

Impact of Bashundhara Baridhara Housing Project on the status, abundance and species diversity of fish in Bashundhara Housing Lake in Dhaka, Bangladesh

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Abstract

A study on the status of fisheries and environmental impact assessment (EIA) was conducted on Bashundhara Baridhara Housing Project (BBHP), Dhaka, Bangladesh for prediction and measure the effects of housing project related development activities that have already been implemented and planned for future implementation. The project is still under development phase and so far allotted 10,000 plots of different sizes. The study shows that the original water bodies and natural fish production there from have greatly declined due to earth filling carried out for development of land for the housing. The physico-chemical parameters of the existing water body within the project area were found to be suitable for fish farming in the estate. A number of economically important fish species are found available in the existing lake. However, the natural fisheries resources of the existing lake is under great stress due to the changes made in the ecosystem, siltation, construction of building and dumping of house building and household waste materials. This has caused some important fish species of the lake to become critically endangered and vulnerable which have been documented in this paper. Appropriate regulatory and mitigating measures with respect to water management, disposal of construction garbage and other biomedical toxic substances far away from the water bodies are required to be taken to keep the water safe and suitable for fish production as well as for multipurpose use of the lake water.

Key words : Fisheries, Environmental impact assessment, Housing project

Introduction

Bashundhara Baridhara is one of the largest private housing projects undertaken by East-West Property Development PL in the Dhaka city. East-West Property Development PL Bashudhara was launched in 1988 initially as a real estate developer and later it expanded its business into other industrial sectors including manufacturing and trading. Over the past two decades, its contribution to the development of urban housing and civic amenity creation has been amazing. In keeping with the rapid population growth in the metropolitan Dhaka mega city, Bashundhara has stretched

itself to cover new boundaries and responded effectively to the long-term needs of the residential facilities of the evergrowing urban population. Keeping this in view, the Bashundhara Baridhara Housing Project (BBHP) was undertaken to develop it as an ideal housing complex with the following major objectives: i) develop Bashundhara Baridhara as the biggest housing apartment project as approved by the RAJUK (Capital City Development Authority) as an ideal residential area for the Dhaka city dweller, ii) create a pollution free environment within the project area, iii) provide a highly secured area for the housing community, and iv) develop all kinds of essential civic facilities including School, College, University, Children Play Ground, Amusement Park, Mosque, Shopping Mall, Modern Hospital, Police Barrack, etc. The project size is still growing. So far, it has allotted over 10,000 residential plots and 1,000 apartments to the interested people. Plots have also been allotted for schools, universities, hospitals, supermarkets, etc. These institutions are now gradually being built. However, the implementation of such a large housing project in the name of Bashundhara in the low-lying area in the northern part of Dhaka city has affected the environment, land and fisheries resources. Therefore, Environmental Impact Assessment (EIA) was required to be done before planning such project.

Fish in addition to a good source of nutrition, is playing an important role in the economic development and poverty reduction. So, there is a need to protect and achieve the benefit of this resource by scientific management (Mazid 2002). But to satisfy the increasing demand for housing for rapidly increasing population of Dhaka city, rapid emergence of housing estate development projects has taken place. These housing projects in many cases contributed to negative impact on the environment and declined the natural fisheries resources. Unfortunately, assessment of impact of private housing projects on fisheries has so far not been made anywhere in Bangladesh. Under these circumstances, School of Environmental Science and Management (SESM), Independent University, Bangladesh (IUB) with the assistance of Bangladesh Fisheries Research Institute (BFRI) attempted to conduct an EIA and to study the effects of Bashundhara Baridhara Housing Project on fisheries resources and to suggest an appropriate management approach to compensate the loss of fisheries and to improve the environment.

Materials and methods

The Bashundhara Baridhara Housing Project is a sandy loamy area being developed in Ander Tack (presently called Balurchar) located to the north of Bashundhara diplomatic zone in Dhaka metropolitan city. Originally, this was a low-lying area most of which remained submerged during whole of the rainy season. There was a lake and many other depressions in the low-lying area of the project which were connected with outside water bodies through several connecting canals. When the housing authority started acquisition and filling up the land to make the project area suitable for housing, the wetland character of the area started losing due to dredging from the lake for development of the adjoining wetlands. As a result, a large part of the lake and connecting canals have already been filled up. Now, the lake has lost all its connectivity

to outside water bodies, which has hampered natural propagation of fish due to blocking of breeding migration. The present area of the lake now retaining stands only about 40 ha with depth ranging from 0.2-2.5 m is connected only with the Bashumoti canal, a part of which falls outside the Bashundhara project area. Presently, it is an unmanaged water body and so far no initiative has been taken for the development of fisheries. Before acquisition of the land for real estate development, fishing was an important activity for livelihood of the local poor people. Local people are presently cultivating rice in Boro season and vegetables (pumpkin, tomato, sweet potato, water melon, etc) in the dry season and catch fishes in the rainy season in a much lesser extent.

The study was conducted during the month of October and November 2005. It was designed to analyze the present status and future prospects of fisheries and how the existing and proposed water bodies (ponds/lakes created and to be created as per BBHP Master Plan) could be better managed for fish production and maintaining a healthy and fresh environment for comfortable living of the residents of the housing project. The project area is quite secured and has little access to outside common people. However, access to water bodies was obtained for the purpose of this study.

Physico-chemical parameters, viz., temperature, transparency, pH, dissolved oxygen, total alkalinity and ammonia of the existing lake in the Bashundhara Housing Project were directly measured in three different locations at an interval of 7 days between 9.00-10.00 am during the period of the study. In two months, ten samples of fish and waters were collected. Temperature was measured by centigrade thermometer, transparency by secchi disc, dissolved oxygen by digital DO meter and pH by digital pH meter. To estimate the alkalinity and ammonia, water samples were collected from 3 different sampling stations of the lake and brought to the water quality testing laboratory of the Bangladesh Fisheries Research Institute (BFRI), Mymensingh. The tests were carried out following standard methods (APHA 1995). Fish samples were collected every week from the lake and as well as from the local fishermen who still occasionally fishes in the lake. Collected fish samples were preserved in ice and taken to BFRI for identification and study species diversity. Information on the abundance of fish in the past and the present trend of the resources was also obtained through interviewing the local people. Basic information on the Bashundhara Baridhara Housing Project and its future development plan was obtained from the BBHP project brochure.

Results and discussion

Physico chemical parameters of the existing water bodies

The results of the physico-chemical parameters of the lake water monitored during the period of the study are presented in Table 1. The values of dissolved oxygen, pH, alkalinity and ammonia as obtained in different places of the lake throughout the study period were found to be within the acceptable levels for fish culture (Dewan *et al.* 1991, Ahmed 1993, Wahid *et al.*, 1997, Kohinoor *et al.* 1998).

Table 1. Physico-chemical parameters of the lake in Bashundara Baridhara Housing Project

Water quality parameters	Sampling Stations		
	1	2	3
Water depth (m)	0.20 - 0.90	1.00 - 1.90	2.00 - 3.00
Water temperature (°C)	30.70 - 32.00	30.70 - 31.50	30.70 - 31.50
Transparency (cm)	32.00 - 38.00	30.00 - 39.00	32.00 - 40.00
pH	7.34 - 7.57	7.34 - 7.57	7.25 - 7.67
Dissolved Oxygen (mg/l)	4.00 - 6.60	4.66 - 6.50	5.00 - 6.60
Alkalinity (mg/l)	130 - 240	120 - 230	130 - 250
Ammonia (mg/l)	0.50 - 0.72	0.45 - 0.66	0.45 - 0.77

Previous and present status of fish and fisheries and its diversity

It is earlier mentioned that as the lake and depressions have lost links to the adjacent river as a result of housing related activities, opportunities for natural propagation and production of fish have greatly reduced. But dredging of the existing lake for development of the project areas has given perennial nature to the lake creating scope for scientific fish culture. However, the housing authority as yet has no plan for fish culture. Under this circumstances, whatever fish normally grows in the lake are caught by the local poor people for consumption and selling. In order to study the catch composition and species biodiversity, fish samples were collected directly from the lake. Besides, samples were also purchased from the catch of the local fishermen and conducted study for catch composition and species identification. Information on the abundance of fish in the past and the impact of the project on fisheries were collected through interviewing the local people and fishermen. The list of major species of fish as recorded during sampling with their local and scientific names is given in Table 2. Based on the result of the catch composition of the 30 species recorded, the most abundant species were found to be *Channa beculis*, *Amblyphrynogodon mola*, *Rasbora rasbora*, *Macrobrachium rudii*, *Channa punctatus*, *Channa orientalis* and *Glossogobius giuris*. The second category in order of declining abundance includes *Anabus testudineus*, *Mastacembelus pancatus*, *Labeo rohita*, *Catla catla*, *Cirrhinus mrigala*, *Lepidocephalus guntea* and *Xenentodon cancila*. The least abundant species were found to be *Puntius sarana*, *Puntius sophore*, *Mystus tengra*, *Ompok pabda*, *Mystus cavasius*, *Ailia coila*, *Nandus nandus*, *Channa striatus*, *Colisa fasciatus*, *Clarius batrachus*, *Heteropneustes fossils*, *Labeo calbashu*, *Notopterus notopterus*, *Notopterus chitala* and *Botia dario*.

In further analyzing the data including the information obtained from local people on the abundance of fish, they were categorized as endangered and critically endangered (Table 2). Of the eighteen species whose abundance was declining and is under threat have been categorized based on IUCN (2000) method as endangered and critically endangered. Species recorded as endangered are *Puntius sarana*, *Ompok pabda*, *Mystus cavasius*, *Ailia coila*, *Colisa fasciatus*, *Labeo rohita*, *Labeo bata*, *Kuria labeo* and *Botia dario* and critically endangered are *Nandus nandus*, *Badis badis*, *Labeo rohita*, *Catla*

catla, *Cirrhinus mrigala*, *Labeo calbasha*, *Notopterus notopterus* and *Notopterus chitala*. As a result, natural fish population has declined in the lake. So, excavation of a link canal to ensure breeding migration of fish or to undertake scientific aquaculture is required to compensate the loss of production caused by the housing project in the wetland.

Table 2. Fish species available in the Bashundhara Baridhara Housing Project lake

Sl. No.	Local name	Scientific Name	Abundance
1	Sharpunti	<i>Puntius sarana</i>	+
2	Titpunti	<i>Puntius sophore</i>	+
3	Tengra	<i>Mystus tengra</i>	+
4	Pabda	<i>Ompok pabda</i>	+
5	Gulsha	<i>Mystus cavasius</i>	+
6	Kajoli	<i>Ailia coila</i>	+
7	Koi	<i>Anabas testudineus</i>	++
8	Vedha	<i>Nandus nandus</i>	+
9	Shol	<i>Channa striatus</i>	+
10	Taki	<i>Channa punctatus</i>	+++
11	Cheng/Raga	<i>Channa orientalis</i>	+++
12	Kata chanda	<i>Chanda beculis</i>	+++
13	Kholisha	<i>Colisa fasciatus</i>	+
14	Tara Baim	<i>Macrognathus aculeatus</i>	+
15	Guchi Baim	<i>Mastacembelus pancatus</i>	++
16	Magur	<i>Calarius Batrachus</i>	+
17	Shing	<i>Heteropneustes fossilis</i>	+
18	Mola	<i>Amblypharayngodon mola</i>	+++
19	Drakina	<i>Rasbora rasbora</i>	+++
20	Gora chingri	<i>Macrobrachium rudii</i>	+++
21	Rohu	<i>Labeo rohita</i>	++
22	Catla	<i>Catla catla</i>	++
23	Kalibaush	<i>Labeo calbasha</i>	+
24	Mrigal	<i>Cirrhinus mrigala</i>	++
25	Foli	<i>Notopterus notopterus</i>	+
26	Chital	<i>Notopterus chitala</i>	+
27	Gutum	<i>Lepidocephalus guntea</i>	++
28	Bale	<i>Glossogobius giuris</i>	+++
29	Kakila	<i>Xenentodon cancila</i>	++
30	Rani	<i>Botia dario</i>	++

Note: + Least abundance, ++ Moderate abundance, +++ Normal abundance

Because of the natural and man induced phenomena occurring in aquatic ecosystem, the natural breeding and feeding grounds of some of the important floodplain and riverine fishes and their habitats have been severely degraded. In addition, indiscriminate and destructive fishing practice have caused devastating effect to the

aquatic biodiversity (Hussain and Hossain 1999). Recent estimates suggested that worldwide 20% of all freshwater species are extinct, endangered or vulnerable (Moyle and Leidy 1992.). According to the report of the local community living around the BBHP, some species of fish of the Bashundhara lake are either extinct or in the verge of extinction (Table 3) due to reduction and filling of the wetland area, changing aquatic ecosystem, heavy siltation and soil erosion and dumping of house building and road construction materials causing ecological hazards for fishes. Bashundhara project authority should take appropriate corrective measures to prevent further degradation of land and water to improve the status of fisheries resources and the environment.

Table 3. List of important endangered and critically endangered fish species reported in the Bashundhara Baridhara Housing Project lake

Sl. No	Local Name	Scientific Name	Critically Endangered	Endangered
1	Sharpunti	<i>Puntius sarana</i>		X
2	Pabda	<i>Ompok pabda</i>		X
3	Gulsha	<i>Mystus cavasius</i>		X
4	Kajoli	<i>Ailia coila</i>		X
5	Vedha	<i>Nandus nandus</i>	X	
6	Napid koi	<i>Badis badis</i>	X	
7	Kholisha	<i>Colisa fasciatus</i>		X
8	Rohu	<i>Labeo rohita</i>	X	
9	Catla	<i>Catla catla</i>	X	
10	Kalibaush	<i>Labeo calbashu</i>	X	
11	Mrigal	<i>Cirrhinus mrigala</i>	X	
12	Bata	<i>Labeo bata</i>		X
13	Vhangan	<i>Lebeo reba</i>		X
14	Gonia	<i>Kuria labeo</i>		X
15	Foli	<i>Notopterus notopterus</i>	X	
16	Chital	<i>Notopterus chitala</i>	X	
17	Rani	<i>Botia dario</i>		X
18	Lal chanda	<i>Pseudembassis ranga</i>		

Note: X indicates the status of species in the respected category

Lakes and reservoirs to be created in future

The concerned Housing Project authorities informed that they have a plan to excavate 3 more reservoirs with a total area of 10 ha within the project area for recreational and commercial fishing purposes for the benefit of the community of the housing. Implementation of such plan is expected to compensate the loss caused by the project to fisheries and environment.

Future prospects of fisheries development in the project area

Creation of three more reservoirs along with the existing lake will certainly provide wonderful opportunity to develop environment friendly scientific fish culture. Adoption of following fish culture technologies in such water bodies by the housing authority will help to derive additional economic and nutritional benefit to the project authority and the people to be residing in the project area. The following aquaculture technologies are recommended as appropriate for adoption:

- Pen/cage culture
- Polyculture of carps and freshwater prawn
- Culture of monosex tilapia
- Culture of tilapia and silver barb
- Polyculture of pangasius with carps

Plantation and miscellaneous activities

It is observed that the entire project particularly the vacant area has no plantation. Sufficient trees are required to be planted to maintain a cool and healthy environment. Sewage and waste treatments are required to be developed for hygienic disposal.

Economic evaluation of fisheries

The above fish culture technologies can be applied on community-based approach by organizing the housing residents. If above mentioned improved aquaculture technologies be properly applied in the existing 40 ha and proposed 10 ha of water bodies in the Basubndhara project, it is estimated that a total of about Tk. 20-25 lakhs can be earned each year as a net profit. Normally in a scientific fish culture, the inputs required per hectare of water body as fish fingerlings, feed and management cost comes to about Tk. 150,000 and the sale proceed assuming an average production 5- 6 tons of fish /ha with an average price Tk. 70/kg comes to Tk. 350,000. So, the net profit per hectare of water body stands at about Tk. 200,000 which is highly remunerative compared to other agricultural activities.

Conclusions

Bashundhara Baridhara Housing Project has caused alteration of the wetland ecosystem of the area. As a result, natural fish production has declined both in abundance and diversity affecting livelihood and nutrition of the surrounding people. The present lake within the project has potential for fish culture which can compensate the loss. However, the lake has a risk to be polluted by dumping of house building materials and biomedical products needs proper attention. Suggested aquaculture technologies have great potential to be used for commercial as well as for recreation purpose. Technical training on fish culture would help the housing residents to initiate fish farming following community-based approach.

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