The Social Science Review A Multidisciplinary Journal. January-February, 2026. Vol. 4. Issue 1. 29-32

Published by: Pather Dabi Educational Trust, (Regn No: IV-1402-00064/2023), Under Govt. of West Bengal, India

The Social Science Review
A Multidisciplinary Journal
ISSN: 2584-0789
(Open-Access, Peer-Reviewed, Refereed, Bi-Monthly, International e-Journal)
Homepage: www.tssreview.in

MEASUREMENT OF ECOSYSTEM SERVICES INDEX THROUGH RAWES OF KONNAGAR-HINDMOTOR WETLANDS, HOOGHLY, WEST BENGAL, INDIA

Dr. Arpita Chaudhury Aich [1] & Dr. Bela Das [2]

RESEARCH ARTICLE

Author Details:
[1] Assistant Professor, Department of General Studies, Institute of Engineering and Management, Kolkata, University of Engineering and Management, Kolkata, West Bengal, India;
[2] Associate Professor, Department of Geography, Raja Narendralal Khan Women's College (Autonomous), Paschim Midnapore, West Bengal, India

Corresponding Author:
Dr. Arpita Chaudhury Aich

DOI:
https://doi.org/10.70096/tssr.260401006

Abstract
The Konnagar-Hindmotor wetlands, a geographically isolated inland urban wetland have significantly impacted the locals; way of life directly or indirectly by harnessing the benefits from these wetlands. People not only receive intrinsic values, or direct values, from the wetlands under investigation but also receive enormous benefits in the form of indirect benefits. Thus, the paper aims to aims to identify the Ecosystem Services (E.S) offered by these wetlands and quantify them through computation of Ecosystem Services Index. Rapid Assessment of Wetland Ecosystem Services (RAWES) was used to quantify the ecosystem services offered by these wetlands. The results revealed that the wetland is undergoing severe infilling and human encroachment, thereby offering moderate level of ecosystem services. This has resulted in shifting of livelihood of the stakeholders and conservation and management of these wetlands is the striking need of the hour.

Keywords: *Ecosystem Services, Wetlands, Ecosystem Services Index (E.S.I), RAWES, Wetlands Infilling, Urban human encroachment*

Introduction

In addition to offering a vast array of ecosystem services, such as food, fiber, raw materials, and medicines, wetlands sustain an extraordinarily high level of biological diversity (Ramachandra & Aithal, 2015). Wetlands' rich biodiversity and extensive food webs have led to them being dubbed "biological supermarkets" in recent years. From a socioeconomic perspective, wetlands are valuable and significant for a number of reasons. The functions and values of the wetland ecosystem are influenced by human population pressure, resource availability, and human perception.

Humans directly gain from the use of water plants, animals, soils, food, fibers, raw materials, and other components of the wetland ecosystem, while humans indirectly benefit from the ecosystem's activities. Currently known as ecosystem services, these advantageous roles fall into four primary categories: provisioning, regulating, supporting, and cultural services. The Millennium Ecosystem Assessment (2005) separated ecosystem services into four categories: (a) Provisioning Services (also called goods; they include food, fuel, timber, water, and other material benefits); (b) Regulating Services (including climate regulation of biogeochemical cycles); (c) Supporting Services, which are essential to the ecosystems' ability to provide the other three services (such as soil formation); and (d) Cultural Services (aesthetics, cultural, recreational, and educational practices).

Objectives

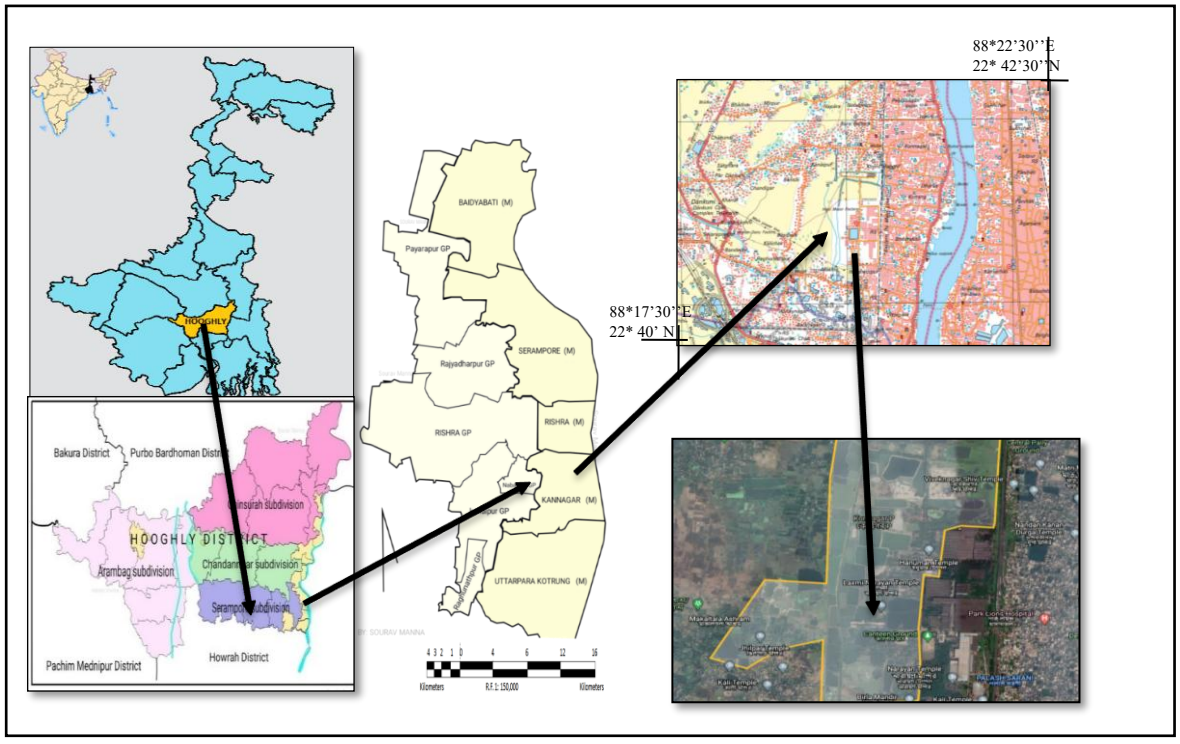
Even though Konnagar-Hindmotor wetlands is an urban wetland, it offers a variety of environmental functions. But due to large scale urbanisation in the area adjoining the wetlands, the wetlands are being infilled for the construction of a massive upcoming township. With the infilling of the wetlands, the ecosystem services offered by the wetlands are also getting compromised resulting in the disruption of the fine balance between ecosystem and their services offered to the society. Thus, the major objective of the study is to identify the major ecosystem services offered by the Konnagar-Hindmotor wetlands which provides an important role in functioning of the entire ecology.

Location of Study Area and Rationale behind Selection of Study Area

Wetlands classified as Geographically Isolated Wetlands (GIWs) are those that are frequently found among drier pastures and lack obvious surface water connection to perennial rivers, streams, seas, or ocean (Mushet, D. M. et al. 2015). Their creation is influenced by variations in slope, hydrology, climate, and regional topography. Because of changes in the current river systems, these wetlands which are situated on former floodplains that were originally flooded by seasonal rivers have become isolated. These wetlands are currently extremely vulnerable because of nearby land use practices, human activity in upland regions, and the quick infilling for infrastructure construction (Cohen, M. J., Creed et al. 2016). Because they are separated from jurisdictional waters, GIWs have little legal protection despite their importance as biogeochemical hotspots (Leibowitz, S.G., 2015). The state of West Bengal in India houses several Geographically Isolated Wetlands (GIWs), such as Berunanpukuria, Barotir Beel (Aich, A. C., & Das, B. 2022) and Konnagar-Hindmotor Wetlands being one of them.

With graticules spanning from 23 degrees 01 minutes 20 seconds North to 22 degrees 39 minutes 32 seconds North and from 88 degrees 30 minutes 15 seconds East to 87 degrees 30 minutes 20 seconds East, the Konnagar-Hindmotor wetlands are situated in the Hooghly district's Sreerampore subdivision. The Konnagar-Hindmotor Wetlands are located in the Serampur-Uttarpara Community Development Block, which consists of six census towns and six gram panchayatas: Raghunathpur, Dakshinrajyadharpur, Bamunari, Rishra, Nabagram, and Kanaipur. These regions were primarily rural which are now bearing the brunt of urbanisation with massive influx in population from surrounding rurban and suburban areas. The Konnagar-Hindmotor wetlands are well connected with the railways connecting the twin cities of Howrah and Kolkata, and is in close proximity to the Grand Trunk Road (national highway). Thus, the Konnagar-Hindmotor wetlands proved to be paradise for the construction of urban township by illegally infilling the wetlands by the realtors as GIW's don't have any legal status for it's protection and management. One of the district's three natural regions, the Hooghly Flats, is where the majority of the Serampore-Uttarpara Development Block is situated. The Gangetic Delta includes the alluvial plains. The region is a narrow strip of land that forms the eastern limit of the district and goes for 80 km parallel to the Hooghly River. The physiography of the region has been impacted by the river's course

Figure 1: Location Map of Study Area



Historically, the wetlands under investigation are depressions that were drained by the surrounding lands. During the rainy season, these creeks and marshes release their contents into the rivers through smaller streams. These swampy depressions, which are drained by little rivulets, are widely distributed across the Sreemrampore Subdivision, namely between the Hooghly and Paleo-river Saraswati interfluves. These wetlands or streams are located in a continuous line from Hooghly-Paleo Saraswati to Paleo Saraswati Kaushiki and Kana Damodar (O Malley & Chakrabarti, 1909) respectively.

Methodology

The Ecosystem Services Index was calculated using the Rapid Assessment of Wetland Ecosystem (Everard et al., 2019). RAWES was created to complement the assessment of wetland ecosystem services in order to enable a holistic evaluation of the whole range of wetland ecosystem services (McInnes and Everard 2017). Primary interviews and intense focus groups were used to

learn more about the environmental services that the wetlands offer. On a scale from "significantly positive" (++) to "neutral" (0) to "significantly negative" (-) or "unknown" (?), each service's semi-quantitative significance was evaluated. The Konnagar-Hindmotor wetlands ecological services were determined using Millenium ecological Services (2005). The services that have an impact on the local ecosystem were divided into two categories: direct services and indirect services. Of the 500 respondents in the sample, 110 were asked about the estimated value they used to create before infilling of the wetlands and after the infilling of the wetlands by selling the goods obtained from wetlands. These respondents were once the direct stakeholders of the wetlands.

Table 1: Computation of Ecological Services Index using RAWES

Transposition of RAWES 'importance of service' scores into numeric values						
Assigned importance	Significantly positive	Positive	Neutral	Negative	Significantly negative	Unknown
Importance score	++	+	0	-	--	?
Numerical value	1.0	0.5	0	0.5	1.0	Excluded for further verification

Source: Everard et al.,2019

According to Millennium Ecosystem Services (2005), groups of ecosystem services were identified, and their weights were assigned according to their relative importance: 1 for significantly positive services, 0.5 for positive services, 0 for neutral and 0.5 for negatively related services, and -1 for significantly negative services provided by the wetlands.

Ecosystem Services Index (ESI)=∑(n+1.0+n+0.5)+∑(n-1.0+n-0.5)/∑nTOTAL……..(1)
where,
∑(n+1.0+n+0.5)= All positive scores (+1.0 and +0.5) summed
∑(n-1.0+n-0.5)= All negative scores (-1.0 and -0.5) summed
∑nTOTAL = number of ecosystem services assessed, discounting any services that are not relevant at the site

Results and Discussion

The Konnagar-Hindmotor wetlands ecosystem services were recognized and divided into four categories: provisioning, regulating, supporting and cultural services.

Presently, the provisioning ecosystem services offered by these wetlands are Food, freshwater, forage, clay soil and medicinal plants.

In regulating services, water regulation and flood control are the services offered. The wetlands offer habitat for biota, biomass production, soil formation, cattle bathing, pasture land, waste dumping, water to agricultural field as the supporting services. The wetlands provide aesthetic value and educational visits as the cultural services. The categorisation of the ecosystem services and its estimated economic value can be represented in the table 2. By calculating ESI, it was found that ecosystem services index value of the Konnagar Hindmotor wetlands is 0.647.

The ESI values ranges from -1 to +1. -1 value indicates wetland is providing a high level of dis-benefit and +1 indicates wetland is providing high level of benefit to the components of the society.

The ESI value of 0.647 indicates the wetland is providing a moderate level of benefits to the regions adjoining the study area.

Table 2: Showing Ecosystem Services offered by the wetlands

Sl. No	Nature of Services	Nature of Ecological services	N	++	+	0	-	--	L	R	G
1	Provisioning	Provision of food	17		0.5				+		
		Provision of fresh water	17	1						+	
		Forage	17		0.5				+		
		Clay soil	17	1					+		
		Medicinal Plants	17		0.5				+		
2	Regulating	Water Regulation	17	1						+	
		Flood Control	17	1						+	
3	Supporting	Habitat for Biota	17	1						+	
		Biomass Production	17		0.5				+		
		Soil formation	17	1						+	
		Cattle Bathing	17		0.5				+		
		Pasture Land	17		0.5				+		
		Waste Dumping	17	1					+		
		Agricultural Field	17		0.5				+		
4	Cultural	Aesthetic Value	17	1					+		
		Educational Visit	17			0			+		
		Social bonding	17				0.5		+		

Conclusion

Thus, from the analysis it can be clearly understood that Konnagar-Hindmotor wetands is experiencing unsustainable and rapid transformation of the environment through rapid infilling of the Konnagar-Hindmotor wetlands, the number of ecosystem services offered have declined considerably. Due to the decline in the number of ecosystem services, the entire ecosystem is getting affected in terms of losing the fine equilibrium between normal functioning of the ecosystem, but also affecting the direct stakeholders who have been the worst affected community. Thus, the plight of the direct stakeholders can be rightfully called as the marginalisation of the marginalised wherein the infilling of the wetlands due to the massive upcoming township have not only uprooted the direct benefits of the wetlands to the direct stakeholders but also have uprooted of the indirect benefits of the wetlands.

Acknowledgment: No
Author's Contribution: *Dr. Arpita Chaudhury Aich*: Data Collection, Literature Review, Methodology, Drafting; *Dr. Bela Das*: Analysis, Referencing
Funding: No
Declaration: All the authors have given consent for the publication.
Competing Interest: No

References

1. Everard, M. (2019). A socio-ecological framework supporting catchment-scale water resource stewardship. *Environmental Science & Policy*, *91*, 50–59.
2. Ramachandra, T. V., Aithal, B. H., & Sreejith, K. (2015). GHG footprint of major cities in India. *Renewable and Sustainable Energy Reviews*, *44*, 473–495.
3. Rathod, S., Rao, G. R., Andrzejewski, B., López, G. P., Ward, T. L., Brinker, C. J., & Datye, A. K. (2003). Monodisperse mesoporous microparticles prepared by evaporation-induced self-assembly within aerosols. MRS Online Proceedings Library (OPL), 775, P1-11.
4. Ukam, U., Odey, A., Paul, J., Akpang, I., & Patrick, U. (2018). Influence of water quality on the abundance of freshwater mollusc in Biase, Cross River State, South-Eastern Nigeria. *Advances in Research, 15*(2), 1-12.