

Land Degradation in Terms of Environmental Cost Due to the Emergence and Development of Brick Kilns - A Study On Khejuri CD Blocks Over Coastal Medinipur in West Bengal

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Abstract: Land is an important natural resource which is present on earth in limited amount. The degradation of this natural resource is one of the most serious problems of the world today. Land degradation implies the temporary or permanent decline in the productive capacity of the land. Land degradation occurs due to natural or anthropogenic factors. Soil degradation is recognized as major aspect of land degradation. In India, bricks are usually made of clay, and are generally produced in traditional, unorganized small scale industries. Bricks are important building material and about 140 billion bricks are annually produced by these industries. Brick industries are essential for economic development as they provide employment to nearly 12 million people. Due to increase in population, demand of houses and infrastructure is increasing, as a result use of bricks is also increasing. An important step in brick making is firing of bricks in brick kilns causes serious environmental pollution and health problems. Brick burning largely influence the concentrations of greenhouse gases in the atmosphere. Impact of brick industries on air pollution, vegetation and human health has been studied by many workers who have shown that brick industries cause air pollution and land degradation besides decreasing herb density and causing nutrient disorders in plants/trees in immediate vicinity. Brick making consumes large amount of clay which leads to top soil removal and land degradation. Large areas of lands are destroyed every year especially in developing countries due to collection of soil from a depth of about 1 to 2 m from agricultural land. These affected areas are expanding rapidly due to increase in brick production. The topsoil nutrient elements and soil biota are also destroyed through brick burning and brick burning also alters the physicochemical properties of soil. The present study has been undertaken to assess impact of brick making on the degradation of land in Khejuri where about 25- brick kilns and 23- tile fields have been developed during last 10-15 years along the adjacent location of Hijli River, Rasulpur River and tidal channels. Intensive questionnaire survey has been conducted taking significant number of samples from each of the villages in Khejuri C. D Block. Secondary data sets have also been collected from the Block Development Office and Panchayat Offices. Generated soil data and other data have been analyzed and compiled by necessary Statistical and Mapping Methods along with GIS Techniques. Those data have been compiled and analyzed. Hence, the results of the study clearly indicate that the land degradation scenario in terms of environmental cost of brick manufacturing is much higher than the economic returns readily available.

Keywords: land degradation, brick industry, nutrient disorders, environmental cost and economic returns.

1. Introduction

Brick is one of the most important building materials or Unit of construction in India. Fired clay bricks are produced in India and about 42,000 small or cottage scale brick kilns and clamps operate seasonally (CPCB, 1996). As per the latest estimate annual production of bricks in India is 51,000 million from 45,000 small/cottage scale units distributed throughout the country and there are 2.5 million workers employed in the sector. Most of the units are located manually (Aslam, 1993). In Khejuri there was only 1 brick kilns in early 1980's. On an average, each brick kiln produces 16 to 17 lakh bricks annually (2005-recent). As much only 3 brick kilns were left in 1996. Rapid growth of city like boosted demand of bricks, land value in the brick kiln area increased and the industry was forced to move out to the rural periphery and peripheral states. Most of the brick kiln activities were near the roadside clustered settlements, which have shifted to remote zone during 2005 to 2010. Huge demand for bricks through the trend of concretization has attracted a number of brick manufactures from the neighbouring blocks, districts and states of Bengal and also the local people.

During the decade of 1990s over 4 brick kilns unit were operating in Khejuri. With increasing demand for bricks, the small units were discontinued and numbers of large scale units have established. But consequently the number of kiln industries declined while production of brick increased greatly during 2010-15. These became large scale industries during 2000's here. The increasing trend of brick manufacturing shows the unapparent effect on the environment of Khejuri where they are still polluting the air, soil, land and ground water. Soil mining is going on day to day in Khejuri along the riverine or channel side agricultural lands. It has some salutary impact on the environment of this area. The brick kilns are close enough to pollute the air quality and ground water here. Some villages are facing land degradation and pollution. Air and water pollution generated by brick kilns continues unaffected.

| <i>Time /Periods</i> | <i>% Of Brick Fields</i> | <i>Past Forms Of Brick Fields</i> |
|----------------------|--------------------------|---|
| Before 1980 | Nil | Nil |
| 1980-1985 | 4.2 | Agricultural lands |
| 1985-1990 | 4.2 | Mostly Danga Land |
| 1990-1995 | 4.2 | Agricultural land & chak area |
| 1995-2000 | 4.2 | Agricultural land |
| 2000-2005 | 12.5 | Agricultural land & chak area |
| 2005-2010 | 50 | Agricultural land, chak area & unproductive lands |
| 2010- recent | 20.8 | Agricultural land |

SOURCE:-Field Survey.

The net result of a brick kiln is known as land degradation. This term is widely used to describe the vast impact of human beings and natural causes on land. Land degradation is defined as the reduction of land quality to a lower rank. The term 'rank' refers to the present and possible uses while 'reduction' implies a problem for those who use the land. When land becomes degraded, its productivity declines unless steps are taken to restore that productivity and check further losses (Blakie and Brookfield, 1987). Barrow (1991) revealed that in Europe brick kiln industry was also concentrated near urban agglomerations. "Brick-pit has been dug in many parts of UK and Europe, for example London. Once abandoned, these excavations have proved valuable for domestic refuse disposal and recreational use".

The data analyses on the brick fields for the study reveal that considerable amount of productive and potential agricultural lands have been given to brick fields. Unfortunately, brick fields are mostly situated on riverine fertile agricultural land, as it need clayish, silty, loamy, clay loam or silt loam soil with good texture. During the last two decades there has been 21 % reduction in livestock population as most of the grazing fields have been taken away by this. Haphazard and unplanned establishment of the brick fields has caused the natural breeding grounds of fishes and aquatic lives to squeeze affecting their species diversity to decay. Expansion of it at the cost of agriculture has also caused Stalinization of lands, land degradation due to removal of top soil. Not only that, many other social problems also indicate human cost of

it. But this industry has generated ample scope for getting jobs of higher wages and enhanced per capita income of the wage earners. The landowners find it more profitable to lease out their lands to the brick fields owners than to cultivate them. Thus, this it has strengthened the economic base of the area and is capable of ensuring economic returns much higher than agriculture and others. Therefore, it may say that the industry, if allowed to grow uncontrolled, is not a viable economic option for the region in terms of land as well as environmental sustainability. So under this backdrop, this study is a humble endeavour made to assess the impacts of brick manufacturing on land resource and the main focus of this paper is a reliable analysis and information, with a clear agenda to protect environment in this study area.

2. About the Study Area

The territory of Khejuri Block came into existence as a consequence of coalescence of twin sister islands- 'Kedegree' and 'Hijili' which emerged as small riverine islands along the western bank of Hugli estuary. Since then the area has undergone not only various morphological and environmental changes throughout its geological history but also witnessed social, political and economic transformations under the Mughal, Pathan, Portuguese and British rules. Its early importance as a trade centre faded out with gradual decline of the native port of Khejuri in response to estuarine morphodynamic modifications. All such transformations have brought about alterations in livelihoods of the local people and economy of the area under consideration. In recent years, brick manufacturing has come up as an emerging economy in a big way that provides livelihood to a considerable proportion of the local population and has become third largest contributor (after agriculture and fish farming) to the local economy. It has grown in fabulous manner in Khejuri Block particularly during the last decade. More than 70% of the existing brick fields have been developed between 2005 and 2011 along the banks of rivers (Hijili and Rasulpur), tidal channels and canals or beside the roads having agricultural lands mainly.



Figure 1: Location Map of the Study Area

3. Objectives of the Study

1. To discuss the determining factors of Brick Industry in the Study Area, Khejuri;
2. To assess the impacts of soil quarrying on land of this area;
3. To ascertain and examine the land degradation through brick kilns of Khejuri CD Blocks;
4. To make concluding remarks for improving the land status as well as environmental sustainability of brick field region in the study area.

4. Methodology

The article titled as “*Land Degradation through Brick Kilns- A Study on Khejuri CD Blocks over Coastal Medinipur in West Bengal*” has been based on primary and secondary sources of data. Primary data/information has been collected through interview with the owners and managers of the sampled brick kilns throughout about three and half of the year. Intensive questionnaire survey has been conducted taking significant number of samples from each of the villages in Khejuri C. D Block. Secondary data sets have also been collected from the Block Development Office, Panchayat Offices and Brick Field Association. Soil samples collection has been occurred based on systematic random sampling method from in and around the brick field areas and these have been analyzed in the laboratories of

Geography, Botany, Zoology and Chemistry Departments of Bajkul Milani Mahavidyalaya. Generated soil data and other data have been analyzed and compiled by necessary Statistical and Mapping Methods along with GIS Techniques. Those data have been compiled and analyzed. These apart, related books, journals, newspapers, Report of Brick Association and also different websites have been consulted to make the study an effective one. The period of study is confined to about four years i.e. from 2011 to 2014. Percentage analysis has been used for interpretation of the data collected from field survey.

5. Factors Determining the Location of Brick-Kilns

One can get a general idea of the location of brick kilns inside the study area. First however, one has to know why the brick kilns are located in Khejuri, this rural segment of Purba Medinipur in West Bengal. Second the choice of location factors, ranked in importance, has been identified.

| SL. NO. | Reasons | % of Farmers |
|---------|---------------------------------------|--------------|
| 1 | Levelling The Lands | 10.81 |
| 2 | Poor Quality of Top Soil | 29.73 |
| 3 | Not Interesting in Active Agriculture | 40.54 |
| 4 | Urgent Need for Liquidity | 18.92 |

Source: - Field Survey

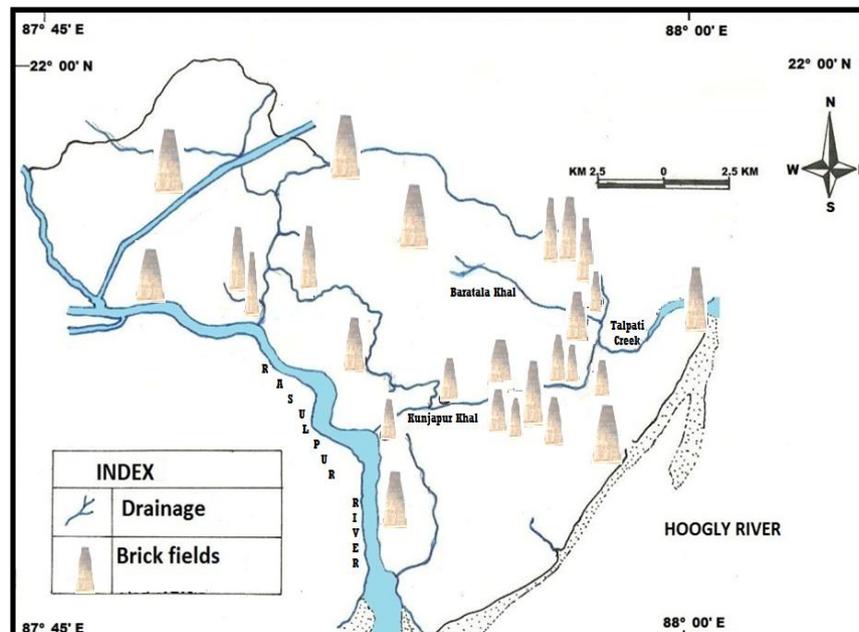


Figure 2: Distribution of Brick Fields in the study area

(A) Soil Availability and Quality

The top layer of soil (clay) must have a depth of at least 5 feet. For this depth, the soil must have the right structure and chemical compound. Close to the Hooghly and Rasulpur River, this depth is sufficient, together with its market accessibility. The availability and sufficiency of clay in this area is the reason that there are a few brick kilns near the river. Often, the brick-kiln owners claim that they predominantly use salinized soil for their industry. They have intent to justify the quarrying of soil with this claim. In some cases it may be true, especially if that makes the lease a very favourable bargain. However, salinized soils produce lower quality bricks. They break easily and absorb too much water when cement and paint is applied on the walls. Consequently, it is likely that good quality soil is generally preferred; especially when it is considered that quality-brick demand is growing faster than that of low quality. Particularly private construction sector is expanding faster than the public construction projects. Private builders are more demanding. In public/government construction committing deception with construction materials is very common. Lower quality bricks are purchased when higher priced bricks are claimed to use on paper. That creates a demand, though limited, for low quality bricks.

(B) Land-Value

In area of high land value there are no brick kilns. The cost of leasing land for quarrying its soil relates closely with general land-price and is higher closer to the city and main roads. Land-value has close correlation with market accessibility. Very close to the sub-urban area, Haria there

are no more brick field. The location factor land-value is also the major cause of the development of the industry in Khejuri.

(C) Accessibility

Transportation costs of bricks are very high. Accessibility of a brick-kiln within one kilometre from a tarmac road is required. It must be possible to reach the brick kiln by truck. One truck can carry about 4,000 bricks, so the value of its freight is low, not more than Rupees 4,000. Generally, it does not pay to take a load of bricks more than two hours from the brick-kiln to the construction site. This is the reason why in area where there is little or no useful soil, no brick-kiln exists. People build using other locally available construction materials like rocks, limestone, and sandstones.

6. Growth of Brick Kilns in Khejuri CD Blocks

These blocks in rural Purba Medinipur in West Bengal had more brick kilns in the last phase of closing the industry. In 1980, there was no brick kiln located in two blocks of Khejuri. About 50% brick kilns came up during 2005-'10. The maximum growth of brick-kilns was due to different Rural Development Project, efforts to protect the houses against frequent flood and sea surges and growing socio-economic comfortness of the inhabitants. During the period, demand for bricks was very high. This attracted a number of brick manufacturers from the nearby blocks and districts of Bengal.

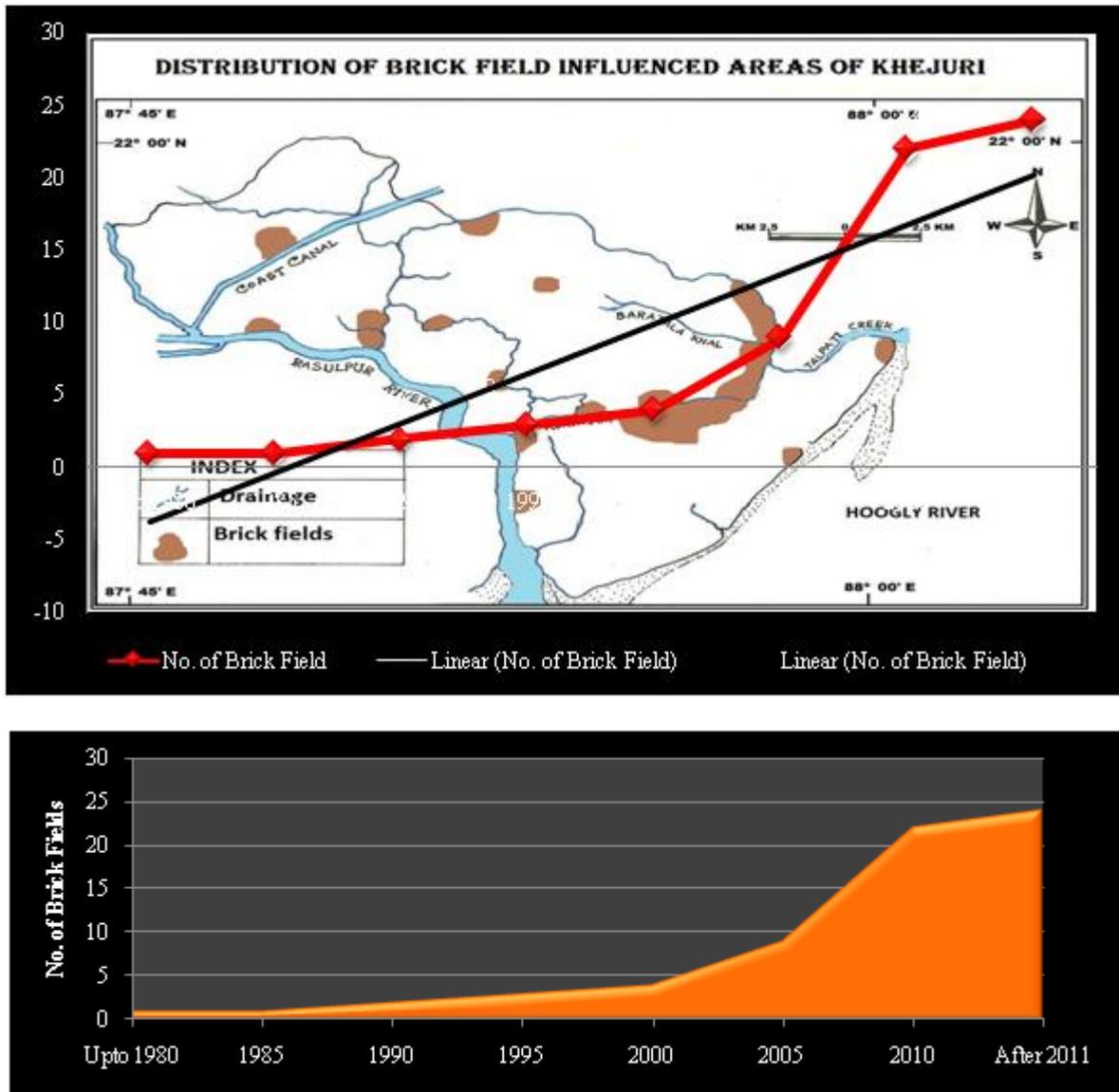


Figure3 & 4: Brick Field influencing zones with growth of it

The rapid urbanization and growing demand of land for residential purposes make the brick kiln industry to spread quickly or search for new sites or locations. Only 16.8% brick kilns came up during 1980-2000 and there is no hope for the brick kiln owners to get new landsides for soil quarrying. This stagnation of brick kiln industry in this block forced the brick to establish further all over these blocks of Khejuri.

Impacts of Soil Quarrying on the Quality of Land

Brick kilns as well as urban demand for refilling the low-lying land indulges in sand and soil quarrying activities. Quarrying activities are major cause of land degradation. This hypothetical assumption had proved wrong. There are numbers of diversity in effect of soil and sand quarrying. It has been observed that there are at least two major impacts of soil quarrying. One is positive impact on the land and other negative impact on the land.

Clay quarrying activities by the brick-kilns causes damage to agricultural lands. May be it has some positive aspects but in most of cases the final outcome is negative and serious.

Good quality of soil is needed to produce good quality bricks but it is also needed for growing various kinds of crops. But, farmers give preference to brick-kilns rather than growing agricultural crops, because brick kiln owners offer much more money than they can earn from agriculture. Farmers are willing to compete with the urban people. Hence, they had forced to surrender their agricultural lands for four or five years lease.

Soil Mined by Brick-kiln Industry in Khejuri during 2010-2013

| Serial No. | Village | No. Of Brick Kilns/Industry | Brick-Made (In Lakh) | Soil Used In Cubic Metre (Estimated) ('000) |
|------------|---------------------|-----------------------------|----------------------|---|
| 1. | Khejuri-I(Interior) | 09 | 145 | 43.2 |
| 2. | Khejuri-II(Coastal) | 18 | 290 | 86.4 |
| Total | Khejuri | 27 | 435 | 129.6 |

During 1980-2013, there were 27 brick kiln industries located in 2-blocks of Khejuri. One brick-kiln produces near and about 16 lakh bricks in a year and consumes 4800 cubic metres of soil. Therefore, 27- brick-kilns produced 435 lakh

bricks and consumed 129600 cubic metres of soil during every year in this coastal area of Bengal.

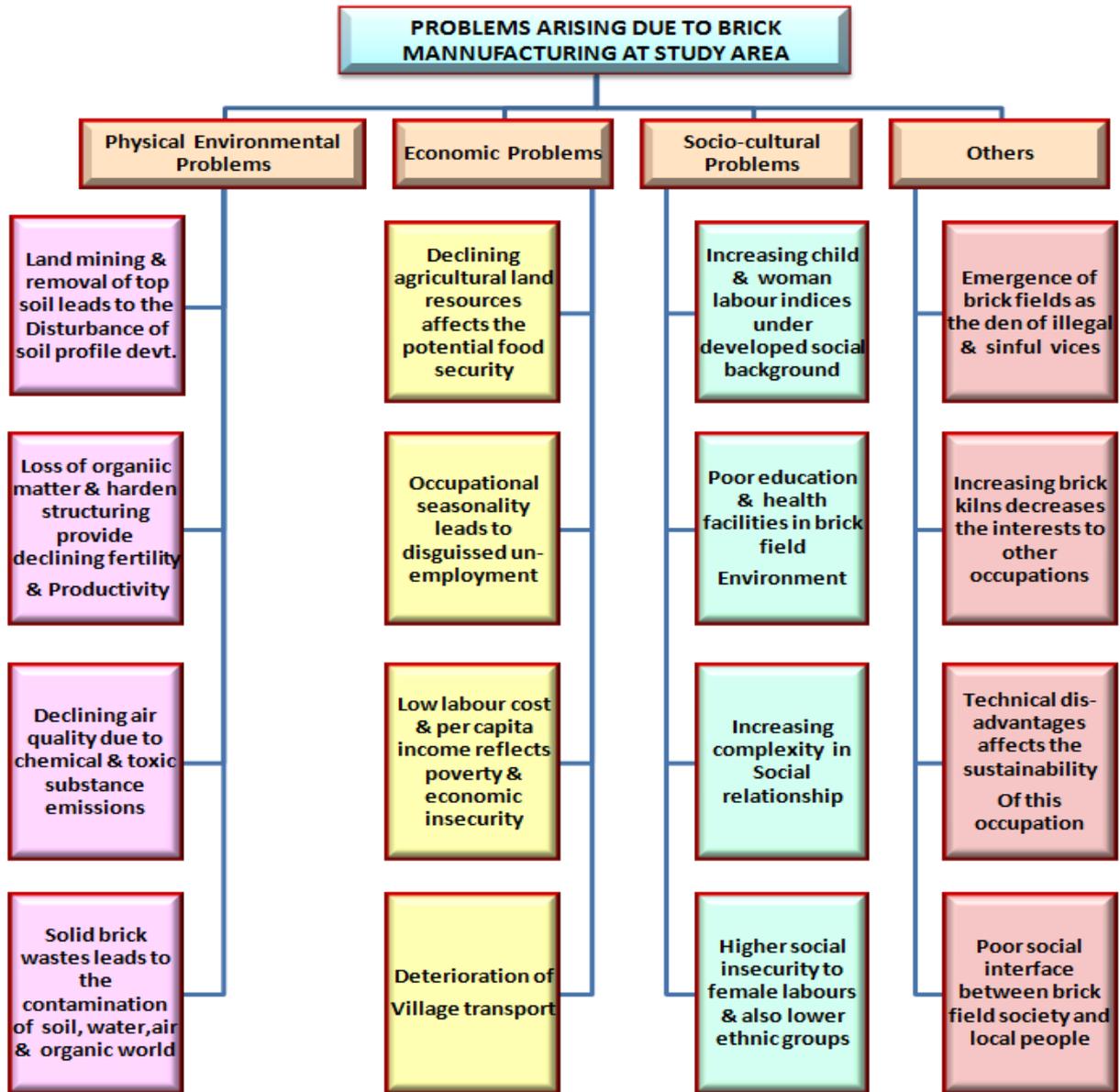


Figure 5: Problems due to Brick Manufacturing in the Study Area

(A) Negative Impacts

Brick-kiln usually looks for good quality of soil particularly the high quality of soil. Removal of fertile top soil leaves renders the land infertile. Nuarat (1991) investigated the decline of fertility of topsoil due to brick-loam quarrying in Mysore. The major contents of nitrogen, phosphorus and potassium soils are considered the indicators of fertility. It has taken samples before and after the quarrying of land and found that the fertility came down by 50%. Field observation as well as interviews with farmers and landholders concluded the same result in the study area of Khejuri CD Blocks.

Brick-kiln activities and sand mining made the land unfertile. Leaving land fallow for a long time is the only way to prevent it from being barren land. Use of huge amount fertilizers is essential to make fertile and productive land.

(1) Solid Waste Generation

Coal ash is the main solid waste generated in brick kilns. Its quantity depends upon the amount of coal or other fuels used and their ash contents. The amount of ash generated is 1-15 tonnes per day that goes on accumulating on or around the brick-kilns. In addition, over burnt and broken bricks also constitute a substantial amount of waste and are piled up near the stockyard. The whole amount of ash is either dumped back on the kiln top or it is stocked along the kiln wall. This excess ash or dust gets dispersed to surroundings are as pavements by blowing wind or by human activities. The dust that is not removed or disposed off on daily basis, plays the most notorious role in making the brick kiln.

(2) Erosion Caused By Adjacent Quarrying Land

Topsoil is carried away by water along the steep slope escaped by soil quarrying during the rainy season. It removes huge amount of fertile soil. This process degrades the topsoil of even that land which is not under quarrying.

Owner of the quarried land does not bear the cost of inconveniences of the neighbouring effected lands. Such understanding between land owners and brick-kiln owners degrades not only land but also environment.

(3)Water Management Problems

Adjacent quarried land can disturb the fragile irrigation system of the area as a whole. It disturbs the topography of the area. The unquarried land becomes higher in elevation and hence difficult to irrigate. Quarrying takes place in the surrounding land, the remaining high land suddenly find difficulties with source of irrigation (a tube well or canal). Irrigation becomes more difficult. Eventually this process leads to the decision of the farmers to lease their lands. This problem is not only in this study area but it is a global problem.

(4)Water Logging

Water logging in the quarried land is a common problem. In this study, definition of water logging includes the flooding of land by rain water. It occurs through water accumulation in the low-lying lands, specifically in the river, channel or canal side areas. Even after levelling of the land, it is as much as 2 metres lower than the surroundings land. Hence, it is more sensitive to water logging problems. Water logging is not only in the rainy season but also occasionally take place in the other season. If the land is cultivated, the crop can be spoiled when drowned by the excessive water. Consequently, cultivation of the quarried lands can be much more risky enterprise. In many cases, the risk of water logging prevents the land from being cultivated.

Water logging does not occur due to appearance of ground water table in the clay quarrying lands. The depth of quarrying is not enough to reach the ground water level, which is low and has gone down further in recent years.

(B)Positive Impacts

In some area, low lying quarried lands have a distinct advantage over the unquarried land particularly in matters of irrigation. Low lying tube wells are more functional. The canal water also reaches low-lying areas easily. Higher situated agricultural land often has problems with irrigation. The depth of ground water is too large for an ordinary tube well to pump it up (More than 25 metres). Leasing the land to brick quarrying can sometimes solve this problem. Regaining of sufficient fertility can be achieved by applying farmyard manures and chemical fertilizers to the quarried lands. It is argued that the costs of this reclamation are often impeditive, but that is not always the case. There are even examples that land previously unsuitable for agriculture, become agriculturally productive after quarrying the top layer of soil. The lower situation makes the integration of the land in the irrigation system of the surrounding possible land. Because of the abundant water, gathering at lower land, rice is a popular crop in formerly quarried areas.

Cook (1986) in Mexico has found the above described advantages of irrigation to be true. He even calls the two sectors; the brick industry and agriculture are highly complementary. However, Cook's research area being confined to his conclusions can not be generalized. Yet, the

distinct advantage of low-lying land enjoys in matters of origination. So, the situation of brick industry in both regions of the countries, India and Mexico are not fully comparable as far as land degradation effects are connected.

(1)Removal of the Salinized Topsoil:-

Quarrying of top layer of soil profile in salinity affected areas is advantageous for farming and agro-forestry. The merits of levelling higher lands with the surrounding area are more often occurring positive effect of soil quarrying than the removal of salinized soil mentioned in this paragraph. However, it is very used as a reason by farmers, who have leased their land. Farmers are getting double benefit. It is common view of the respondents. Although exaggerated to justify their drive for quick profits, it is probably true for some cases.

Apart from the landowners leasing land, the brick-kiln owners are also inclined to emphasize the following mechanism. "After quarrying the top layer of saline top soil, land becomes more productive." Theoretically this is possible and it would be desirable, but in reality the brick kiln owners avoid saline soils for brick making because poor quality bricks result from poor quality soils. The lower lease-price, which may apply for land with saline soil, does not compensate for lower prices obtained for poor quality bricks. However, it is also a matter of degree salinization. When soil is only slightly affected, it is more likely that the brick industry will be able to produce bricks to a satisfactory quality for low quality bricks a market certainly exists. With the current state of applied technology in brick making, it is impossible to produce brick of acceptable quality out of salinized soils.

The leaders of the brick industry, All Indian Brick and Tile Federation, acknowledge the benefits of possible brick-production on saline soils. Research is on to make better quality bricks from poor quality soils, the preliminary results are encouraging (Gupta, 1995, Hajela, 1991, Nyati, 1992). Although, brick production from saline and alkaline soils is insignificant at this moment, in future, it may be hoped and expected to occur on a larger scale.

(2)Economic Pressure

It is hard to be green when you are struck in red. One of the reasons why farmers tend to give their lands for brick making is poverty. Some farmers became brick-kiln owners. Man use a part of their own lands and launch brick kiln industry leading to own. Growing economic difficulties of farmers has caused a major pressure on the land base directly or indirectly. This problem has been especially marked since the mid-1980s.

(3)Land Ownership

A land owner, who starts a brick kiln on his own land, is very common feature. This happens because for the brick kiln it leasing land is much more difficult. For this longer period than a quarrying contact (5 to 10 years), he has the advantage of not having to bother about leasing the land with the accompanying difficulties and factors of uncertainty. However, it is rare that he would only use his own land for the required clay. The size of his land is not likely to be enough for 2 to 4 acres of land required per

season. Besides, he may choose to leave some of his land under cultivation. Agriculture thus remains as a secondary occupation because it is a relatively stable source of income and it may employ some family members. Therefore, he takes surrounding land on lease from other landowners.

(4) Shift To Non-Agricultural Activities

Occupational shift away from agriculture takes place in the area. Most land owning households in the urban periphery or advanced village areas get their income from source other than agriculture. The status of agriculture, as the only source of employment of a male family member is low. Many households have only one male family member engaged in agriculture. Tractor driving, labour contractor and labour supervision are the usual jobs they take care up. Women work in fields, but are not supposed to interfere in the actual management and decision-making about land use. Consequently, if they lose the male family member they prefer taking up other activities. It is often seen that the option of leasing land to brick kiln owners is considered. The money can be used for business and consumption. The temptation is so strong, that rational decision based on real cost and benefits of the lease contract is rare.

(5) Short-Term Profit

At times, the lease of land to brick industry proves very profitable enterprise. This is especially so if the owner is able to sell his land to colonizers and builders after the lease period is over. This way, he earns double profit. However, factor of uncertainty is involved. Although not very influential at the moment, yet it is hard to know what government policies regarding land use will apply to him after the years of the lease contract. Also quarried land can be worth less if it confronts water logging problems or other problems.

In any case the lease of land to brick kiln owners is an easy way to earn money in a short period of time. Money is used in project that does not yield regular income. Constructing a new house, buying a car, giving huge dowry in girl's marriage, turning to alcohol and other drugs are in common practice.

7. Effect on Ambient Environment

Brick kiln emission and fugitive dust are known to affect both the workers health and surrounding environment.

(1) Effect on Occupational Health:-

- Workers engaged in brick manufacturing such as raw brick, loading and unloading of raw brick-kilns, firing of coal (rushing, fuel charging, etc.) are under various thermal and physiological stresses due to extremely unhygienic conditions prevailing in brick kilns. Workers face tuberculosis, asthma and respiration problems.
- Pollutants such as dust, SO₂, NO_x, etc., emitted through brick kiln stacks and heat stresses prevalent near the brick works have not been studied in a systematic manner in the country so far. However, these pollutants are known to cause serious health hazard to the inhabitants in the region. All the gaseous pollutants have their specific toxic effect on human body. A dust-laden atmosphere is potential health hazard leading to

pneumoconiosis or related pulmonary disorder depending on particle size and concentration of dust particulate matter, duration of exposure and composition of dust particles.

- Dust concentration on kiln platform is usually very high due to various operations especially loading and unloading or brick windblown fine dust from fired clay or ash cover over the entire kiln and changing of pulverized coal. This dust is injurious to workers as major part of it belongs to respirable range (less than micron in size). Exposure to such high levels of coal and dust particles may also cause irritation of skin and eyes.
- No precautionary measures are taken by the industry to protect the workers from the ill effects of particulate and gaseous pollutants. The workers are generally advised to eat jiggery (gur) daily. It is believed that it will absorb all the dust and gaseous pollutants that go into the human system. This is partially true. Jiggery may help in removing particulates and gaseous pollutants, which pass into alimentary canal but cannot remove the pollutants, which have been inhaled into the respiratory tract or lungs. It is, therefore, extremely essential to make the use of respiratory mask compulsory for workers.
- Brick industry in this region is concentrated geomorphologically on Bhagirathi-Hooghly plains as well as Bengal coastal plain and remains active during November to June. During winter months the heat radiated from the kiln top makes the workers thermally more comfortable but during April to June they are exposed to intolerable thermal discomforts.
- During summer months the sensitive heat that escapes the kiln top increases thermal load on workers. Its major components are radiant heat from the kiln top, surrounding hot wind and the hot gasses escaping from feeding holes during charging. These excessively hot conditions may cause various heat-induced illnesses such as heat exhaustion, dehydration, heat cramp and heat stroke apart from occasional skin burns. The level of heat exposure ought to be kept to prevent serious physiological imbalance or injury to workers.

(2) Effect On Surrounding Vegetation:-

- Air pollutants, including smoke coming out from chimney as a result of incomplete combustion of coal, has long been known for their adverse effect on vegetation. It not only affects the leaves of plants but also flowers and fruits. Brick kiln emissions are aerosols, composed mostly of carbonaceous and siliceous particles as well as soot and particulate matter in the form of dust and soot. This robs the plants and trees of full sunshine. The reduced light intensity adversely affects the rates of photosynthesis, growth and yield. Agricultural crops and fruit trees growing around brick kilns have found to be damaged as a direct effect of pollutants in Khejuri.
- Incidentally brick kiln emissions are not rich in acidic gasses such as SO₂, NO_x, HCl and HF, etc., which are known for their severe damaging effects on plants. However, high concentration of carbonaceous and siliceous particulate coupled with soot and fire causes perceptible damage to plants. Research carried out at India Agricultural Research Institute (IARI) has shown that this smoke causes various disease and necrosis in mango. Yields of wheat and rice crops grown in fields adjacent to

brick kilns have been found to be badly affected in the Coastal Blocks of Khejuri problems. Then leasing land is easily considered. The sudden need for cash has played a role in the case study or in this region.

8. Concluding Observation

Brick-kiln industry consumes top fertile soil of the area during the last two and half decades. Most of the agricultural lands became barren or infertile. There are many patches of land that have become agriculturally unproductive due to water logging. 25- Surveyed brick kiln industries have consumed 2520,000 cubic metres soil during 1995-2010. It had been consuming lots of fertile soil. This industry has been closed in different metropolitans of India as it falls in 'H' category of polluting industry. But, it is still polluting and harming the environment of this region. Numbers of brick kilns are running along the interior channel line location. Brick kiln industries has played the major role causing land degradation in Khejuri. It had big impact on health, crops, and wetland and overall environment of Khejuri. Soil mining has become serious problem and causing land degradation problem. For sustainable agriculture to work, farmer must be given options that do not threaten the economic viability of their farms yet encourage them to become as good managers of the environment as they are of food production (Government of Canada, 1991).

9. Recommendations

Every nation can develop if its environment are preserved and sustained. So it is the first and principal sense of duty of our Government to disburse concentration for the protection and conservation of his spatial environment. A digit of actions has been adopted by the Government for the wellbeing of land resources. But in most of the cases, land status as well as land use sustainability is not protected. Through the hand of concretization in both urban and rural landscapes, there is observed huge land degradation scenario in and around numerous brick manufacturing regions over different corners of India. My study area is not also exceptional in this sense. So, under this backdrop, there may be provided the following recommendations as well as suggestions from my site.

- In case of brick manufacturing, there are many brick fields which are not permitted from government and administration. So, the regular and proper registration way should be conducted for the brick kilns.
- There should have a separate neat and clean land use policy for the brick field establishment and development from government site.
- There should be provided no political and partiality based administration for brick field expansion.
- Exhaustive and comprehensive legislation is urgently needed for regulating land resource assessment, environmental status justification in and around the brick kilns.
- The Agriculture and Land Reform Department should come frontward to put off land degradation and environmental pollution in the brick kiln factories. For this, the Department should set up special arm that can

oversee the subject and take essential action against the wrongdoers.

- Voluntary organizations of distinguished personalities of the region (where brick kilns are situated) should be involved to see whether the different requirements and wellbeing actions are being harshly implemented.
- Government as well as NGO should make an awareness programme that will discuss about the ill effects of land degradation on society and environment. The co-operation of brick kiln owners and workers are urgently needed in this regard also.
- Researchers, academicians, environmentalists, all types of nature lovers and also local people should try to prevent this environmental disease due to this illegal, haphazard and unplanned expansion of brick manufacturing as possible as for saving their home ground as well as environment.

10. Scope for Further Research

There are some specific limitations, which should be addressed as a means of improvement for further study. This study has equipped based on intensive literary survey and ground truth information used for the data on soil as well as land degradation. Planning is never whole without local people's opinions and helps integrated. The study can be considered as the guideline or instruction for landuse and environmental planning. Yet, this research will expose opportunities for further research and investigation, and help decision makers to review what options exist for improving land conditions and environmental status in the brick kilns of not only my study area, but also of West Bengal as well as India. There are many scopes for further research work on "Brick Industry". The researchers may do the research work on:

- "Environmental cost of Brick Kilns in Purba Medinipur, West Bengal, Bangladesh and India": A Comparative Study
- "Causes and Consequences of Land Degradation in and around Brick Kilns": A Case Study of Purba Medinipur in West Bengal
- Misuse, Abuse and Overuse of Soil Resource in the Brick Kiln Fields of India: A Study
- Brick Industry and Environment Degradation: A Study
- Problems and Prospects of Land Resource in India: A Study in the light of Brick Industry.
- Mistreatment of Land Resource in self of Brick Kiln Industry: A Study
- Qualitative Study on the Land Quality in the Brick Field Region: A Study
- Top Soil Removal due to Brick Kilns and Future of Agricultural Land: A Study
- Status of Soil Resource in terms of Landscape Assessment in and around the Brick Fields: A Study, etc.

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Author Profile



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