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CHANGING LANDUSE OF BASNA NALA BASIN AND ITS IMPACT ON BIODIVERSITY IN PHAPHAMAU ENVIRONS

Bechan Yadav*

Abstract

All over the world urbanization and rurbanization are the twin processes bringing about drastic physical and cultural landscape alterations around the cities. This is also causing degradation in terrestrial and aquatic biodiversity. Drainage pattern, drainage mode and waterscape are also getting changed.

Basna drain is a tributary of holy river Ganga in the suburb of Phaphamau, Allahabad. The drain extends from 25^0 30' N to 25^0 40' N latitude and 81^0 45' E to 81^0 55' E longitude in Holagarh and Soraon Blocks of Soraon Tehsil, Allahabad district. It originates from a big pond near Holagarh. Basna drain passes through Phaphamau suburban area with 25 Kilometer length and 15.5 meter average width. The average depth of the drain is 2.97 meter and area of catchment of the drain is 1273.8 hectare in Phaphamau suburban region, which spreads over Malak Chaturi, Malakiya, Mohanganj, Singarpur, Gaddopur, Mata Din Ka Pura, Prasiddh Ka Pura, Shantipuram, Phaphamau Bazaar and Ganga Nagar. During October month average flow of the Basna drain was measured at three sites. At site no-1 flow was 0.56 meter/second near Ganganagar, at site no-2 flow was 0.80 meter/second near Mohanganj and at site no-3 flow was 0.65 meter/second near Malak Chaturi. This study in context with urbanization is of paramount significance environmentally. But the over-exploitation of the natural resources like biotic, pedogenic and land and water of the drain's basin area has led to a number of environmental problems in the region. At the same time land use change supplemented by various human activities has led to extinction of many plant and animal habitats and species. In this context the relevance of biodiversity for human survival is becoming a major environmental issue.

The rapid rate of urbanization exhibits that in coming days the Basna drain will shrink and be reduced into a polluted urban nala and the Basna nala will be losing all its aquatic

* (Research Scholar-S.R.F.), Department of Geography, University of Allahabad, Allahabad-211002

biodiversity i.e. fish, frog and other phyto and zooplanktons which are today an integral part of the trunk stream Ganga.

Hence in place of uncontrolled rapid growth of squatter settlement in Phaphamau suburban area a proper land use and resource planning should be formulated and implemented by government machinery in collaboration with local people. Local people of the study-area should be imparted environmental education and awakened to keep the environment and biodiversity of the study-area healthy for the coming generation.

Keywords: - Basna drain, Phaphamau suburban area, Human interference, Biodiversity loss.

Introduction

All over the world urbanization and rurbanization are the twin processes bringing about drastic, physical and cultural landscape alteration around the cities. This is also causing degradation in terrestrial and aquatic biodiversity. Drainage pattern, drainage mode and waterscape are also getting changed. The present study in context with the urbanization of Phaphamau suburb of Allahabad is of paramount significance environmentally. The over exploitation of the natural resources as biotic, pedogenic and land and water resources of the study area has lead to a number of environmental problems in nation and worldwide fringe area and the present study area. At the same time land use supplemented by various human activities has lead to extension of many plant and animal habitats and species. In this context the relevance of biodiversity for human survival is becoming a major environmental issue.

Basna drainage basin flowing in Soraon Tehsil and Phaphamau suburb of Allahabad has been selected as a study area. Basna drain is a tributary of holy river Ganga in the suburb of Phaphamau, Allahabad. The study-area extends from 25^{o} 30’ north to 25^{0} 40’ north latitude and 81^{0} 45’ east to 81^{0} 55’ east longitude in Holagarh and Soraon block of Soraon Tehsil, Allahabad. The Basna drain originates from a big pond near Holagarh. The Basna drain passes through Phaphamau suburban area. Its length is about 25km and average width is 15.5m. The average depth of the drain is 2.97m. Its total catchment area is 1273.8 hectare, which spread over Malak Chaturi, Malakiya, Mohanganj, Singarpur, Gaddopur, Mata Din Ka Pura, Prasiddh Ka Pura, Shantipuram, Phaphamau Bazaar and Ganga Nagar.

The study-area is sensitive Urbanalogically, agriculturally and environmentally because since 1973 the study area is witnessing rapid rate of urbanization and opening of near institutions and complexes in Phaphamau suburb. Simultaneously to fulfill the basic need of vegetables of urban people. There is growth of farms cape in the Basna drainage basin. Allahabad urban Planning by deciding the acquisition of 48 villages for urbanization has

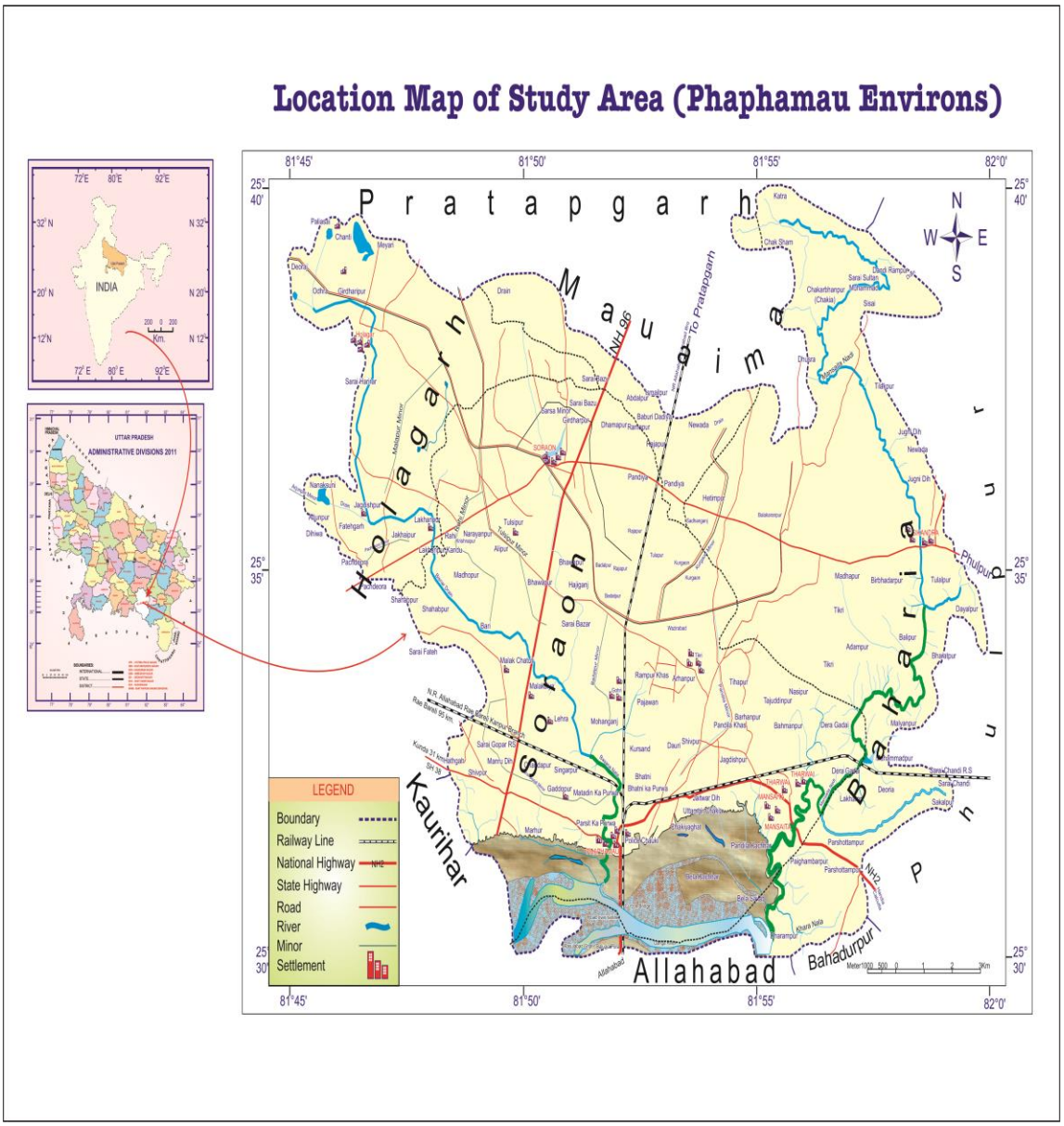
posed a threat to the fertile crop land which has been challenged by local farmer in Allahabad High Court but the adevour impact of urbanization and farmscape development on terrestrial and aquatic biodiversity explicit on the healthy environment of the study area which is continuously degrading.

Study Area

The study-area extends from 25˚ 25'N to 25˚ 35' N latitude and 81˚ 50'E to 81 57'E longitude. River Ganga and its tributary river Mansaita and Basna drain pass through this region. This region spreads over 31.45 km^2geographical area. Geomorphologically, the region is a segment of "Upper Ganga Plain" and particularly is known as a part of "Avadh Plain"(Lucknow Plain), which is one of the most important micro-physiographic units of "Great Plains" of North India. Geologically, the region is filled up with younger and older alluvial deposits. These deposits are comprised of caliches formation, buried soil layers and current soil layers in sequential order from bottom to top ranging from upper Pleistocene to Holocene periods. The main constituents of litho logy in the area are "Khather" and "Bhangar".

The alluvial soil of the area are still largely immature and are of little pedogenic evolution, but have encouraged geomorphic agent 'man' to establish a close relationship with nature, which is the earnest necessity of the present geological era 'anthropocene'.

The region enjoy mild monsoon climate with long hot summer (maximum temperature 41.82˚C and minimum temperature 24.91˚ C in May), medium rainfall generally from mid-June to mid-October (55.28 mm in June, 177.44 mm in July, 231.78 mm in August, 197.82 mm in September and 24.88 mm in October) and dry winter (maximum temperature 23.50˚C and minimum temperature 7.90˚C.



Map-1

Hypothesis

- Urbanization has impact on agricultural landscape.
- Agricultural has impact on land and water quality.
- Urbanization and agricultural development is degrading biodiversity.

Methodology

The following methodology has been adopted to collect process and analysis data and find conclusion and extend suggestion-

- Study from topomap and collect planimetric details like linear and areal data and altimetric information.
- To consult satellite imagery to upgrade planimetric and altimetric information.

- Different offices consulted to collect secondary data
- Primary data like water flow rate, land digging data, fisheries, and crop land data collected from questionnaire and personal observation based study area.

Result And Discussion

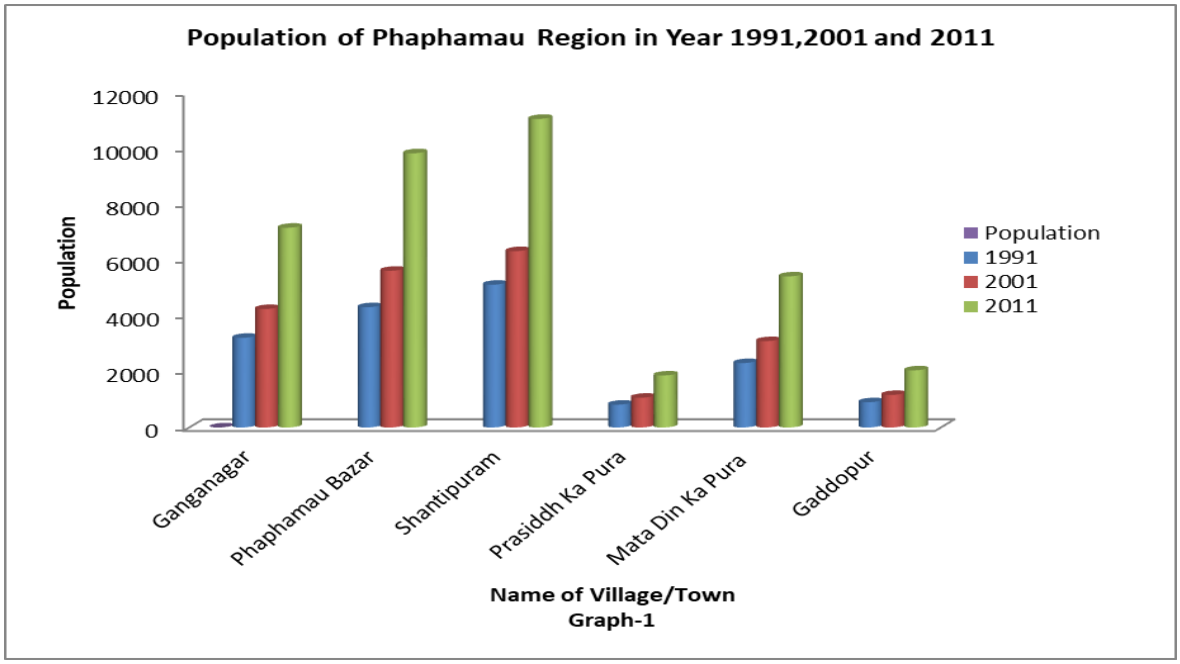
Old Phaphamau is located on the left bank of holy river Ganga to north of Allahabad city across the Ganga to the east of this village there is tri-junctions of railway station and tri-junction and state and national highway. From here rail and road line stretch to state capital Lucknow, religious capital of Avadh i.e. Faizabad and sacred place Varanasi. Hence between the two tri-junction came into existence Phaphamau town.

After rapid rate of urbanization in 1970s Allahabad development Authority acquired the non-agricultural badland of Phaphamau surroundings, Phaphamau village and Phaphamau town. This area in 1971 was located to the north of the Ganga River in 1971 to accommodate the urban population of the Allahabad city in new residential colony was proposed, which could not be materialized due to local unsocial element. But in 1991, when a camp of Rapid Action Force (RAF) was established there both government and private sector residential and commercial settlement started coming into existence. The name of Shringverpuram colony was renamed as Shantipuram colony.

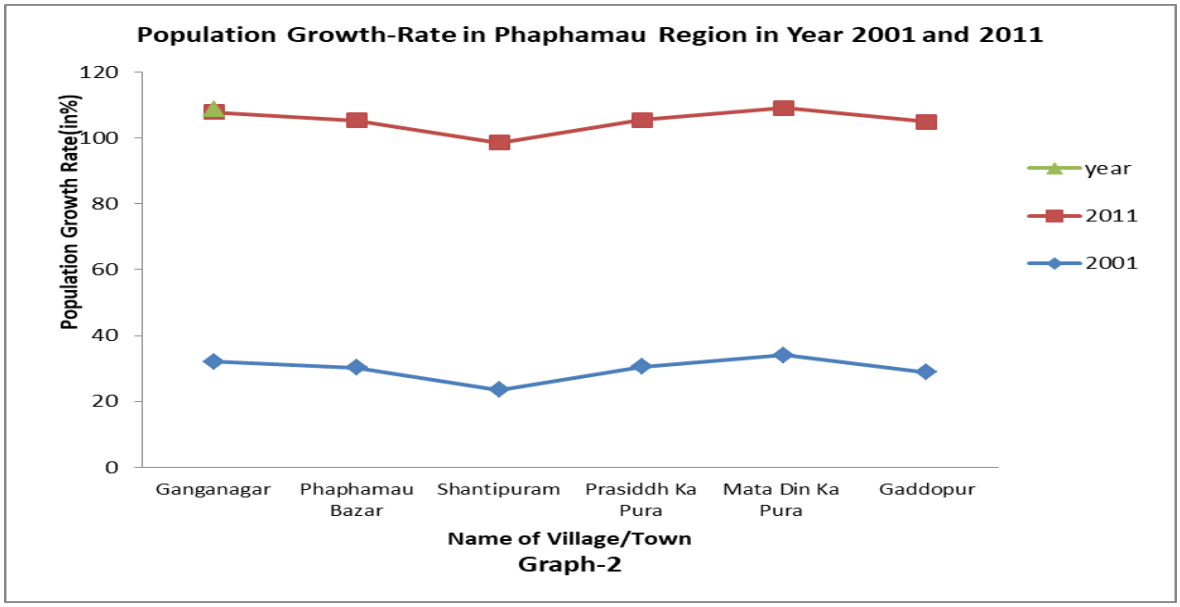
Table-1: **Population and Population Growth in Phaphamau suburban region**

S.N.	Name Of Town/Village	Population			Decadal Population Growth (In percentage)	
		1991	2001	2011	2001	2011
1	Ganganagar	3214	4246	7160	32.11	75.69
2	Phaphamau Bazaar	4311	5618	9831	30.32	74.99
3	Shantipuram	5118	6322	11063	23.52	74.99
4	Prasiddh Ka Pura	816	1065	1863	30.51	74.92
5	Mata Din Ka Pura	2309	3095	5416	34.04	74.99
6	Gaddopur	903	1164	2048	28.90	75.94
	Total	16671	21510	37681	29.90(average)	75.25(average)

(Source: Urban primary census abstract)



Graph-1



Graph-2

The study of table-1 shows a great change in Phaphamau suburban area consisting of six villages i.e. Ganganagar, Phaphamau Bazaar, Shantipuram, Prasiddh Ka Pura, Mata Din Ka Pura and Gaddopur. The population of Phaphamau region is 16671 in year 1991, 21510 in year 2001 and 37681 in years 2011. Year 2001 shows 4939 more people than in year 1991 with average growth rate of 29.90. Likewise year 2011 shows 16171 more people than in year 2001 with average growth rate of 75.25. There is a great variation in the growth rate of above two decade. Decade 2011 has a drastic growth rate than 2001. this average population

growth rate of decade 2011 i.e.75.25is greater than the growth rate of national level, state level and district level population growth rate i.e. 17.64,20.09 and 20.71 respectively.

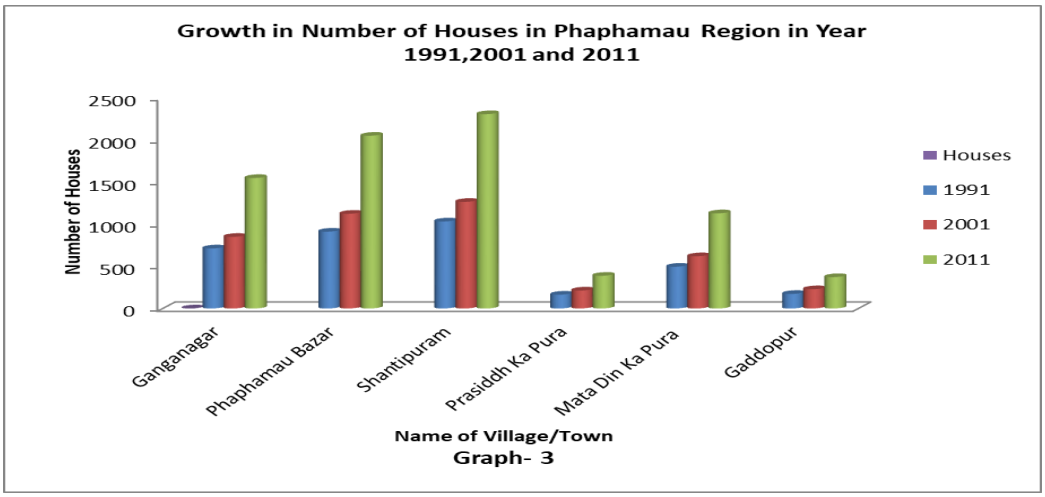
Rajarshi Tandan Open University (2003), C.R.P.F. Camp (2003), B.B.S. Engg. College (2003), Lal Bahadur Shastri Homeopathic Hospital (2002) and other private and government service centre are the main factor attracting people from different part of the country. Above service centre play dominant role in developing different occupational structure like marketing shops, vegetable mandi (whole sale market), transport and so on.

The fast growing Population of the Phaphamau suburban needs houses, markets, shops, vegetable wholesale market and various service centers. All these require construction of houses and buildings which are shown in table no.2.

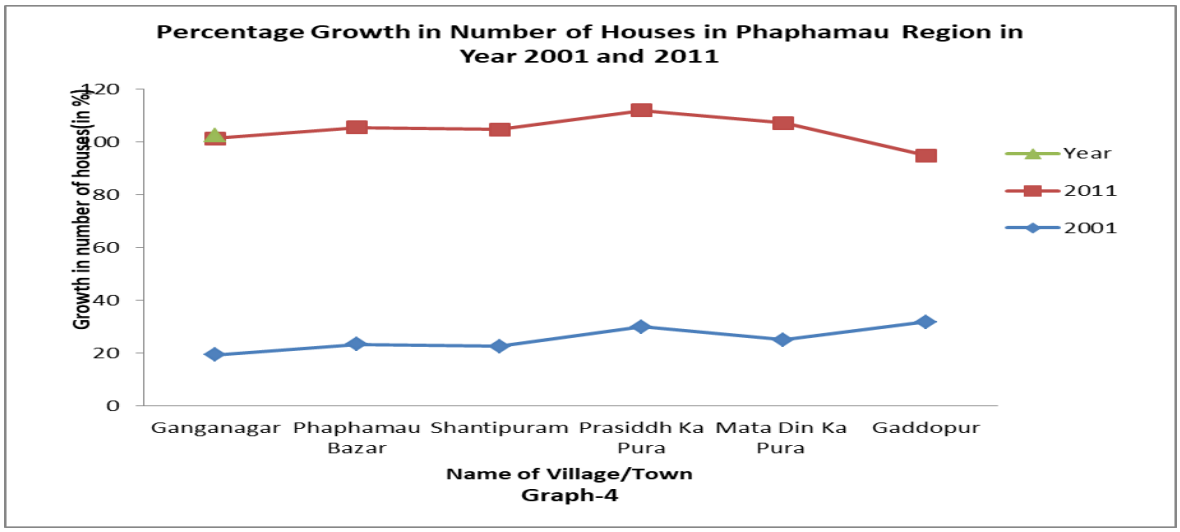
Table –2: Number of Houses and Growth Rate of Houses in Phaphamau Environs

S.N.	Name Of Town/Village	Number of Houses			Decadal Growth of Houses (%)	
		1991	2001	2011	2001	2011
1.	Ganganagar	712	849	1547	19.24	82.21
2.	Phaphamau Bazaar	911	1123	2048	23.27	82.36
3.	Shantipuram	1032	1264	2304	22.48	82.27
4.	Prasiddh Ka Pura	164	213	388	29.88	82.15
5.	Mata Din Ka Pura	495	619	1128	25.05	82.23
6.	Gaddopur	173	228	372	31.79	63.16
Total		3487	4296	7787	25.29(Average)	79.06(Average)

(Source- urban primary census abstract.)



Graph- 3



Graph-4

Photograph –1 shoes the construction of wall in the valley of Basna drain

Photograph –2 shoes the incomplete bridge on Basna drain.

Photograph –3 shoes the collapse bridge in Basna drain.

On the basis of observation of table no.2 it can be concluded that the number of houses and growth rate of houses in Phaphamau suburban region has variations in different year and decade. The number of houses in year1991 and 2001 and 2011 are 3487, 4296 and 7787 respectively. The average growth rate of houses in year 2001 and 2011 are 25.29% and 79.06% respectively. Thus there are 809 more houses built in decade 2001 and 3491 houses built in decade 2011. The number of houses of decade 2011 is more than three times of houses of decade 2001. Decade 2011 has a large growth rate in number of houses than decade 2001.

Fast growing population of the region has important needs for infrastructural development like roads and bridges. This covers the large part of the region. So there is no open space for growing green grass and plants. The total transport and travelling area in Phaphamau suburban region including bus terminus, truck terminus, railways and airways is 480.38 hectare.

The heavy demand of houses and infrastructural developments like road and bridges has need of brick and soil in large quantity for constructions of the houses in Phaphamau suburban region including 6 villages (Ganganagar, Phaphamau Bazaar, Shantipuram, Prasiddh Ka Pura, Mata Din Ka Pura and Gaddopur). People bring a great quantity of soil by digging agricultural land from the north-east side of the region near Mata Din Ka Pura and Prasiddh Ka Pura village. The digging area is approximately 12 hectare of the region. The digging purpose of the region is raising the height of the houses in the region and making

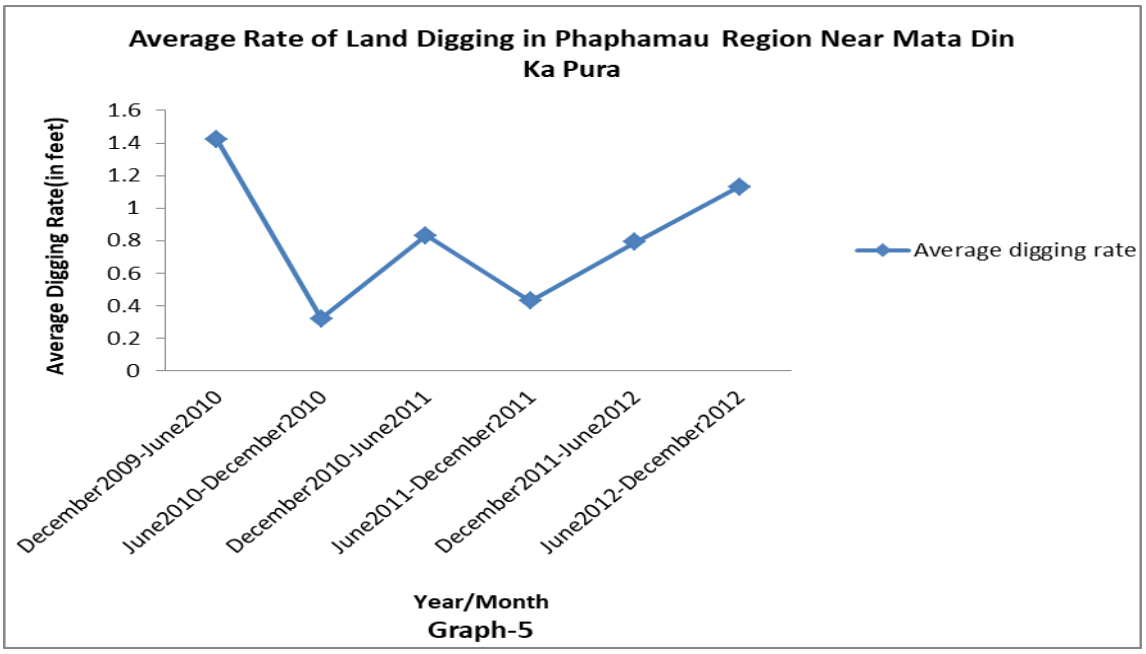
brick by brick kiln. There are more than five brick kilns in the Phaphamau region. The rate of digging can be seen by the table no.3 in different year.

Table –3: Digging Of Land in 12 Hectare Area

S.N.	Year/Month	Digging(In Feet)
	Total	4.92
1.	December2009-June2010	1.42
2.	June2010-December2010	0.32
3.	December2010-June2011	0.83
4.	June2011-December2011	0.43
5.	December2011-June2012	0.79
6.	June2012-December2012	1.13

(Source- Field Survey Based On Questionnaire Method of Primary Data Collection)

According to the table no.3 the total digging depth is 4.92 feet in year 2009 (December) to year 2012.The total digging area is approximately 12 hectare. The average digging in Phaphamau suburban region is 0.82 feet/half year.



Graph-5

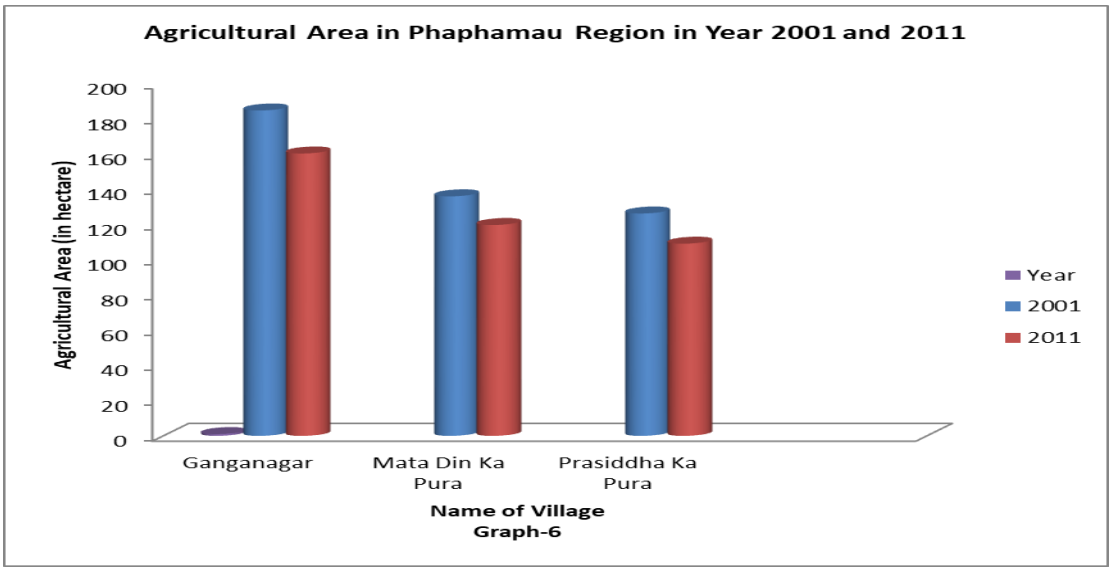
Photograph –4 shoes the high level of soil mining in Basna drain

The above discussion makes it clear that the growth rate of population in Phaphamau suburban region very high in 2011 decade than 2001 decade. This high growth rate has heavy demand of houses and other infrastructural development like roads, bridges, railways and so on. All these needs of this Phaphamau suburban area have a great demand of land acquisition. But there is no any open land for above needs. So people of the region are acquiring the agricultural area around Basna drain for cover constructive houses, roads and bridges etc. After this the agricultural area is decreasing day-by-day. But cause of fast growing population and urbanization of the Phaphamau suburban area's people demands of food grain is increasing rapidly. Then there is a heavy load of agricultural production in a limited area.

Table no.4: Agricultural Land of Phaphamau Suburban Region in Year 2001 and in Year 2011

S.N.	Name of Village	Agricultural Area (In Hect.)		Decreased Area (In Hect.)
		2001	2011	2011
1.	Ganganagar	184.70	160.30	24.40
2.	Mata Din Ka Pura	135.98	119.70	16.28
3.	Prasiddh Ka Pura	126.24	109.11	17.13
	Total	446.92	389.11	57.81

(Source - Urban Primary Census Abstract.)



Graph-6

In table no. 4 the total agricultural area of the above three villages located in Phaphamau suburban area is 4446.92 hectare in year 2001 and 389.11 hectare in 2011. The decreased area of the region is 57.81 hectare in decade 2011.

Shrinking agricultural area of the Phaphamau suburban region is unable to fulfill the crop production need. So people begin to use different type of chemical for per hectare high production of food grain. People of the reason use pesticides for removing insects and diseases of the crop. Thus there is a side-effect of using above chemicals and pesticides on agricultural land of Basna drain basin and its water. During the rainfall chemical and pesticides flow with surface runoff and meet into Basna drain. This chemical and pesticides mixed water when meet the drain's water, disturbs its ecosystem. Then there is a loss of the biodiversity of the Basna drain's water. The change can be seen by following table.

Table no.5: Decrease in the water quality of Basna drain

S.N.	Element of water analysis	Quantity(In mg/liter	Normal Condition(In mg/liter)
1	B.O.D.	7.30	3.0
2	D.O.	2.97	5.0
3	C.O.D.	37.03	6.0
4	pH.	5.9	6.5-8.5

(Source-Field survey based water quality analysis from IFFCO- Phulpur)

According to above table.5, B.O.D. should be normally remaining less than 3mg/liters. But due to use of chemical and pesticides in agricultural field there is a increase in quantity of B.O.D. i.e. 7.30. This change of B.O.D. is not favorable for living organism of Basna drain's ecosystem. Like B.O.D., D.O., C.O.D. and pH value is also varying from its normal

condition in water of Basna drain, cause of using chemical and pesticides in agricultural land of Basna drain's catchment area.

Before a decade people of the Basna drain's catchment area could hear the tur-tur of frog. But now a days' there is no frog in the basin. Fisheries were an important occupation of the people in the region. People catch fishes within a distance of 1 km. between mouths to Phaphamau Bridge. Fisheries can be seen in table.6.

Table-6: Fisheries in Basna drain at its mouth near Ganga

S.N.	Month	Average fishing 2011 (in quintals)	Month	Average fishing 2012 (in quintals)
1	July	30	July	25
2	August	35	August	30
3	September	28	September	22
4	October	25	October	18
5	November	19	November	10
Total		137		105

(Source – Based on field survey and questionnaire method)

Photograph-5 shoes the fisheries in Basna drain.

Photograph –6 shoes the barriers in Basna drain for fisheries.

Some fisherman's earning depend on fisheries for 5 months, they catch fish during the months of July, August, September, October and November. They sell the fish for their livelihood with their family member. The total fishing during five month in year 2011 is 137 quintal. The average fishing rate of each month is 27.4 quintal. The total fishing during five months in year 2012 is 105 quintal. The average fishing rate of each month is 21 quintals in year 2012. The fishing decreased rate is 6.4 quintal per month. This shows the fishing decreasement in year 2012 than year 2011.This decreasment rate shows the impact of urbanization and agricultural. People of the region use chemical and pesticides in agricultural field. The surface run-off of rainfall meets the drains water and imbalance the water quality of the Basna drain. This affects fishes and another animal of the drain. So there is biodiversity loss in Basna basin.

The fast growing urbanization of Phaphamau suburban region has a great impact on biodiversity in Phaphamau suburban region. Basna drain's basin was rich in biodiversity. But the people cut the plants and trees of the drain's catchment area and built their houses. The total settlement area is 1200.91 hectare in year 2001. It (settlement area) will be 1509 hectare in a year 2011 according to Allahabad Municipal Planning. Like this the roads are extending. The total extension of road is 480.38 hectare.

It (roads) will be 541.0 hectare in year 2021. Two decades ago there was vegetation and forest cover in the catchment areas of the Basna drain's basin. There can be heard the chirping of birds, the presence of monkey, rabbit, deer and blue cows. But today these creatures are not seen.

Findings

On the basis of the above discussion the following findings can be reached:

- Basna drain should be protected from the incensement by the people and A.D.A. on both sides at least 50 meters land should be left for existence of local biodiversity.
- To preserve the aquatic and land biodiversity. Some land along Basna drain should be allocated for parks.
- Local people should not discharge there domestic effluent and dispose of solid waste in Basna drain.
- In agricultural chemical fertilizer should not be used to keep natural and man engineered biodiversity of the region. Bio fertilities should be used.
- Digging of fertile agricultural land and soil should be prohibited.
- Acquired land for building construction should be first planned by A.D.A. and private sector developers.

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