Naveen Shodh Sansar (An International Refereed / Peer Review Multidisciplinary Research Journal)
RNI No.- MPHIN/2013/60638, ISSN 2320-8767, E- ISSN 2394-3793, Scientific Journal Impact Factor (SJIF)- 8.054,
October to December 2024, E-Journal, Vol. I, Issue XLVIII, ISO 9001:2015 - E2024049304 (QMS)

Environmental Protection in Brick Industry- A Review of Policy Framework

Pradeep Kumar Joshi* **Prof. (Dr.) Sandeep Shandilya****

*Research Scholar, Shri Khushal Das University, Hanumangarh (Raj.) INDIA
** Professor (Commerce & Management) Shri Khushal Das University, Hanumangarh (Raj.) INDIA

Abstract : The brick industry, a vital sector for construction, significantly contributes to environmental degradation through high energy consumption, emissions, and the unsustainable use of natural resources. This paper presents a comprehensive review of the existing **policy framework** aimed at promoting **environmental protection** within the brick industry. It explores key **regulations**, **guidelines**, and strategies implemented globally and regionally to mitigate the industry's environmental impact. By analyzing the effectiveness of these policies, the paper identifies gaps and challenges in their enforcement and offers recommendations for strengthening regulatory measures. The review emphasizes the role of **technology**, **innovation**, and **sustainable practices** in reducing the **carbon footprint** of brick manufacturing. Ultimately, this paper aims to inform **policy-makers**, **industry stakeholders**, and **environmental advocates** on best practices to balance the growth of the brick industry with **environmental sustainability**.
Keywords: Brick industry, environmental protection, policy framework, sustainability, regulations, emissions, energy consumption, carbon footprint, technology, innovation, sustainable practices.

Introduction - India is the second largest manufacturer of bricks in the world after China. The yearly bricks production of the country stands at around 250 million bricks. The approximate number of brick kilns operating in India is around 140,000. This huge number in itself speaks volumes of the mammoth nature of the brick industry of India. India contributes to the 10% of the total bricks production of the world. Mostly these brick kilns are located in the rural and peri- urban areas. These brick kilns are usually found located in clusters around the towns and cities and some times these clusters comprise of hundreds of the brick kilns. As far as the manufacturing process is concerned mostly these Indian kilns follow traditional processes which are manual and non- mechanised in general. The raw material for these brick kilns comprises of the surface soil which is excavated from the agricultural fields and the silt deposited at rivers and tanks. These bricks are given the shape mostly by hand moulding method. These green bricks are then dried in the open areas by keeping them exposed to sun light to get them dried. Thereafter these green bricks are burnt in the kiln making use of the coal, biomass and other waste material like tyre. (Ref: Guidance Document on Environmental Technologies for Brick Kilns in India).

Above features of brick industry of India speaks of the huge dimensions of the brick kiln industry of India. This industry is labour intensive in nature. It is pointed above that mostly, the brick kilns in India are based on the traditional process of production and generally these are non- mechanized in nature and the process of molding them to shape is also mostly manual in nature. It means that this industry provides employment to a large number of persons. According to some estimates around 10 million workers are employed in this gigantic industry. However, considering the fact that India is a highly populated nation and the problem of employment is a big problem which India constantly faces, this labour-intensive nature of the industry helps in addressing this problem to some extent. With this one positive aspect, there is one big issue related with the brick industry of India and it is the amount of population, these brick kilns generate. If an estimate form the United States Environmental Protection agency is to believe, industrial sector accounts for around 15% of the total black carbon emissions in India and out of these emissions, approximately two- third is contributed by the brick kilns alone. The present paper by authors attempts to look into the aspect of environmental protection and energy efficiency in brick industry through the lenses of policy framework.

Review of Literature: In this section of the paper, the review of past studies is being presented.

Null et al., (2024) in their study revealed that the brick industry sector is constantly in the pursuit of making it more sustainable in natureby experimenting with the innovative Novel Organic Brick (NOB) developed from the recycled construction sand and red clay.

Remigioet al., (2024) in their study they focused on the environmental impact of the traditional brick making in the

Goma division. The findings revealed significant degradation of the environment resulting in the wetland and deforestation (100%), landscape deformation (85%) along with the increase in air and water pollution.

Moh.Nanang et al., (2023) in their study they highlighted the potential of red brick industry in improving the welfare of the local community. Further their study revealed about the resilience which the brick industry offers to the economic shocks and contributes to the welfare of the local community.

Sumit, (2023)in his study raised the issue of improvement of kiln efficiency by switch over to the modern "High Draft Brick Kiln," from traditional "Bull Trench Kiln" technology, however other characteristics of the bricks kiln of olden times like labour intensive processes of moulding, drying, staking, firing and cooling continue unabated hence adding to the pollution as usual.

Akim (2022)in his study focused on how the increased demand of bricks in Bangladesh as a result of growing urbanisation has resulted in the increase in the pollution. Tye study revealed that the marginal costs associated with the CO_2 emissions from brick kilns supersede the marginal private costs indicating that the benefits of the brick industry are at the cost of the environment and the society.

Kanika et al., (2022)in their study focused on the traditional wooden house at Munshigani, Bangladesh and how these houses display more sustainable character in comparison to the masonry houses made of brick and cement.

Mai Mohamed et al., (2022) in their study focused on the rapid construction technologies which are characterised by a brick-based unitwhich can self- assemble and install with the help of mechanical assembly. Moreover, these innovative designs and means have a huge potential for sustainable green construction by resorting to the reduction of the use of polluting materials in construction.

Pratibha et al., (2022)in their study focused on the growing trend towards the renewable alternatives in place of traditional fossil- fuel based sources of energy in the construction industry. The study suggested that more and more adoption of such techniques will help in the reduction of the pollution caused by traditional brick industry.

Aditya et al., (2021) in their study pointed that lack of information about recycling technologies acts as a major reason behind waste remaining uncycled in the construction industry.

Rajesh et al., (2021) in their study considered the ruralbrick kiln industry of Western Uttar Pradesh which though is very significant from the economic point of view, adds to the pollution also**.**

Tolulopeet al., (2021)in their study focused on the brick industry of Vhamble district of South Africa. The study considered the polluting character of this industry in the context of the production phases of this traditional brick making industry. The study suggested for adopting the vertical shaft kiln to reduce harm to environment as well as the sustainability of the brick industry.

Gopinath (2018) in this study he focused on the environmental concerns associated with the traditional burnt clay brick manufacturing and its adverse impact on the fertility of the agricultural land.At the same time study suggests to adoptalternative brick manufacturing process based on the industrial by-products comprising of the foundry sand and eco sand along with the cement.

Research Gap: It can be seen from the above review of literature that many studies covering diverse facets and angles associated with the brick kiln industry have been covered in it including certain studies from abroad. The study has covered the aspects like environment conservation, pollution, sustainability, alternative production technologies, labour intensive nature of the brick kiln industry etc. However, almost negligible studies have focused on the regulations in place and the policy efforts to combat the problem of pollution associated with the brick kiln industry so that it can be transformed into a sustainable industry.

Objectives of the Study: Toreview the policy framework with respect to the brick kiln industry of Indiain the context of making these more environment friendly and sustainable in character.

Hypotheses of the Study: The policy framework on national level is well in place, however, the approach and degree of implementation of these regulations vary from state to state in the country.

Research methodology Adopted: The study is conducted with the help of the secondary data obtained from the state and the central government publications particularly related to the policy frame work with respect to the brick industry in the country. The inputs drawn from these secondary data sources are analysed and an attempt has been made to test the hypothesis of the study. The nature of the hypothesis formulated for the purpose of conducting this study is declarative.

Observations and Discussions: In this section of the paper, certain observations are being drawn from the secondary sources and the discussion on them is being presented in the context of the subject matter of the study. Here are certain observations taken from the **Brick Manufacturing and Kiln Establishment (Control) Act, 2013 (Act No. LIX of 2013).**This act came into being on Nov 20, 2013. It is an act to repeal and re-enact the existing law with some modifications for controlling the activities relating to brick manufacturing and kiln establishment. Here are certain excerpts from the Form B related to the License of brick manufacturing reproduced form the Brick Manufacturing and Kiln Establishment (Control) Act, 2013 (Act No. LIX of 2013).

Pont 4.Conditions:

(a) Nofuel wood shall beused in thebrick kilns under anycircumstances.

(b) The Deputy Commissioner himself or UpazilaNirbahi

Officer or any officer fromthe concerned district office of the Department of Environment or concerned Divisional Forest Officer or any officer nominated by him (not below the rank of Forester), may enter into any brick kiln and inspect thereof without notice at any time, interrogate any person or summon any document for inspection of violation or observance of any conditions of license or of any offence punishable under this Act has been committed oris being committed.

(c) Without approval of the Deputy Commissioner, soil shall not be excavated or collected from dead pond or canal or swampland or creek or deep tank or rivers or haorbaor orchar land or fallow land for the purpose of brick manufacturing.

(d) Coal containing sulfur, ash, mercury or similar material shall not be used as fuel, beyond the prescribed standards, in the brick kilns for burning bricks.

(e) Nobrickkiln shall be established within the boundaries ofthe following areas-

(1) Residential, reserved or commercial areas;

(2) City Corporation,Paura savaor Upazila Sadars;

(3) Agricultural lands;

(4) Ecologically Critical Area;

(5) DegradedAirShed.

(f) Nobrickkiln shall be established in the following distances or places, namely:

(1) within minimum 1 (one) kilometer distance, from the boundaries of areas referred to in clause (e);

(2) within 2 (two) kilometers distance from boundaries of public forest;

(3) incaseofbrick kiln establishment on the to porslopeor the surrounding ground surface of any hill or hillock, within minimum ½ (half) kilometer distance from the foot of the said hill or hillock;

(4) in case of brick kiln establishment in hill districts, in any other place other than the place determined by the Hill Districts Environment Development Committee;

(5) within minimum 1 (one) kilometer distance, from any special structure, railways, educational institutions, hospitals and clinics, research institution, or any other similar place or institution.

(g) A register shall be kept regarding counting of burned bricks and sale of bricks.

(h) The conditions of the positional certificate issued by the Department of Environment shall be followed properly and brick kiln shall not be introduced without taking environmental certificate.

(i) Land, more than the size mentioned in the application, shall by no means used for brickkiln.

(j) No activities shall be taken which violates the Actor rules made there under and all provisions of the Act shall be observed.

(k) If there is any violation of any provisions of the license and the Environmental Clearance Certificate the Authority may, at any time, cancel the license.

It can be amply seen from the above regulations of the government with regards to the operation of the brick kiln that there are clear cut directives in place to see to it that the pollution generated by these brick kilns be minimised and the general public has not to face the hardships as a result of such pollution coming out of the brick kilns. Hower, despite these directives in place, the pollution from brick kilns is going on unabated and it forms around 4 to 5% of total industrial pollution in the country as per certain estimates. Various states governments have also taken steps in this direction to check the pollution generated by these brick kilns but still a lot needs to be done. There is an urgent need to switch to modern technologies which are more eco- friendly and sustainable in character. At the same time, it must also have to be kept in mind that switching over to newer technologies and more mechanisation does not result in an adverse impact on the employment generating capacity of this industry as it is a labour-intensive industry and provides the employment to a large number of persons in the country.

In the same continuation, it is worth mentioning the Environment (Protection) Sixth Amendment Rules, 2023. This amendment came into force since Dec 15, 2023. Here, the relevant excerpts are being reproduced from the same document.

In the Environment (Protection) Rules, 1986, in the SCHEDULE-I, in entry at Sl.No.74, for note no.2, the following entry shall be substituted, namely:-

2. The existing brick kilns which are not following zig-zag technology or vertical shaft or use piped natural gasas fuel in brick making shall be converted to zig-zag technology or vertical shaft or use piped natural gas as fuel inbrickmakingwithinaperiodof:

(a) one-year w.e.f. 23.02.2023 in case of kilns located within ten kilometres radius of non-attainment cities; except those located in million plus population cities, NCR districts,and critically & severally polluted areas as categorized by CPCB;

(b) one-year w.e.f.23.02.2024 in case of other kilns. Provided that in case where Commission for Air Quality Management / Central Pollution Control Board /State Pollution Control Board/Pollution Control Committee has separately issued more stringent Norms/time lines, such orders shall prevail.'

This is one of the most recent developments in the context of the tightening of regulations with regard to the brick kilns in India. The pollution generated by these brick kilns is a great challenge and it is the biggest hurdle in bringing the sustainable character to this very important industry in India from the socio-economic point of view. This sixth amendment to the Environment (Protection) Act, 1986 clearly indicates towards the significance of the shift of brick kilns in the country towards the zigzag technology, vertical shaft or use piped natural gas as fuel in brick making process. This initiative was much in need to curb the

pollution generated by the brick kilns in the country. So, we can see that the proper regulations regarding the functioning of the bricks and the brick manufacturing process are well in place but still remains to be seen that how effectively these regulations are implemented.

Here one more important notification from the Ministry of Environment, Forest and Climate Change is being cited to further highlight the government regulations and policies on brick kiln in India. Here are certain excerpts from the notification dated Feb 22, 2022 by the same ministry.

In the Environment (Protection) Rules, 1986, in the SCHEDULE-I, for entry at Sl. No.74, the following entry shall be substituted, namely: -

"74	Brick Kilns	Particulate matter in stack Emission	250 mg/Nm^3
		Minimum stack height (Vertical Shaft Brick Kilns) - Kiln capacity less than 30,000 bricks per day - Kiln capacity equal or more than 30,000 bricks per day	 14 m (at least7.5m from loading platform) 16 m (at least8.5m from loading platform)
		Minimum stack height (Other than Vertical Shaft BrickKilns) - Kiln capacity less than 30,000 bricks per day - Kiln capacity equal or more than 30,000 bricks per day	 24 m 27m

1. All new brick kilns shall be allowed only with zig-zag technology or vertical shaft or use of Piped Natural Gas as fuel in brick making and shall comply to these standards as stipulated in this notification.
2. The existing brick kilns which are not following zig-zag technology or vertical shaft or use Piped Natural Gas as fuel in brick making shall be converted to zig-zag technology or vertical shaft or use Piped Natural Gas as fuel in brick making within a period of (a) one year in case of kilns located within ten-kilometre radius of non-attainment cities as defined by Central Pollution Control Board (b) two years for other areas. Further, in cases where Central Pollution Control Board/State Pollution Control Boards/Pollution Control Committees has separately laid down timelines for conversion, such orders shall prevail.
3. All brick kilns shall use only approved fuel such as Piped Natural Gas, coal, fire wood and/or agricultural residues. Use of pet coke, tyres, plastic, hazardous waste shall not be allowed in brick kilns.
4. Brick kilns shall construct permanent facility (port hole and platform) as per the norms or design laid down by the Central Pollution Control Board for monitoring of emissions.
5. Particulate Matter (PM) results shall be normalized at 4% CO2 as below:
   PM (normalized) = (PM (measured)x 4%)/ (% of CO, measured in stack), no normalization in case CO2 measured > 4%. Stack height (in metre) shall also be calculated by formula H=14Q03 (whereQ is SO2 emission rate in kg/hr), and the maximum of two shall apply.
6. Brick kilns should be established at a minimum distance of 0.8 kilometre from habitation and fruit orchards. State Pollution Control Boards/Pollution Control Committees may make siting criteria stringent considering proximity to habitation, population density, water bodies, sensitive receptors, etc.
7. Brick kilns should be established at a minimum distance of one kilometre from an existing brick kiln to avoid clustering of kilns in an area.
8. Brick kilns shall follow process emission/fugitive dust emission control guidelines as prescribed by concerned State Pollution Control Boards/Pollution Control Committees.
9. The ash generated in the brick kilns shall be fully utilized in-house in brick making.
10. All necessary approvals from the concerned authorities including mining department of the concerned State or Union Territory shall be obtained for extracting the soil to be used for brick making in the brick kiln.
11. The brick kiln owners shall ensure that the road utilized for transporting raw materials or bricks are paved roads.
12. Vehicles shall be covered during transportation of raw material/bricks".

Above excerpt from the Environment (Protection) Sixth Amendment Rules, 2023 clearly present the strict rules and regulations in place for the protection of environment from the pollution generated by the brick kilns in India. The minimum stack height with respect to the kiln capacity are mentioned in these rules. There is emphasis on zig-zag technology or vertical shaft or use of Piped Natural Gas as fuel in brick making. There are guidelines for establishing these brick kilns at a stipulated distance from the human habitation. Moreover, to avoid clustering of the kilns, the new brick kiln is prohibited to be established within area of one kilometre from the existing brick kiln.

Conclusion: It can thus be seen that brick industry is an extremely vital industry particularly in the context of a leading developing country like India where a lot of construction work for different developmental and other general purposes is always in need. However, the pollution generated form these brick kilns is also a serious threat from the brock industry. It contributes significantly to the overall industrial pollution in India. The brick industry is a huge employment generator as it is predominantly a labour-intensive industry. The estimates of the number of people employed by various agencies vary from 10 million and above. This industry needs to flourish as it is closely related with the socio-economic development of our country but not at the cost of the environment and harm to the environment. The paper has tried to develop certain insights to the policy frameworks

with regards to the brick kilns in the country. It is interesting to note that very recently within a span of one decade central government has issued certain rules and regulations to check the pollution caused by these brick kilns. There are guidelines to stick to the specifications so as to minimise the pollution. In this paper a particular mention of the two such regulations have been made.Thes are Brick Manufacturing and Kiln Establishment (Control) Act, 2013 (Act No. LIX of 2013) and Environment (Protection) Sixth Amendment Rules, 2023. Though there are rules and regulations in place regarding the functioning of these brock kilns and the Brick Manufacturing and Kiln Establishment (Control) Act came into existence around one decade before but on the execution and implementation fronts, various irregularities from state to state can be noticed. These all-lacklustre developments have made it necessary for the government to introduce Environment (Protection) Sixth Amendment Rules, 2023. Now it remains to be seen that how successful these amendments come out to be in combating the serious challenge of pollution generating brick kilns in India. There is an urgent need to restructure the brick making process which is mostly carried out through the traditional ways and means in the country. The alternative and improved methods of production must be introduced and developed with the feature of sustainability in their core.

References:-

1. Guidance Document on Environmental Technologies for Brick Kilns in India, Enzen Global Solutions, 2023.
2. Null, A. I., Null, A. I., &Madhumathi, A. (2024). Developing a low carbon brick for residential building construction. *Proceedings of the Institution of Civil Engineers*, 1-9. doi:10.1680/jensu.23.00065
3. Remigio, T., Edward, A., Andrew, M., & Alice, N. (2024). Understanding the nexus between traditional brick-making, biophysical and socio-economic environment of Goma Division, Mukono Municipality, Central Uganda. *Journal of Degraded and Mining Lands Management, 11*(4), 6367-6378. doi:10.15243/jdmlm.2024.114.6367
4. Moh. Nanang, S., &FenscaFenolisa, L. (2023). Prospek Perkembangan Usaha Batu Bata Merah: Peluang Dan Analisis (StudiKasusPada Usaha Batu Bata Merah Kelurahan MajenerKatapop 1). *JurnalJendelaIlmu*. Retrieved from https://jurnal.lpmiunvic.ac.id/index.php/ji/article/download/156/118doi:10.34124/ji.v4i2.156
5. Sumit, A. (2023). Technology used in Clay Brick Making Process in India on Brick Kiln Investment and Business Feasibility and Sustainability in View of Environment Condition. *International Journal for Research in Applied Science and Engineering Technology*. doi:10.22214/ijraset.2023.57647
6. Akim, M. R. (2022). CO2 Emission from Brickfields in Bangladesh: Can Ethical Responsibility byDoing Reduce Level of Emission? *Athens journal of social sciences, 9*(3), 255-272. Retrieved from https://doi.org/10.30958/ajss.9-3-3 doi:10.30958/ajss.9-3
7. Kanika, B., & Sheikh Muhammad, R. (2022). Comparing Social Sustainability: Traditional Practices in Wooden Houses with Contemporary Practices in Masonry Houses in Munshiganj. *ECS transactions, 107*(1), 6371-6380. doi: 10.1149/10701.6371ecst
8. Mai Mohamed, M., & Mohammed El-Sayed, H. (2022). Self-Bricks in the Field of Rapid Construction. *IOP Conference Series: Earth and Environmental Science,1056*(1),012016-012016.doi:10.1088/1755-1315/1056/1/012016
9. Pratibha, S., Sharma, V., Sandeep, K. S. G., Savitha, H. S., Ashank, U., &Srivastava, N. (2022). Green Energy Bricks: A Step Towards Smart and Sustainable Structures. *Ecology, Environment and Conservation*, 275-278. doi:10.53550/eec. 2022.v28i02s.045
10. Aditya, K., Manoj Kumar, S., Naresh Kumar, S., & Shreyance,S.(2021). A Comparisonon Modern Construction Techniques for Different Components of Building Structure.*InternationalJournalofAdvance Research and Innovative Ideasin Education, 7*(2), 1499-1502. Retrievedfrom https://ijariie.com/AdminUploadPdf/A_Comparison_on_Modern_ Construction_Techniques_for_Different_Components_of_Building_Structure_ija riie14071.pdf
11. Rajesh, K., &Amit, S. (2021). An Empirical Study on Brick Industry of India: A Perspective of Cost Analysis. *Asian Journal of Management, 12*(3),279-285.doi:10.52711/2321-5763.2021.00042
12. Tolulope, E. A., Joshua, N. E., John, O. O., & Stuart, J. P. (2021). Traditional Brick Making, Environmental and Socio-Economic Impacts: A Case Study of Vhembe District, South Africa. *Sustainability, 13*(19), 10659. doi:10.3390/SU131910659
13. Gopinath, R. (2018). Manufacturing of Bricks using Eco Sand and Foundry Sand. *International journal of engineering research and technology, 7*(4). Retrieved from https://www.ijert.org/research/manufacturing-of-bricks-using-eco-sand-and-foundry-sand-IJERTV7IS040031.pdf
14. Brick Manufacturing and Kiln Establishment (Control) Act, 2013 (Act No. LIX of 2013)
15. Environment (Protection) Sixth Amendment Rules, 2023.

****