CHAPTER - II

CHAPTER II

MATERIAL AND METHODS

2.1 Introduction:

In order to study the impact of the brick industries on environment, various sites were selected in the study area. It is ensured that the industries at the sites represented a cross section of the objectives of this study. The investigations were carried on further by collecting information regarding each brick industry at every site and noted on a pre-designed and pre-tested questionaire that is completed through structured interview. The information collected comprised of details about the location, kiln, production capacity, manpower, fuel used and sources of soil and other raw materials etc.

Also the study includes the impact of the industries over the soil nature air quality as well as the vegetation in the vicinity of the brick industries. In order to study the effect of brick industries on the nature of soil, various samples of soils were collected from the source as well as from the vicinity of the brick industries. The various parameters like N, P, K, organic carbon, water holding capacity, electrical conductivity etc. were studied through soil analysis to determine the quality of the soil.

The brick industries also have their impact on the ambient air quality. The obnoxious gases emitted from the chimneys of the industries created the problem of air pollution. To study this, the air samples were collected using high volume sampler (HVS) and were analysed for various parameters like particulate matter, SO_2, NO_2, suspended particles etc.

2.2 Hypothesis

The study is based on the following hypothesis:

- For brick manufacture large quantity of top fertile soil is used.
- The brick kilns affect the ambient air quality due to particulate matter and various types of harmful gases such as carbon monoxide, oxides of sulfur (SOx) and nitrogen (NOx) etc. The gases are released in the air due to the incomplete combustion of the fuel and burning of bricks.
- For brick manufacturing large amount of fertile agriculture soil is used which is converted into non-productive material. This may eventually reduce the acreage of cultivable land for food production. It will also affect the flora and fauna supported by it and the environment around.
- Respiratory diseases are common around the brick industry area, particularly among the workers and people living in proximity due to the air pollution caused by the poisonous gases released from brick kilns.
- Due to rapid rate of urbanisation, large areas of fertile cropland around Kolhapur are being converted into brick kilns.
- Alternative raw materials like FaL-G-brick, marble slurry bricks, cement bricks, stones, stone powder etc., as a substitute is not being adequately used in the manufacture of bricks.(Plate VI (b))
- The traditional technique of brick making is still prevalent i.e. not much improvement in the technology of brick making is seen due to the ignorance, apathy and investments involved on part of kiln owner.
- The brick industry is not much aware and concerned about the health of workers and residents in the vicinity of the brick industries and the environment.

2.3 Objectives

In spite of the social, economical and environmental importance, there are hardly any studies on brick industry and the nature of hazards and pollution faced by the workers. The present study was undertaken with following aims and objectives.

- To conduct a rapid survey of the present status of brick kilns in and around Kolhapur.
- To assess the environmental impact of the brick kilns in the study area.
- To study the ambient air pollution around the brick kilns.
- To check the soil quality, before and after brick making.
- To collect information on the health problems of the kiln workers by administering interview schedule.
- To assess the cropland degradation, if any due to brick making.
- To study the brick kiln waste disposal problem.

2.4 Profile of the Study Area

Kolhapur district is situated in the upper catchment of Krishna river basins. The district lies between16^{0}42' and 17^{0}17' North latitude and 73^{0}40' and 74^{0}14' east latitude. It has an area of 8254.7 sq.km. It is surrounded by Sangli district to the north. Belgaum district of Karnataka State to the, southeast, Ratnagiri, and Sindhudurg district to the west. The Sahyadri mountain ranges, with high rainfall, form the west and Warana River to the north form the natural boundaries. The district has an area of 7685 sq. km., which are about 2.50% of the total area of the state.

Kolhapur, locally known as Karveer, is one of the oldest towns with a historical background of over 2000 years. The city now derives its importance from its past socio-cultural and political association and it's present position as a prominent commercial, religious and educational

center. As religious center, Kolhapur derives its appellation of "kashi of the south" from the imposing ancient temple of Mahalaxmi. There are several sugar factories at some distance around Kolhapur City. Kolhapur is surrounded by agriculture areas dominated by sugarcane cultivation. The district has 12 towns and 1203 villages spread over 12 tahasils. Karveer has 128 villages situated in the tahasil.

The climatic condition of the Kolhapur city are moderate and ranges from 15^0C-40^0C . It is always cooler than the eastern part of the district which is liable to hot winds during April and May. The year may be divided into three major period's summer from March to May, rainy season from June to October and winter from November to February. The district gets rain from the south west as well as the north east monsoons. The amount of rainfall received decreases rapidly from west to east. In Kolhapur City and around average annual rainfall is 100 cm/yr. In winter, although day temperatures remain higher than the monsoon season. December and January are the coldest months of the year. There is rapid rise in temperature is March, reaching maximum in April and May. Total cultivated area in Kolhapur district is about 482000 hectares .

The area was initially surveyed for choosing the study sites, out of several sites around Kolhapur, after careful consideration given to various criteria of the study. The five sites finally selected, on the sides of Kolhapur city, are namely Bapat camp, Shiroli naka, Gandhinaganr, Waliwade, and Uchgaon.

2.5 Status of Brick industries around the study area

The entire area around Kolhapur City was initially surveyed for choosing the study villages for the study. In and around the city there are about 450 brick kilns out of which 250 are small, 150 medium and 50 large kilns. Apparent for starting Brick kilns no registration is required. Initially only a formal license from the municipal corporation is sufficient.

Plate I

a) The basic raw material of brick Industry i.e. clay, ricehusk, ash etc. (Shiroli Naka Site)

b) Preparation of clay for bricks, note drying bricks and house in the background (Bapat Camp Site)

Plate II

a) Brick kiln operation at all stages, raw material, brick drying, brick firing and loading for transport. Note the location of kiln in agricultural field (Shiroli Naka Site)

b) Brick kilns on roadside near house and plantation. The overhead wires is a potential hazard (Waliwade Site)

Plate III

a) Removal of fertile top soil from agricultural field, on river bank at different stages of excavation. (Gandhinagar Site)

b) Stored top soil as brick raw material, note groundnut planted on the hip of this soil (Uchgaon Site)

Panchaganga, Tulsi and Kumbhi river basins are the sources for the raw soil required in the local brick industries, while some brick industries purchase there soil, raw material from agricultural field. The permission for lifting soil from river basins is sanctioned by the Mamledar. While some industry owner's lift the soil illegally without any permission. The cost of raw soil is 7 Rs./ brass of soil as revenue.

Total population of Kolhapur district is 35,15,413 out of which 2473251 rural and 1042162 urban population. (census 2001) and it is fast growing. Environmental conditions of that area are relatively good and this area even today is a agro-based area. As a result there is growing demand for bricks from Kolhapur, Sangli, Satara, Ratnagiri districts. There are found the large, medium and small-scale brick industries. The brick making operations lasts for nearly about 6-7 months in a year. Some brick industries are situated in the agricultural fields while others are in the residential area.

The brick industries in the villages around Kolhapur city namely Kerli, Kuditre, Walivde are located in agricultural areas while Bapat Colony and Shiroli Naka are situated in and around the city and Uchgaon, Shiroli Naka are near the National highway on the boundary of Kolhapur city. In Waliwade, Gandhinagar some brick industries are found near the roadside while others are in the agricultural field.

2.6 Data Collection

In order to study the impact of the brick industries on the environment, various sites were selected in the study area. It was ensured that the industries at the sites represented the objectives of this study. The study was carried on further by collecting information regarding the identified brick kiln at every site. A pre-designed and pre-tested questioner was completed through structured interview. The information collected

revealed details about the location, profile of kiln, production capacity, manpower, fuel used and sources of soil and other raw materials etc.

2.7 Methodology

The study includes impact of the kilns over soil nature, air quality as well as the vegetation in the vicinity. In order to study the effect of brick industry on nature of soil, numbers of soil samples were collected from the soil source as well as from the vicinity of the industry. The parameters like N, P, K, organic carbon, water holding capacity, electrical conductivity etc. were studied through soil analysis to determine the quality of the soil.

The brick industry has impact on the ambient air quality. The obnoxious gases emitted by industry created problem of air pollution. To study this, air samples were collected using High Volume Sampler (HVS) and were analysed for various parameters like Respirable Suspended Particulate Matter, Suspended particulate Matter, SO_2, NO_x, and etc.

The following parameters from the soil and air samples collected around the identified five brick kilns sites namely Bapat camp, Shiroli naka, Gandhinagar, Waliwade and Uchgaon are studied during the investigation. The table 2.1 gives the methods used to analyse the 16 parameters in soil and 4 air samples. For the air sampling, frequency was determined considering the main three seasons and taking precautions to uniformly cover the entire study period.

Table 2.1 Methods used for soil and air quality analysis

Sr. No.	Air Quality Parameters	Method Used
1.	Sulphur Dioxide (µg/m^3)	Spectrophotometric
2.	Nitrogen Oxides (µg/m^3)	Spectrophotometric
3.	Respirable Particulate matter(µg/m^3)	Gravimetric
4.	Suspended Particulate matter(µg/m^3)	Gravimetric
	Soil Quality Parameters	
1.	pH	Electrometric
2.	Soil moisture (%)	Gravimetric
3.	Electrical Conductivity (mmhos/cm)	Electrometric
4.	Water Holding Capacity (%)	Gravimetric
5.	Alkalinity (mg/l)	Titrimetric
6.	Organic carbon and matter (%)	Titrimetric
7.	Nitrogen (Kg/ha.)	Titrimetric
8.	Phosphorous (Kg/ha.)	Spectrophotometric
9.	Potassium (Kg/ha.)	Flame Photometric
10.	Iron. (ppm)	A.A.S.
11.	Lead. (ppm)	A.A.S.
12.	Cobalt (ppm)	A.A.S.
13.	Copper. (ppm)	A.A.S.
14.	Manganese. (ppm)	A.A.S.
15.	Zinc. (ppm)	A.A.S.
16.	Nickel. (ppm)	A.A.S.

2.8 Social Survey:

The workers, owners and the people residing around the brick kilns are the important components who get benefited due to the brick kiln business but at the same time they are the sufferers of the mismanaged brick kiln operations. Therefore during the study a social survey, at the identified site, was conducted by interviewing the locals from the study sites

by administering interview schedule technique. A total of 125 interviews were conducted comprising of 25 owners, 50 workers and 50 residents from the five identified sites. The interviews were conducted in order to assess the awareness levels of the respondents about the issues related to the environmental impacts of brick kilns on the health of the population in the neighbouring areas.

For the purpose of this social survey, interview schedule was prepared by consulting the experts. Initially it was field tested in the pilot survey. Subsequently the schedule was improved as per the requirement and administered in the main study.
