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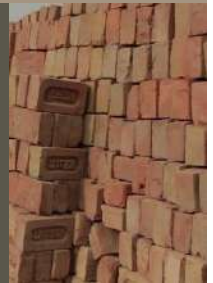
Ask the Experts: Interview with Dr. Sameer Maithel on Environmental Impacts of Brick Manufacturing and Sustainable Solutions

June, 2022

Issue
TWO



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Facts and Figures...

- # In 2015, approximately 1.1 million deaths in India were reported to have been caused by the particulate matter (PM) air pollution caused from various sources. Brick production contributed 24,100 deaths.

https://www.healtheffects.org/system/files/GBD-MAPS-SpecRep21-Summary-English-revised_0.pdf

- # 65% of bricks are produced in the Indo-Gangetic plains, which are rich in fertile alluvial soil. Brick kilns impact soil quality as well as the quantity and quality of food grain production, thus affecting food security.

https://www.researchgate.net/publication/324495882_Fired_Bricks_CO2_Emission_and_Food_Insecurity

- # The economic costs on public health of the brick sector in India is reported to be US\$ 3.6 billion.

<https://openknowledge.worldbank.org/bitstream/handle/10986/33727/Dirty-Stacks-High-Stakes-An-Overview-of-Brick-Sector-in-South-Asia.pdf?sequence=1&isAllowed=y>

From the Editor's Desk...

This newsletter is the second in the series produced by HAQ: Centre for Child Rights. It is part of an initiative towards securing health, nutrition, food security and dignity for brick kiln workers and their families in 30 kilns of Ajmer, Bhilwara (Rajasthan) and Surir (Mathura, Uttar Pradesh), hoping to thus contribute to SDG 2. The initiative is supported by the German Federal Ministry for Economic Cooperation and Development (BMZ) and terre des hommes (Germany). It is being implemented by the Centre for Labour Research and Action (CLRA) in Rajasthan and the Centre for Education and Communication (CEC) in Mathura, Uttar Pradesh, with HAQ providing technical inputs for evidence creation and informed discourse on the subject, making the much needed connect between gender, child rights, labour rights and ecological rights.

Besides sharing good practices and impact of the interventions being carried out in the 30 brick kilns, this newsletter aims at capturing issues that can have a lasting impact on the situation of brick workers as well as the brick kiln industry in India, with specific focus on the environmental impacts of brick manufacturing. The interconnectedness between environmental impacts and the right to work under decent work conditions is also explored with a view to highlight measures that can form part of sustainable solutions to development and help secure social and economic justice for the migrant workers and their families who form the backbone of the brick industry.

Bharti Ali



Making out a case for Environment and People's Protection!

Mukesh Kumar Aggarwal Vs Central Pollution Control Board and Anr. (National Green Tribunal, OA No. 93/2021, Order dated 12.08.2021)

In this case, the applicant, a resident of Kosi Kalan (Rural), Chhata Tehsil, Mathura District, UP living with old parents, went to court aggrieved by the pollution caused by the brick kilns in the district. Contentions raised are:

- There are about 350 brick kilns in Mathura district operating on coal as fuel and contributing to the severe air pollution in Mathura, where the AQI crossed 400. 189 brick kilns are operating in violation of siting criteria and environmental norms and contribute to around 28% air pollution.
- These kilns do not have requisite consents and are non-compliant with the UP Brick Kilns (Siting Criteria for Establishment) Rules, 2012, which requires brick kilns to maintain prescribed distance from habitations, educational institutions and hospitals.
- The Comprehensive Environment Pollution Index score of Mathura Industrial Area is 91.10, much above 70, which is considered as critically polluted.
- Mathura has emerged as a hub of brick kilns and consent to establish was being granted by UPPCB even in 'critically polluted areas'.

The Tribunal held – “No doubt the earlier order in Utkarsh Panwar is for Delhi and NCR, the principle underlying the said order has to be followed. ...The Uttar Pradesh Brick Kilns (Siting Criteria for Establishment) Rules, 2012 requires a distance from 250 meters from the Government Hospital habitation area, school, colleges and highway.”



UTKARSH PANWAR vs. CPCB AND ORS. [National Green Tribunal, OA No 1016 of 2019 - Order dated 17.3.2020]

The Hon'ble Supreme Court of India in Civil Appeal No. 1742-43 of 2020 (Diary No. 5935/2020) vide order dated 20/02/2020 requested the National Green Tribunal to decide the O.A. No. 1016/2019, in the light of the provisions of the Graded Response Action Plan (GRAP) of the Ministry of Environment, Forest and Climate Change (MoEF&CC) and Environment Pollution Control Authority (EPCA). The question before the Tribunal was whether brick kilns operating on zig-zag technology using coal fuel should be prohibited to run during high level of air pollution in the National Capital Region (NCR) on parity with other coal run Fixed Chimney Bulls Trench Kilns (FCBTK) that have been prohibited as part of the GRAP during 'severe' condition of air quality.

Jist of the order passed by the Tribunal on 17.3.2020, which holds good till date is as follows:

- Unless the brick kilns operate on cleaner fuel like PNG, they will not be permitted to function in 'severe' air quality conditions even if they are using zig-zag technology (which is a cleaner technology compared to the older FCBTK technology) but are operating on coal as fuel. This is because during 'severe' air quality conditions the assimilative carrying capacity (the limit till which ambient air quality can be said not to be affected) of the region cannot sustain emissions from brick kilns to keep pollutants below the permissible levels.
- Coal fired brick kilns using zig-zag technology can be permitted only from March to June in NCR when the carrying capacity of the region can sustain the emissions. Only those brick kilns switching to cleaner PNG fuel may be permitted to operate beyond the months of March to June.
- Compliance by an individual brick kiln, otherwise contributing to the pollution load of the region beyond carrying capacity, does not confer a right upon such individual brick kiln to continue such activity in 'severe' air quality condition.
- The location of brick kilns should be scattered on pro-rata basis having regard to the background and carrying capacity of the region. This should be done by applying suitable siting criteria by taking into account distance from sensitive locations (such as habitations, schools and hospitals) and compliance of consent conditions.

An appeal has been filed in the Supreme Court of India against the final Judgment and Order dt 17.2.2021 in Utkarsh Panwar Vs. CPCB and Ors. (OA 1016 of 2019) passed by NGT. The case in the Supreme Court is titled, "NCR Brick Kiln Association vs. CPCB [Civil Appeal Diary Number 18213 of 2021].

Dust, Heat, Air Pollution, Work and Migration: Health of Children in Brick Kilns



This is where they play and what they play with. They've got used to the heat and dust, but who cares what they inhale? So what if they have respiratory infections? And what will change if they get some nutritious food and day care?



Did you know...

“Children’s lungs and their immune systems are still developing, making them especially vulnerable to polluted air, and their respiratory airways are smaller than adult airways, so infections are more likely to cause blockages than in adults.

Children breathe twice as fast, taking in more air per unit of body weight, compared to adults.

Exposure to air pollution during childhood can harm the healthy functioning of children’s lungs, and this sometimes has lifelong implications.

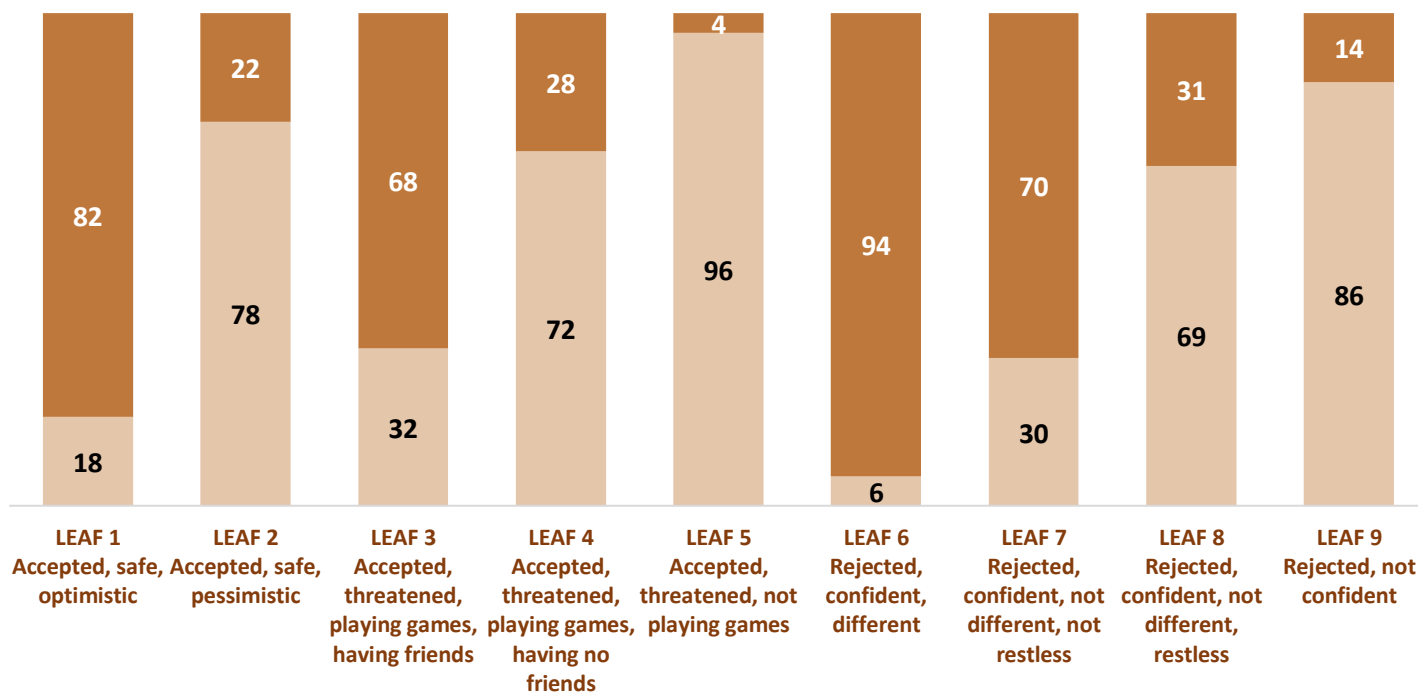
Approximately two billion children live in areas where air pollution levels exceed the baseline standards (of 10µg/m³) set by the World Health Organization (WHO).”

- UNICEF: The Climate Crisis is a Child Rights Crisis:: Introducing the Children’s Climate Risk Index, 2021

The Psychological Health of Children Working in Brick Kilns:

A Classification Tree Analysis

Proportion of non-worker and worker children



■ Darker part of bars = Proportion of non-workers
 ■ Lighter part of bars = Proportion of workers

Source: ILO
https://www.ilo.org/wcmsp5/groups/public/---ed_norm/--ipec/documents/publication/wcms_672539.pdf

Psychological well-being of children in brick kilns is one of the less-studied components of their health. Seasonal migration to new locations, alien environments, social and physical isolation, taxing work and stressful living conditions have a deep impact on children’s mental well-being.

Ground Report: Improving Access to Services for Women and Children in Brick Kilns

Fighting Malnutrition

Interventions by CEC in Surir, Mathura District, UP

Radhika, aged 9 years, accompanied her parents Radha Devi and Indal Manjhi to Raju Eint Udyog. Her parents belong to Phulma village in Nawada District of Bihar. The Centre for Education and Communication (CEC) has set up Child Health and Nutrition Centre (CHNC) in 10 brick kilns in Surir, including Raju Eint Bhatta to provide day care, nutrition and immunization to children of brick workers and monitor their growth. When the brick workers arrived at the kiln in October 2021, their children were evaluated on certain health indicators. Radhika was very weak and hence included among the 30 children who joined the centre. For the first two months, the child gained some weight with the help of the nutrition she received at the centre, but the next month there was no change. When measured again, Radhika weighed 4.8 kg, which was less according her height of 55 cm. The centre facilitator then shared this information with the local ASHA (Accredited Social Health Activist) and ANM (Auxiliary Nursing Midwife). When ASHA and ANM took her Body Mass Index measurement and carried out other evaluations, they found Radhika malnourished. They immediately informed the health department officials at the Community Health Centre (CHC) in Naujheel. Next day the health team from the department visited the child at Raju Eint Udyog, and upon certain evaluation, they also concluded that the child was malnourished. The health team recommended Radhika's parents to take her to the Nutrition Rehabilitation Centre (NRC) in Vrindavan, which was 34 km away from the brick kiln. Radhika's parents, who are brick moulders, refused to go as they had the burden of making as many bricks as possible. They had already taken an advance from the kiln owner and could not have left the work midway. It was also a new place for them. The centre facilitator and block coordinator from CEC then approached the kiln owner and shared the child's condition, explaining the need to take her to the NRC. Fortunately, the kiln owner understood the need and with the support of CEC and the owner of the kiln, the parents agreed to take the child to the NRC. Next day, the CHNC facilitator, Dr. Sandhya from the health department and Radhika's mother went to Vrindavan and got her admitted in the NRC. For the next few days doctors at the NRC monitored Radhika regularly and gave her all the necessary nutrition supplements and medicines. There was a marked difference in Radhika's health and her mother was happy to see the change. She thanked the CHNC facilitator and block coordinator from CEC. After 15 days in NRC, a healthy Radhika was back at the kiln.

One of the possible measures that can be taken to help children cope with health impacts of brick kilns is to invest in building their immunity.

Addressing Hunger and Malnutrition can help!

Interventions by CLRA in Ajmer, Rajasthan

3 year old Bindiya came to JMD Ladpura Bhatta in Ajmer with her parents. Her parents had come to the kiln from Arangi village in Mahasamund District of Chhattisgarh to work as brick moulders. In October, when her family arrived at the kiln, Bindiya's weighed 8.2 kg and her MUAC (Middle Upper Arm Circumference) tape measurement was 12.5 cm. On enquiring, Bindiya's mother informed the facilitator of the Child Health and Nutrition Centre (CHNC), set up by the Centre for Labour Research and Action (CLRA) at the brick kiln, that Bindiya did not eat anything and was usually sick, lying around without any energy. She was counselled to send the child to the CHNC. The mother was asked to drop her child at the centre every day without failure. At the centre, Bindiya was served hot and dry food twice a day and given iron syrup twice a week. Her parents were also counselled regularly to pay attention to her meals and it was mutually agreed that she will be given adequate diet three to four times a day. What to serve in the meals was also decided – Cooked mix of spinach and lentils, sweet and sour porridge, seasonal fruits, green vegetables, and milk (twice daily). To ensure easy access to green vegetables, the CLRA team set up a kitchen garden for the family, where spinach, fenugreek leaves, tomatoes, coriander leaves, etc. were grown. Meanwhile her mother had a miscarriage, where after Bindiya's care received a setback. Bindiya was soon suffering from diarrhoea and was vomiting out whatever she ate, which made her very weak. The centre facilitator started a new diet plan for Bindiya, whose condition has gradually improved. After an effort of six months, Bindiya weighs 10.7 kg and her MUAC tape measurement is 13.5 cm. Bindiya is now an active child who loves talking and playing. She takes part in all activities organised at the CHNC.



Ground Report: Improving Access to Services for Women and Children in Brick Kilns

Interventions by CLRA in Bhilwara, Rajasthan

Chikni is a 7 year old daughter of a seasonal migrant worker couple employed at Azad Bhatta in Bhilwara as brick moulders. Noticing her keenness to go to school, Puja, a staff at the Child Health and Nutrition Centre (CHNC) set up by CLRA at the brick kiln, tried to convince her parents for the same. However, they refused as the school was far from the kiln and it would not have been possible for them to drop her and pick her up every day. Chikni used to enjoy coming to the CHNC at the brick kiln. She would come regularly, had learnt new poems and loved playing with all the children. All of a sudden Chikni stopped coming to the centre. When Puja did not see her for two days, she enquired from other kids if they knew anything. The kids told her that Chikni was very sick. Puja went to her house and found that she had developed a lump around her neck and thigh. Her mother informed Puja that she had got some medicine from a private doctor, but it has not helped. The mother was advised to take her to the sub-health centre in Bhagwanpura. The child had been unwell for quite some time and did not receive adequate attention. Puja took her to Bhagwanpura. Recognising the seriousness of the problem, the doctor directed them to the Mahatma Gandhi Hospital in Bhilwara. Next day Chikni and her mother were sent to Bhilwara with another staff from CLRA and a family relative who was a little educated and had also come to the kiln for work. As the doctor was absent that day, they had to go back the next day. It took two days to diagnose that Chikni suffered from tuberculosis. CLRA staff got her the necessary treatment and informed the sub-health centre so that Chikni could easily get her medicines on time. Next day the family was counselled about tuberculosis and the doctor's advice as it is a communicable disease. Chikni's mother made necessary arrangements to isolate her from other family members. Puja went to the sub-centre to get an update on Chikni's medicines and applied for support money for her under a government scheme. With timely medicines and treatment, Chikni has shown good recovery.

Challenges that remain ...

Destination Areas	Percentage of families who have a ration card	Percentage of families who carried their ration card to the destination areas in the season starting October-November, 2021
Ajmer, Rajasthan	69%	22%
Bhilwara, Rajasthan	85%	19%
Surir, Mathura	87%	17%

Destination Areas	Percentage of brick workers and their family members who have an Aadhar Card	Percentage of Persons carrying Aadhar Card to the kiln
Ajmer, Rajasthan	56%	87%
Bhilwara, Rajasthan	82%	89%
Surir, Mathura	40%	55%

Food insecurity adds to poor nutrition and health indicators

Amidst many challenges faced by migrant, the challenge of access to food is the worst. Despite portability of one nation one ration card scheme they are unable to get subsidised food supplies in the destination areas. Hence they do not carry their ration card even when they have it. The linking of Aadhar card with ration card is another hurdle. Many do not possess an Aadhar card. Besides there are technical issues faced with respect to biometrics. Machines don't work due to server errors or poor internet connectivity in rural areas. Once a data is entered in the software, making any changes to it or resolving a data error takes ages.

Water and Sanitation woes also contribute to poor health and immunity

The Contract Labour (Regulation and Abolition) Act, 1970 casts a duty on the contractor to provide for certain basic facilities for contract labour such as adequate drinking water, toilet and washing facilities. Where the contractor fails, the duty lies with the principal employer.

The Factories Act, 1948 also provides for regulation of working conditions, health, drinking water and sanitation, safety, crèches for 0-6 year old children of women workers, and other welfare measures for the workers.

According to a study conducted in the brick kilns of Chhattisgarh, 50 to 100 families were forced to share one hand pump. About 84.7% of the women had to go for open defecation due to the non-availability of usable toilets, endangering their hygiene, and health.

-Mishra, 2014. *Effect of seasonal migration on lives of women and children in Chhattisgarh*, Madhya Pradesh Journal of Social Sciences, 19(1), pp 17-39.

The Intervention Collage from Ajmer, Bhilwara and Surir



January to June, 2022 Ground Report from 30 Brick Kilns

- 1,275 families of brick workers were informed about the importance of health and hygiene and the variety of locally available food.
- 28% families have included at least two new recipes in their diet.
- About 15% of all families are aware of the need to invest in health and nutrition.
- All 30 kilns have drinking water facility.
- 14 kilns have availability of toilets.
- All 30 kilns have a child health and nutrition centre, established with contribution from the kiln owners.
- 913 children aged 0-6 years are enrolled in the CHNCs and are receiving nutrition support, immunization, early childhood education, growth monitoring and health care services.
- 264 pregnant and lactating mothers have been connected with the health care services.
- 62 institutional deliveries were conducted.
- 130 adolescent girls engage in menstrual hygiene programme and are provided sanitary pads.
- 48 meetings held with VHSNCs and SMCs, enlisting participation of 715 persons from VHSNCs, SMCs, gram panchayats, Anganwadi worker and ASHA.



Ask the Experts...

Environmental Impacts of Brick Manufacturing and Sustainable Solutions

On April 8, 2022 the Hon'ble Supreme Court of India in "NCR Brick Kiln Association vs. Central Pollution Control Board & Ors. (Civil Appeal Diary No.- 18213/2021)", directed that all brick kilns in the National Capital Region (NCR) shall comply with the requirements laid down in the notification issued by the Ministry of Environment, Forest and Climate Change, on February 22, 2022, amending the Environment (Protection) Rules, 1986. This includes adopting the zig-zag technology and fuel that is approved for the process and establishment of kilns at a minimum distance of 0.8 km from habitation and fruit orchards among other conditions. Hearing the appeal against the order of the National Green Tribunal (NGT) dated 17 February, 2021, the apex court stated that such an order was "required to be passed keeping in view, undoubtedly, the interest of the environment, and factoring in both the interests of the persons who are running the brick kiln industry and the employees who would be working therein."

What are the environmental concerns that bothered the Supreme Court and the NGT and what are the sustainable solutions to deal with such concerns?

Ms. Bharti Ali, Co-founder & Executive Director of HAQ engages in a conversation with Dr. Sameer Maithel, Director, Greentech Knowledge Solutions Pvt. Ltd., who is a mechanical engineer by qualification and has spent 30 years in the development and dissemination of energy-efficient, low-carbon, renewable energy solutions in the building sector, small industries, and rural communities.

Bharti: HAQ has been working jointly with CLRA in Rajasthan and CEC in Mathura to draw attention to the rights and entitlements of brick workers and their families, particularly their right to health, food and nutrition, decent work and dignity. In this context it becomes important to understand the nature of the industry and its impact on the environment and the people. So the first request to you is to help us understand brick production and the materials used. For example, what factors contribute to burnt clay brick popularity in India and its acceptance as a building material?

Sameer: Data shows that during the last 50 years brick production in India has increased by almost eight times. One can see how successively since the 1970s, 80s and then 90s, the brick has become a dominant building material for walling in housing. As per the last Census (2011), walls in 65% of urban households were made of burnt clay brick, which means that burnt clay brick is a very popular material. There are various properties which the material possesses, such as long life, good strength and insulation properties and as clay is widely available, burnt clay bricks can practically be produced almost everywhere in the country. People have been making terracotta products with clay for a long time, so people have the knowledge about how to acquire clay, produce bricks and masons know how to use the material. All of this makes clay bricks one of the key building materials in the country. Its production and use has been increasing over the last 50 years, though it seems that the growth has stagnated during the past 5-10 years.

Bharti: Indeed! All research papers and policy documents tell us that we're the second largest brick manufacturing country in the world after China. There was some question raised in the Parliament about use of fly ash, particularly in and around the thermal power plants and replacing clay with fly ash bricks. Could you throw some light on that please?

Sameer: There have been concerns about the use of clay for making bricks because essentially it is soil which is good for agriculture. Around 60-70% of the bricks produced in India source their clay from agricultural fields, remaining 30-40% source their clay from areas other than agricultural fields, such as silt from water tanks, rivers, etc. The agricultural clay is a suitable raw material as nothing much needs to be done with that. We can directly make bricks out of it. But that need not necessarily be the case. Worldwide, if we look at Europe and many developed countries, even in China, they're processing mined clay and stone to make it suitable for brick making. Now, with concerns stemming from use of good quality agricultural soil, several other alternate materials are being promoted. We can have the concrete blocks made from a mix of stone, sand and cement or we can have fly ash bricks as fly ash is big industrial waste produced mostly through the burning of coal in the power plants. There are other ways also of making bricks from clay. Instead of firing bricks you can make bricks by just adding cement to clay, which is called compressed stabilised earth blocks, or you can have adobe bricks, which was a traditional method using building material usually made with tightly compacted sand, clay,

and straw or grass mixed with moisture, formed into bricks, and naturally dried or baked in the sun without an oven or kiln.

So coming back to fly ash, the government has been trying to promote the utilisation of fly ash. Since 1999, the government came up with a regulation, which made mandatory that the bricks must be made from fly ash at least in areas around coal based thermal power plants, though the implementation is another story. The production of fly ash bricks has increased. Fly ash bricks now service about 10-15% of the total market, so the share is still low. And there are various reasons why it has not increased very significantly. If we take the case of Punjab, already most of the fly ash from the thermal power plants has been designated for use in cement plants etc. So Punjab does not have excess fly ash. But on the other hand, the central and eastern region of the country have excess fly ash, for example area around Singrauli in Uttar Pradesh and parts of Chhattisgarh and Madhya Pradesh. Greentech Knowledge Solutions has done some calculation, which shows that even if we use all of the excess fly ash available annually for fly ash brick production, we will be meeting about 25% of our brick requirement. So fly ash is an important material and it should be utilised in the production of bricks, but is not the only solution. We require multiple products including burnt clay bricks, which will be able to fulfill our requirements for construction. What we feel is that a policy is needed, which promotes use of multiple materials. Different regions have different raw materials and know-how that needs to be put to use. As far as burnt clay bricks are concerned, we should move away from primary dependence on agriculture top soil towards greater utilisation of mined clay, shale rocks, silt from rivers and ponds for making bricks. Further through addition of waste and production of hollow bricks (brick with holes), the requirement of clay can be decreased.

Bharti: With clay being the most used raw material, what are the different types of kilns we have in India and what really is the process adopted in these kilns; how do they operate?

So first let us understand the process of making clay bricks. It is quite simple - the clay is mined or dug and then water is added to it to prepare the clay mix. The dough is kneaded and left for some time till it is ready to be moulded. There are moulds in which it is put and then we get what is called the green brick, which contains around 25-30% moisture. The green bricks are then dried and in India most of the drying happens in the sun, so you will see that these are dried in the open. Once they have dried out to a large extent, when the moisture content has reduced to 5-7% in the bricks, they are put in a kiln for firing. These dried green bricks has to be fired minimum at a temperature of 800-1100 degrees centigrade and then it gets converted into a fired brick. This temperature depends on the type of place. So in South India, we can fire bricks at 850 degrees centigrade but in the Indo-Gangetic plains we have to go up to 1050 degrees centigrade. So the main process in a kiln consists of gradually heating the dried green bricks to the firing temperature, maintaining the brick at the firing temperature for some time and then gradually cooling the brick to the ambient temperature. The kilns can be very rudimentary. For thousands of years the basic method has been to arrange or stack the dried bricks with fuel under or among them and then burn them, which is called clamp burning of bricks. So there is no permanent kiln. Brick and fuel are put together. It is similar to the way the traditional potters fire their products. So these are called clamps and still about 20-25% of Indian production comes from clamps. These are still the main types of kiln which are used for firing bricks in central India, western India and parts of southern India. But when we come to the Indo-Gangetic plains, this area has a very abundant supply of clay and population density is high. So it requires material in larger quantities. In clamps you can fire bricks in smaller quantities, but for larger requirement industrial technologies were introduced probably around the 1880s, about 140-150 years back. These are a type of continuous kilns. Currently, one of the versions called the Bulls Trench kiln is in use and now there is an improved version of it in the form of the zig-zag kiln. So these are the main kiln technologies used practically in the entire north and east of the country. When we go to say Kerala and parts of Tamil Nadu and Karnataka, there are other technologies too like the Hoffman kilns. Almost 75% of the energy used for firing in all types of kilns comes from the burning of coal and may be 25% from burning various kinds of biomass fuels, which could be firewood or agricultural residue, depending on what is available locally. So this is broadly the situation as far as kiln technologies are concerned.

Clamps are still the main types of kiln used for firing bricks in central India, western India and parts of southern India. In the Indo-Gangetic plains the Bulls Trench kiln is in use and now there is an improved version of it in the form of the zig-zag kiln. When we go to say Kerala and parts of Tamil Nadu and Karnataka, there are other technologies too like the Hoffman and down draft kilns.

Bharti: So as you said, the Bulls Trench Kiln - is that something more common than the others?

Sameer: Yes, it is. There was a version that was introduced by the British - an army officer by the name of Bull introduced it. It was a sort of low cost version of the Hoffmann Kiln technology that was being used in Europe at that point of time. It was introduced, as I said, sometime around 1880 and it used to have chimneys, which were made of up iron sheets and were not permanent chimneys; so the chimneys would be shifted around. This technology was called the Moving Chimney Bulls Trench Kiln (MCBTK), which remained popular till almost the 1990s and then the government came with a regulation that it should be converted to Fixed Chimney Bulls Trench Kiln (FCBTK). So instead of a moving chimney now there is a fixed chimney, which helps with saving fuel as well as improving the product quality. In recent years there is now an attempt to shift the FCBTKs to zig-zag kilns. They are from the same family, but the latter is a slightly improved version, with different brick setting and fuel feeding arrangement. The MCBTK can still be found in some interior locations, but there are only a few existing. Currently, out of 60-70 thousand FCBTKs and zig-zags, 40-45 thousand would be FCBTKs and approximately 20 thousand would be the zig-zag kilns.

Orders banning use of coal as fuel only for the NCR will not help as the kilns will move out to other nearby locations. Also, if the kilns in the NCR are to shift to use of gas, who is going to supply it?

Bharti: So are these shifts because of the environmental impacts that the brick kilns have and what are those impacts?

Sameer: Not essentially. There is a combination of factors. Initially, let's say in the FCBTK in 1980s, almost 50%-60% of the cost of brick production was due to fuel. So there was a question of how to reduce the fuel consumption. Also the bricks

The environment issue for the brick kiln industry started coming up since mid-1990s. First the concerns around air pollution led to environment regulation and then in 1999 the regulation regarding use of fly ash came about - these were the two important regulations which had a direct impact on the brick industry.

we get are not of uniform quality. Generally, in north India bricks are divided into five classes - class one and then class two and class three bricks and some other varieties too. A manufacturer would like to have the highest percentage of class one bricks which are properly fired bricks, have the largest market and which sell at the highest price. Like everywhere, there are a small percentage of brick kiln owners who are progressive and try to improve things and I think that most of this technology change started from them, who adopted something and then there were a few researchers who helped them out with innovation. Subsequently, the issue of environment started gaining importance - like in 1986, the Parliament passed the

Environment Protection Act, a law through which we now have the air pollution and other norms laid down. Then in 1996 the first set of environment regulations to control air pollution from brick kilns were formulated and they also specified that all MCBTKs should shift to FCBTKs. More or less that conversion took place by 2002-2003. Initially there was resistance, but once the brick industry realised that it was for their benefit, and it is a win-win situation for them they adopted the change. So they had to spend some money but got benefits because of reduction in fuel consumption as well as improved quality of bricks, which increased their revenue. The story with introduction of zig-zag kilns is almost similar. The zig-zag technology was introduced in the 1970s but it is very recently, in the last 5-10 years, that efforts have been made by the government and others within the industry to popularise the technology and its benefits. Again, it saves fuel and increases the quantity of class one brick production. So, I would say that the environment issue for the brick kiln industry started coming up since mid-1990s. First the concerns around air pollution led to environment regulation and then in 1999 the regulation regarding use of fly ash came about - these were the two important regulations which had a direct impact on the brick industry.

Bharti: Could you tell us more about the environmental concerns.

Sameer: Broadly there are three main environmental concerns with brick kilns. One we have already talked about, which is the use of good agricultural soil as clay. Suppose if we are producing 250 or 300 billion bricks a year and if each brick weighs 3 kg, then we can say that we are consuming 600-800 billion kg of soil every year. That is one concern. The second concern is related with the use of solid fuels like coal and biomass and they are not burned properly, which is why we get lots of black smoke that can be seen when you go to a brick kiln. If you leave out other pollutants, this black smoke is the main cause for concern. The burnt fuel emitted in the form of black smoke, essentially contains a lot of particulate matter which is a big concern particularly in the Indo-Gangetic plains, where we have to suffer

There are three main environmental concerns with brick kilns - use of good agricultural soil as clay; use of solid fuels like coal which if not burned properly emits black smoke, causing air pollution; and carbon dioxide emissions from use of fossil fuels like coal that is responsible for global warming.

the most due to the air pollution caused during winters, and in fact throughout the year as the level of pollution is always above safe limits set for the particulate matter by the WHO. The third issue that has come up recently is the carbon dioxide emissions, because most of the fuel which is burnt is coal and coal produces carbon dioxide, and carbon dioxide is responsible for global warming. If in the country 3-4% of the coal is being used in brick kilns, then the brick industry becomes an important source of carbon dioxide. Carbon dioxide emissions have global impacts. On the other hand, air pollution has more sort of local or regional impacts, and similarly, soil degradation has local and regional impacts.

Orders banning use of coal as fuel only for the NCR will not help as the kilns will move out to other nearby locations. Also, if the kilns in the NCR are to shift to use of gas, who is going to supply it?

Bharti: Have any specific directions have been passed by the Central Pollution Control Board (CPCB) or the NGT with respect to air pollution that is caused by the brick manufacturing units?

Sameer: The CPCB set up the Emission Standards for brick kilns in 1996, which specified that the smoke coming out of a brick kiln chimney should not contain particulate matter above a certain level. They have specified in terms of how many milligrams of particulate matter per meter cube of exhaust gases is allowed. They also said that MCBTKs would not be allowed to operate. These standards and norms have been updated several times and the very recent amendment which has come out in February this year (2022) says that all the FCBTKs should change over to zig-zag technology within a period of two years. In certain areas it is within one year and in certain others within two years and the particulate matter limit has also become more stringent - 250 milligrams per normal metre cube, which was 750 earlier. During the last many years a lot of attention was drawn to air pollution in the NCR. In 2016-17 the CPCB said that the NCR brick kilns should change to zig-zag kilns and this was before the CPCB came out with the notification which is applicable now throughout the country. Similarly in Bihar, in 2016 probably, the Bihar State Pollution Control Board said that kilns in Patna district should change to zig-zag kilns and later by 2020 they said all the kilns in Bihar should convert to zig-zag kilns. I would say that in the last 5-7 years directives have come either at the state level or at the national level from the pollution control boards. So there are some directives and now there is an Emission Standard. Apart from the environment regulations, currently brick industry is involved in many environmental litigations in the NGT on various counts. Currently, the situation

Currently, the situation has become very complex for brick kilns in the NCR. Already in the NCR, kilns are banned from operation between July-February and now the NGT judgment says that even from March to June they will be allowed to operate only if there is carrying capacity, i.e. if the air in the region is not already polluted. Then there is the issue of the GST rate which has been increased to 12% and the price of coal has almost increased.

has become very complex. The NGT has passed many judgements. There is a particular case in which the brick industry of the NCR has filed an appeal in the Supreme Court against an order passed by the NGT. This is for the NCR. In very simple words, essentially what the NGT judgement means is that even if the kilns are using zig-zag technology but using coal and biomass fuels, they cannot operate if the region does not have sufficient carrying capacity, i.e. if the air in the region is already polluted, these kilns cannot operate. Already in the NCR, these kilns are banned from operation between the months of July to February and can operate only from

March to June. Now this judgment says that even from March to June they will be allowed to operate only if there is carrying capacity. However, brick kilns are free to operate throughout the year if the brick kilns shift to cleaner fuels like natural gas. Brick industry is aggrieved that why should only the brick industry be singled out and why there are no similar bans related with carrying capacity on vehicles or other industries that are contributing to air pollution in the NCR. The case is sub-judice. The Supreme Court has allowed conditional operation of brick kilns in NCR during March-June 2022, and a judgement is expected in next few months. The industry is currently in a very difficult situation. The All India Bricks & Tiles Manufacturing Federation, which is a body representing brick kiln owners, have called for a nationwide strike during the 2022-23 brick season. Apart from environment regulations, the industry is battling with issues related with GST which has been increased recently and the price of coal, which has increased by two and a half to three times during this year (2022). So all these things have made it very difficult for the industry to operate right now.

Bharti: But given the rate at which development is taking place, particularly infrastructural development and the construction work around the country, how will this help?

Sameer: I don't think that is something which is appreciated or there is any attempt to really work in a coordinated manner to improve the burnt clay brick industry. We don't see this understanding among the policy makers and a lack of coordination between various Ministries.

Now the latest order in the NCR by the air pollution body says that by the end of this year no industries in the NCR would be allowed to use coal as a fuel. So one of the options is to shift to gas. But brick kilns in the NCR are scattered in the agricultural fields and there is no provision to supply gas to them through pipelines. Who is going to supply gas, who will provide the gas firing technology and finance to brick kilns, what is going to happen? Since this order is only for the NCR, the moment we cross the NCR boundary, there are kilns all around still operating on solid fuels; nothing changes a few kilometers away, say in Mathura, where so many new kilns have come up. Even if the idea is to control air pollution within the NCR, the boundary limitation of the order does not help as practically what will happen is that the kilns will just shift outside the NCR region and then we will have a much larger number of trucks coming daily from longer distances to supply the bricks, only further contributing to air and noise pollution. There are multiple issues that need to be addressed if the government really wants to improve the sector. Otherwise what is happening is some piecemeal steps without taking into account the practical feasibility of how they will be implemented. Such policy is not implementable; it does not get implemented and also promotes corruption and illegal activities at the lower levels.

Bharti: And we don't know how far the brick industry is regulated. Like you said, if it shifts to other areas outside the NCR, to what extent will they be regulated is one question.

Sameer: Several states now have satellite imagery. Things have improved quite a lot in the last 3-4 years so it is not very difficult; the satellite imagery can be used to locate brick kilns. In a lot of the states, like in Bihar, the tax/royalty collected from mining of clay is one of the significant revenue generation for the state and the mining department has a good database of brick kilns. These kilns are giving quite a lot of revenue, so the database may be there with different departments. May be 20% of the kilns may still be out of the database, but for the rest of the 80%, the state or some departments within the state will have all the information; they are collecting taxes from them. So it is possible to regulate the kilns, if there is political will and adequate capacities and resources with the concerned departments.

Bharti: To what extent can the shift to zig-zag technology serve any purpose? How does it reduce air pollution and other hazards?

Sameer: So as I said, this shift is on the way. Currently as per our estimates, around 20,000-25,000 kilns have shifted to the zig-zag technology and a very large part of these, something like 20,000 out of the 25,000 have shifted in the last 7 years, since 2015. Now anyways there is a regulation which says that in the next two years all kilns have to shift to zig-zag technology. The way in which things happen on the field, if not two years, I would say over the next 3 to 5 years the shift will happen. We have done monitoring of kilns to understand how much air pollution gets reduced with such a shift. The Central Pollution Control Board also has data to suggest that there is significant reduction. The particulate matter emissions can come down by 30% to 60%, depending on how you operate the kiln. It is not just a matter of technology

With the shift to zig-zag technology, the particulate matter emissions can come down by 30% to 60%, depending on how you operate the kiln. Production of class one bricks from FCBTK can also increase from 60-65% to 85%. There is around 20% reduction in fuel consumption.

but how you operate it. So various studies show that there is a significant reduction; there is minimum 20% reduction in fuel, so the carbon dioxide emissions will go down by that percentage. The particulate matter emissions come down and the FCBTK, in Uttar Pradesh for example, which would be getting 60-65% class one bricks, will start getting

85% with zig-zag technology. So there is a significant increase in revenue along with reduction in waste and air pollution. These benefits are documented and there is a very good probability that most of the Bulls Trench Kilns will change over to zig-zag kilns in the next 2 to 5 years.

Bharti: Does that mean mechanisation to the extent that the labour suffers and they get no jobs!?

Sameer: No. In the shift to zig-zag, there is only one part of the process that improves, which is firing. As such, the entire process of brick making is not changing. In a typical brick kiln in North India, there are almost 200 workers employed, 75% of whom are engaged in making bricks which is called moulding. Only when the mechanisation comes to brick moulding will there be a reduction in manual work and the workforce. Earlier the transportation of bricks used to be done manually, people would carry loads on their heads, but now that is generally not the case - they are using some arrangement whether mechanised or animal driven carts for transporting bricks. Similarly, all of the digging of clay used to happen manually earlier. Now JCB excavators are used everywhere, so there is some reduction in labour. In my view semi-mechanisation is good for the industry and workers, it may result in reduction of some jobs, but it helps in reducing drudgery, improving

health and safety conditions of the workers and creating better paying jobs for the workers. We should be mindful that the environment policies will have quite an impact because if a kiln can operate for only 3 months instead of 6 to 8 months, there is so much uncertainty if the kiln will operate at all. That is going to have a lot of impact on labour employment and there are no plans to address such concerns.

Bharti: Can one say that labour somehow does not really figure in the discussions around environmental impacts of the industry?

Sameer: If you go through the discussions in the NGT or Supreme Court, generally brick industry associations do put this point forward that a very large number of workers are dependent on it, but if you look at the way in which our environment regulations are framed, no one thinks about the workers. So that way I don't think our environment regulations are sensitive to the needs and concerns of the workers. I think it is the workers in the informal industries who get disproportionately impacted. Nobody is stopping a middle class or an upper middle class family from driving a car or owning more than one car per family. Nothing impacts their lifestyle. But imagine a migrant worker coming to a kiln in November and the work does not start until February! First the owner has given them some advances, they will give them some *khuraki* (sustenance allowance) and all this accumulates, for which the workers have to compensate through their work and what they would earn in the 3 to 4 months at the kiln. I don't think this aspect is taken into consideration. Similarly one needs to look at the question of who gives land for mining clay. These are small farmers. It is true that brick kiln owners are capable of using their muscle power to get the clay they want but the other truth is that in a lot of areas due to the use of chemical fertilizers the top layer of the soil does not remain good for agriculture, so these farmers allow the top layer to be taken out. Also, suppose a farmer wants some money for marriage or something but does not want to sell the land, they might say that they will sell the soil. I am not supporting the mining of topsoil from agricultural fields, what I am saying is that there are all these interconnections that need to be looked at and understood while making environment regulations.

It is the workers in the informal industries who get disproportionately impacted.

Bharti: What are your final thoughts on the key measures that need to be taken in the next couple of years if one was to reduce environment impact while keeping the workers in mind?

Sameer: If we just start from the environment point of view, it is possible to reduce the environmental impact of brick making by 60-80%. We can reduce clay use by may be 60%. First of all we need to have a uniform size of the bricks. Currently the bricks in Bengal are almost 30% larger than the bricks in Delhi. Why? Most importantly, we can make holes in the bricks or what is called hollow bricks, which reduces clay requirement. Because they are hollow, they consume less energy to bake and provide more insulation when used in the walls. So currently if we are making 100% solid bricks, at least a part of them can be shifted to hollow bricks. Similarly we can mix 5-10% fly ash and other materials in the clay. So some other waste materials can be used at least partly. Also, instead of using coal, quite a lot of bricks can be fired through various biomass materials. There is a lot of issue with *parali* (burning of stubble) and other agricultural residues. These can be converted into briquettes and then used as fuel. As brick kilns are situated in rural areas, particularly in north India, animal dung can be used to produce biogas, which can be used for firing. If one is able to harness biomass fuels, first of all we can reduce a lot of clay through hollow bricks or use of waste materials. Then from coal we can shift to biomass fuels. Once you do that, concerns regarding use of clay (top soil that is good for agriculture), CO2 emission, as well as the particulate matter can be addressed, but it will require new technology and will also increase capital investment. If today one can start a brick kiln with an investment of 1 crore or 2 crore rupees, it may go up to 10 crore or 15 crore rupees or more. Some low-cost and shorter pay-back measures like the conversion to zig-zag kilns can be taken by the industry without much support or role of the government. The industry has invested in zig-zag kiln conversion on its own. If there are 20,000 kilns and each kiln is investing 20 lakh rupees, it comes to 4,000 crore rupees, which is invested by the industry. But beyond that for adopting modern technologies, it will require a structural transformation of the industry and that is why it requires a coordinated approach that addresses issues of a stable policy environment, providing access to finance, technology, cleaner fuels and putting in place a system for skill training of brick kiln workers.

HAQ: Centre for Child Rights is extremely grateful to Dr. Sameer Maithel for his valuable insights on the environmental impacts of the brick kiln industry while drawing our attention on the need for policy makers to adopt a holistic and coordinated approach, keeping the workers and their rights in mind and work towards both technological and structural changes that are required.

final thoughts...



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