

POLLUTION AND POLLUTION CONTROL MEASURES: A CASE STUDY OF BRICK INDUSTRY IN KARIMGANJ DISTRICT OF ASSAM

Dr. Manash Das

Assistant Professor, Department of Commerce, Karimganj College, Karimganj, Assam, India

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ABSTRACT

Brick kiln is a traditional and an important unorganised industrial sector in India and other developing countries. Brick kilns are small scale sector which uses manual labour and traditional firing technologies. It is estimated that more than 100,000 kilns produce about 80 to 100 billion bricks per year in India. The present demand is estimated as 120 billion bricks per year. The employment of brick kilns is approximately eight million people. These industries supply bricks for constructions of the housing sector, bridges, roads and canals etc. in both rural and urban areas. The construction sector is an important part of the Indian economy with the contribution of 10 per cent in the GDP and is registering an annual growth of 9 per cent. According to Pollution Control Board, Guwahati, (2013) the state has 912 permanent brick kilns. As per the report of Pollution Control Board, Regional Office, Silchar, Cachar, Assam, there are 182 brick units in the Barak Valley, as on 26th Feb, 2013. The number is expected to grow further keeping in view the future plans for development of infrastructure of roads, canals, bridges, buildings and constructions which are required for overall development of the nation. Thus, there are two categories of issues in brick making industry such as environmental and social. The traditional brick making technologies are clamps, movable chimney and more recently fixed chimney kilns. This industry is responsible for different types of pollution viz. soil, air, and water resulting in environmental imbalance in the society.

The present paper highlights that environmental pollution and health hazard problems caused by the brick industry as a result of emission of huge quantity of smoke, fine dust particles etc. The paper has also covered various measures taken by the Government in order to prevent/control pollution and to what extent the various guidelines for prevention of pollution are implemented by brick industry. Both primary and secondary data are used in the present paper.

KEYWORDS: *Brick Industry, Pollution, GDP, Suspended Particulate Matter, Pollution Control Measures.*

INTRODUCTION

Brick making is a traditional and an important unorganised industrial sector in India and other developing countries. The construction sector is an important part of the Indian economy with the contribution of 10 per cent in the GDP and is registering an annual growth of 9 per cent. Clay fired bricks are the backbone of this sector. The Indian brick industry is the second largest producer of bricks in the world after China.¹ Brick kilns are small scale sector which uses manual labour and traditional firing technologies. It is estimated that more than 100,000 kilns produce about 80 to 100 billion bricks per

¹ . Punjab State Council for Science & Technology. (2010). *Model Project Report for Setting up Energy Efficient Brick Kiln for the production of Resource Efficient Bricks.* submitted to Corporation Bank, June, 2010. Chandigarh-160019.

year in India.²The present demand is estimated as 120 billion bricks per year.³ There are about 50,000 Tile and Brick Industries which belong to the small scale sector in India. The employment of brick kilns is approximately eight million people. These industries supply bricks for constructions of the housing sector, bridges, roads and canals etc. in both rural and urban areas.⁴ According to Pollution Control Board, Guwahati, (2013) the state has 912 permanent brick kilns.⁵ As per the report of Pollution Control Board, Regional Office, Silchar, Cachar, Assam, there are 182 brick units in the Barak Valley as on 26th Feb, 2013. The number is expected to grow further keeping in view the future plans for development of infrastructure of roads, canals, bridges, buildings and constructions which are required for overall development of the nation. Thus, there are two categories of issues in brick making industry such as environmental and social. The choice of technology for firing of bricks depends on factors viz. scale of production, soil and fuel availability, availability of skilled manpower, marketing and business considerations like profitability and availability of finance and capital. The traditional brick making technologies are clamps, movable chimney and more recently fixed chimney kilns. The small scale brick entrepreneurs are confronted with environmental regulation and face numerous challenges for survival, considering the situation that there are very limited options for them to adopt for their brick business.⁶

The workers in the brick industry are subject to bad working conditions and poor remuneration. Brick industry is seasonal in nature and employs labourers through contractor(s). The brick moulder families were contracted through middlemen. Earlier most of them came from the different districts of Uttar Pradesh, Bihar, Chattisgarh and Orissa.⁷ Nowadays, it is observed that limited workers are migrated from other states. Local workers get employment in the brick kiln unit. The work force is paid on the basis of quantum of work and against completion of certain tasks. Operations are mostly manual and under present conditions the working schedule for the workers is mainly in the dry season in between the months of October and April. This industrial sector provides not only a large number of employment opportunities for rural unskilled illiterate and less educated workers but also enriches the economic growth of the country.

There are two types of brick production on the basis of scale of production. Clamps which are having small production capacity are owned and operated by brick making people as a traditional occupation. Brick making people live in permanent settlements and earn their living through selling bricks. On the other hand, a large number of producers of Bull's Trench Kilns (BTKs) employ workers on the contract basis in the unit. They are paid against completion of specific tasks such as moulding of 1000 bricks, transportation of 1000 green bricks, and carrying of 1000 sun-fired brick, unloading of fired brick from the kiln and loading of sun-fired bricks in the kiln etc. Some of the workers are generally internal migrated from one place / state to another with their families. They live in make shift shelters in the campus of the unit and shelter is provided by the employer of firm.⁸

². Maithel, S. et al. (2000). Environmental regulations and the Indian brick industry. *Environmental Practice Journal of the National Association of Environmental Professionals*. 2 (3): 230-231, the Energy and Resources Institute Creating Innovative Solutions for a Sustainable future.

³. Environmental Systems Branch, Development Alternatives. (2005, December 30). *Environmental and Social Report for VSBK, A Guidance Document for Entrepreneurs and Project Auditors*. Retrieved from 30th Dec, 2005, New Delhi, pp.1-2, www.devatl.org

⁴. Kumar, N. N. Sampath. R & D Centre for Clay Roofing Tiles, Bricks and Other Ceramic Products. National Institute of Technology, Karnataka. Karnataka State, India, Retrieve from www.nitka.ac.in. , Articles on 'Save the Earth' - Eco friendly solutions to iron ore tailings.htm

⁵. The Telegraph 10th Jan, 2013

⁶.Environmental Systems Branch, Development Alternatives, op. cit.pp. 1.

⁷. Ibid, pp. 2

⁸.Ibid, pp.3-4

Environment Systems Branch, New Delhi (2005) studied on Environmental & Social Report for Vertical Shaft Brick Kiln (VSBK) and found that use of internal fuel increases efficiency and reduces emission. It suggested that to ensure improvement in the living conditions of worker community, several measures will be undertaken in this project. It is also focused that being an energy efficient kiln, VSBK reduces air pollution. Suspended Particulate Matter (SPM) emission from VSBK is as low as 250 mg/Nm³, lower than that in any other existing kilns. Green House Gas emission is reduced.

OBJECTIVES OF THE STUDY

The Main Objectives of the Present Paper are:

- To discuss the health hazards/ diseases of workers due to pollution of Brick Units.
- To examine the important measures for pollution control in Brick Industry
- To analyze the implementation of pollution control measures of Brick Industry of Karimganj District.

METHODOLOGY OF THE STUDY

The present study was carried out with the help of both primary and secondary data. For this study, 12 numbers of brick units were selected by using simple random sampling in Karimganj District of Assam. The primary data were collected in the form of the opinions of the sample workers, and employers or managers through questionnaires/schedules, specially developed for these two categories. The secondary data, on the other hand, were collected from the different books, journals, periodicals, Government and Non-Government reports, statistical hand books, judicial decision, research papers, articles and relevant websites etc.

The perception and awareness of the workers and employers/managers were studied after collecting relevant information by canvassing schedule among the sample workers of the units and employers or managers of the selected brick units of Karimganj District of Assam. Thus, it covered 120 respondents from workers and 12 respondents from the employers/managers of the selected brick units of Karimganj District of Assam for this study. The total number of respondents of both the categories is 132 for the present study.⁹

Moreover, interview was conducted with the Officers of Pollution Control Board, Regional Office Silchar, to gather the information regarding the pollution created and caused by brick units and pollution control measures of brick units of Barak Valley.

ENVIRONMENTAL POLLUTION

Pollution means “any introduction by man, directly or indirectly of substance or energy into the environment resulting in deleterious effects of such a nature as to endanger human health, harm living resources, eco-systems and material property and impair amenities or interfere with other legitimate uses of environment.”¹⁰ The different kinds of environmental pollution are air pollution, water pollution, land pollution, radioactive pollution & noise pollution.

⁹ .Field Survey, Feb, 2019

¹⁰ “International Law Association in the Committee on Legal Aspect of the Conservation of the Environment” in the Montreal Conference in April, 1982.

Air pollution may be said to mean the imbalance in the quality of air so as to cause ill effects on the living beings. And the said imbalance in the air is caused by the presence of air pollutants in the air. Air quality has increasingly been an issue of social concern in the backdrop of rising industrial and vehicular pollution.

The Central Pollution Control Board, Delhi (CPCB) has already recognized the brick production industry a highly resource and energy intensive as well as polluting industry which is mostly due to obsolete traditional production technologies employed in India. While the cluster of brick kilns are vital source of air pollution affecting local population, agriculture and vegetation, they also contribute sufficient amount of pollution to change climate in global environment. The traditional brick making needs considerable land area and top soil. The land area near the kiln is normally high temperature, as a consequent, unsuitable for uses in agricultural production after being abandoned.

The Central Pollution Control Board (CPCB) has identified 2301 medium and large-scale polluting units covered under 17 categories of highly polluting industries. Out of these 2,301 industries, 1,927 have provided the requisite pollution control facilities, 139 are still defaulting and the remaining 235 are closed.

The Government of India has set up the Central Pollution Control Board (CPCB), a statutory organization in September, 1974 under the Water (Prevention and Control of Pollution) Act, 1974. Further, CPCB was entrusted with the powers and functions under the Air (Prevention and Control of Pollution) Act, 1981. The judiciary has tried to take painstaking job to prevent and control pollution from industrial atmosphere.

Health Hazards/Diseases Caused by Pollution of Brick Units

The area around the brick unit is constantly polluted by dusts and smoke that spread in the atmosphere, thus causing damages to the environment and lives of the residents living nearby. The brick units by emission of substantial quantity of dust and smoke creates and causes the diseases / health hazards to the workers of the unit as well as surrounding population by causing respiratory diseases. Brick making involves crude techniques causing considerable worker drudgery. Brick workers, especially moulders are exposed to the sun for long hours. They are exposed to high concentration of dust and smoke while they are engaged in manual breaking of coal. There is also the risk of exposure to dust (from bottom ash spread on the kin) and open fire during manual coal feeding. The workers have to walk on hot surface (top of the furnace) while monitoring and regulating the fire. They are also exposed to high concentrations of respirable suspended particulate matters (RSPM), during monitoring and regulating the fire, as the furnace chamber is covered with ash (ash acts as insulator).

During the kiln unloading and shipping process it may produce a lot of dust and particulate matter pollutants that come from the surface of the bricks and have the same chemical components as brick itself. The kilns are a semi tight environment and the average temperature in the kiln is higher than that outside the kiln. Work exposure to the high temperature and the high density dust and particulate matter over a long period of time can result in health problems; including serious disease e.g. lung cancer. Brick kiln workers are exposed to dust particles and are susceptible to multiple pulmonary complications. Problems like asthma, chronic obstructive pulmonary symptoms, and silicosis are common diseases among brick-kiln workers.

Brick manufacturing plant uses many different raw materials and produces many intermediates, by-products and products. Among these, there are many substances potentially harmful to the health of brick kiln workers. Hazardous dust is one of the most important exposures in brick kiln workers who are suffering from various diseases such as eye problem,

skin allergy, throat and lungs diseases due to living and inhaling in the polluted air in and around brick units. The brick workers are also suffering from chronic bronchitis and decreased lungs function due to atmospheric dust, smoke and pollution, especially in the firing, loading and unloading section of the unit. It is clearly observed during field visit that the brick kiln workers are exposed to high levels of dust and temperature.

Nowadays, most of the brick producing units operate with natural draft within their chimneys. The principal fuel consumed for energy in brick industry is coal. Electric power is not used in the brick producing process, although it is used for lighting purpose in the night in brick units. Water pump machine is used in almost all the brick units in brick manufacturing process and spraying water to control dust in the unit created in the operation in brick kilns.

Environmental Impact in Brick Production

Brick manufacturing industrial sector use energy intensive, resource depleting and highly polluting technologies and production methods. In India, most of the processes deployed in brick producing are with low inputs of technology and archaic techniques. This industry is responsible for different types of pollution viz. soil, air, and water resulting in environmental imbalance in the society.¹¹

Creation of Different Types of Pollutants

The possible pollutants from Brick Industry are:

- Carbon dioxide (CO₂).
- Carbon monoxide (CO).
- Sulphur dioxide (SO₂).
- Nitrogen Oxides (NO_x).
- Suspended Particulate Matter (SPM).

Apart from these, there is a problem of high volume of bottom ash as residue.¹² The large quantity of coal is used for firing of bricks. The bottom ash obtained as a residue from combustion of coal causes air pollution. Some part of this bottom ash is used as an insulation material for the firing chamber, while the rest gets dispersed by wind and rain.¹³

Acts to Control the Air Pollution

The following acts are imposed by Central Pollution Control Board and Ministry of Environment & Forests:

- Air (Prevention and Control of Pollution) Act, 1981
- Environmental Protection Act, 1986

¹¹ . Environmental Systems Branch, Development Alternatives, op. cit. pp. 2

¹² . Dubey, R. M. (Chairman). (2013). *Guidelines on Brick manufacturing Unit*. Retrieved from www.guidelinesofbrickkiln.in

¹³ . Environmental Systems Branch, Development Alternatives, op. cit. pp. 3.

Key Measures for Pollution Control in Brick Industry

Following measures must be taken by brick kiln owners for abatement of pollution¹⁴:

- Approach road within the premises of brick kiln area should be pucca / stabilized with brick bats etc.
- They should use crushed coal for better burning efficiency.
- Bricks should be laid in such a staggered manner for baking to entrap maximum particulate matter at the source itself.
- They should use a properly designed gravity chamber.
- Permanent stack should be provided at the brick kiln and height of chimney /stack should be at least 30 meters. No moving chimney shall be allowed.
- Water sprayers shall be installed and operated at every brick unit for controlling dust, smoking and pollution.
- The approach road to site of brick kiln (including the storage site if it is at different place) from the nearest public road for the transportation of raw material/final products must be paved or hard surfaced.
- Active haul roads inside the works should be adequately wetted with water (preferably recycled and treated waste water).
- Exhausts of trucks for transportation of materials within the site should be directed upward.
- Wheel cleaning facilities should be provided, for delivery trucks leaving the works, for the removal of mud.

Implementation of Pollution Control Measures (PCM) by the Brick Industry

It is observed from the opinion expressed by the owners or managers of the selected brick units of Karimganj District, Assam that the pollution control measures which have been prescribed by the State Pollution Control Board/State Government are applicable and implemented in the brick units for controlling pollution. The owners of the brick units have also obtained the necessary permission from the concerned authority before setting up the units under the Air (Prevention and Control of Pollution) Act 1981.

It is mandatory on the part of the project proponent to obtain Consent to Establish (CTE) from the competent authority, before start of the project. The project proponent must obtain CTE under section 21(1) of the Air (Prevention & Control of Pollution) Act, 1981 before establishing the unit.

Table-1 deals with the views of owners/managers of selected brick units of Karimganj District, Assam with reference to pollution control measures in the units. It is also observed from the field study that the occupier of the unit has adopted water spraying system in the unit as a pollution control measure. For installation of water sprayer, Water-Pump Machine is installed all the units for their production process and as measures of pollution control. Plantation is another important job of the employer of brick units to make pollution free environment.

¹⁴. Guidelines on Brick manufacturing Unit: www.guidelinesofbrickkiln.in, 2013

For controlling dust and reducing risks & accidents, there is an instruction of Pollution Control Board that metalled road in the premises of the unit is to be constructed. But it is observed during the units visit that some of the units have started production process without constructing metalled road inside the unit.

Views of the owners or managers of 12 selected brick units of Karimganj District, Assam regarding the implementation of the Pollution Control Measures are shown in table-1.

Table 1: Views of the Owners' or Managers' of the Selected Number of Brick Units of Karimganj District, Assam Regarding the Implementation of the Pollution Control Measures

Pollution Control Measures(PCM)	Reply "Yes" out of 12 units	Reply "No" out of 12 units	Total No. of Respondents
Consent to Establishment of Unit from authority under Act	12	00	12
PCM notified under the EPA Rules 1986	12	00	12
Fuel specification applicable for Diesel Generator Sets	03	09	12
No. of ducts for waste discharge through water disposal	12	00	12
Setting criteria fixed by SPCB/State Govt.	12	00	12
Comment Adequacy Prevalent Dust Control Arrangement	Water Spraying All Units	Nil	Water Spraying All Units
Whether workers are using protective dresses during working hours	00	12	12
Whether medical facility is available in the unit	04	08	12
Whether "Doctor Full-Time" available in the unit	00	12	12
Whether "Doctor Part-Time" available in the unit	00	12	12
Whether "Nurse" available in the unit	00	12	12
Whether "Frist-Aid" facility available in the unit	12	00	12
No. of Fixed Chimneys Installed in the Brick Units	12 (Single Chimney)	00	12
Movable Chimneys Installed in the Brick Units	00	12	12
Whether approach road is "Paved"	07	05	12
Whether approach road is "Hard Surfaced"	08	04	12

Source: Field survey of brick units of Karimganj District, Feb, 2019.

Table-1 highlights that fixed chimney was installed in all the selected brick units of the study in Karimganj District of Assam. In this regard, Gauhati High Court has directed the Assam State Pollution Control Board to take steps to close down brick kilns which do not have its mandatory permission. The high court, at the same time, has also cracked its whip on temporary industrial establishments manufacturing bricks using only tin sheet chimneys, which are not allowed by the pollution control board. Kamal Kalyan Dutta, member secretary of the board, today says over phone from Guwahati that all the deputy commissioners in the state have been asked to take steps within a month to wind up the temporary tin-chimney kilns for the sake of environment.¹⁵

¹⁵.The Telegraph 10th Jan, 2013.

It is revealed from the table-1 that the approach road of the brick unit from the nearest public road for the transportation of raw material/final products is paved or hard surfaced. Table-1 also shows that in the name of medical facility available in all the brick units, merely first-aid treatment is arranged within the unit.

From the point of view of workers of the selected brick units of Karimganj District, Assam, it is clearly observed that a large number of workmen are required for brick making i.e. unfired bricks (kaccha/green bricks) in the unit. Workers are engaged on the basis of their skill and the requirement of the owner of the brick units. Of course, it is true that the workmen of firing of bricks, loading of unfired bricks in the kiln and unloading of fired bricks from the kiln are always skilled and efficient. They are aware of their assignment and also supervise properly. The work force is paid on the basis of quantum of work and against completion of certain tasks. Operations are mostly manual and under present conditions the working schedule for the workers is mainly for dry season from November to April.

From the field survey, it is observed that the workers engaged in brick units both male and female. It is obviously clear that the brick unit uses coal, fire, clay, kiln and chimney to convert kucha soil (raw soil) etc. for production of bricks. As the brick industry uses fire and coal, kiln and work is done by workers manually, so there is risk of exposure to pollution, smoke, heat, emission and open fire during manual coal feeding. Brick kiln workers are exposed to dust particles. Views of the workers or employees of the selected brick units of Karimganj District, Assam regarding the implementation of the Pollution Control Measures is shown in table-2 which covered 120 respondents from workers of the selected 12 number of brick units of Karimganj District.

Table 2: Views of the Workers' or Employees' of the Selected Brick Units of Karimganj District, Assam Regarding the Implementation of the Pollution Control Measures

Pollution Control Measures and Protective Measures of workers of the Units	Reply "Yes" out of 12 units	Reply "No" out of 12 units	Total No. of Respondents
Exposed to any harmful substance / Chemicals/methods/system in the unit	00	120	120
Suffering from pollution during working hours in the unit	104	16	120
Suffering from any disease after joining in the unit	02	118	120
Using of Helmet as protective measures at working hours	01	119	120
Using of Shoes for protection at working hours	05	115	120
Using of Dresses as protective measures at working hours	01	119	120
Using of Nose protector at working Hours	11	109	120
Using of Ear protector at working hours	00	120	120

Source: Field survey of brick units of Karimganj District, Feb, 2019.

The above table-2 reveals that 104 workers out of 120 have expressed that they have been suffering a lot due to pollution during working hours in the units. This is because of lack of installation of anti-pollution devices. It is also highlighted that a large number of workers are not using nose protectors, protective dresses, helmets etc. during working hours. It is observed during the field visit that most of the work in the unit is done mainly on contractual basis; as a consequence occupier of the unit is least aware of the problem, workers are also unaware due to lack of literacy, knowledge, and education etc. Thus, it is found from the respondents of both owners/managers and workers that a limited number of workers use the protective measures such as nose protector, protective dresses etc. during the working hours in the unit.

SUGGESTIONS

Certain suggestions have been offered for prevention of health hazards due to pollution in Brick Industry of Karimganj District, Assam. These suggestions are:

- There is need for installation of pay-loader for carrying of raw materials & finished products in every brick unit.
- Workers should not be allowed to carry of heavy load during the working hours in brick units.
- There is a need to install fire extinguishers in every brick unit for protection of fire in brick industry.
- Workers should use suitable goggles for protection of their eyes during the working hours in brick industry.
- All workers should use nose protectors during the working hours in brick industry.
- Adequate numbers of spittoons should be installed in the work place for good health of workers in every brick unit.
- Employers/managers should take properly cleanliness which can be reduced hazards and free from pollution in the surrounding of the unit.
- Shelter and rest rooms with drinking water facilities or alternative accommodation should be provided better quality to the workers by employers of brick industry.
- Separate comfortable and hygienic place for dining should be provided for workers in the brick industry.
- Medical and Health Check-up facility should be extended in every unit, so that all workers can get appropriate and adequate benefit if any accident/injury occurs or even for illness of the worker and records of workers should be maintained properly, at the same time some other arrangement than first-aid treatment in the unit for health of the workers.
- Workers' participation in safety management should be involved in every brick unit for prevention of accidents and health hazards during the working hours.
- Awareness among the workers should be made in brick units.
- Water sprayers should be installed in every brick unit for controlling dust.
- More trees should be planted in the surrounding of every brick unit to make the environment pollution free.
- Fixed chimney should be installed for prevention of pollution in every brick kiln.
- Talley-wheeler/Vehicles should be installed for transportation of unfired bricks (raw bricks) and finished products (brunt bricks) in every brick unit.
- Local agro industrial wastes residue should be encouraged for use as internal fuel to replace coal in a phased manner in brick industry.
- The use of local agricultural wastes residues as a substitute to coal fire should be encouraged and non-hazardous industrial waste such as stone dust, rice husk ash; red mud etc. should be encouraged to be mixed with top soil for brick production.

- Fly ash should be used in brick moulding in compliance of the notification (as amended) issued under the provision of Environment (Protection) Act, 1986 to manufacture soil – fly ash brick.
- Both State and Central Government should give more attention in technology adoption as well as in energy efficient brick production by setting examples in the use of green building materials in construction.
- A high standard of house-keeping should be maintained by the owners of brick kilns for reducing health hazards and diseases of the workers who stay in the campus of the unit.
- All types of measures for pollution control should be installed and implemented as per prescribed by the State Pollution Control Board / State Government for prevention of health hazards and diseases of workers in brick industry.
- Toilets should be kept clean and provided with soap for workers for hand washing in brick units.
- Regular and close interaction with experts of safety and Health Academy and Occupational Health and Safety Inspectorates can help to minimize health hazards among industrial workers.

CONCLUSION

It is known to all that pollution control measures can succeed only through the involvement of the occupier of industries and the people. The opinion of an aware and informed workman can play a positive role in promoting environmental pollution control programmes to help supplement official efforts to check the health hazards and diseases of workmen of the industry. The common men should be given environmental education so that he/she can make positive contribution towards control of pollution.

In view of air pollution, it is a fact that some people will be more sensitive than others to a given amount of pollution. For example, people with pre-existing chronic bronchitis, emphysema, or asthma suffer more when the sulphur oxide and particulate levels go up than people without these diseases. So, initiative should be taken to prevent the more sensitive groups from being unduly affected by a level of air pollution or environmental problem.

In the context of brick industry, it is basically the source of dusts, smoke, heat, emission and pollution which are causes of health hazards and also accidents in the industry. The occupier of the industry is responsible to control and prevent the dusts, heat, emission and pollution. In case of pollution in industrial activities, it is the obligatory duty of the owner of the industry to install anti-pollution device in the industry as per the guidelines of the Central Pollution Control Board, and different Acts as mentioned in the discussion. In respect of minimizing the industrial pollution of brick units, the implementation of the pollution control measures must be required in every unit.

Our courts, by various judgments, have given birth to a new right i.e. a right to have clean environment. This right has to be recognized in our Constitution. The Supreme Court has already held in the case of *Subhash Kumar v. State of Bihar*¹⁶ that the right to live is a fundamental right under Article 21 of the Constitution and it includes the right of enjoyment of life. The right of enjoyment of life must include the right to have a clean environment. This right can be described as: All citizens shall have the right to clean and healthy environment throughout the territory of India. Nothing in this Article shall prevent the Parliament from making any law imposing reasonable restriction only in the extra ordinary

¹⁶ AIR 1991 SC 424

circumstances and in the interest of general public. There is a constitutional imperative on the State Government and the municipalities, not only to ensure and safeguard proper environment but also an imperative duty to take adequate measures to promote, protect and improve both the man-made and the natural environment.¹⁷

It is mandatory that Pollution Control Board either Central or State must visit and inspect the pollution control measures of brick industry. In this regard, Government has the rules and guidelines to ensure the installation of anti-pollution device in every brick unit to control the pollution. The brick industry is also within the purview of Environment Protection Act 1986, Air (Prevention and Control of Pollution) Act 1981 and it is mandatory for this industry to follow the rules enacted by the Central and State Pollution Control Board. From the legal point of view, it is the primary function of the occupier of the brick units to follow and observe properly the rules and regulations framed by Government either State or Central for preventing/controlling the industrial pollution.

REFERENCES

Books

1. Khan, I. A (2002): "Environmental Law (Text Book)," Central Law Agency, Allahabad.
2. Malik, P.L: (1971): "The Industrial Law." Eastern Book Company, Law Publishers and Book sellers, Head Office, 34, Lalbagh, Lucknow – 1,
3. Nanda, Sukanta K (2009): "Environmental Law", Central Law Publications, Allahabad- 211002.
4. Sarma, A. M (1985): "Aspects of Labour Welfare and Social Security.", Himalaya Publishing House, Mumbai – 4,
5. Shukla, M. C (2000): "Mercantile Law", S. Chand and Co. Ltd., Ram Nagar, New Delhi-110055, and PP-533-536.
6. Shyam, Divan and Armin Rosencranz (2001): "Environmental Law and Policy in India", Cases, Materials and Statutes, Oxford India Paperbacks, Published in India, By Oxford University Press, New Delhi.
7. Tiwari, H.N. (2002): "Environmental Law", Published; Allahabad Law Agency, Faridabad, Haryana.
8. Universal's Legal Manual, (2012): "Labour & Industrial Laws," Universal Law Publishing Co. Pvt. Ltd., New Delhi, India.

Journals and Websites

9. Annual Report 2004-2005: "Abatement of Pollution, Ministry of Environment & Forests", Chap-4.
10. Asia-Pacific Environmental Innovation Strategies (APEIS): Research on Innovative and Strategic Policy Options (RISPO), Good Practices Inventory; Adaptation of vertical shaft brick kiln (VSBK) technology for Indian brick industry, www.0028.pdf.Mr. N. Vasudevan, Fellow, TERI, Darbari Seth Block, India Habitat Centre, Lodi Road, New Delhi – 110 003
11. Brick encyclopedia topic Reference_com.htm40.
12. Central Pollution Control Board: From Wikipedia, the free encyclopedia. (Modified on Feb, 2013)

¹⁷ Id at 580-1

13. Centre for Science and Environment National Knowledge Commission Government of India, Technology Partners: Mimir Tech, India Environment Portal by Centre for Science and Environment is licensed under a Creative Commons Attribution-Share Alike 2.5 India License
14. Chintan Parikh (2012) Air Pollution Control Norms in India, Posted on December 21, 2012 <http://www.techflow.net/blog/?p=15>
15. Code of Practice on Pollution Control (2000 Edition) (with amendments in Feb 2001, Jun 2002, Feb 2004 and Feb 2009), www.code-of-practice-control.
16. Detailed Project Report on Induced Draft Fan in Brick Industry (Varanasi Brick Cluster): [www.bee-india.nic.in/Brick SME cluster Varanasi, Uttar Pradesh \(India\), BEE-2010](http://www.bee-india.nic.in/Brick%20SME%20cluster%20Varanasi,%20Uttar%20Pradesh%20(India),%20BEE-2010).
17. Dubey R M (Chairman) (2013): "Guidelines on Brick manufacturing Unit". Retrieved from [www.guidelines of brick kiln in Assam](http://www.guidelinesofbrickkiln.in).
18. Eco Carbon Private Limited. (2006). Environmental and Social Review (ESR) for FaL-G Bricks/Blocks Project. Ecology with Economy, Visakhapatnam, Retrieved from 2006, January, www.fal-bricksblocksproject
19. Environmental Systems Branch, Development Alternatives. (2005, December 30). Environmental and Social Report for VSBK. A Guidance Document for Entrepreneurs and Project Auditors. Retrieved from 30th Dec, 2005, New Delhi, pp.1-3. www.devatl.org
20. Guidelines for Abatement of Pollution in Brick Kiln Industry, Rajasthan State Pollution Control Board, Institutional Area Jhalana Dungri, Jaipur, www.new_brick_kilnguidelines_ankit
21. Kumar, N. N. Sampath. R & D Centre for Clay Roofing Tiles, Bricks and Other Ceramic Products. National Institute of Technology, Karnataka. Karnataka State, India, Retrieve from www.nitka.ac.in, Articles on 'Save the Earth' - Eco friendly solutions to iron ore tailings.
22. Madhumita DharSarker (2005): "Legislative Measures and Control of Air Pollution in India: Retrospect and Prospect" Ph. D. Theses (unpublished).
23. Maithel S. et al (2000): "Environmental regulations and the Indian brick industry" Environmental Practice Journal of the National Association of Environmental Professionals. 2 (3): 230-231, the Energy and Resources Institute Creating Innovative Solutions for a Sustainable future.
24. Managing Solid Waste in India Needs Attention: Central Pollution Control Board, Article General. © Enviro Spectra Welfare Society, Ministry of Environment & Forests, Central Pollution Control Board.
25. Pariyar Suman Kumar, Das Tapash, Ferdous Tanima (May, 2013): "Environment and Health Impact for Brick Kilns In Kathmandu Valley". International Journal of Science and Technology, Research Vol.-2, Issue-5. IJSTR. www.ijstr.org.
26. Pollution Act; Closure Could on brick kilns htm. The Telegraph 10 Jan, 2013, Calcutta, India
27. Punjab State Council for Science & Technology (June, 2010): "Model Project Report for Setting up Energy Efficient Brick Kiln for the production of Resource Efficient Bricks". Submitted to Corporation Bank, Chandigarh-160019.

28. Rajasthan State Pollution Control Board: "Guidelines for Abatement of Pollution in Brick Kiln Industry". 4, Institutional Area Jhalana Dungri, Jaipur, www.new_brick_kilnguidelines_ankit
29. R&D Centre for Clay Roofing Tiles, Bricks and Other Ceramic Products, National Institute of Technology, Karnataka, Dakshina Kannada District, Karnataka State, India, www.nitka.ac.in.
30. Singh Ramchandra Prasad and Kumar Amarendra Narain (December, 2014): "The Problem of Informal Sector Workers: A Case Study of the Brick Kiln Workers of Bihar". *The Indian Economic Journal, Journal of the Indian Economic Association. Special Issue, Challenges for Transforming the Informal Economy in India. PP. 86-94.*
31. Vikas Monga et al (2012): "Respiratory Health in Brick Kiln Worker", *SIJPSS Volume 2, Issue 4, April, ISSN: 2249-5894, A Monthly Double-Blind Peer Reviewed Refereed Open Access International e-Journal - International Journal of Physical and Social Sciences* <http://www.ijmra.us>. 226.

