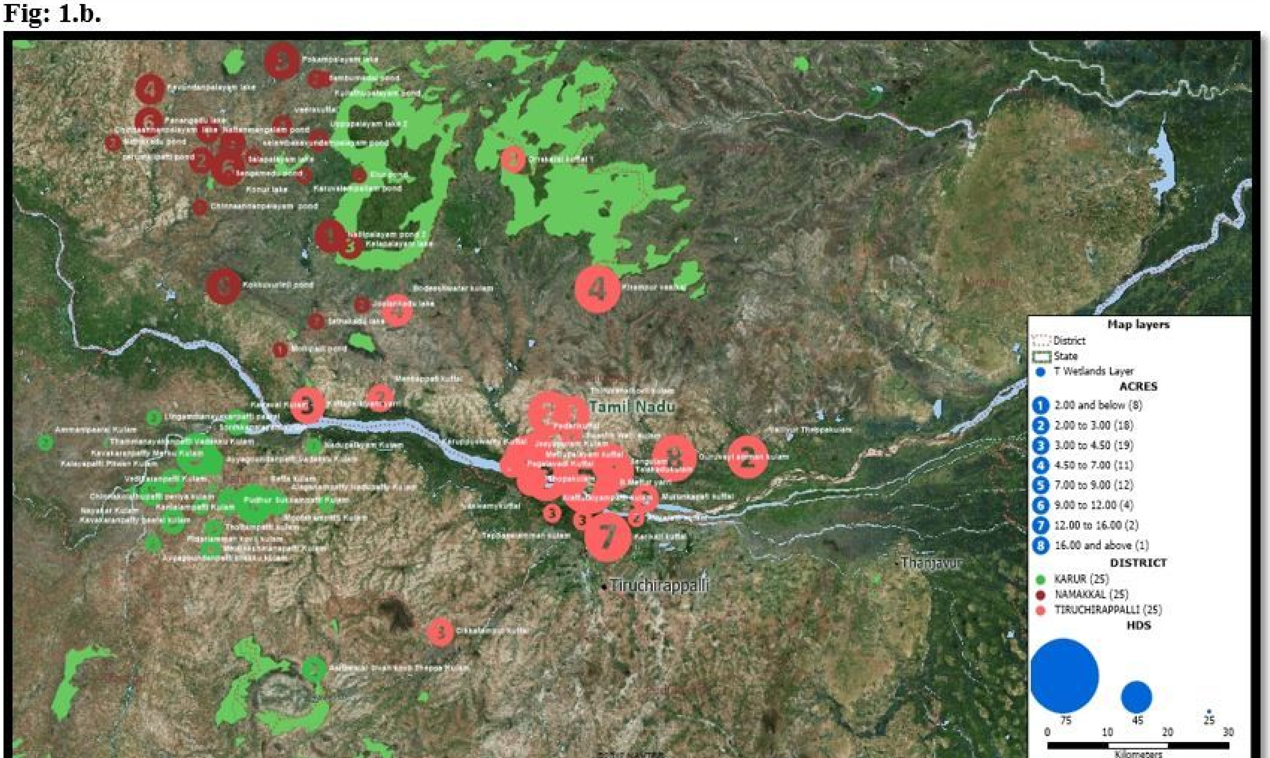

Figure 1

A.GPS location of surveyed wetlands in the CTND.

B.SAELLITE MAP OF SURVEYED WETLANDS IN THE CTND.

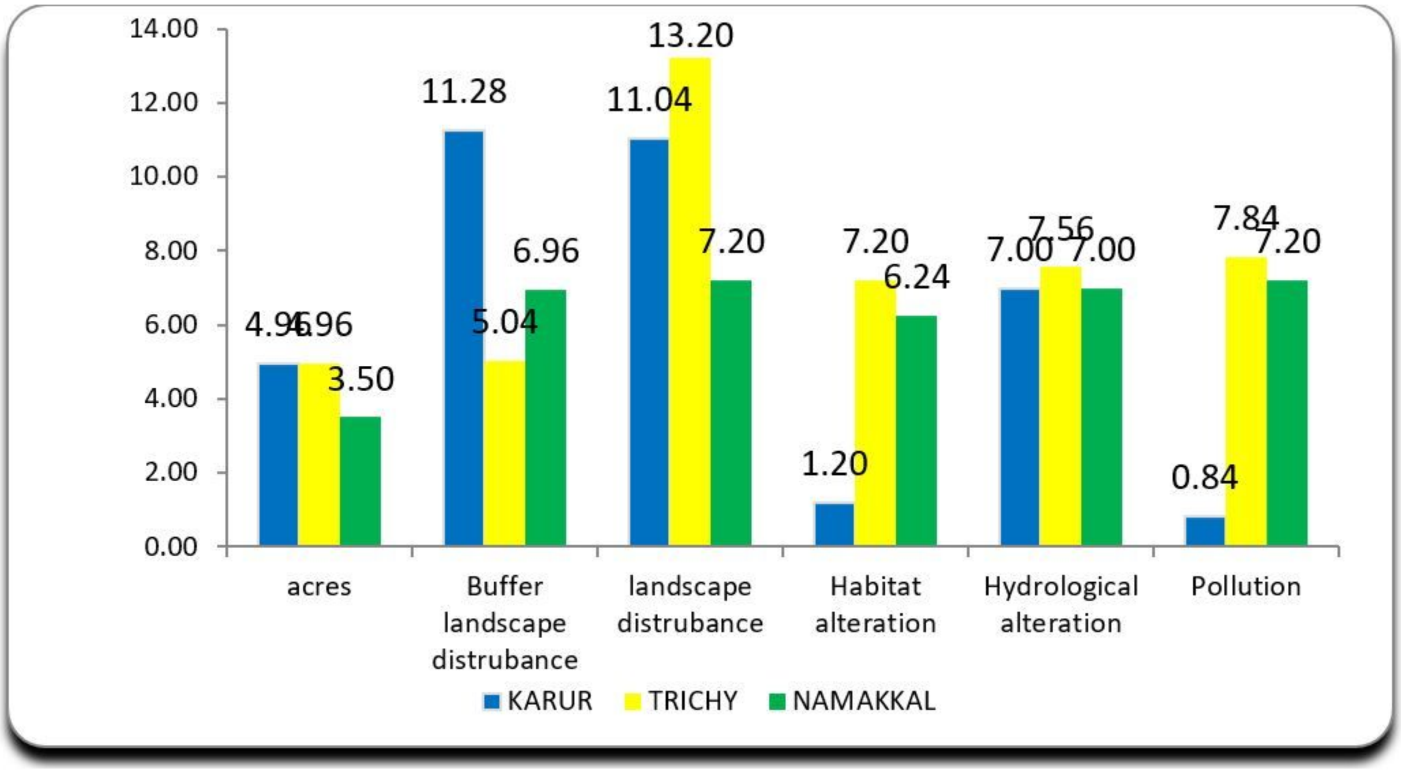

Figure 2

OVERALL WETLANDS DEGRADATION FACTORS IN THE CTND.

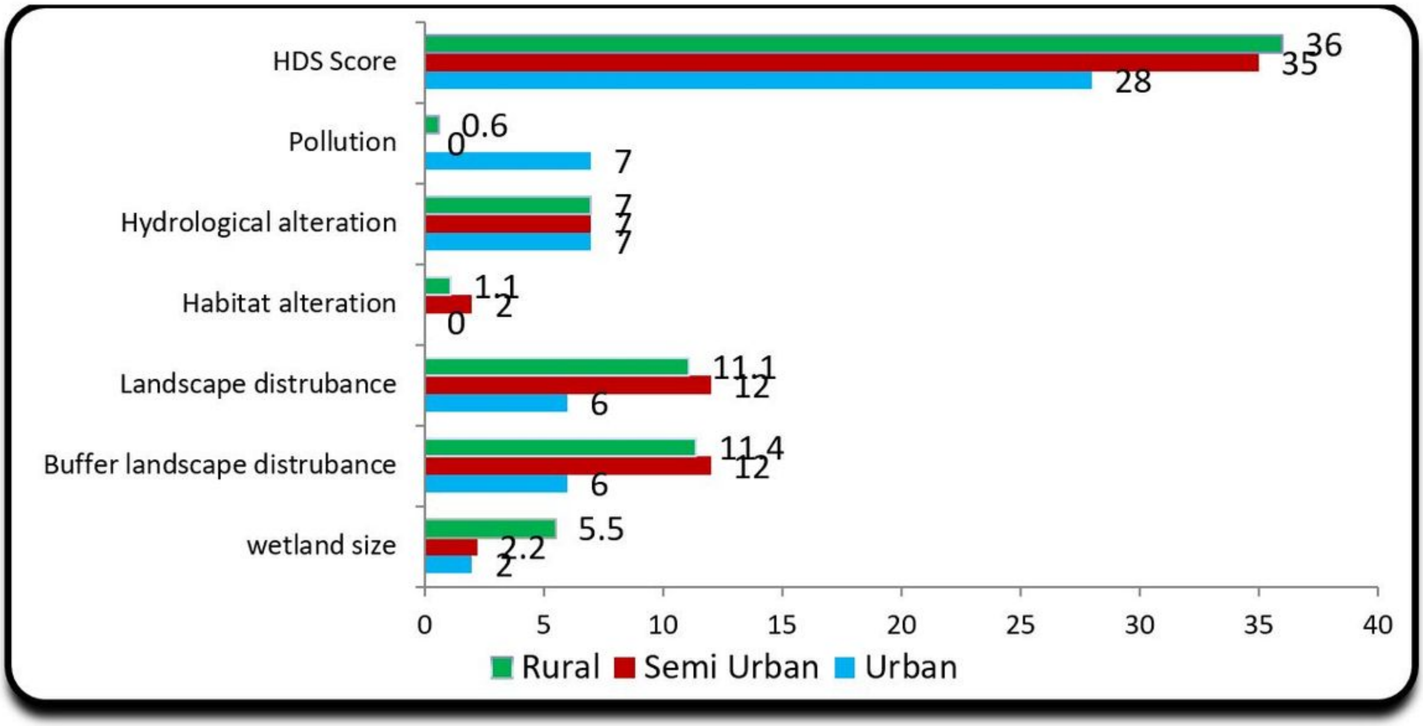

Figure 3

WETLANDS DEGRADATION FACTORS IN THE KARUR DISTRICT.

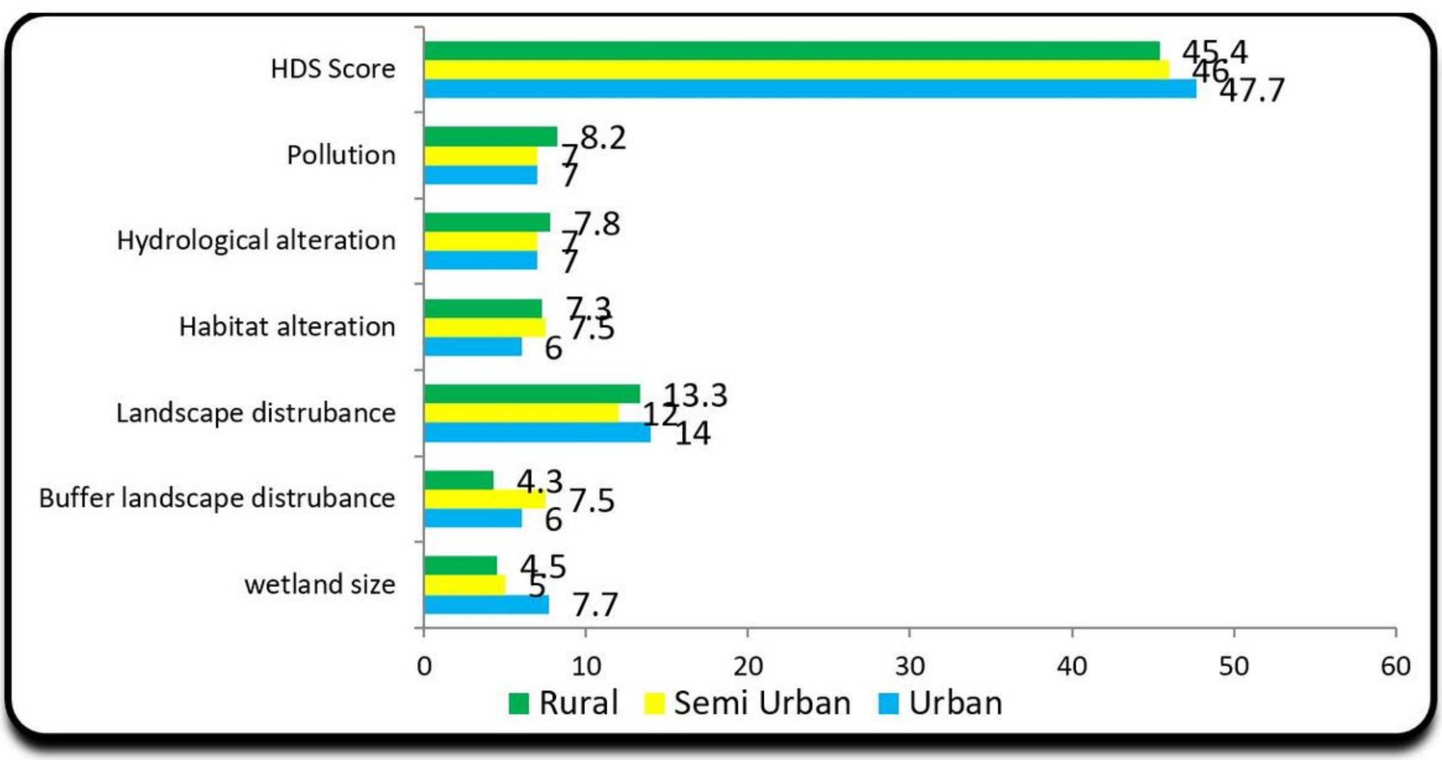

Figure 4

WETLANDS DEGRADATION FACTORS IN THE TRICHY DISTRICT.

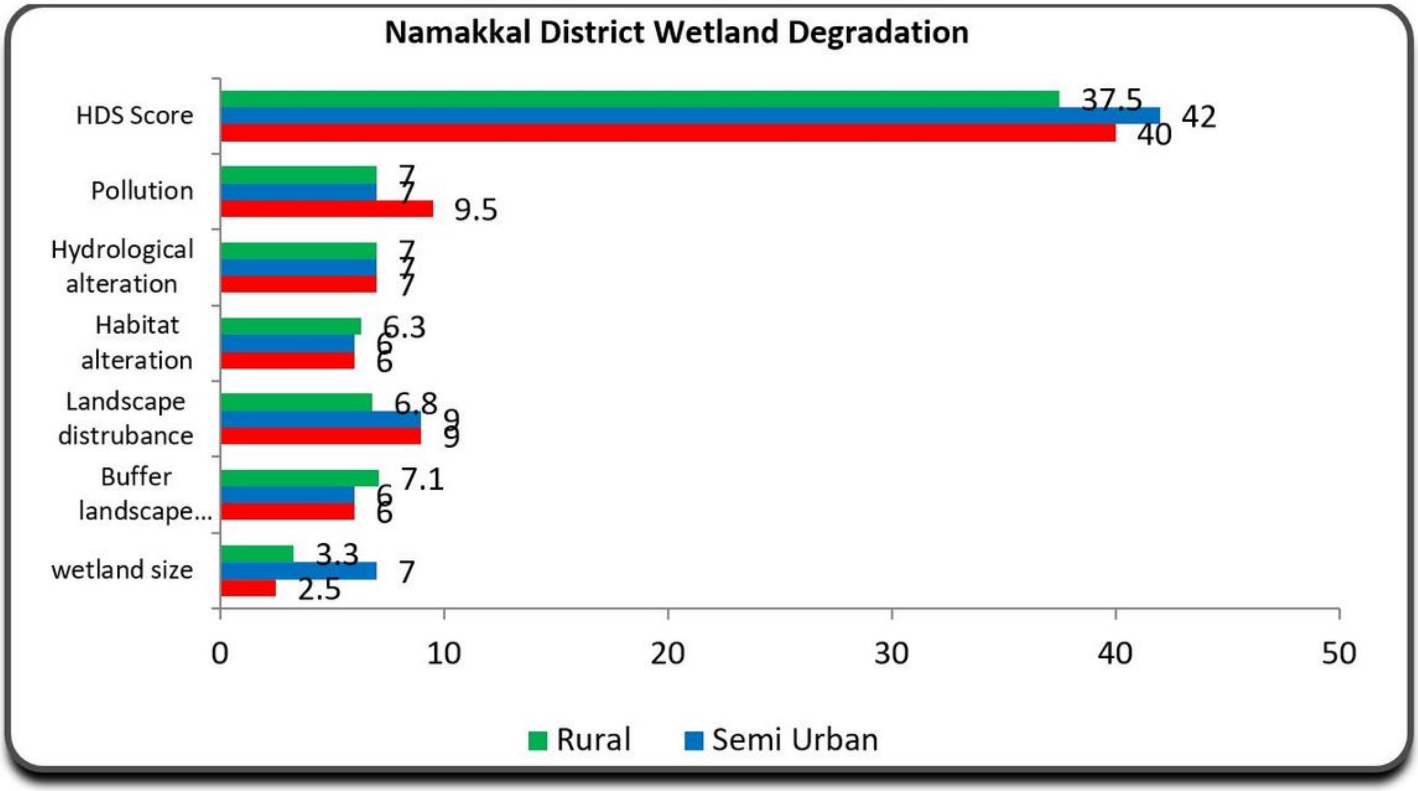

Figure 5

WETLANDS DEGRADATION FACTORS IN THE NAMAKKAL DISTRICT.

Supplementary Files

This is a list of supplementary files associated with this preprint. Click to download.

- QuestionnaireforAssessmentofwetlands..pdf
- SURVEYEDTEMPORARYWETLANDS.docx