

Population Growth and Land Use Pattern of the Brick Industrial Belt: A Case Study in Ganeshkuwari Gaon Panchayat, Sipajhar Block, Darrang, Assam, India

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Abstract- The physical set up and growing inhabitants of an area as well as the dynamic human decisions determine the pattern of land use. The Pattern of land use for different purposes in any area influences the local and anticipated future economy. The industrial land use pattern of a particular spatial unit of the earth's surface is characterized by the positive and negative effects. The relationship between changing land use pattern and population growth is communicated by a number of socio-economic, cultural, political, industrial and other aspects. An effort towards better education, health & nutrition as well as better scientific and technological education will be a solid contribution to the appropriate use of land in a particular area. In the absence of the above said effort there will be a threat to sustainability. During the last few decades, most of the agricultural paddy fields have been used for the establishment of brick industries in the neighboring areas of urban centers due to high demand of building materials. The immediate outcomes of such type of transformation of land use can be summarized as threat to fertility of attached agricultural land, land and air pollution, sanitation, problem to child labours, change of demographic structure due to migrated labours and also other relevant socio-economic aspects. In this paper an attempt has been made to highlight the trend of decadal population growth and to highlight the present scenario of the land use pattern of the brick industries at the villages under Ganeshkuwari Gaon Panchayat measuring an area about 1518.95 hectares and population more than 7000 of Sipajhar C.D. Block, Darrang district, Assam. The present work tries to trace out the changing population scenario, land use pattern, brick industrial economy and relevant problems related to brick industrial growth. SOI topographical maps, secondary data, field data, GIS and field observations will be used to carry out this study.

Index Terms- Ganeshkuwari GP, Anticipated Future Economy, Demographic structure, Industrial Land use, Demographic Structure, GIS

I. INTRODUCTION

Land cover and land use change are increasingly recognized as major factors of global environmental change (Meyer and Turner 1994) [1] and important for sustainable management of natural resources. Human impact on global land cover change, especially in terms of change from agricultural land cover to industrial land cover, has been one of the important issues. The present century has been a century of unprecedented population

growth, economic development and environmental change. The world population grew by four times from 1.6 million to 6.1 million persons during 1900 to 2000. Decrease in mortality rate is partially responsible for this rapid population growth. In addition, advances in public health and medicine have increased the life expectancy of populations worldwide. Thus, the rapid growth of human population is often identified as one of the main factors behind environmental degradation. Population affects the environment mainly through changes in land use and industrial metabolism. (Turner and Meyer, 1991). The rapid rate of industrial development in India has on one hand make the country self reliant in industrial produce and has enabled the country to earn foreign exchange through export of manufactured goods, it has also created hazardous environmental problems by polluting air, land and water not only in the urban and industrial centers but also in the rural areas on the other hand. The land use pattern of land varies from one region to another not because of diversity in the natural endowments alone, but more importantly as a result of variations in the adaptability of human beings under the inter functions of nature and man. In most parts of the world, land use can be considered an interface between natural conditions and anthropogenic influences. The extent of population growth drives the change in land use pattern. Most underdeveloped countries place so much faith in industrialization without proper controls which lead to serious environmental problems. The brick industries as one of the ceramic industries had been started in West Bengal in 1874 [2] and at present these industries have become the major earning source for the owner as well as the workers engaged in these industries. The growth of these industries has been changing the land use pattern, land cover scenario and the socio economic conditions of the inhabitants of a particular locality. The main purpose of this paper is to highlight the decadal population change of the villages belonging to the study area, the land use and land cover of the study area and the socio economic status of the persons engaged in the brick industries. In order to advance this purpose, the paper has been structured under the following headings.

II. GEOGRAPHICAL SETTING OF THE STUDY AREA

The study area is located in Ganeshkuwari Gaon Panchayat, Sipajhar Block, Darrang district in the northern part of the Brahmaputra River of Assam, India. The study area covers an area of 1518.95 hectares. It lies between 26°15'-26°19'N and 91°47'-91°52' E (Fig 1). The study area is located in the interfluvial regions between the two rivers i.e., the Barnadi river

and the Nanai river. The study area represents variations in topology- high mountains, river valley and Plain area. The elevation of the study area is about 48 to 50 meters above mean sea level. The important hills of the study area are Jauhar Parbat, Dewarmati Pahar, Kenwari Pahar and Madogholi pahar, Dipling Parbat, Barkhdia Parbat, Baman Parbat and Khatra Parbat. Wetlands like Bar Beel, Medhi Pukhuri and Baman Beel are seen in the study area. The brick industry flourishes rapidly in this area because of suitable climate, soil, easy market to the nearby urban centers. Because of diversity of topology of the study area brick industries were established in the foothills of the hills, near the river and in the agricultural land. The region has suffered from severe land degradation due to the increasing number of brick industries and rapid population growth. The region also experiences a high rate of land use change. The area is drained by the lower reaches of the two northern tributary rivers of the mighty Brahmaputra namely Barnadi, Nanai and their small tributary branches for which the area is frequently affected by flood.

III. DATA USED

The data has been collected from primary and secondary sources. The data collected from the primary sources include the survey data by schedule, and GPS. The data collected from the secondary sources include the demographic data (Primary Census abstracts for the years 1971, 1991 and 2001 from the Directorate of Census Operations, Census of India), Survey of India (SOI) toposheet (Scale-1:50,000 & No. 78N/15) for the year 1971 and IRS LISS-III FCC, 17-12-02 collected from Assam Remote Sensing Application Center (ARSAC). The base map of the study area has been obtained from the Primary Census abstracts and Administrative Atlas of Assam, 2001.

IV. METHODOLOGY

The study on the dynamic phenomena such as land use change and population growth pattern is based on the field survey and also on the secondary data. The population census

data for the study area for the years 1971, 1991 and 2001 have been collected from the Census of India office. ERDAS (Leica) and ArcGIS software (ESRI) have been used to generate various thematic layers like boundary map, roads, rivers, settlements and administrative boundary map using the toposheets and other available maps. Land use map have been prepared using different layers. Population growth of the study area has been evaluated using the demographic data of three decades, i.e. 1971, 1991 and 2001 from Census of India. The trend of the Decadal population change of the included villages of the study area is obtained by plotting the data in the suitable graph. The required information of the brick industrial belt has been collected by field visit and using schedule & GPS

V. OBJECTIVES

- i) to analyze the decadal population change of the villages under the study area .
- ii) to examine the land use pattern of the study area.
- iii) to study the socio-economic aspects of the population section engaged in the brick industries of the study area.

VI. POPULATION CHANGE

Population change or population growth is used to imply the change in the number of inhabitants of a region during a specific period of time, irrespective of the fact whether change is negative or positive. Such a change can be measured in terms of absolute numbers and in terms of percentage [3]ⁱⁱⁱ. The three basic components of population change are fertility, mortality and migration. The study area faces the problems of migration of labour from other places in brick industry, resulting in increase in population as well as decrease in the mortality due to improve in health facilities. Due to increasing demand of the bricks from the surrounding urban places, brick industries grow at a rapid rate in the study area. The trends of population change/population growth in the villages of the study area during the different decadal period are shown in the [Table 1] and [fig: 2]

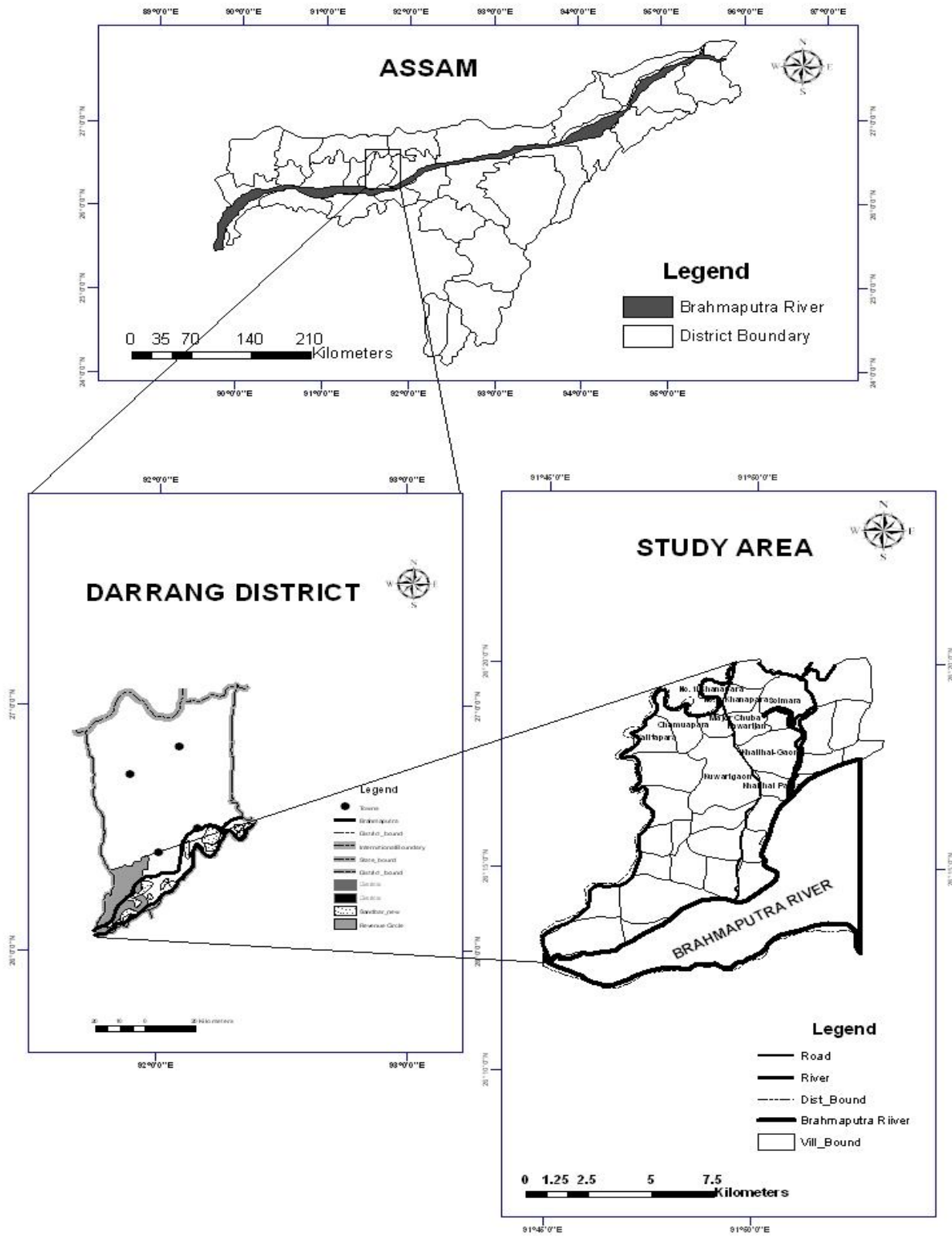


Fig. 1 Locational map of the study area

Table 1: Trend of population growth in the study area

Village Name	Area (acres)	1971	1991	2001
Khanapara No.1	290	627	2578	797
Khanapara No.2	392	21	159	149
Solmara	975	448	293	1164
Kuarizan	473	123	505	944
Major Chuba	297	207	2490	772
Chamuapara	628	291	137	565
Kalitapara	586	745	495	1197
Kuarigaon	1736	456	617	1219
Khalihai Gaon	1028	411	968	922
Khalihai Pathar	289	354	1077	687
<i>Total</i>	<i>6676</i>	<i>3683</i>	<i>9319</i>	<i>8416</i>

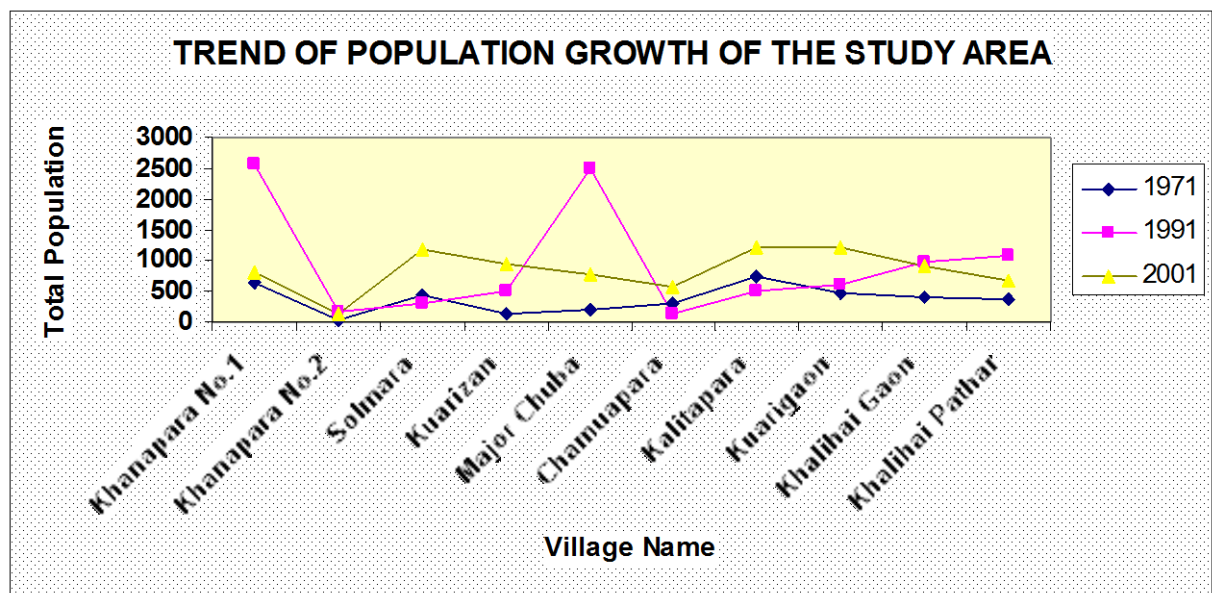


Fig. 2 : Trend of population growth in different decadal period

The Population growth of the study area shows both positive as well as negative growth. In some villages like Khanapara No.1, population increases rapidly from 1971-1991. But during 1991-2001, population decreases slowly in this village. In the other villages like solmara, Kuarigaon, Kalitapara the population increases rapidly from 1991-2001 than 1971-1991. Due to the growth of the brick industries migration rate increases at some villages, while in some villages negative growth takes place. Population increases rapidly in 1991 in Major Chuba and again decreases in 2001. Laborers are indigenous as well as migrants. The population growth takes place in the area as the migrants laborers migrate at a large scale in the study area in comparison to the indigenous laborers. The demographic structure of the study area is totally affected during 1971 to 1991, as the population increases at a rapid rate in some villages in the study area like Khanapara No.1, Major Chuba and Khalihai Pathar. The demographic change in the decrease and

increase in population numbers in the study area is observed and it is caused by the ongoing flood inundation due to the nearest location of the villages to the rivers and the high birth rate and better medical facilities. The table-1 and figure-2 highlights the decadal population in the study area.

6.1. Change of general caste population

The study area is mainly dominated by general caste population, as most of the brick industrial owners and indigenous laborers are Muslims and the general caste Hindus. The numbers of general caste population decrease in the year 2001 in comparison to 1971 and 1991 in the villages namely Khanapara-1, Khanapara-2, Chamuapara and Kholihoi pathar. The other villages experience a normal trend of population change. Most of the brick owners are indigenous and some are from outside the study area. The [Table-2] indicates the changing nature of general caste population in the study area.

6.2 Change of Scheduled Caste POPULATION

The [Table-3] indicates the drastic change in the scheduled caste population numbers and concentrations. As per the census report of 1971, SC population are mainly concentrated in the villages namely Khanapara No. 1, Chamuapara, Kuarigaon and Khalihoggaon. The census report of 1991 depicts the drastic change in the concentration of SC population. Khanapara No. 1

is the only village which has the minimum SC population concentration of 14 numbers. The population record of 2001 census highlights that the villages namely Khanapara no.-2 and Kalitapara has no concentration of SC population. The other villages excluding the above said two villages have more or less concentration of SC population.

Table-2: Decadal Population Change of General Caste Population in the study area.

Villages	1971	1971	1991	1991	2001	2001
	Male	Female	Male	Female	Male	Female
Khanapara No.1	329	298	1350	1228	413	384
Khanapara No.2	12	9	111	48	80	69
Solmara	230	218	167	126	605	559
Kuarizan	65	58	273	232	502	442
Major Chuba	109	98	75	62	295	270
Chamuapara	146	145	1291	1199	385	387
Kalitapara	385	360	257	238	618	579
Kuarigaon	221	235	310	307	633	586
Khalihai Gaon	209	202	485	483	469	453
Khalihai Pathar	188	166	566	511	349	338

Source: Census of India Report, 1971, 1991, 2001

Table-3: Decadal Population Change of Scheduled Caste Population in the study area.

Villages	1971		1991		2001	
	Male	Female	Male	Female	Male	Female
Khanapara No.1	79	94	8	6	148	143
Khanapara No.2	0	0	0	0	0	0
Solmara	0	0	0	0	9	7
Kuarizan	0	0	0	0	3	5
Major Chuba	0	0	0	0	165	153
Chamuapara	100	103	0	0	46	49
Kalitapara	0	0	0	0	0	0
Kuarigaon	3	2	0	0	49	54
Khalihai Gaon	19	21	0	0	48	54
Khalihai Pathar	0	0	0	0	8	6

Table-4: Decadal Population Change of Scheduled Tribes Population in the study area.

Villages	1971		1991		2001	
	M	F	M	F	M	F
Khanapara No.1	3	0	0	0	0	0
Khanapara No.2	0	2	0	0	1	1
Solmara	0	0	0	0	0	0
Kuarizan	0	0	0	0	5	1
Major Chuba	0	0	0	0	0	0
Chamuapara	0	0	0	0	0	0
Kalitapara	0	0	0	0	0	0
Kuarigaon	89	88	0	0	129	114

Khalihai Gaon	23	15	0	0	59	38
Khalihai Pathar	84	77	0	0	135	115

Source: Census of India Report, 1971, 1991, 2001

6.3 Change in Scheduled Tribe POULATION

The census records of 1971 and 2001 indicates the concentration of ST population in large numbers in the villages namely kuarigaon, Kholihoigaon and Khalihoi pathar only. The minimum concentration is seen in the Khanapara no.-1 and Khanapara No.-2 villages as indicated in the [Table 4]. The census report of 1991 represents no concentration of ST population in the study area.

VII. LAND USE

Land use relates to human activity or economic function associated with specific piece of land and land cover refers to the extent and of the features present on the earth surface (Lilles and et.al, 2007) [4]^{iv}. Human impact on global land cover change, especially in terms of change from agricultural land cover to industrial land cover, has been one of the important issues for sustainable development of any area. Information on land use or land cover also provides a better understanding of the spatial distribution of the cropping pattern, fallow lands, forest, grazing land, water lands and surface water bodies and important developmental planning (Philip & Gupta, 1990) [5]^v. The land use pattern of the study area is characterized by so many physical

and cultural features. The land use pattern of this interfluvial brick industrial belt area is analyzed with the help of the available toposheets of that area and the present observation of the study area. Based on the analysis of toposheet of the study area, the land use can be categorized into barren land, forest, wetlands, agriculture, grassland and industries. Rapid growth of brick industries in the study area has totally changed the land use pattern of the area. Field survey in the study area shows decline of agricultural land cover due to increasing number of brick industries in the study area. The comparison of the land use pattern of the study area in 2002 with 1971 in terms of brick industries then it becomes clear that there was only one brick industry in the area which increases to 10 in 1991 and in 2002 the number increases to 22. The total area under brick industrial sector has been increased from 30 bigha in 1971 to 270 bigha in 1991 and 530 bigha (70.75 hectares) in 2002. This shows that suitable environmental conditions, proper market and the nearness to the urban centers results in rapid growth of brick industry in the study area. The figure 3 and figure 4 highlights the land use pattern of the study area indicating the change in the total number of brick industries.

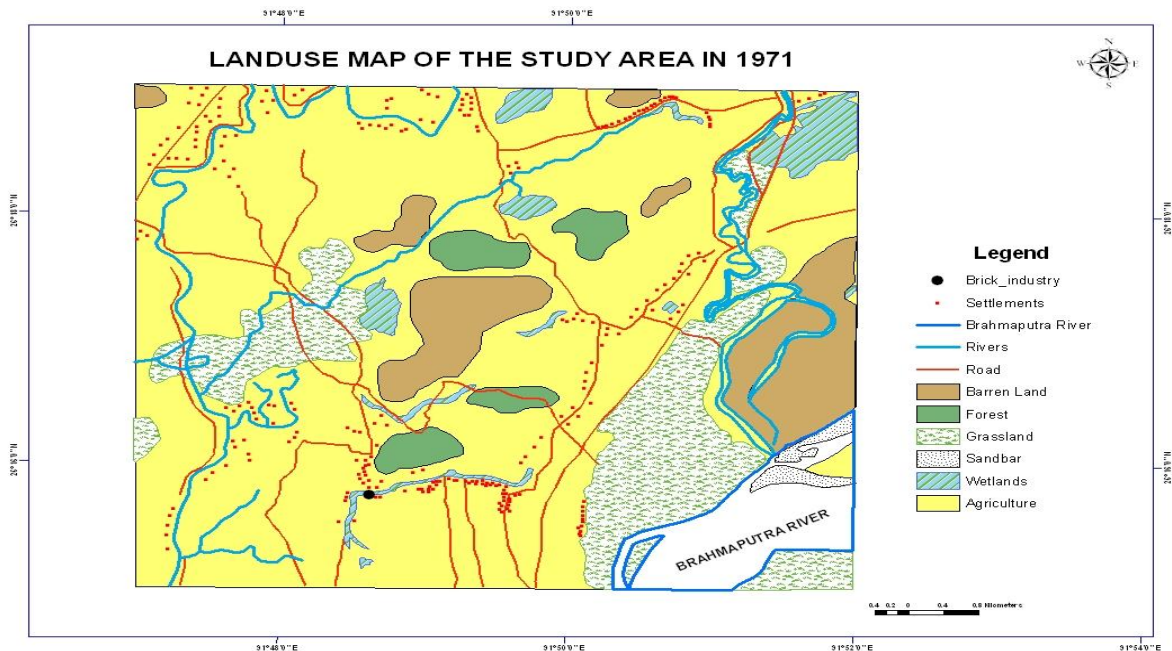


Fig. 3 - Land use map of the study area in 1971.

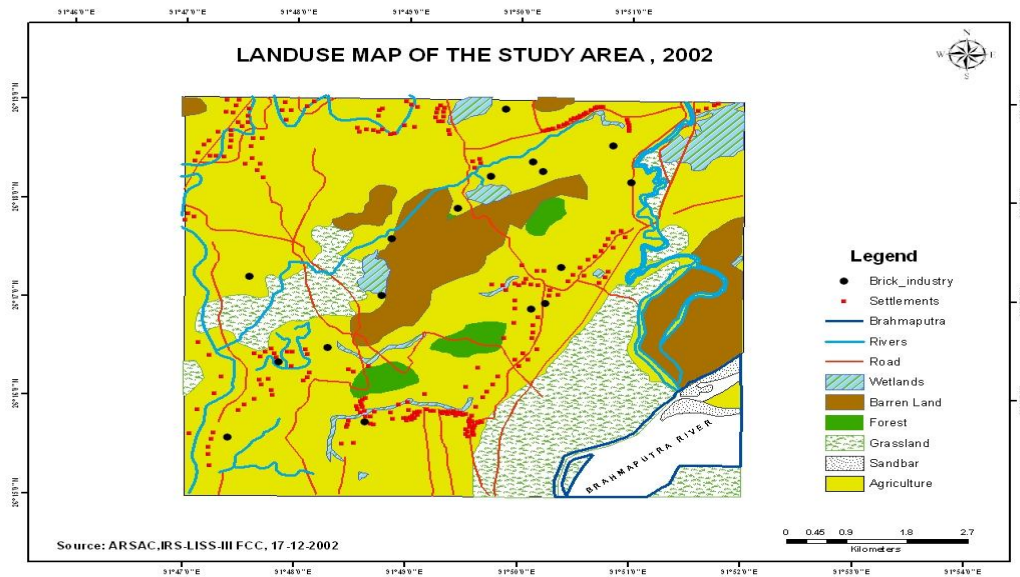


Fig. 4- Land use map of the study area with some brick industries in 2002.

VIII. SOCIO-ECONOMIC STATUS OF THE BRICK INDUSTRIES

8.1. Growth of Brick Industries

Rapid growth of the brick industries in the study area is due to the suitable climatic condition, soil condition and increasing demand from the peripheral urban centers. In 1971, there was only 1 number of brick industry in the study area, which increases to 10 numbers in 1991, and 22 numbers in 2002. The name of the existing brick industries in the study area is mentioned in the [Table-5] and [Table 6] indicates the numbers of brick industries in different years

8.2. Manpower and estimated total ASSETS FOR A NEW BRICK INDUSTRY

The total estimated cost needed for establishing a brick industry is about ₹ 15,00,000/- and the required materials needed for such industry are Plain picket, 1 No. brick, 2 No. brick, 3 No. brick, Cement, Bamboo, Iron/rod, land Area and JCB dumper set. Besides these 250-300 numbers of laborers, permission from the concerned Deputy Commissioner, NOC from local inhabitants, pollution free certificate from the State Pollution Control Board are the prime needs. The [Table 7] highlights the basic estimated assets with quantity for the establishment of a brick industry.

Table 5- Name of the brick industries in the different villages of the study area.

Name of the brick industry	Inclusive Village Name	Name of the brick industry	Inclusive Village Name
APB	Dampur	IBI	Kuarijan
KMB	Hetemtola/ Singimari	KBI	2 No. Major Chuba
TBI	Hetemtola/ Singimari	SKB	Maruachuburi
IBI	Kuarijan	MAA	2 No. Major Chuba
HBI	Dampur	KBI	2 No. Major Chuba
DNP	Kholihoi	VBI	Maruachuburi
SAR	2 No. Major Chuba	RKB	Kholihoi
SBI	Ganeshkuwari	SPB	Kalitapara
BTI	Kholihai	MEA	Kuarijan
MBI	Hetemtola	SAN	Kholihoi
SMB	Dampur	-	-

Table 6- Numbers of brick industries in different years

Year	1971	1991	2002
Number	01	10	22

Table 7- Estimated Assets and Man Power with Quantity for a new brick industry

Sl. No.	Assets & Man Power	Quantity	Sl. No.	Assets & Man Power	Quantity
01	Plain Picket brick	12000 pieces	07	Rod/Iron	10 quintal
02	Number 1 brick	33000 pieces	08	Land Area	25-30 bigha
03	Number 2 brick	50000 pieces	09	Labourer	250-300 Numbers
04	Number 3 brick	13000 pieces	10	J C B Dumper set	3 / 4 Numbers
05	Cement	150-200 bags	11	Sand and Stone	5-10 truck
06	Bamboo	10000-15000	12	Others	NOC, Permission etc.

Source: Data based on field survey carried out by the author, 2010

8.3. Production and Supply

The production from the brick industries is about 6 rounds in one year. The numbers of bricks produced in each round is about 6, 00,000, i.e., 36, 00,000 bricks in a season. The production of the bricks of different quality is totally dependent on the weather condition i.e. rain free season of the year. Generally preparation of the raw bricks start from the month of September and burning process ends before the last part of April and first half of May in a year. At present the owners of two of the brick industries have purchased two costly raw brick producing machines which can produce 2000 numbers of raw bricks per hour to speed up the production as well as to reduce human labour. These brick industries supply their bricks to the nearest urban centers like Guwahati, Rangia, Mangaldai, Kharupetia, Routa and the nearest local places.

8.4. Income Levels of the owners

The income level of the owner is very high and sound. They sell their bricks at rate of ₹ 4.00/- and ₹ 5.00/- per piece of brick. The seasonal income of the owner is not less than ₹ 10 Lakhs, and in the rainy season the income becomes less as the study area is an occasional flood prone area.

8.5. Locality of the labourers and age group

The laborers in the brick industries of the study area are indigenous as well as migrants from Koch Bihar, Barpeta, Mangaldoi and Kharupetia of West Bengal and Assam. . The numbers of indigenous laborers is less in comparison to the migrant's laborers. The maximum numbers of workers are belonged to the age group of 15-60 years. As per the field observation of the study area, the workers get their wages on the basis of their duration of working hours. The minimum range of wage is ₹ 100/- per day. No worker has settled permanently in the study area through inter caste marriage with local people or other way. They use to come in the season along with their family and leave the area during the rainy season. Most of the labourers are belonged to scheduled caste and general muslim caste.

8.6. School and sanitation facilities FOR THE LABOURERS

The Sarba Siksha Abhijan of Assam Govt has provided the primary school facilities to the children of the labourers to enhance the educational quality. The sources of water for the domestic use were mainly from the Tube wells and the nearest

rivers. Most of the owners of the industries have provided the proper water facilities with running water linkage, concrete lavatory facilities and medical facilities to the laborers. Although the water for domestic use in the industrial area is of good quality, the laborer and indigenous dwellers usually suffers from some water-borne diseases like diarrhea, dysentery and jaundice. The sick laborers are brought to the nearest Dumunichowki and Sipajhar health centers

IX. ENVIRONMENT DEGRADATION

The rapid growth of brick industry in the study area results in decrease in the soil quality and number of plots for agricultural purposes, besides air pollution from the chimneys. Earth cutting from the hill side for the establishment of new brick industry leads to the landslide problem as well as decrease of forest cover in the study area. At present decrease of forest cover in this area has become a threat to the wild animals, particularly for Tigers. Now the conflict in between wild animal and man is a common feature in the study area. The issuing authority of permission certificate, pollution certificate and also the local people must be aware of the probable hazardous situation of the area due to the on going growth of brick industries in the study area.

X. CONCLUSION

The human decisions and physiographic settings of any area determine the use of land for different purposes. The present paper tries its best to outline the village wise decadal population change of the study area, number of indigenous and migrant labour population, the changing trend of the brick industries on the land cover map and socio-economic condition of the brick industries of the study area. The growth of the brick industries in the study area has modified the land use pattern, socio-economic condition, ecological set up and demographic structure of the industrial belts. The ongoing increase in the number of brick industries in the study area has been reducing the area under paddy crops and alternatively has been increasing the area under brick industrial activity. The owners of the different brick industries of the area are economically benefitted by utilizing the favorable ecological condition of the study area. The three main objectives of this paper are fulfilled in the foregoing representations and analysis of relevant data as indicated in different tables and figures. The precise representation of

different aspects of the brick industrial belt of the study area as mentioned in different sections of the paper will be useful to the environmentalists, land use planners as well as research workers. The present study does not end unless various land use parameters relating to the growth of brick industrial belt are comprehensively analyzed and understood.

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