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Urbanisation Impact on Local Water Bodies: A Case Study of Northern Gurgaon City Ponds

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Abstract Urbanisation in India has brought some positive changes including improved infrastructure, better facilities, and so on. There are some adverse impacts also, and changes in land use are one of them. In the rapid pace of urbanisation, some small but very significant land uses, are lost. In the horizontal expansion of urban areas, the surrounding villages are brought under urban limits and converted into the concrete jungle. Ponds, one of the important land use of village life, are lost in this blind race of urbanisation. The fast pace of urabanisation has changed the land use in Gurugram and surrounding area dramatically. The ponds of these villages have been lost in the process and adversely affected the drainage of the area. The present paper attempts to highlight the loss of some ponds located in selected villages of Gurugram Urban Area. These ponds are traced out from the available topo-sheets of the survey of India along with the local drainage pattern. Then with the help of satellite imageries of different time periods, an attempt is made to find out how the land use of these villages has changed using QGIS. With the changing land use, how gradually the ponds are lost and the drainage pattern is disturbed. The policy implications of loss of such water bodies in the process urbanisation will also be highlighted.

Keywords Urbanisation; land uses; ponds; satellite imageries; QGIS

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Introduction

A quick glance through the literature available on internet , indicates that there is no fixed definition of a pond. It is clear that a pond is of comparatively smaller size of water body formed due to natural depression or man-made. In Indian context, a pond is an essential feature of a village, which is either a low lying area where the rain water of the area gets accumulated or may be dugged out by the residents to collect rain water. It has been informed that in some cases, a pond is the main reason for the origin of villages at certain sites. This rain water collected in natural depressions or water brought from canals, plays a crucial role in the village life. In northern Indian villages, the ponds plays multiple functions for villagers. The villagers take their cattle to the ponds not only to quench their thirst but also allow them to enjoy a free swimming. Kids enjoy bath in the pond, learn swimming in the pond along their buffalos and play different water games. Generally, there is a large open area around the pond, used as playground or a place to pass free time. It provides water to wash clothes, to make dung cakes, and day to day activities. Ponds are the natural storage of rain water and protect the village from floods. In some villages when the pond overflows during rainy season, the surplus water is used for irrigation. In certain villages of Rajasthan, the pond water is used for drinking purpose only. Ponds are valuable from biodiversity point of view, and termed as a local ecosystem and local climatic modifier. Such important small water bodies, are either lost or completely neglected once a village is added to the urban limits.

A village land is generally composed of two components, one is Lal dora land, marked for residential dwellings, and the second one is surrounding agricultural land. There is a transitional zone between these two, common land, and a pond is generally found located in this part. Once the agricultural land is acquired by the local urban development authority, this common land is susceptible for land speculation. If the Panchayat is not alert enough, it will be gradually grabbed by the land sharks operative in the area. As a result these small water bodies essential for a village are put to different uses. After some years ponds will disappear from the landscape of the area. In this background the present paper attempts to study the loss of such water bodies due to urbanisation in Gurugram city of Haryana**.**

Objectives

The aim of the study is to understand the mechanism of the loss of water bodies in the process of urbanisation. So that the concerned policy implications can be highlighted. In this background the objectives of the study are:

- To find out the current status of the selected ponds in Gurugram city;
- To identify the process of change at different time period;

- To discuss the policy implication of loss of ponds (small water bodies) with respect to urban development and the urban villages.

Database and Methodology

The most authentic source of information about locations is toposheets publised by survey of India. So an attempt is made to digitise the ponds marked on the toposheet published in 1992. Then, their location is traced from satellite imageries of 5 different time periods to verify their location in 1977, 1988, 1999, 2008 and latest in 2017. By superimposing all these locations, an attempt is made to trace out the gradual changes in the land use of the villages, in general, and the ponds, in particular with the help of QGIS (an open source GIS software). The results are personally verified by visiting the sites of these villages to ascertain first hand information, and accordingly modified on the basis of information collected through field visits.

Study Area

To understand the mechanism of loss of water bodies in the process of urban development, a city which is currently developing at a rapid rate is required. Gurugram city located near National Capital City of Delhi, is developing at a fast pace due to agglomeration of national and multinational companies. As a result, there is continuously rising demand for land to accommodate corporate sector offices and residential premises. In this process, the land-use of number of villages was changed and brought into the urban limits. Five such villages, namely, Dundahera, Mullahera, Sirhaul, Nathupur, and Sikanderpur located along the south west border of NCT of Delhi are brought under urban limits. The ponds of these villages, located on the western slope of the Aravali's received drainage water during the monsoon period and forms a minor watershed. Ponds located in such villages are a fit case for the present study.

Figure 1 Location of the study area

Result and Discussion

The analysis of Landsat satellite imagery (MSS) of 1972 shows (Figure 2), 14 small water bodies can be identified by visual interpretation in these 6 villages and very less built up area. The toposheet published in 1992 verified the location of these water bodies and some of these are dry ponds (Figure 3).

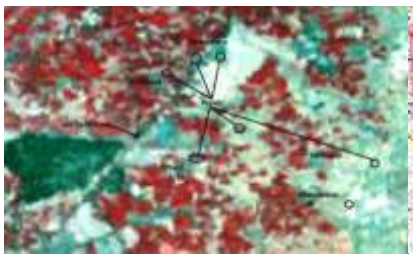

Figure 2

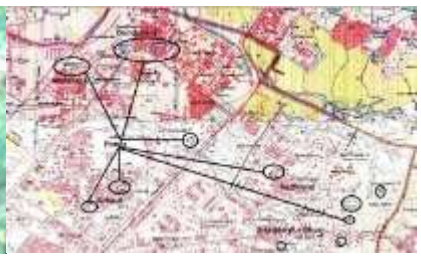

Figure 3

In Landsate image of 1988(TM), the ponds can be identified (Figure 4). In Landsat image of 1999(ETM) (need correction, nathupur is missing and sikander pur is repeated), these small water bodies are almost enclosed by built up area (Figure 5).

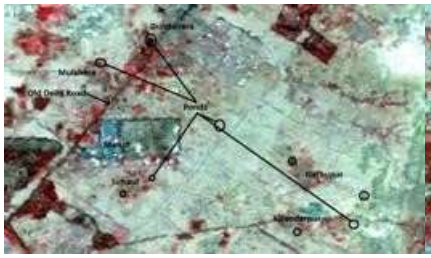

Figure 4

Figure 5

With an intense construction work after 2000 by real estate developers, the loss of these small bodies starts appearing in the successive images or Google satelite images. There are two main ponds in Nathupur village. The northern pond surrounded by built up area appears as a neglected and dry patch of land in Google 2008 image (Figure 6 a and b). In 2017 Google image the water body is lost and a some development work of a park is visible.

Figure 6 a and b shows gradual loss of Northern pond and development as a park.

Some vegetation starts growing around the southern pond of the Nathupur village and water covered area gradually start shirking towards the central part of the pond as shown in the Google satellite image of April 2008 (Figure 7 a and b). Some part of the ponds are developed as park as shown in Google satellite images of 2017.

Figure 7 a and b shows gradual loss of Southern pond and development as a park.

The Google images of 2008(Figure 8) and 2017(Figure 9) clearly shows how the pond of Sikanderpur Ghoshi is gradually neglected for some years and later on developed as a park.

Figure 9

Figure 10

Gradually, the entire areal expansion of Gurgaon started encroaching upon the agricultural land of the surrounding villages of Gurgaon town such as Gurgaon village, Dundahera village, Mulahera village. These were the villages located outwards from the Old Gurgaon to Delhi and close to the old NH8. By the year 1975, the sectors started being constructed were sectors 14 and 17 and these were placed outwards from the city core (towards Delhi).

Conclusion

Ponds are of utmost importance for rural life, have been degraded and encroached by the land grabbers, as and when the village is declared to be part of the urban developed area. The ponds of these five villages were also encroached by private builders. The loss of these small water bodies led to the loss of natural sources of storage of storm water, and the micro-watershed is disturbed, which results in water logging during rains. The villagers reported that with the loss of ponds they lost many things like common land, a place to gather in the evening, the surrounding open area where children used to play, and a source of water games. In the absence of ponds, they lost a means of their livelihood, as they cannot rear domestic animals. A quick glance at the master plans indicates that there is no mention of ponds in the master plans. In the concrete jungle of a city, the ponds play a significant role in maintaining the local biodiversity and microclimate. Therefore, it is strongly recommended to include these small water bodies in the master plans and all efforts should be made to preserve, conserve, maintain and improve the ponds.

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