

The Negative Effects of Brick Kilns on Climate and Environment: A Socio-Legal Study in Paikgacha Upazilla of Bangladesh

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Abstract

Brick industry has been an integral part of Bangladesh's growth since the construction flourishing of the last decade. But government of Bangladesh has found it tough to control the brick industry in Bangladesh. Around 90% of the 8500 brick kilns in the country are Fixed Chimney Kilns (FCKs). FCKs consume more coal, emit more particulate matter (PM), and generate more sulphur dioxide (SO₂) than modern Improved Zigzag Kilns (IZKs) or Hybrid Hoffman Kilns (HHKs). The government of Bangladesh has taken actions to move away from FCKs to adapt modern and cleaner technologies. However, the transition is capital exhaustive and owners are unwilling. The purpose of this study is to explore environmental effects of brick kilns and assess the environmental laws in Bangladesh. Paikgacha Upazila of Khulna district has been selected as the study area because of its rapidly varying population density, socioeconomic crisis, industrial and environmental concerns etc. At present, 26 brick kilns are located in the study area. This findings of the study is based on selected respondents' perception on the change of climate and environment as well as on the assessment of *the Brick Manufacturing and Brick Kilns Establishment Control Act, 2013, the Environment Conservation Act, 1995, the Environment Court Act, 2010, Bangladesh Climate Change Trust Act, 2010, Bangladesh Climate Change Strategy and Action Plan, 2009, Bangladesh Delta Plan 2100* etc. From the study, it is found that most of the brick kilns of the study area are located near agricultural lands and residential areas which are responsible for loss of agricultural production, fish cultivation, local community's health problems and violating climate and environmental laws to a great extent. Improving brick production technology, development of existing related laws and proper implementation of these laws may be the best recommendation for the betterment of climate and environment as well as to achieve the goal no. 13 under the Sustainable Development Goals (SDGs) by 2030.

Keywords: Brick kilns, Agriculture, Environment, Pollution, Environmental laws.

1. Introduction:

The demand for construction materials is very high in Bangladesh because of a large volume of government projects as well as private construction works since the last decade. According to the officials of Department of Environment (DoE) of Bangladesh, there are around 8,500 brick kilns in the country, although independent researchers and green activists claim that the number is no less than 13,000. They consume around 350 crore cft soil while producing around 2,400 crore bricks annually (Business Standard, August 24, 2023). According to the Food Planning and Monitoring Unit (FPMU) under the

Ministry of Food, land used for agriculture declined at 0.26 per cent annually between 1976 and 2010 and faster after 2000 at 0.45 per cent. Other sources report that croplands have declined by one million hectares since 1976. Brick kilns are one of the reasons for such loss of agricultural land (Daily Star, August 24, 2022). Two billion bricks are produced every year, out of which one billion and 375 million is burnt with wood, 400 million with coal and 225 million with natural gas (Azad & Iqbal, 2006). Every year total quantity of wood fuel available in Bangladesh is 204 million cft, out of which 52 million cft are burnt in brick kilns (Miah & Alam, 2002). As a result, deforestation is a major problem for Bangladesh in the brick-manufacturing season. Wood fuels and fossil fuels, which are burnt in brick kilns, are mainly responsible for the emissions of the trace and non-trace greenhouse gasses, such as CO₂, CH₄, CO, N₂O, NO_x, and NO (Anon, 1998). According to the Columbia University's Environmental Performance Index (EPI) 2020, Bangladesh ranks at 162 among 180 countries of the world in protecting the environment. Countries industrially ahead of Bangladesh are Thailand, China and Vietnam are also ahead of Bangladesh on the index. In fact, even Pakistan and Nepal rank higher than Bangladesh. India, though, lags behind Bangladesh (Asaduzzaman & Deepto, 2021). The EPI 2022 report showed that Bangladesh has ranked 177 out of 180 countries in reducing environmental pollution, its position in the index declined 15 steps in the last two years (Financial Express, June 12, 2022).

According to the report of the Bangladesh Centre for Advance Studies (BCAS), only 1,745 of the brick kilns in Bangladesh began operations before obtaining a license (Ahmed, 2019). Nearly 90% of the brick-makers have not updated their production process in keeping with new environmental regulations on the fuel, location and use of brick kilns, set by the government (bdnews24, December 15, 2016). According to the Deputy Commissioner's Office, there are 153 licensed brick kilns in Khulna. Although the registrations of these brick kilns have to be renewed every year, most of the brick kilns continue to operate without renewal as they lack the required documents (Daily Star, February 12, 2021). Brick kilns location in agricultural lands, low quality wooden for burning of bricks, improper fixed chimneys and the violation of laws to conserve environment is leading this sector into a major cause of agricultural productivity decline, pollution of environments and hazards towards human health (Guttikunda & Khaliquzzaman, 2014).

Khulna is one of the oldest districts in Bangladesh. There are 146 brick kilns in Khulna district. Among of them, 46 brick kilns are illegal (Channel24 TV, December 28, 2022). There are 26 brick kilns in Paikgacha Upazilla, out of them 21 brick kilns are illegal. Without the license, these industries use wood and tire as fuel for the production of brick. Most of the brick kilns are located near agricultural lands, residential areas and adjacent of roads (Daily Sangram, August 28, 2023). There are 10-12 brick kilns in Paikgacha Upazilla which are grabbing Shibsha, Katakhal and Kapotakkha River and causing severe river pollution (Boishakhi TV, December 2, 2022).

A few articles were found on effects of brick kilns in Khulna region but no specific papers have been found on the compliance of climate and environmental laws by brick kilns in Paikgacha Upazila. It is intended that the following gaps should be filled to achieve the goal of this research. That's why Paikgacha Upazila is selected as the study area. The concluding result will be helpful for the policymakers toward defining adaptive initiatives against illegal brick kilns owners. This study is analyzed based on the changes of climate and environment what the respondents observed before and after establishment of brick kilns around them. The location of brick kilns and burning process of bricks are evaluated on the basis of kilns field study. The objectives of this research are:

1. To find out the effects of brick kilns on soil fertility, agriculture, vegetation and health of residents of the study area.
2. To evaluate the compliance of relevant climate and environmental laws.

2. Materials and Methods:

2.1. Study Area

Paikgacha Upazila is a small administrative unit, situated in Khulna district under Khulna division. Paikgachha is located between 22°28' and 22°43' north latitudes and between 89°14' and 89°28' east longitudes. It has 41,194 households and a total area of 411.19 km² and the total population is 2, 47, 983 (Bangladesh National Portal, 2024). It is bounded by tala and dumuria upazilas on the north, koyra upazila on the south, batiaghata and dacope upazilas on the east, Tala and assasuni upazilas on the west. It is divided into Paikgacha Municipality and 10 union parishads; Chandkhali, Deluti, Godaipur, Goroikhali, Horidhali, Kopilmuni, Loskor, Lota, Raruli, and Soladana. The union parishads are subdivided into 170 mauzas and 212 villages. Paikgacha Municipality is subdivided into 9 wards and 5 mahallas. Main sources of income of the study area are agriculture 35.48% among all occupation types (Banglapedia, 2024). Figure 1 shows the location of the Paikgacha Upazila in the context of Khulna district.



Map 1: Location of the Study Area [Source: Author, 2024]

2.2 Sampling and Data Collection

Primary data were collected by Kilns Observation, Questionnaire Survey, Focus Group Discussions, interviews of the people and from different Acts. For the questionnaire survey, a total of 200 adult people were selected randomly in the study area. However, all respondents were later divided into two groups. The owners and workers of brick kilns are in category-1 who was engaged in the brick manufacturing process and the workers were the most vulnerable to health hazards because of direct involvement with brick kilns activities. The people who were living within 01 kilometer of the brick kilns are in category-2. Each category consisted of 100 respondents in the study area. They were involved in farming, labour, and different types of activities. Local knowledgeable persons including officials of the Department of Environment, Forests and Climate Change in Khulna district, community representatives, and teachers were interviewed individually to know their perception about this study. Two FGD were conducted with the workers of brick kilns to identify the brick kiln technology, chimney height, fuel and brick manufacturing process. Impacts of brick kilns were assessed in terms of changes in soil fertility, agricultural production, aquaculture, vegetation, fish production, health and air quality based on how respondents found these after the construction of brick kilns. Secondary data were collected from newspapers, journals, reports and web browsing.

2.3 Data Processing and Analysis

Data were analyzed and produced graphs by SPSS (Statistical Package for Social Science) software and Microsoft Excel and GIS (Geographic Information System) is used for map preparation.

3. Data Analysis And Results:

3.1 Impacts on Soil Fertility:

The brick kiln workers remove topsoil for brick production. The emissions from brick kilns are not only destroying crops in farmlands, but the way that brickkilns are built leave a lasting negative impact on the arability of the land (Dhaka Tribune, May 9, 2022). According to the survey report, 72% of the

respondents' answered that they feel severe effects on soil fertility due to the brickkilns. On the other hand, 10% answered minor effect and 04% felt no effect on soil fertility because of brickkilns that show in figure 1.

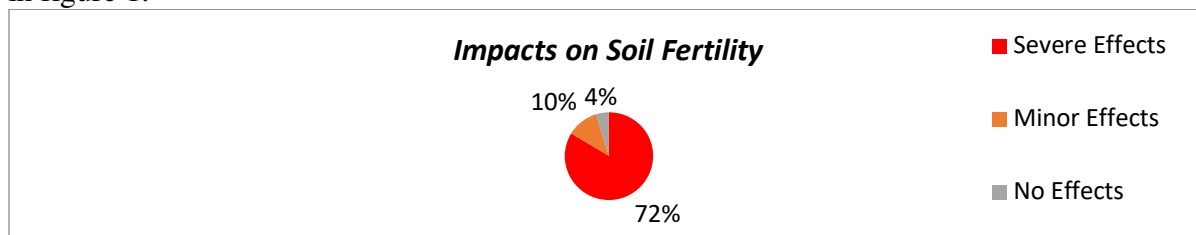


Figure 1: Impact on soil fertility [Source: Field Survey, 2024]

3.2. Impacts on Vegetation

Many of the residents said that the plant blooms died due to the emission of black smoke of brick kiln i. e. mango tree, litchi tree, coconut trees and so on. They also said that fruits production is reduced after the establishment of brickkilns in the study area. Study shows that 60% of the respondents opined that they felt severe effects on vegetation, especially on fruits and vegetable plants within 1 km of brickkiln. Among the respondents, who were the residents nearby brickkilns, 10% commented on minor effect and 02% felt no effect on vegetation (figure 2).

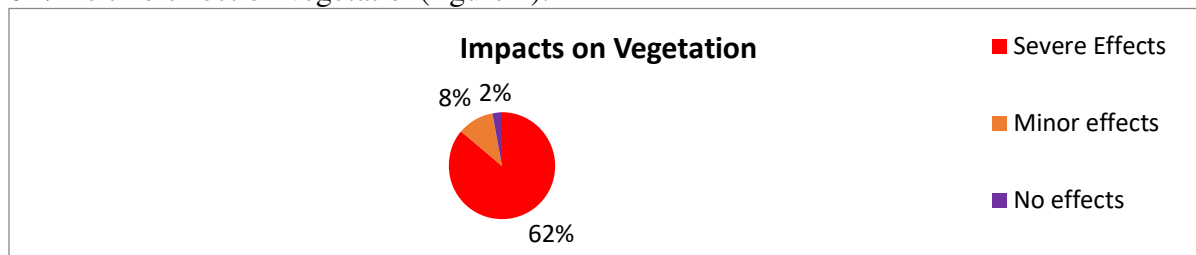


Figure 2: Impact on vegetation [Source: Field Survey, 2024]

3.3 Impacts on Aquaculture

From the kiln study, 43% of the respondents in category-2 said that, “brickkilns had no effects on fish production and aquatic plant production” and 17% of the respondents said about the severe effect, and 19% respondents said that they felt minor effects on aquaculture after establishment of brickkilns (figure 3).

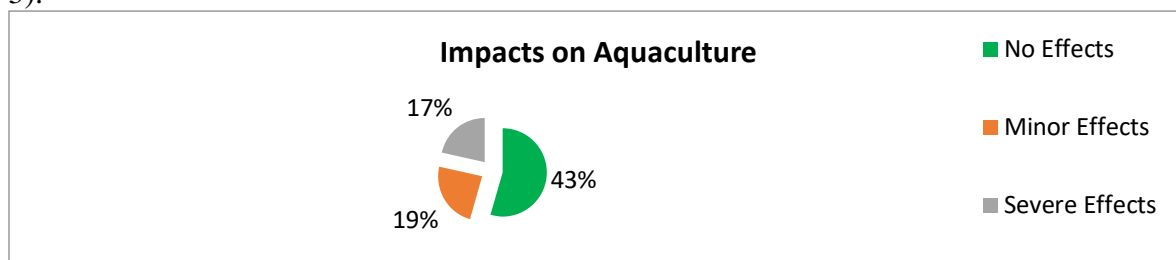


Figure 3: Impacts on aquaculture [Source: Field Survey, 2024]

3.4. Impacts on Air

The main pollutants which are emitted from the brickkilns are particulate matters (PM), some hazardous gases like CO₂, CO, NO_x, NO and SO₂. Brick kilns generating 11% of PM, 22% of black carbon, and 17% of total annual CO₂ emissions in Bangladesh (Business Standard, August 24, 2023a). At present, in the study area all the 16 brickkilns are FCKs. All of them are using poor quality of coal and biomass mainly firewood and consequently, pollutants are being emitted by a greater rate. According to the respondents of category-1, the chimney height of some brickkilns is less than 120 feet. It is another major cause of air pollution in the study area. According to the survey report, 68% of the respondents' answered

that they felt severe effects on air due to the brickkilns. On the other hand, 13% answered minor effect and 02% felt no effect on air because of brickkilns that show in figure 4.

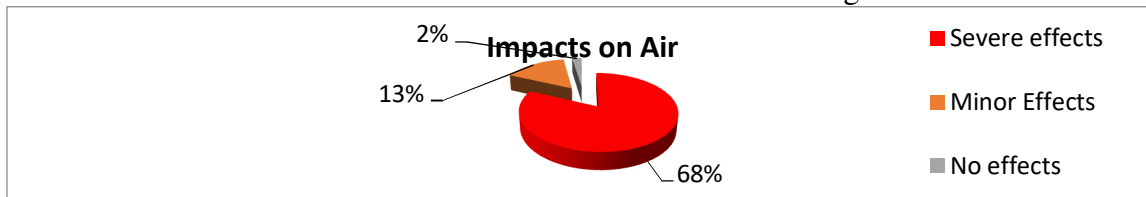


Figure 4: Impacts on Air [Source: Field Survey, 2024]

3.5. Impacts on Public Health

In the study area, most of the brickkilns are situated near the residential area and many people work in the brickkilns daily in the brick production period. School children nearby brick kilns have the worse condition of health and they are suffering for higher prevalence of upper respiratory tract infections. Air pollution generated by brick kilns results in over 6,000 premature adult deaths in Bangladesh (Business Standard, August 24, 2023b). Children in Bangladesh lose IQ at the blood level of 1µg/dL. Some 29 million or about 60% of children in Bangladesh have a blood lead level above 5 µg/dL, the average blood lead level among children tested in Bangladesh is 8 µg/dL, and around 21 million or 44% of children in Bangladesh have a blood lead level above 10 µg/dL (Business Standard, December 12, 2022).

3.6. Impacts on the Brick Kiln Workers

From the kiln study it is found that brick kiln workers are suffering from discomfort in different parts of the body e.g.in the lower back, knees etc. They are suffering from eye irritation, respiratory problems, skin diseases etc.

A cross-sectional study conducted on 200 brick kiln workers reported severe pain in different parts of the worker's body, especially in their lower back which is as follows-

Types of Pain	Brick carriers	Molders	Fireman	Stackers
Lower back pain	83%	93%	71%	85%
Neck pain	91%	81%	52%	62%

Figure 6: Impacts on the Brick Kiln Workers [Source: Field Survey, 2024]

Another study found the commonness of low back pain among the female workers. It showed that 83% of the 150 female workers suffering low back pain and it was most common among brick Molders. Among them, 61% reported it due to manual material handling and 53% due to awkward lifting of heavy objects. Workers work 12-14 hours a day, six days a week in these brick making kilns and they lack basic health and safety measures and do not have access to employer provided benefits such as limit to overtime, healthcare facility, worksite clean drinking water or washroom availability, sick or earned leave, maternity leave, etc. which are common in the formal organized employment sectors. These enormous numbers of laborers, including people and even children work in the brick kiln on a temporary or verbal agreement only and with very low wages. The workers work there for very long hours, sitting or standing in awkward positions, close to very high heat, without any personal protective equipment provision (Financial Express, November 23, 2022).

3.7. Violations of the Conditions of License:

According to section 9(1) and 9(3) read with Form “B” of the Schedule of the *Brick Manufacturing and Brick Kiln Establishment Control Act (BMBKECA) 2013*, there are some conditions which should be complied before getting the license. From the kiln study it is found that most of the Brick Kilns are not complying the conditions. The statistics are as follows-

Conditions of "Form -B" of the Schedule	Nature of Violations of License Conditions	Number of Brick Kilns in Percent
4(a)	Using wood as fuel/energy	99%
4(c)	Collection of soil without permission from concerned authority for brick manufacturing from <i>haor-baors</i> , ponds, canals, beels, river beds, chars and fallow land.	96%
4(d)	The excessive use of sulphur, ash, Coal containing mercurial or other elements.	97%
4(e)	Establishment of brick kilns within the boundary of residential, commercial or preserved area, municipality or Upazila headquarters, forest, orchard, wetland, sanctuary, agricultural land, ecologically critical area and degraded air shed.	98%
4(f)	Brick kilns within 01 kilometers distance from the boundary of prohibited areas.	99%
4(h)	No Permission from the Department of Environment.	99%
4(i)	Using of unauthorized land for Brick kilns.	99%

Figure 7: Violation of License conditions [Source: Field Survey, 2024]

4.Recommendations:

1. According to the section 4 of *the(BMBKECA)*, 2013, "brick manufacturing is prohibited without taking a license from the Deputy Commissioner (DC) of the district". But from the kilns field study it is found that most of the brick kilns have not any license from DC or other legal documents from the DoE.This provision should be strictly implemented.

2. In most of the country block (made by sand and cement) is used in construction of buildings, roads etc. We have to follow it also. Brick made by soil should be banned by law as soon as possible.And if not possible, then only soil from river bed should be allowed for brick production. It will reduce the huge river dressing cost of the government one hand and in the other hand the agricultural land will be protected.Govt. should take initiative to bind using block in constructions under section 5(3)(a) of the said(*BMBKECA*) Act as well as to fulfill the commitment of Bangladesh towards climate and environment under the United Nations Framework Convention on Climate Change(*UNFCCC*), 1992 and other related international laws on climate and environment.

3. Brick kilns should be declared as an industry and industrial law should also be applied for it for the sake of environment protection as well asfor ensuring the workers rights.Environment clearance certificate should be made compulsory requisite to establish brick klins under the Bangladesh Environment Conservation Act, 1995.

4. As per section 5(1) of thesaid(*BMBKECA*)Act, any person can't cut soil from ponds, canals, marshes, creeks, lakes, rivers, wetlands, sandbars or other areas without permission from appropriate authorities. Section 5(2) requires permission from the appropriate authority for the collection of soil for brick manufacturing from *haor-baors*, ponds, canals, beels, river beds, chars and fallow land. From the kiln study it is found that most of the brick kilns are located adjacent to the agricultural kiln. In the study area, owners of brick industry cut top soil of agricultural land, dug canals and ponds to collect soil for brick production. This activity is a serious violation of this act, which should be stopped by the concerned authority immediately.

5. According to the Rules, there are three types of brick kilns are allowed for the burning of bricks i. e. improved zigzag kiln, Hybrid Hoffman kiln and Tunnel Kiln. According to the survey data, 90% of the kilns are using fixed kiln chimney in the study area which is not allowed. The chimney height of some brick kilns is within 110-115 feet. But the chimney height of zigzag kiln should be 120 feet in height according to the Rules. It should be monitored and punished by mobile court at regular intervals.

6. According to section 6 of *the (BMBKECA)*, 2013 and section 6A, 7 of the Bangladesh Environment Conservation Act, 1995, Plant wood cannot be used in brick kilns for burning bricks. But workers of brick kiln said that they use wood, tire for burning of bricks. From the kiln study it is found that 99% brick kilns using wood as fuel/energy in the study area. It should be stopped immediately. The local people and the workers says that mobile court punishing them by imposing fine but the fine is not enough to stop it. Law should be amended and imprisonment should be given instead of fine for using wood for burning of bricks.

7. According to the section 8(a), establishment of brick kilns within the boundary of residential, commercial or preserved area, municipality or Upazila headquarters, forest, orchard, wetland, sanctuary, agricultural land, ecologically critical area and degraded air shed is prohibited and according to section 8(b), establishment of brick kilns in the following distance or places is totally banned namely: (a) within 1 kilometers distance from the boundary of prohibited areas, (b) within 2 kilometers distance from boundary of public forest, (c) within half kilometers distance from the foot of the hill or hillock, (d) within 1 kilometers distance from any special structure, railways, educational institutions, hospitals and clinics, research institutions or any other similar place or institution, and (f) with half kilometers distance from Upazila, union or rural roads made LGED.

But figure 7 shows the location of brick kilns where most of the brick kilns are located near the residential area and agricultural lands. The population of the ward no. 6 of Chandkhali Union of Paikgacha Upazila is 4000. In this ward 3 brick kilns are located near educational institutions, agricultural land within 1 km. As a result, people especially children and old men are suffering from many respiratory diseases. It was directly observed that in Chandkhali Godaipur, Goroikhali, Horidhali, Kopilmuni, Loskor union, brick kilns are located with near half kilometer from the LGED road. So, immediate action should be taken by the concerned authority in the said areas.

8. Since 2013, the government has been promoting zigzag kilns (ZZK), which comprise about 80% of the industry now in our country by name but not properly built in (Business Standard, December 2, 2021). A correctly built and operated ZZK can reduce pollution, yet these gains are not realized. It should be strictly ensured by proper monitoring from the concerned authority until the transition into block construction ages.

9. The department of environment is reluctant to ensure stern punishment of the polluters and grabbers. They impose fines by filing cases with the mobile courts and the polluters get most of this back through appeals. As a result, there is no decrease in either pollution or illegal encroachment. Under the Environment Court Act, 2010, if any persons try to file a case directly with the environment court, they are beset with bureaucratic knots. The law must be amended so that any public can directly file any case before this court and the environment court be given full power to conduct the trial of all environmental cases.

10. There are only three environmental Courts in Bangladesh. The environmental courts in Dhaka began functioning in 2003. There are two environmental courts for the Dhaka zone. One is original court and the other an appellate court. There are presently 2,796 cases with the main environmental court. Of these, only 117 are under the environmental conservation act, 1995 that is, only 4.18 per cent of the total cases

(Daily Prothom Alo, March 13, 2021). The trials of criminal and other cases are conducted at these courts. The Environmental Courts should be vested with only Environmental Cases.

11. The reality suggests that the government has remained mostly non-compliant in implementing the directives of the High Court and generally negligent in enforcing relevant laws. There have been several other High Court directives on mitigating air pollution, which, too, remained unimplemented. The High Court on February 15, 2022 directed the secretaries of the ministry of housing and the Roads and Highways Division, the chair of the Rajdhani Unnayan Kartripakkha and the Roads and Highways Department's chief engineer to develop and implement an action plan to use block bricks in all government constructions in phases by 2025, as an alternative to burnt bricks, a key air pollutant, as the government declared in a notification issued on November 24, 2019. At least this directive should be complied by the government for a better and healthy environment in Bangladesh.

12. As brick kilns is one of the major source of greenhouse gases, each brick kilns should have a compulsory subscription alike the corporate social responsibility (CSR) to the climate changetrust fund under the *Climate Change Trust Fund Act, 2010* to redress the adverse impact of climate change in Bangladesh.

5. Conclusion:

From the study it was found that most of the brickkilns of the study area were located near agricultural lands, ponds and residential areas. Those brickkilns are responsible for decrease of soil fertility, loss of agricultural production, fish cultivation and local people's health problems in a great extent. 99% of the brickkilns don't follow the existing acts and they have no license from the deputy commissioner which is totally illegal. Besides, those brick kilns are considered as the principle reason of land degradation, health problem and air pollution which is worsening the environment day by day in rural areas of Paikgacha Upazila, Khulna.

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