Sustainable Strategies for Management of Protected Areas- case of Okhla Bird Sanctuary, Delhi.

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Abstract

Protected areas (PAs) are the geographical regions recognized to achieve the long-term conservation of nature with associated ecosystem services and cultural values (Keenleyside et al., 2012). The present scenario of majority of protected areas reflects the negative face of the development which leads to stress in ecological areas due to lack of management and monitoring. Urban growth and industrial development in Indian cities of Delhi and Gautambudh Nagar have an uncontrolled increase in built up areas. These activities ultimately have put an adverse impact on the ecology of Okhla Bird Sanctuary (Urfi, 2003). This study deals with recommending sustainable strategies based on Ecosystem Approach to prevent degradation of Protected area.

Keywords: Protected Area, Urbanization, Ecosystem Approach, Bird Sanctuary, Migratory Bird Species.

1. Introduction

The increased development in urban areas not only boosts the nation’s economy but is also accountable for various undesirable occurrences and consequences thereof. There is an increased demand for land as more and more people migrate towards urban areas (Sankhe et al., 2010). Spearheading cut-throat competition, technology innovation and rapid urbanization at times make us forget about their possible adverse impacts on nature and its services. Retrenchment of available green spaces has resulted in deterioration of wildlife species, destruction of habitat areas which in the long run accountable for ecological unbalance (Mehra et al., 2016). In order to acquire land for basic needs viz. providing the residential areas, commercial areas and other land use purposes, the land use transformation consumes the green spaces and agricultural land to give way for development activities.

Okhla Bird Sanctuary located on outskirts of Delhi and Gautambudh Nagar (Uttar Pradesh) is one amongst the notable bird sanctuaries in the country. A bird sanctuary is a wildlife refuge especially inhabiting the bird species. These natural reserves are a hub for the large variety of flora and fauna, thereby encouraging the wildlife conservation. This sanctuary has a manmade lake is a dominant feature covering nearly 273 hectares (68.23%) out of total area of 400 hectares. The lake was formed in 1986 after the construction of barrage on river Yamuna. This sanctuary is known for winter migratory bird species who visit this place every year. This bird sanctuary inhabits more than 320 bird species as well as migratory bird species (Mukherjee & Sarma, 2014). Protected area network of Uttar Pradesh Government on 8th May 1990 recognized Okhla Bird Sanctuary as a ‘protected area’ under the Wildlife (Protection) Act 1972 of India. Even the ‘protected areas’ are also getting effected due to the anthropogenic pressure on environment. The ecological balance gets disturbed in moving ahead towards more development. The biodiversity and ecosystem are facing impacts which needs protection and conservation. This need can be fulfilled by an effective management system to maintain the protected areas and its environment.
2. Understanding Ecosystem Approach

Ecosystem approach is framed by ‘Convention of Biological Diversity’ (CBD) and this approach is mostly used in foreign countries. The Convention of Biodiversity (CBD) has used this approach as a framework for achieving the objectives i.e., conservation; sustainable use; and the fair and impartial sharing of the benefits from the utilization of natural resources (CBD, 2004). This approach is a goal driven development approach which encourages the amalgamation of social, economic and ecological factors. As defined by CBD, ecosystem approach is a strategy for the integrated management of land, water and living resources that promotes their conservation and sustainable use in an equitable way (CBD, 2004). Although this approach is not practiced in India at great extent but through this approach management of all such areas can be regulated in an equitable and productive way which the current policies and guidelines for protected areas has not yet achieved. The implementation of ecosystem approach depends on local, provincial, national, regional or global circumstances.

Figure 1: Map of Okhla Bird Sanctuary with Surrounding area within 5 km buffer.

Figure 2: Map showing habitat areas in Okhla Bird Sanctuary.
3. **Study Area**

The study area encompasses the 5 km buffer around Okhla Bird Sanctuary (OBS) (Figure 1). This protected area is also known as an important bird area (IBA) as identified by the Bombay Natural History Society (BNHS). The bird sanctuary of Okhla is featured with water body (273 hectares), reed beds and sand beds (97 hectares) and the rest of the area with roads and bunds (30 hectares). The sanctuary includes wetland (covering an area of 4 square km) which was formed after the construction of Okhla barrage over river Yamuna, at the inter-state boundary of New Delhi and Uttar Pradesh. A part of this sanctuary comes under Zone “O” of Master Plan of Delhi, 2021 (MPD 2021). This man-modified flood plain wetland acts as an perfect winter hub and transit ground for migratory birds species visiting every winters (Mukherjee & Sarma, 2014). As a part of this study, it has been tried to spatially map out the main habitat areas in the wetland in ArcGIS platform (Figure 2), for further understanding the spatio-temporal environmental impacts of the high-density surrounding development on the protected area of Okhla Bird Sanctuary.

Based on prioritization of the magnitude and significance of the various impacts of the surrounding development, selected environmental impacts have been discussed in the study which include water pollution (CPCB, 2006), air pollution (DPCC, 2017) and vibrations. Also, during the study it has been observed that there has been a significant decline in species count, which may be directly attributed to the fast-paced decline in lack of food sources for birds and disturbed habitat spaces.

4. **Issues, Threats and Implications**

All the natural resources and living organisms present inside the bird sanctuary have been facing survival issues due to these impacts. To overcome these issues, there are techniques and processes which can be implemented for prevention of upcoming impacts and protection of biodiversity in protected areas.

The prime issues identified in the study area are:

- At Okhla, the total coliform was always found violating the threshold limits by a significantly high margin. The recorded count is 3,30,000 -16,00,000 MPN/100 ml (CPCB, 2006) as compared to prescribed standard of 500 MPN/100 ml. This has resulted in loss of water bird habitats; poor growing aquatic and terrestrial plants, insects and invertebrates living in bird sanctuary wetland.
- The degraded water quality has resulted in poor health of birds and other species.
- The air quality levels of particulate matter (PM) for summer and winter seasons are 721 and 635 µg/m$^3$ (for PM10), and 412 and 433 µg/m$^3$ (for PM2.5) respectively (DPCC, 2017) as compared to minimum standards. This shows severely deteriorated air quality all through the year.
- According to the DPCC data of June 2008 to January 2009 the ‘noise levels’ exceed standard levels, thereby disturbing the wildlife, especially the bird species.
- Electro-magnetic radiations and buzzing sound caused by electric current flowing through the high-tension line passing through Okhla Bird Sanctuary have threatened the birds and their nearby habitat areas.
- Less food availability, narrowing of river channel width, reduction of agricultural land, and green spaces has become evident as nearly 33% area increase in built up area and around 23% decrease in agricultural land has been recorded. The inhabited residential areas are marked by low share of green area, averaging up to 4%.
- An increase in nesting mortality has been a reported (Ricklefs, 1969) as a result of significantly high presence of heavy metals in air.

5. **Recommendations**

Based on the principles of Ecosystem Approach under the Convention of Biodiversity, the sustainable strategies for Okhla Bird Sanctuary have been developed to manage the PA using Ecosystem Approach. The formulation of recommendations for Okhla Bird Sanctuary is framed in three phases, which include – issue-based proposals, policy framework and institutional framework for maintaining, safeguarding and monitoring the Okhla Bird Sanctuary environment from the identified effects. The outline of select principles based on which the recommendations are framed out are – (1) rank ecosystem services; (2) distinguish the ecosystem limits; (3) operate at a fitting scale, spatially and temporally; (4) management for the long–term, and consider delayed effects; (5) accept change as integral and unavoidable, and (6) balanced usage and protection (CBD, 2004).

5.1 **Issue Based Proposals**

Following are the recommendations for mitigating and resolving the threats and adverse implications of the respective issues.
**Bioremediation:** To overcome the water pollution coming from river Yamuna which is emerging due to flow of untreated effluents from industries and treatment plants upstream, one effective, ecologically efficient and economically sustainable pollution control method is bioremediation. This is the process in which the living organisms, primarily microorganisms (naturally occurring bacteria and fungi, ideally indigenous), or plants are used to detoxify the environmental contaminants into less toxic forms to human health and/or the environment. The microbial culture once developed in waterbody can be utilized for longer time span. The microorganism’s cultures with strong oxidizing capacity need to be cultivated for six weeks in the process of bioremediation. The bacteria used in this purpose are pseudomonas, alcaligenes, and rhodococcus have degradative capabilities (Shah, 2014).

**Aqua bio-filters:** The aqua bio-filter is an inimitable bio-filtration service which purify the storm water, wastewater, ponds, lakes, dams and aquaculture water. It can be used in different ways as floating reed bed, floating wetland and floating habitat islands (Sridevi et al., 2013). This process is used for specific pollutant reductions and also enhances birdlife and aquatic species life.

**Plantations for Air Purification:** The air quality of Okhla Bird Sanctuary is degraded due to industries and heavy traffic roads in its surrounding area. For this climatic region, there are varieties in air purifier plants which may be considered for low plantation and ground coverage such as lady palm, bamboo palm, peace lily, boston fern, aloe vera, weeping fig, rubber plant, snake plant, spider plant, dragon plant golden pothos etc. For the purpose of air purification in the bird sanctuary, trees species like Mangifera indica, Dillenia indica, Michelia champaca Salyx babylonica, Eucalyptus eostata, Saraca indica, Ficus benjamina, Nyctanthesarboritristis, Thespesia populnea, Acacia auriculiformis, Alstonia scholaris, Butea monosperma, F. benghalensis, Madhuca indica, Pongamia glabra, Terminalia arjuna, Bombax ceiba, and Ficus religiosa can be planted on the outer periphery of Okhla Bird Sanctuary.

![Figure 3: Different kinds of aqua biofilters in wetland ecosystem.](image)

![Figure 4: Types of Noise barriers. a) Transparent noise barrier, b) Noise barrier with vegetative cover, c) and d) Noise absorbing steel barriers with perforated surface and absorbing material.](image)
Vegetative Barriers: Noise pollution in the sanctuary is mainly generated through the movement of vehicles and heavy traffic on surrounding roads - DND flyover, extension of Kalinda Kunj road. Sound barriers (as shown in figure 3) like tree plantation can be recommended to mitigate the noise pollution levels here. Moreover, the plantation will also provide food and habitat for birds living in the sanctuary. Also, it will enhance the aesthetic beauty and improve the quality of environment.

Use of Insulators: The HT line along the road of Okhla Bird Sanctuary cannot be relocated, so insulators can be used instead, which can absorb the vibrations. There are different types of insulators that can be installed to mitigate the vibration levels like porcelain insulator, glass insulator, polymer insulator etc.

The different habitat areas in the Okhla Bird Sanctuary (as shown in Figure 1) also depicts the situation and quality of environment for birds. These habitat areas are drastically affected by human interventions. By providing the mitigation measure elaborated above and spatially mapped in study area (Figure 4) can help to reduce the impacts, enhance the recreational value of the bird sanctuary and provide safe and healthy habitat areas inside the bird sanctuary. The mitigation strategies suggested above will help in preventing the decline in species counts of flora and fauna and safeguarding the sanctuary. In addition, pollution testing systems which can monitor pollution levels of Okhla Bird Sanctuary time to time, can be established to regularly check the environmental quality.
5.2 Policy framework for Protection of Environment and Biodiversity in Okhla Bird Sanctuary

Migratory Birds Protection Act (MBPA): Okhla Bird Sanctuary is one of the specific spots which still remain home for many migratory birds in winter season in this region. These birds are the main attraction for tourist visits to the bird sanctuary. The environmental impacts presented in this paper are also negatively affecting the migratory birds and their migration pattern. These environmental consequences have led to reduction in bird species and population, and diversion of movement corridors or routes to other places, as observed and quoted by ornithologists and environmental activists. For protection and preservation of bird species, there is no ratified precise law, rules and regulations. So, there is need of special regulations for bird preservation which focus particularly on migratory species. As an example, Migratory Bird Convention Act (MBCA) is a Canadian law established in 1917 which was later revised in 1994 (Justice, 2009), and Species at Risk & Regulation (SARR), similar to the Canadian law (1917) ‘Species at Risk Act’ are Canadian legislations that can be considered to be enacted in India for protection of migratory birds, preferably at the national level. This act shall aim to establish an authority to regulate protection and conservation of migratory birds as populations and individual birds and their habitats. The laws can even specify the closed season as during breeding periods of birds, make necessary provisions in bird sanctuary to attract people and hold awareness camps or trips to introduce about the birds and motivate people for contribution in conserving them, prescribe the prohibitions and permitted hours for entrance of locals and cattle grazing etc. In India, even though the Wildlife (Protection) Act 1972 discusses regarding protection of species, specific regulations for bird species including the permissible and non-permissible activities, zonation within the sanctuary etc. can be separately chalked out at the bird sanctuary level.

5.3 Institutional Framework

There arises a need for a management and monitoring authority which can implement the environment management plans, monitor the quality of environment and carefully inspect the activities with respect to impacts and development in and around Okhla bird sanctuary. For serving this purpose, an Institutional Framework may be established with powers distributed and integrates the functioning of other agencies such as Resident Welfare Associations (RWAs), NGOs, real estate agencies and concerned development and management authorities. Prescribed authority will have the charge of bird sanctuary which comes under Ministry of Environment, Forest and Climate Change (MoEFCC). This Institutional framework is outlined based on these two principles of ecosystem approach i.e., “Bring all knowledge to bear and involve all relevant stakeholders”. For development, monitoring and management of Okhla Bird Sanctuary, an authority can be established with the help of this framework which only deal with the protected area concerns. Influencing factors while devising the framework are decision makers, earlier judgements (precedents), investigations, inspections made by the regulatory authority etc. By implementing this kind of framework in OBS, the management can surely be enhanced which provide quality life for birds and other species, encourage the visits of migratory birds and enhance the recreation value of the bird sanctuary.

6. Conclusions

Being an Important Bird Area (IBA) and also recognized as a protected area, the Okhla Bird Sanctuary (OBS), topmost priority and due attention to resolve the various adverse impacts is solicited from the authorities. The aforesaid recommendations have been suggested to mitigate the impacts and to regain the deteriorated bird sanctuary environment. Application of ecosystem approach, as recommended in this study, will assist to maintain, monitor and safeguard the Okhla bird sanctuary and will also help to achieve nature conservation goals and sustainable environment in protected areas.

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