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Soil Degradation and Land use change by Brick Kilns in Bassi Tehsil of Jaipur District (Rajasthan)

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A brick is a block made of clay burnt in a kiln. It is one of the primary building materials known to humankind. Over time, bricks have appeared, gained prominence, lost importance, and then come to the forefront again with various architectural styles. The primary raw materials used in the brick kilns include topsoil, coal, paddy husk, fly ash, wood, and also locally available agro wastes to some extent. The brick manufacturing process generates emissions discharged from the brick kilns. The brick industry eliminates the top soil of the agricultural land. As a result, there is a change in land use due to the conversion of fertile soil into wasteland.

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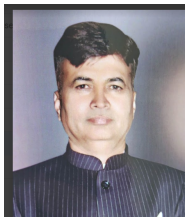

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Introduction

Since independence, India's population, urbanization, and economy have been growing continuously. As a result, the need to construct industries, community buildings, government offices, and residence buildings is also increasing timely. Backed bricks were used in the construction of bathroom floors since the Hardpan civilization in Rajasthan. Raw clay bricks are backed to high temperatures in kilns. The mining department has allowed soil mining to a depth of two meters from the surface.

The Problem

Clay bricks are produced in Rajasthan in small or cottage scale brick kilns and clamps almost throughout the year, excepting intermittence in four months of the rainy season. The scale of brick production is increasing due to the rapid demand for

bricks in the building construction sector in Jaipur. Near about 150 Brick Kilns are situated in Bassi Tehsil. These have been operating for 30 years approximately in this area. Production is mostly supplied for Building development in Jaipur City and nearby towns. It is becoming more and more core material on building construction in urban areas and the countryside because of the restricted availability of stones in constriction of building. Many Brick kilns are highly clustered near the Kanota area in Bassi Tehsil. This area is near the city of state capital and metro city Jaipur, so the value of the land is at a high level. Due to the high demand of brunt bricks, illegal mining is being carried out to greater depth than prescribed by the mining department.

Objectives of the Study

Research objectives outline the specific steps to achieve the research aims, goals,defining the what, why,who,when and how. Research objectives are the ultimate cause of research work done to solve a research problem with their help, necessary, and information is collected for research.

These are two following objectives of the study-

1. To find out the status of soil/land degradation by brick kilns in the study area.
2. To find out the status of land use changes by brick kiln industries.

Hypothesis

A hypothesis is a precise, testable statement of what the researcher predicts the study's outcome. This is the hypotheses of the possible result of the research problem-

1. Brick kiln is making significant negative changes in land use of local land.

Source and Methods of Data Collection

The unit of study is Gram Panchayat. In this study, the primary data were collected by personal interviews, field surveys, and questionnaires from 16 BKs sites by stratification and random sampling from the following table no.1. Location of Brick kilns was majored by the GPS device. The soil mining depth measured at sites. Discussion with the industry owner, land owner, employees, and officers of Brick industries on various issues of the impact of brick kilns. Secondary were obtained from the following institutes, and departments like Revenue Board of Rajasthan, Tehsil headquarter office and Patwar Ghar, Mining department.

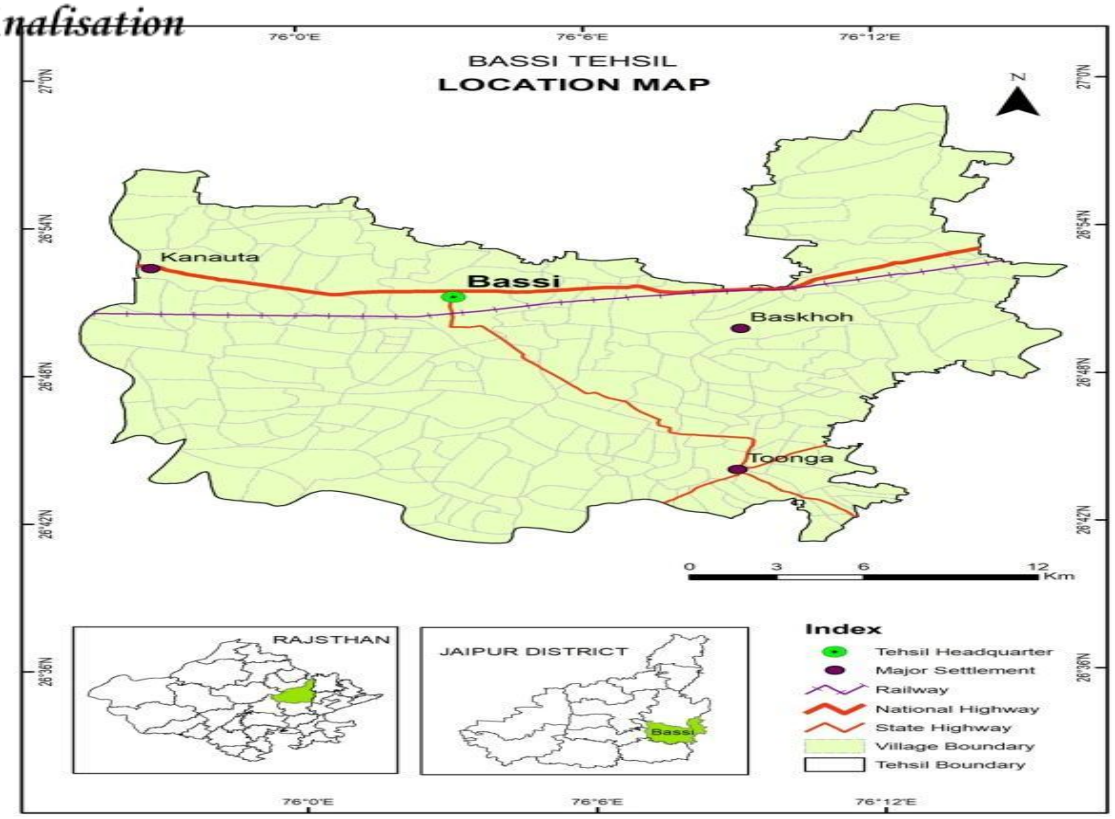
Table 1: Selected Brick kilns (BKs) sites in Study area (Bassi tehsil)

Village name	Total no. of BKs	Site ID of BKs	Name of BK
Kanota	18	01.	KBT Bricks
		02.	CBC Bricks
		03.	Subham. Bricks
		04.	SRB Bricks
		05.	J.B.T. Bricks
Ramratanpura	12	06.	Jai Jagdish Bricks
		07.	Shakti Ient udhog
		08.	NBC Bhatta
		09.	Usha Ient Bhatta
		10.	S.R. Ient Bhatta
Hirawala	9	11.	H.B.C.
		12.	R.B.T. Ient Bhatta
Balyawala	7	13.	D.B.T. Ient Bhatta
Jeetawala	5	14.	JSB (Rambabu)
Ghata	4	15.	M.B.C
Bhatti	1	16.	Shyam Ient

Source of data: SDO office Bassi, 2020

The Study Area

The study area is located to the east of Jaipur district. On its east side, the Dausa and Lawan tehsil of Dausa district from the inter-district boundary. Jamwaramgarh tehsil is in the north, Jaipur tehsil in the west, and Chaksu tehsil in the south. Sanganer tehsil is in the southwest. National Highway number 21 (old NH 11) passes through the northern part of this region from the west direction towards the east. The total area of this study area is 654.69 sq km. The latitudinal extension is 26° 40’ to 26° 58’ NL, and longitudinal extension is 75° 54’ to 76°13’ EL. The total population of this study area is 308170 as of the census year 2011. The male population was 52.02%, and the female population was 447.98 % of the total population.



Review of Literature

Khan et al. (2008) studied Ujjain city's environment and concluded that brick industries' effect on soil, air, vegetation, and human health was adverse. Kim et al. (2009) studied the brick kilns in Vietnam (Thailand). They studied the severe health and environmental impacts, including the effects on crops by the brick kiln. Wang (2010) studied in Gansu province in China, and analyzed the health impact of brick kilns. Gupta et al. (2010) concluded that a vegetation mosaic was discernible even at the relatively smaller study in anthropoid habitats around brick kilns. Khan (2011) studied Brick kiln emissions affection on crop yields Ismail et al. (2012) studied in Peshawar (Pakistan). They estimated that the heavy metal content (Cd, Cr) of soil and plants affected by brick kiln emissions in all directions at increasing distances from the chimney. They also analyzed the particulate and dust fall rate in brick kilns' vicinity and estimated input of heavy metals (Cd, Cr) from brickworks. Uooj et al. (2017) conducted a study using GIS techniques in Rawalpindi (Pakistan). They assessed the spatial distribution of fluorine in the soil around the brick kilns in the study area.

Land use Change

Brick manufacturing industry established on the availability of raw material. The clay and loamy soil is the best raw material for green bricks. To determine the impact of brick kilns on the land use information of the study area collected land use information from primary field survey before and after establishing selected BK sites. These pieces of information are given in the following table no. 2

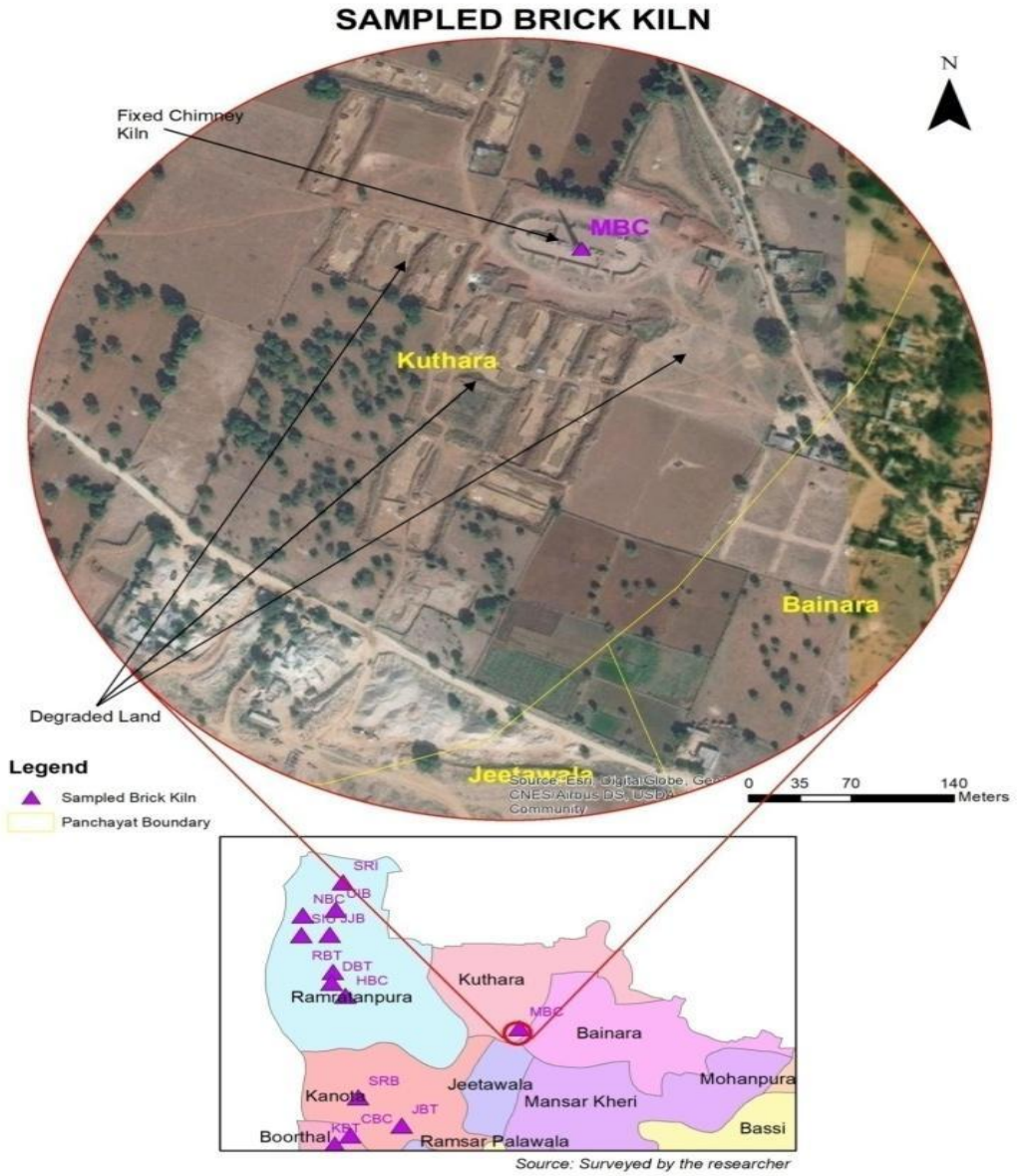


Table 2: Land Use Before and After Soil Mining

Site ID	Land Use Before Soil Mining	Land Use After Soil Mining
01	Fertile Agriculture Land	Wasteland, Residential use
02	Fertile Agriculture Land	Wasteland, Residential use
03	Fertile Agriculture Land	Wasteland, Residential use
04	Fertile Agriculture Land	Wasteland, Residential use
05	Fertile Agriculture Land	Wasteland, Residential use
06	Fertile Agriculture Land	Wasteland, Fallow Land
07	Fertile Agriculture Land	Wasteland, Rough Land
08	Fertile Agriculture Land	Wasteland, Rough Land
09	Fertile Agriculture Land	Wasteland
10	Fertile Agriculture Land	Wasteland, Rough Land
11	Fertile Agriculture Land	Wasteland, Residential use
12	Fertile Agriculture Land	Wasteland
13	Fertile Agriculture Land	Wasteland, Residential use
14	Fertile Agriculture Land	Wasteland, Residential use

15	Wasteland	Wasteland
16	Fallow Land	Wasteland, Rough Land

Source: Primary Data

Outcomes

It is clear from the above (table no.2) that the land there was fertile before establishing the brick-making unit. It was 100% converted into wasteland after soil mining. The study area is located near Jaipur Metro city, where the land is costly. The land of Kanota and its surrounding area is used to settle residential colonies. For this reason, this 50% of Wasteland is being used by housing cooperative societies for issuing leases legally and illegally for housing construction at affordable rates. That is, houses have been built for much living here. Of the wasteland produced by this industry, 25% of the land appears as Rough land and 18.75% land area as wasteland, and 6.25% as Fellow Land.

Soil Degradation

The brick industry is an industry based on raw materials; it's located where suitable clay soil is available for the manufacture of bricks. In the study area, the most suitable soil is found near Kanota town in the Basin of Dhund River which is dug out from machines like JCB, tractors.

Table 3: Depth of Soil Mining by Sample Brick Kiln Sites

Site ID	Maximum depth for Soil Mining set by the Mining Department (Meters)	The actual depth of Soil mining for kK Site (Meters)	Disparity (Meters)
01	2.0	3.25	1.25
02	2.0	2.75	0.75
03	2.0	3.10	1.10
04	2.0	3.00	1.00
05	2.0	2.50	0.50
06	2.0	2.75	0.75
07	2.0	1.85	-0.15
08	2.0	3.00	1.00
09	2.0	2.75	0.75
10	2.0	2.15	0.15
11	2.0	2.50	0.50
12	2.0	2.25	0.25
13	2.0	2.50	0.50
14	2.0	2.00	0.00
15	2.0	2.10	0.10
16	2.0	2.00	0.00
Average of disparity			0.53

Source: Primary Data

Outcomes

The mining department of Rajasthan allows soil mining up to 2 meters deep from the earth's surface. At the time of field study, the researcher studied these brick kiln industries to check the reality of soil mining depth. The data obtained from the study are shown in the following table. An in-depth study of the above table shows that sites ID 01, 03, 04, and 08 have mined the soil to a depth of 3 meters and above. The soil mining is mainly due to suitable soil availability to the greater depth and the land being more expensive. At BK site ID no. 16, the maximum depth prescribed by the Mining Department for soil mining has been mined to a depth of fewer than 2 meters because the soil is not found suitable, and deposits of calcium carbonates are found in the ground below. Deposited lime pebbles make worse soil quality. Bricks made from this type of soil are not considered profitable. On average, 0.5-meter depth is being mined by the prescribed parameters of soil mining. That is, mining is taking place at a centre of 26.4 per cent.

Conclusion and Suggestions

It has been observed that illegal mining is carried out by the brick kiln industry. Due to which the fertile soil is being depleted at a rapid pace. After this, for many years this land is no longer useful for agricultural work. This place turns into rugged topography. Residential colonies in the area close to the city are inhabited by housing development cooperatives.

The administration and mining department should take strict action against illegal soil mining. Instead of clay bricks, other options such as fly ash, cement brick and eco-friendly technology should be emphasized for building constriction sector.

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