

## Assessment of environmental impacts and socio-economic factors of brick kilns in Peshawar, Pakistan

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**ABSTRACT:** *In the past century, industrialization and urbanization have created many environmental problems like air, water and soil pollution. The focus of this study was to find out environmental and socio-economic impacts of brick kilns in Peshawar. The fuel sources and their environmental impacts on the workers and in the surroundings were studied. The economic factors involved were also investigated. Black smokes and dust emitted from brick kilns were discovered to be the major pollutants and the workers found lacking any occupational safety equipment. The study indicates 45% respiratory, 15% eye and 10% skin diseases among workers. It was observed that child labour is common in brick kilns. The salary of workers is insufficient for their family needs.*

### INTRODUCTION

Making bricks is one of the world oldest industries. The earliest known examples of bricks making dates back 4500 years to the region of Sargon - I of AKKAD in Babylonia. Bricks making has been carried on, possibly for centuries in Western India (Ahmad, 1995) and the tradition continued till pre-and post partition times shown by the presence of many old monuments including forts, gardens, mosques and modern day structures.

Bull's Trench Kilns (BTKs) were named after a British engineer, who developed the kiln at the end of the last century. Ordinary BTKs are common in Pakistan. In NWFP, Peshawar, Mardan, Bannu, D.I. Khan, Abbottabad, Swat and Kohat districts are famous for making bricks, with the former two as the major ones. In Peshawar brick industry, with about 300 BTKs mainly occur at about 4-10 Km along Kohat road at Zungali, Sorezai, Zandi, Urmar stop, Inqilab

road, Pandu, etc (Fig. 1). The number of BTKs increase every year. The area a highly fertile land of upper Indus plain and is extensively cultivated by the locals residing in 1500 to 2000 villages. However, shortage of irrigation water is the main limiting factor for agriculture. The water table is 30-40 feet deep. The land has soil free from gravel, pebbles, grit and organic matters, and thus suitable for brick industry. The government normally grants permission for establishing brick kilns here. The current study was carried out to determine (a) the types of fuel used in this industry, (b) environmental problems of BTKs, (c) environmental impacts on the workers and also (c) figure out the socio-economic background of the workers.

### METHODOLOGY

The methodology comprised mainly fieldwork, questionnaire survey, interview and literature studies. Regular and frequent visits were conducted to brick kilns of the study area with an insight to learn about the



overall process of bricks making, fuel sources, fuel types and quantities used, man power involved and visual negative impacts upon environment and people as well. For specific detailed data collection, a questionnaire was formulated keeping in mind the study's objectives to avoid biased responses as much as possible. The labours were interviewed and the relevant information regarding occupational safety, and socio-economic aspects of the daily life were collected.

## RESULTS AND DISCUSSION

BTK is either circular or oval in shape and constructed with brick walls. The kiln is divided into sections by brick partition. Dampers for controlling draught are provided and the top consists of fire hole. The depth of trench is 5 feet, the width is 20-24 feet and the length is 180-200 feet.

The kiln is loaded with dried green bricks in sections having six inches space for circulation of draught. Above these sections, draught chimneys are placed. The sections of bricks are covered with earth and ashes to prevent the escape of hot gases. When burning of one section goes on, hot gases pass on to the next chamber and pre-heat the bricks stacked in it. Finally, the gases escape through the chimney. Burnt section under goes cooling and is after wards unloaded.

The principal manufacturing material for bricks is clay. Clay is produced by the natural decay and disintegration of igneous rocks, finally divided into particles having diameter less than 0.005 mm. The constituents suitable for bricks making are alumina, silica, lime, magnesia and iron oxide present in soil (Zaman, 1980).

### Bricks making process

In general, manufacture of bricks comprising six main steps, which are (1) Selection of

suitable clay, (2) Preparation of clay, (3) Moulding, (4) Drying, (5) Burning/Firing and (6) Cooling (see also Deshpade, 1989).

### Fuel sources of BTKs

In BTKs of Peshawar coal, wood, tyre/rubber and furnace oil are used as fuel sources in burning process. The proportion and types of the material burnt are shown in Table 1. The crushed coal is the main source of fuel, obtained from Hyderabad, Quetta, Cherat and Hangu. The consumption of coal per month ranges from 90 to 180 tons per kiln depending upon size and production per kiln of the BTKs.

TABLE 1. CONSUMPTION OF COAL, TYRE AND WOOD PER MONTH IN TONS USED BY BTKs

Parameter	Range	No. of BTK & %	
Coal	90-110	84	(46.7)%
	110-130	30	(16.6)%
	130-150	36	(36.7)%
Total:		180	(100)%
Wood	5 - 10	66	(36.7)%
	10 - 15	84	(46.7)%
	15 - 20	30	(16.6)%
Total		180	(100)%
Rubber/	½ -1	108	(60)%
Tyres	1- ½	72	(40)%
Total		180	(100)%

The wood of morus nagrum, eucalyptus, acacia modesta, acacia arbica and delbergia sissou is used as fuel, obtained from Khyber Agency, Kohat and Orakzai Agency. The monthly consumption of wood ranges from 10 to 15 tons per kiln . Tyres or rubber is used in all BTKs. After construction of a brick kiln, the initial consumption of rubber and tyres ranges from 4 to 6 tons within 24 hours. While the normal daily consumption of rubber and tyres are one to half ton. Fuel oil is used as a catalyst for combustion at the starting time of burning process.

### Environmental problems

The BTKs have become the main source of environmental pollution around Peshawar, release air pollutants like CO<sub>x</sub>, SO<sub>x</sub>, NO<sub>x</sub> and particulate into the air. The detail of data collected for these gases is given in Table 2.

TABLE 2. DAILY MEAN CONCENTRATION OF VARIOUS PARAMETERS IN PPM AT THE FIRING AREA OF THE BTKs

Days	CO	SO <sub>2</sub>	NO (%)	CO <sub>2</sub> (%)	HCs (%)
1.	10.6	19.1	0.30.	0.1	0.0
2.	8.9	12.2	0.25	0.1	0.0
3.	10.7	13.3	0.16	0.1	0.0
4.	11.1	8.9	0.18	0.1	0.0
5.	12.7	12.1	0.17	0.1	0.0
6.	9.2	15.4	0.19	0.1	0.0
7.	11.7	16.2	0.22	0.1	0.0
8.	9.8	10.5	0.21	0.1	0.0
9.	10.5	11.3	0.21	0.1	0.0
10.	10.3	13.5	6.24	0.1	0.0
Mean	10.6	13.2	0.22	0.1	0.0

Source (Bashir, 1995)

Table 2 and other data collected from general information during interviews and question and answer sessions indicate that the following environmental impacts occur in the area:

- (a) The mean concentration of CO and SO<sub>2</sub> is found 10.60 ppm and 13.25 ppm, respectively, at firing area, which are above the permissible limits and thus pollute the air. CO form carboxy haemoglobin (COHb) that causes drowsiness, coma respiratory failure, and impairment of central nervous system and. Similarly SO<sub>2</sub> above 8-12 ppm irritates the respiratory system, stimulates the mucus secretion and above 10-13 cause eye irritation. (Raven, 1998). In the study area several readings of SO<sub>2</sub> are above these permissible limits

and workers were found suffering from these diseases (Tables 2,3).

- (b) The soil has no gravels and pebbles are used for making green bricks, mostly from top upto 21 feet depth. Due to digging of earth so deep it leads to soil erosion and destruction of microorganisms, because of which soil fertility is lost and nitrogen and carbon geochemical cycles are disrupted (Arms, 1998). A lot of organic matter, minerals and fertilizers will be required to bring the fertility of the soil back.

### Environmental impacts on workers

Occupational health facilities including gloves, shoes, respiratory and eyes protection devices were not found provided to the workers. Therefore respiratory, eye, skin and stomach diseases were found common in the labour. The data obtained in this regard are shown in Table 3 that indicate the following facts:

Dust and noxious gases emitting from BTKs, result in 45% respiratory and 15% of eye diseases. In extremely hot summer dehydration and heat exhaustion are also caused in the labour. Working bare footed, with out gloves and protective clothing appeared to be the main causes of 10% skin diseases in these workers.

The applications of hot oil and henna, on the wounds and cuts on legs and hands caused by the appliances used for digging, is the most common treatment among the workers of the BTKs. The wound is normally wrapped in any available cloth, which is the main source of infections in the wound. In deep wounds tetanus can develop e.g. two children from among the workers died during 2000-2001, because of tetanus in Urmur and Pondu areas.

**TABLE 3. DIFFERENT TYPES OF DISEASES IN THE WORKERS OF BTKs**

Parameter	Range	No. of BTK & %
Respiratory diseases	30 - 35	54 (30.0)%
	35 - 40	84 (46.6)%
	40 - 45	42 (23.4)%
Total		180 (100.0)%
Eye diseases	10 - 15	84 (46.6)%
	15 - 20	96 (53.4)%
Total		180 (100.0)%
Skin diseases	10 - 15	120 (66.7)%
	15 - 20	60 (33.3)%
Total number		180 (100.0)%
Stomach diseases	30 - 35	30 (16.8)%
	35 - 40	66 (36.6)%
	40 - 45	84 (46.6)%
Total		180 (100.0)%

**Workers status and socio-economic factors**

The detail of the data collected on the manpower in BTKs is given in Table 4. Manpower is the basic requirement for brick kilns operation. In study area, the BTKs have about 80% Afghanis and 20% Pakistanis as labour force. The wages received by BTKs workers are not sufficient to meet their family basic needs like food, education, health etc.

**TABLE 4. NUMBERS OF DIFFERENT TYPES OF WORKERS AND THEIR SALARY/MONTH**

Parameters	Range of workers	Salary/m
Moulding step	40 - 60	Rs.2200-2400
Loading and empty the donkeys	20-25	Rs.1800-2000
Lauding kilns	2-4	Rs.3000-3500
Firemen	4	Rs.2500-3000
Experts	2-5	Rs.2500-2800

The houses provided to workers are isolated from the rest of the population and lack the basic amenities. Child labour is a chronic problem in Peshawar, particularly in BTKs. Lack of effective and comprehensive

legislation, inadequate education system, poverty and social imbalances are the main factors of child labour. In BTKs, among children 75% are male and 25% are female. Their current status is very pathetic. No schools are available and no Basic Health Units (BHUs) and dispensaries are present in the areas.

**CONCLUSION**

It is concluded that the burning of low-grade coal, wood, tyre, furnace and mobile oil in BTKs have created air pollution in Peshawar. BTKs have adverse impacts on the health of workers and the people of periphery because they are exposed to the emission of dust and toxic gases. Soil fertility is reduced due to using of topsoil in bricks making. Poverty and the bad socio-economic condition of the people are responsible for child labour. The brick manufacturing is a potentially hazardous occupation, especially for the health, growth and development of the children.

**RECOMMENDATIONS**

- ◆ Environmental laws of the country may be implemented in letter and spirit.
- ◆ All the workers should be provided with occupational health and safety equipment like gloves, mask, apron and long boots.
- ◆ To reduce air pollution high grade of coal, crushing machine and proper feeding devices should be used.
- ◆ Fixed chimney with filter system should be installed to reduce air pollution
- ◆ Government should impose ban on the use of rubber, tyre, and wood and new BTKs should be established far away from residential areas.
- ◆ Brick making machine (Extruder) should be introduced to minimize labour cost and child labour.

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