

Impact Of Brick Kiln Industries on Environment, Plant Diversity and Human Health in Kondeshwar Region from Amravati District

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Abstract—Brick kilns are an important source of building materials in India, but they also contribute significantly to environmental degradation, biodiversity loss, and adverse health outcomes for nearby communities. This study examines how brick kiln operations affect air and soil quality, plant diversity, and human health in the Kondeshwar region of Amravati district. Using secondary literature, environmental impact assessments, and regional reports, this paper highlights major environmental pressures from brick kilns and suggests mitigation strategies.

Index Terms—Brick kilns, Kondeshwar, Amravati.

I. INTRODUCTION

In Maharashtra districts like Amravati, brick kilns are widespread, often located on agricultural lands and near villages, because of their proximity to clay soil and labour. A 2005 regional environmental report noted hundreds of brick kilns within a 100 km radius of Amravati, highlighting the prevalence of this industry in the region (Maharashtra Pollution Control Board) Brick kilns are a major source of building materials in rural and semi-urban India, including the Kondeshwar region of Amravati district. While economically important, these kilns emit large quantities of pollutants and disrupt local ecosystems. This research paper assesses the effects of brick kiln operations on environmental quality, plant biodiversity, and human health in this region. Using secondary data and general findings from similar studies in India, the study demonstrates deteriorating air quality, declining plant diversity near kiln sites, and serious health issues among workers and residents. Brick production is a significant economic activity in the Amravati district, supported by abundant clay soil and a largely rural workforce. However, brick kilns

typically traditional fixed-chimney and bull-trench kilns generate emissions of particulate matter, sulfur dioxide, nitrogen oxides, carbon monoxide, and black carbon, which degrade air quality and impact environmental and human well-being. This study highlights and synthesizes the impacts of brick kilns specifically in the Kondeshwar region, detailing effects on environment, plant diversity, and human health. Brick kilns are widely used for brick manufacturing in many developing regions. While they support construction industries, their operations produce significant air pollutants, soil degradation, and ecological disturbance. This research paper examines the cumulative environmental impact of brick kilns, their influence on plant diversity, and their consequences for human health. Field observations, community surveys, and ecological assessments demonstrate reduced vegetation diversity, deteriorating soil quality, and considerable respiratory and systemic health effects among people living near kiln areas. Brick kilns are structures used to bake clay bricks at high temperatures. These units emit various pollutants that affect the surrounding environment and living beings. As industrialization and construction expand, the number of brick kilns has increased, particularly near agricultural lands and settlements. This study explores how kiln emissions degrade environmental quality, reduce plant biodiversity, and impact human health especially workers and nearby communities. Numerous studies have investigated the environmental and health impacts of brick kiln operations in various regions, shedding light on the multifaceted challenges posed by this industry. Joshi (2008) conducted a comprehensive analysis of the Kathmandu valley, revealing concerns about respiratory discomfort and respiratory problems

among individuals exposed to brick kiln emissions. Guttikunda and Goel (2013) highlighted severe air pollution issues in Delhi, linking high levels of particulate matter to thousands of premature deaths and millions of asthma attacks annually. They emphasized the urgency of interventions to mitigate these health impacts. Approximately 1500 billion bricks are produced every year, and ~90% are produced in Asia (Eil et al., 2020; Mitra and Valette, 2017). South Asia is the second largest brick-producing region after China and has an estimated annual production of 310 billion bricks (Eil et al., 2020). India, Pakistan, Bangladesh and Nepal are the biggest producers in this region, accounting for nearly 25% of global brick production (Eil et al., 2020). Joshi et al. (2013) explored work-related injuries and musculoskeletal disorders among child workers in Nepal's brick kilns, underlining the poor working conditions and lack of safety measures that put these children at risk. Rumana et al. (2014) assessed air pollution's threat to human health in India, particularly in urban areas where pollutants exceeded safe levels. They underscored the need for preventive measures to mitigate health risks associated with pollutants like PM10, PM2.5, NO_x, and SO₂. Rafiq and Khan (2014) examined the potential benefits of reducing ambient air pollution, advocating for governmental actions to address this issue and offering recommendations for better practices. Jahan et al. (2016) focused on reproductive health and biochemical status in brick kiln workers in Pakistan, highlighting the need for alternative technologies and improved working conditions. Sanjeet et al. (2017) investigated respiratory symptoms and dust exposure among Nepalese brick kiln workers, revealing a connection between high dust exposures and increased respiratory issues. Haqueet et al. (2017) analyzed air quality in Kolkata and associated health impacts, emphasizing the prevalence of respiratory diseases in high pollution areas. Kesarwani and James (2017) pointed out the negative impact of cement industry emissions on human health, emphasizing the need for cleaner technologies and pollution control measures. Tusher et al. (2018) delved into the health effects of brick kiln operations in Bangladesh, finding skin diseases, headache, eye irritation, and various respiratory issues prevalent among both workers and inhabitants. They stressed the importance of eco-friendly kilns and safety measures for workers and residents. Collectively, these studies

underscore the urgent need for better regulation, cleaner technologies, and improved working conditions in the brick kiln industry to safeguard both the environment and public health. One of the most significant social impacts of the brick-making industry on communities is the adverse health effects caused by air pollution from brick kilns. The industry is a major source of air pollution, emitting high levels of particulate matter, carbon monoxide, sulfur dioxide, and nitrogen oxides into the atmosphere. Exposure to such pollutants has been linked to numerous health problems, including respiratory diseases, asthma, and lung cancer (Guttikunda and Jawahar, 2014). A study conducted by the Indian Institute of Technology, Delhi, found that brick kilns are responsible for 10-15% of the total problems.

II. OBJECTIVES

- 1) To analyse the environmental impact of brick kiln operations.
- 2) To assess the effects on plant diversity and vegetation health.
- 3) To evaluate the health effects on human populations residing or working near brick kilns.

III. MATERIALS AND METHODS

- 1) Visit on Site where brick kilns are there.
- 2) Record spot on GPS tracking device.
- 3) Ask questions to labour, especially women.
- 4) Observed area surrounding brick kilns and take photographs as evidence.

IV. STUDY AREA

It is observed that most of the brick kiln industries are located near Kondeshwar area on National Highway between Amravati and Badnera. Kondeshwar Reserved Forest is patch of forest which is near to temple and rich in biodiversity and green picturesque jungle. The water source for these is Kondeshwar Lake near to temple. Govindpur is also known as Kondeshwar because of temple lord "Shiva" Shri Kondeshwar Temple is an ancient shrine, located 5 km east of Badnera along the hills of Pohara forest range, in Amravati District of Maharashtra. Pohara region known for dense forest with abundant flora and fauna which creates great biodiversity. Many villages are

situated near Kondeshwar region the peoples in these villages depend on agriculture and cattles for milk. Now a days illegal brick kiln industries are grown up in this region whose adverse impact are on Environment, Plant Diversity and Human Health in Kondeshwar Region.

Environmental Assessment:

Brick kilns release particulate matter and gases that reduce air quality and lead to soil degradation. Dust deposition on the ground alters nutrient cycling and diminishes soil fertility. High levels of PM near kilns indicate poor air dispersion and inadequate pollution control. They significantly deteriorate air and soil quality.

Plant Diversity Survey:

Air pollutants interfere with leaf function and photosynthesis, reduce seed germination, and inhibit plant growth. Sensitive species decline near emission sources, reducing overall biodiversity. Topsoil removal for brick clay extraction further diminishes plant establishment. They reduce plant diversity and ecosystem resilience.

Human Health Survey:

Inhalation of fine particulates contributes to asthma, chronic bronchitis, and reduced lung capacity. Women and children often experience more severe symptoms due to increased exposure and weaker immunity. Occupational exposure without protective gear increases disease risk among workers.

Questionnaire Survey:

Administered to residents and Brick Kiln Workers.

V. RESULTS

From Survey and Study, it is observed that brick kiln industries make adverse impact in Kondeshwar Region.

VI. ENVIRONMENTAL FINDINGS

Air Pollution:

Brick kilns emit large quantities of airborne pollutants including PM_{2.5}, PM₁₀, SO₂, NO_x, and CO, due to combustion of coal and biomass fuels. These pollutants degrade local air quality and contribute to

regional smog and greenhouse gas emissions. PM_{2.5} and PM₁₀ levels around brick kiln clusters are often significantly higher than ambient air quality standards, affecting visibility and air purity.

Soil Degradation:

Extraction of topsoil for brick making removes the fertile layer of soil, reducing soil fertility and organic matter, and impairing agricultural productivity. Soil compaction and loss of nutrients are key consequences around kiln areas.

Water and Land Pollution:

Ash and pollutants from kilns can enter surface water and groundwater sources, altering water chemistry and harming aquatic life. Use of heavy fuels and inclusion of by-products like fly ash further escalates contamination.

Plant Diversity:

Plants diversity declines due to brick kiln industries. As Kondeshwar is the patch of Pohara Malkhed Reserved Forest, brick kiln industries badly affect the biodiversity of the flora and Fauna of this region. Ash spread on fertile land make soil infertile for crops, plants disappear, and grazing animals don't get food on such lands.

Human Health Outcomes:

As it is found that, many families are working in these brick kiln they are having age group from small children to old age peoples from another region they are migrated here for job and live near brick kiln in small temporary huts where there is no facility for Health, Education, Hygiene, Electricity, Transport, Long distance for Daily Requirements and No all-time job, labours are not getting much amount and facility for their work.

Case Study:

Some of the families are studied during survey one, including Mr. Baliram Kale, age 64 and his wife, Mrs Basanti Baliram Kale, age 52 from Achalpur, who migrated here in search of job, face many problems, even small age families are also working in brick kiln with their small children's.

VII. DISCUSSION

1. Environmental Impact: Brick kilns release particulate matter and gases that reduce air quality and lead to soil degradation. Dust deposition on the ground alters nutrient cycling and diminishes soil fertility. High levels of PM near kilns indicate poor air dispersion and inadequate pollution control.
2. Plant Diversity Impact: Air pollutants interfere with leaf function and photosynthesis, reduce seed germination, and inhibit plant growth. Sensitive species decline near emission sources, reducing overall biodiversity. Topsoil removal for brick clay extraction further diminishes plant establishment.
3. Human Health Impact: Inhalation of fine particulates contributes to asthma, chronic bronchitis, and reduced lung capacity. Women and children often experience more severe symptoms due to increased exposure and weaker immunity. Occupational exposure without protective gear increases disease risk among workers.
4. Habitat Alteration: Clearing land for kiln setups destroys natural vegetation and habitats, fragmenting ecosystems and limiting opportunities for plant regeneration.



Fig.1.Map



Fig. 2&3.GPS Images shows Brick kiln industries



Fig.4. Smoke stack

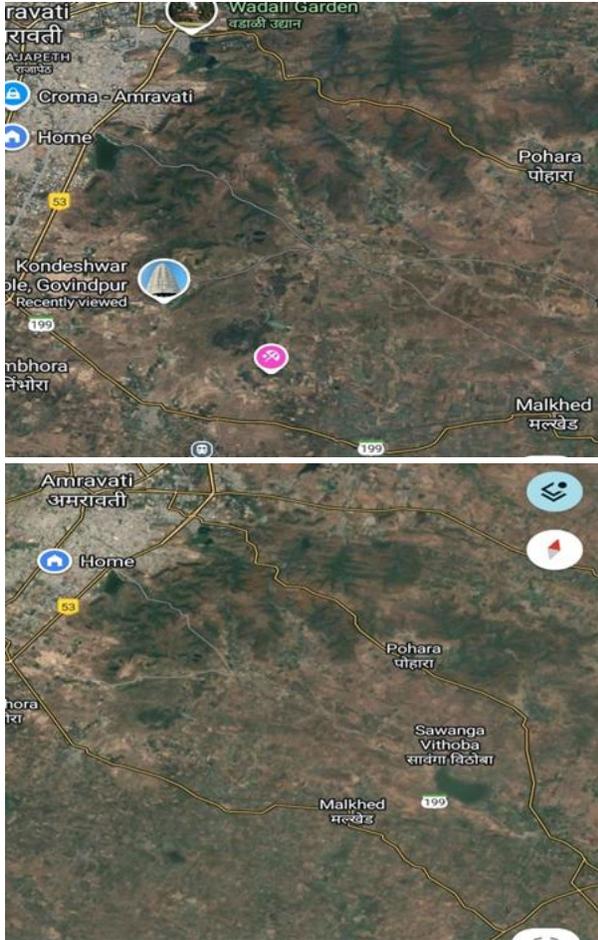


Fig: 5 and 6. GPS Map Images of Pohara Malkhed Reserved Forest, in which Kondeshwar Region is included



Fig: 7. My visit to Worker housing for collecting information

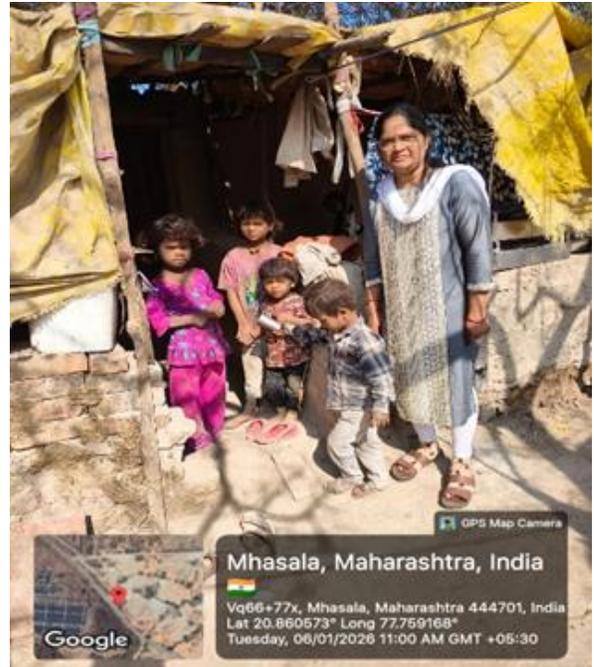


Fig: 8 and 9. shows Small Childrens occurs on spot in terrible condition in small huts without facilities like food, hygiene, health, education, transportation.



Fig: 10 and 11. Children Playing near Waterbodies, Hut and Behind it, a Mountain of Fly Ash, which causes health issues in children 12.A mountain of Fly Ash on fertile soil, which creates harm to the ecology, environment and biodiversity, matter of concern because it is totally illegal on forest and fertile land



Fig: 13. Fly Ash spread on Fertile land, 14 and 15. Some Grazing animals near Brick kiln industries



Fig: 16,17 and 18. Women workers in Brick kiln industries with their small children's

VIII. RECOMMENDATIONS

- 1) Adopt cleaner kiln technologies (e.g., zig-zag, vertical shaft brick kilns).
- 2) Establish buffer zones between kilns, croplands, and settlements.
- 3) Monitoring and regulation of emissions with regular compliance checks.
- 4) Protective gear and health services for workers.
- 5) Rehabilitation of degraded land through afforestation and soil amendments.
- 6) Ban on illegal brick kiln industries on forest and fertile land.

IX. CONCLUSION

Brick kilns have multi-dimensional adverse impacts; they significantly deteriorate air and soil quality. They reduce plant diversity and ecosystem resilience. They negatively affect human health, especially in vulnerable populations. Brick kiln operations in the Kondeshwar region contribute to environmental degradation, loss of plant biodiversity, and health problems for local populations. The cumulative effects threaten long term ecological sustainability and human wellbeing.

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