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Review Article

An Assessment of the Ecological Services Provided by Deepor Beel Wetland and its perceived Contribution to Quality of Life Among the Wetland-Dependent Community

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A B S T R A C T

Guwahati, the only metropolitan city of Assam, India is rapidly urbanising with a large influx of population along with spatial growth. The areas adjacent to the city boundary, which were once native villages; now transforming into peri-urban areas and experiencing land use transformation, cultural changes and ecological disturbances like cutting of trees, filling of wetlands and ponds, changing of land uses etc. The ecological services offered by the wetland have changed over the years due to anthropogenic activities around the wetland. The declining connection of people with the wetland and concentration on another source of income is happening rapidly. This has changed the perception of people about the benefits and services of the wetland and its contribution to the quality of life. The changing perception has demotivated the youth to take part in traditional fishing and other activities related to the use of wetland services for economic, social and environmental benefits. Having a positive perception motivates people to engage and work for the betterment of themselves and also for the wetland.

The paper tries to understand the connection between the wetland and people. The outcome of this paper will give insight into the economic, cultural, religious, social association of people with the wetland. The study will be helpful to understand the perception of people about wetland services and their relation with quality of life. Secondary data along with primary investigation were used to identify wetland services. A simple random survey with a Likert rank-based questionnaire was used to rank the indicator selected for the research to understand the perception of people about wetland services and human wellbeing.

Keywords: Wetland Services, Perception of Quality of Life, Deepor Beel Wetland, Contribution of Wetland

Introduction

The urban population has gained a momentum from latter half of last century (Pawe, C. K., & Saikia, A. ,2018) and it has been estimated that by 2030, almost 56% of population of developing countries will be living in cities (Bhattacharya, A. ,2017). In the past 50 years, world population has increased rapidly and in 2007, a milestone year when the urban population of the world overtook the rural population. In 2016, world's 54% people was living in urban areas whereas it has been estimated that two third of world's population will live in urban settings by 2050. The urban areas are the engines of economic growth and contribute significantly in the GDP of a nation.

Guwahati, only million plus city in the entire north east is urbanising over the years with rapid population growth from 8,394 in the year 1891 to approximately one million in the 2011-year census (Bhattacharya A, 2017). The growth of population has demanded need for different land uses like residential, commercial, Industrial, institutional etc. which has resulted into expansion of cities to its neighbouring areas in an unplanned way. The city of Guwahati has been developing and expanding towards its peri urban villages leading to distinct urban sprawl. The growth of the city has come up with environmental consequences such as cutting of hills, encroachment's in hills, forests and wetlands, increase level of pollution in the city, filling up small vacant plots of human use, sprawling effect towards peri-urban areas (Patowary S, & Sarma AK, 2018).

Guwahati city's unplanned and uncontrolled development has created many urbanisation issues; especially related to environmental degradation like decrease of wetlands, reduction in green open spaces, loss of forest area covers, unplanned settlement in hill areas, reduction in tree canopy and cutting of trees for developmental needs (Sultana, M.,2020). The increase in urbanisation has affected mostly the hills due to the tremendous increase in habitation in the hills creating negative effects on the environment as well as increasing high risk of soil erosion, landslides, earthquake-related disaster (Gogoi, L.,2013). Cities are becoming concrete jungles with reducing green cover coupled with the presence of dust particles in the air, rise in temperature, disease causing harmful gases etc. leading to poor quality of life of people (Gujarat Forest Department, 2012)

The growing urbanisation has impacted the ecological character of the Deepor Beel wetland by changing the purity of water, turbidity in water, increase of weeds in the wetland, reduction of aquatic plants and decrease of production of fishes.

This paper has aimed to understand the status of wetland services generated from the wetland. This paper proposes to identify the perceived contribution of wetland services in the life quality persevered by the locals living in the selected 14 villages. However, the perceived contribution of wetlands in the life of people is to be assessed through the selection of a few indicators and based on Likert scale (1 to 5) rankings.

Aim

To understand the contribution of assessing the ecological services and to assess the perceived contribution of wetland services in the life quality from the Deepor Beel wetland.

Objectives

1. To assess the ecological services provided by Deepor Beel wetland.
2. To understand the perceived contribution of wetland services in the life quality.

Methodology

For the study, secondary data gathered from reports, research papers, books and primary data from field visits are to be used. A random sample survey through a structured questionnaire will be used to understand the perception of people towards wetland services and their contribution to human wellbeing. A total of 123 numbers of samples were collected from the site to understand the perception of people. The indicators used in the five-point Likert scale were selected from the review literature. Interviews with people, discussion and are to be presented a descriptive way to achieve the objectives.

A Brief about the Study Area

The site of the research is located on the south western side of Guwahati city in the Kamrup metropolitan district of Assam. The morphology of the city shows its growth towards the southwestern side and there has been a tremendous growth of population in these villages adjacent to the Deepor Beel wetland in the last two decades. The site was traditional Assamese villages of different tribes which has been changing day by day due to the migration of people from different areas. 14 villages that are dependent on the wetland resources directly and indirectly were taken as sites for the research (Mozumder C, & Tripathi NK, 2014).

Literature Review

The urban environment is a combined effect of micro-environment as well as macro-environmental outcomes. Urban areas generally have multifaceted problems associated with environmental degradation such as loss of green cover, pollution, tree cutting, hill and sensitive

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area habitation, air pollution, poor oxygen level, heat island effect, wetland degradation, a decline of ecosystem services from wetlands etc. resulting degraded living quality of the inhabitants. Wetlands are significant purifiers, oxygen providers, carbon sinks and important for environmental, social and economic benefits. Wetlands are responsible for cooling the urban environment and possess hydrological benefits. Apart from environmental benefits wetlands provides recreational benefits as well as are associated with religious and cultural life. Three fourth of carbon emission of the world comes from urban areas which can be reduced by reviving the urban wetlands. The increased wetland can result in increased carbon storage and sequestration. Urban wetlands cool the surroundings, beautify the area, are valuable for stormwater runoff, sequestration, habitat for migratory birds and insects and also responsible different ecological services.

A wetland is a common recreational space and plays a significant role in improving social interaction and hosts a common urban green landscape. The wetland periphery is a natural recreational space that is accessible to different user groups such as the informal sector, pedestrians, cyclists etc. An inspiring example of a livable city with a high score of livability is Melbourne city which has successfully increased its wetlands to increase the livability of the city. The city has invested millions to create five floating wetlands in the heart of the CBD to revive the Yarra River. The city authority aimed to bring the river closer to the people and so in the 90s they developed a 36km long riverside trail around the river Yarra (Waters C, 2022).

The Ramsar has recognized efforts of various cities under the "Wetland city accreditation" programme for remarkable efforts in urban wetlands conservation and wise use of wetlands for socio-economic benefits. Various cities from China (Hefei; Jining; Liangping; Nanchang; Panjin; Wuhan; and Yangcheng), Canada (Sackville), France (Belval-en-Argonne and Seltz), Indonesia (Subaraya and Tanjung Jabung Timur), Islamic Republic of Iran (Bandar Khamir and Varzaneh), Republic of Korea (Gochang; Seocheon; and Seogwipo) etc. has been recognised for conservation and wise use of ecosystem services (R, 2022).

The idea of quality of life encompasses a wide range of areas and indicators, as well as personal, social, economic as well as health-related aspects. According to the breadth and complexity of the research, many different dimensions make up the notion of quality of life Felce D, & Perry J. (1995).

The Millennium Ecosystem Assessment recognizes the links between ecosystem services and human well-being. Wetlands near residential areas have high cultural service value.

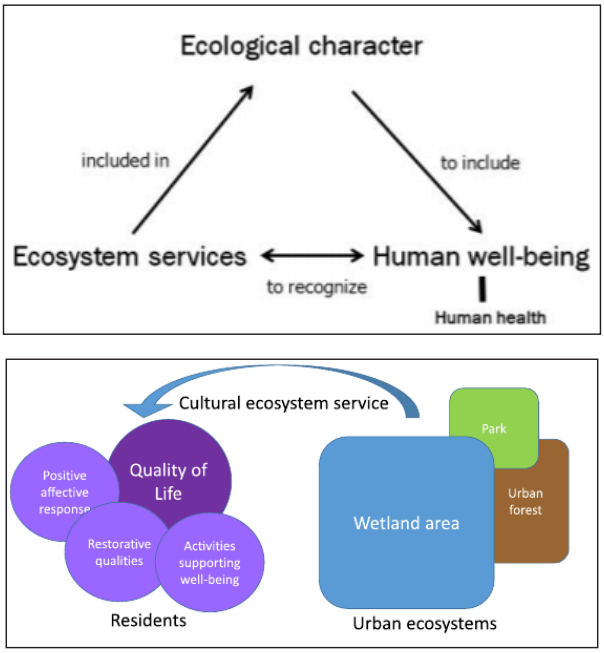

Figure 1
Source: Horwitz, P. (2018)

The wellness of people's CES (cultural ecosystem services) has been investigated by Cheng, X., et al., (2018). The CES is the cultural value of an ecosystem related to recreational benefits, opportunities for physical activities, socialization etc.

Human welfare as it relates to the ecosystem services provided by wetlands has been extensively examined in the Millennium Ecosystem Assessment (2005) and Ramsar Convention (2005). These works of literature recommended the "sustainable use" and "wise use" of ecosystem services for an improved quality of life. Urban wetlands are essential for reducing the adverse consequences of urbanisation and climate change. The services that are provided and regulated are quantitative and are easily valuable and measurable (Pedersen E, 2019).

The need of maintaining highly productive ecosystem services for human well-being was covered in the Millennium Ecosystem Assessment (2005). The provisioning (food, water, fuel, wood, fibre), regulating (climate, flood, disease, water purification), cultural (aesthetic, spiritual, educational, recreational, social relations, sense of place, heritage value, etc.), supporting (primary production, soil formation, photosynthesis, etc.) ecosystem services provided by wetland ecosystems are discussed in this report (Assessment ME, 2001).

Analysis

Ecosystem Services of the Deepor Beel Wetland

The Deepor Beel wetland is a sensitive ecological entity and provides provisioning, regulating, supporting and cultural

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services to its dependent population. Apart from non-monetary services like religious, cultural and supporting services, the major monetary service proved by the wetland is fishing. 825 households are dependent on fishing activities as per the resource inventory of beels and fisheries in 2015. Dutta J, Sharma A, 2012. has calculated the monetary and non-monetary values of the Deepor Beel wetland. Fishing in the wetland and fisheries around the wetland is a major source of fish and occupation of the fishermen.

Most of the household fish along the periphery of the wetland and almost 81.8 per cent of people fish 7 days a week remaining nearly 12 per cent fish 6 days a week. The fishermen went fishing early in the morning and fished for 3 to 4 hours. Again in the evening, they fish for 3 to 4 hours. The average income earned by a fisherman per month is 13,500 INR and annually 1,62,000 INR. The total cost incurred in fishing per fisherman annually is calculated as 20,825 INR. The total monetary value of fishing from the wetland is around 11,64,69, 375 INR (Dutta J, Sharma A, 2012). The annual fish catch from the wetland is 639 tons as mentioned by Dutta J, 2017.

Apart from fishing the other monetary products gathered from the wetland are aquatic plants, snails, crabs, Mollusca, Crayfish etc. and these are sold usually in the Gadhuli bazaar and the Pepsi Chowk bazaar near Ranigate. The people from the nearby villages collect aquatic plants like, Makhana, water lily seeds etc. and sell them in the nearby market.

The wetland periphery is used for crops and agriculture. A total of 200-300 bighas of land near Deepor Beel has been cultivated for Ravi and Kharif corps by the villagers. A net monetary value of 18,36,500 INR annually, is extracted from the paddy cultivation (Dutta J, 2017). The Karbi people cultivate rice in the peripheral alluvial soil of the wetland. Besides agriculture, the wetland is used for aquaculture and fisheries by the SC communities that are guided by the forest and fishery department of Assam to reduce the stress of fishing directly in the wetland. The wetland is beneficial for the livestock as the grass from the wetland is used as fodder for the livestock. From fodder of animals, Deepor Beel contributed around 16,92,000 INR (Dutta, J.,2017). The villages collect firewood from the wetland and the Garbhanga forest adjacent to the wetland. In the Patgaon villages, almost 82 per cent of the population is engaged in gathering firewood from the forest. The wetland is a major source of water for the nearby villages and animals especially elephants from the Garbhanga forest (Saikia J L, 2019). Every day each family collects around 25-30 kgs of firewood from the Garbhanga forest (Dutta J,2017).

The wetland has hydrological advantages as it acts as a major drainage basin for the stormwater run-off through the inlet Mara-Bharalu and the Basistha Bahini and the outlet of the Khanajan River. The wetland offers cultural value as during Bihu community fishing is performed. Apart from Bihu, the wetland is being worshipped by the fishermen community as they offer prayers and Navedya in the wetland. The agricultural fields adjacent to the wetland, during Kati Bihu offering Navedya is a general practice. The wetland offers recreational benefits as different people come to visit the area for migratory birds, photography, leisure walks, evening gathering, picnic party etc. As this wetland is home to 232 bird species it has been declared an Important Birds area. Tourism activities in the wetland are at an infant stage with few homestays and resorts present near the wetland. The few local shops selling coconut water, tea, roti sabji etc. are present near the wetland run by the locals. Boating in the wetland is a part-time business done by the local youth. The wetland was earlier used for transportation by the locals; still, this is practised during monsoon time when the water level is high in the Deepor Beel wetland. The biodiversity of the wetland and environment provides the base of research and educational activities. Hundreds of research have been developed taking various dimensions of the wetland. The wetland is serving as a source of educational research for young researchers interested in wetlands and environmental research (Saikia JL, 2019). The wetland helps to bring social relations and intersection among the people during recreational trips, evening walks etc. The social interaction and participation of the locals can be observed during the time of boating, fishing, arrangement of picnics, Deepor Beel Mahotsav, Manasha Puja, community fishing during Bihu by the villagers.

The total economic value of Deepor beel wetland, for the year 2015-16 was calculated to be 12,03,45,941.42 INR, estimated after adding up non-use value (3,48,066.42 INR per year) and direct use value (11,99,97,875 INR per year) extracted from the wetland (Dutta J, 2017).

The Perceived Contribution of Wetland Services in the Quality of Life

The majority of the respondents know the importance of ecosystem services offered by the wetland. They have the knowledge that Deepor Beel wetland requires a conservation and management programme to restrict the degradation of the wetland.

When asked about their willingness to be a part of the conservation and management programme majority replied positively. There are few respondents mentioned that government is responsible for the conservation programmes and locals cannot be a part of this due to their lack of knowledge and expertise.

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Table 1.Perception of contribution of the wetland services in quality of life (in percentage)

Total no of Sample 124	I do not agree at all		Do not agree		Can't Say/Undecided		I agree		Strongly Agree	
	N	%	N	%	N	%	N	%	N	%
Do you feel Natural and cultural heritage of this area needs to preserve?	8	6.45	18	14.5	12	9.68	33	26.6	54	43.5
Advantage for Recreational value of the wetland	3	2.42	5	4.0	3	2.42	35	28.2	78	62.9
Perception Benefit from wetland services	9	7.3	11	8.9	8	6.45	13	11	83	67
Perception for eco sensitive zoning	43	34.6	28	22.5	10	8	28	22.5	15	12
Perception about benefit of health from wetland	5	4	13	10.4	14	11.2	15	12	76	61

Source: Field survey

Interviewed inhabitants agrees that the natural and cultural aspect of the area needs to be protected by 26.6% agreeing and 43.5% strongly agreeing with the statement. Almost 63% of the interviewed strongly perceived the wetland as significant for recreational benefit of the area. The respondents possess high perception about benefit from the wetland with almost 67% strongly agrees to have wetland benefits. The perception about eco sensitive zoning is alarming as almost 34.6% of respondents strongly disagree, 22.5% disagree with the concept of eco sensitive zoning. Almost 61% of the respondents strongly agrees followed by 12% that agrees the contribution of the wetland in health. Survey shows that female respondents are more concern about the health benefits as 72% agrees wetland benefits.

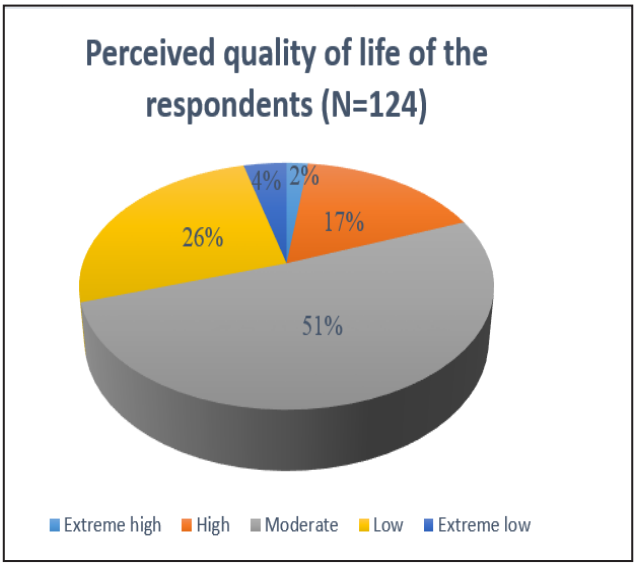

Figure 2.Perceived quality of life of the respondents

Source: Primary Study

The protection of a natural environment is highly related with the perception of the locals for conservation and protective measures. This is a positive sign for Deepor beel wetland is that, 70.1% respondent believes (including strongly agree and agree) that the wetland should be protected. When asked about the perception of happiness living near a wetland, nearly, 64% responded were happy and benefited from living near a wetland.

The female respondents are more positive than the male respondents. The findings show that the young population are happier, satisfied and possesses a positive outlook about their locality as compared to the adults. Most of the respondents have followed a moderate view and marked their quality of life within the range moderate (51%) and High (17%), Low 26%, Extreme low (4%), Extreme high (2%). When combined the moderate and high figures comes up as 68% which is a satisfactory figure. This shows that despite of having different issues from the urbanisation, changing livelihood and social aspects of life the respondent's stills believes having a decent quality of life. The finding implies that people living around the wetland are happy and satisfied with their life.

Conclusion

The analysis shows that there is high perception of contribution of wetland services to the overall quality of life of people. Among the respondents 67 percent strongly agrees, 11 percent agrees, 6.5 percent are neutral, 8.9 percent disagrees, 7.3 percent strongly disagrees with the contribution of wetland services and resources to the quality of life. At the same time despite having low rate of literacy, majority 43.5 percent understand the importance of conservation and management of the wetland. The villagers are optimistic about their participation for the

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conservation and management projects. These findings will be significant for the future conservation project to design the project as participatory, taking contribution from the local residents. From the perception study inference can be drawn that majority of people understands the environmental, socio cultural, recreational and economic contribution of the wetland in their quality of life. The positive perception of contribution of wetland services in the overall quality of life is an important criterion for the success of future conservation and management programmes.

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