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Analyzing the Changing Scenario of Brass and Bell Metal Work and its Environmental Implications: A Study of Khagra's Brass and Bell Metal Industry", Berhampore Municipality, Murshidabad District, West Bengal

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Abstract

At present, countries all over the world are facing some issues and problems concerning environment, social, transportation, economy and many others in their respective cities. During this present time where countries are progressing at a much higher rate, there exists also a black side of this urbanization. Due to this urbanization and its consequences people are losing their traditional and cultural assets. It can be said that for the coming generation a streaking gift wrapped in an attraction gift ready to give. Brass and Bell Metal or "kansa&pital" referred as a popular craft by the skilled craftsmen of Khagra. so many problems facing this industry, but one of the problems is "pollution". Although its handicraft industry, but it's also created pollution like soil pollution, air pollution which is very degradable part of our environment. Day by day the Brass and Bell metal work have been declined specially from 1980 till 2025.

Keywords: *Brass and bell metal, Environmental Management, Industry, Policy*

1.Introduction

Metal craft is perhaps the single most important craft in India in term of artisans engaged in its practice as in its close link with the daily lives of the people of the country. Handicrafts, which include Brass and Bell metal products, are the part of India's rich cultural heritage. The Indian Brass and Bell metal utensils/ products industry, one of the traditional Indian industries spread throughout the country, is facing tough competition in present economic environment. For some problems in this small industry, which manufacture Brass and Bell metal utensils/ products, particularly at Khagra is losing ground and becoming uncompetitive, in term of both price and quality. In the past Khagra region was considered as being a leader in the Brass and Bell metal technology and production with thousands of enterprises. Today only a few thousands of families are engaged in this important sector in the Khagra region and this important sector in the Khagra region and this has led to shrinking of Employment Avenue while the sector can provide additional employment to 5% of the exiting workforce every year. The artisans on the KhagraGhat side are mainly making brass "Kolsi" other products of the Khagra are brass "wicklamp", where also making of Bell metal "Thala" (dish), "Bata" (bowl), decorative items.

This requires special attention as many people who were engaged with this work of Brass and Bell metal were registered as the permanent employee of this factory. This brought a new ray of hope in their lives. But to these political issues their dreams are all shattered and they can nowhere see a silver living.

Also, pollution is a very negative point of this industry, here have been showing the problems of this industry and have to take some environmental management.

1.1 Literature Review

- Bairagya (2014) tried to explain historical background of industrial development of Murshidabad District. He also tried to explain the formal capital of Bengal Murshidabad had its own glory of during the opulence of Nawab but all the industries like Silk industry, Ivory carving, Textile industry, Brass & Bell Metal industry and Bidi industries are suffering.
- Khatun and Nandi (2010) identified the factors behind the growth of pottery industry in the Chandernagore and its surrounding area. They also identified to highlight the production and marketing mechanism; problems and prospects related with the pottery industry.
- Kasemi (2008) opined to examine the employment and income generation of the sample units of different household industries in the villages of Madarihat-Birpara block of Jalpaiguri.
- Dutta (2002) tried to attempted to seek relationship between the urbanization and the development of small rural firms, He also opined the infrastructure & services are mainly confined to a small region, rural industrialization has not been promoted and it has been notified that Government investment is essential to promote the rural non-agricultural sector in backward area.
- Chouduri (1997) opined that how and why have been declining every craftsman's economic condition in Murshidabad due to lack of Government aids.
- Pal (2012) tried to present a unit level report of Interactive Study of Clay Doll Cluster of Ghurni, under the premise of MSME scheme and the major issues and suggestions against those issues.
- Das (2011) worked on socio economic condition of clay modelers, changing time of clay modeling and problems they faced due to their profession and at last suggested some way for solving those problems.

1.2 Objectives:

- To find out the Demographic Profile and Dependency profile of the shop-owners and artisans in Khagra, Berhampore Municipality, Murshidabad District.
- To study the declining nature of Brass and Bell metal work in the study area.
- To find out the major environmental problems of Brass and Bell metal work in the study area.
- To find out strategies of environmental management.

1.3 Significance of the Study:

This study is also mentioned by regional way, where Brass and Bell metal work have been declining for many years like other traditional metal work in West Bengal. This study is improving the marketing and economic condition of artisans through association, organization and technology-led intervention for enhancing the productivity of the sector and poverty alleviation.

1.5 Limitations:

Any in-depth geographical study demands long periods. Availability of semester time of this study was inadequate. It was difficult to get some available secondary data which may be enriching this study than it.

1.6 Study Area:

Berhampore is a very socially, culturally and economically popular city in Murshidabad. Berhampore is located approximately 200km north of Kolkata and the extension of Berhampore is 24°5' N to 24°7'N latitude and 88°15' E to 88°16'E longitude. It is also situated on the eastern side of the Bhagirathi River, a distributary of Ganges. As per Census of India (2011), the recorded total population of Berhampore is 195363 persons. Among this male and female population are 100430 and 94933 persons respectively. The total area of Berhampore is 31.42 sq km. Berhampore literacy rate of is79%. In those days, field near the stream of Ganges is the most fertile land, so this was described by the British as "Berhampore is the golden Bengal". Khagra a neighborhood in Berhampore is renowned for its manufactured of Brass and Bell metal utensils. Total area of Khagra is 5.62 sq km. According to Census of India (2011), it has been reported that the total population of Khagra is 87216 persons. A famous type of metal is used to make Bells, called "Khagraikansa" is made in the city.

1.7 Problems of the Brass & Bell metal industry:

- i) Unavailability of Raw materials: Copper and Zink are raw material of Brass and Copper and tin is raw material of Bell metal which is important for make the utensils. But, at present unavailability of raw materials is one of the big causes of decline this work.
- ii) Lack of Government aids: Government aid is very important factor which is responsible for development this work. But Government have not been helpful to the artisans and Government have also not been gave any aid for develop this work.
- iii) Lack of Association and Organization: There have not been any associations and organizations among the Brass and Bell metal shop-owners and artisans, which is responsible for decline this work.
- iv) Old Technology: Technology system is very old of Brass and Bell metal work in Khagra.
- v) Infrastructural problems: Infrastructure system of Brass and Bell metal work in Khagra is not so well for which production of utensils have been became low.
- vi) Poor Marketing Facilities: Marketing system is also bad of Brass and Bell metal work on Khagra.
- vii) Inadequate Transportation facilities: Inadequate transport system is also having been declining this work.
- viii) Training system: Although it's a traditional and genetically art craft, it has been requiring proper training for develop this work. But the Brass and Bell metal work have been declining for this poor training system.

1.8 Impact of Brass and Bell Metal Industry on Environment:

Bell metal is a hard alloy usually consisting of about 80% copper and 20% tin. The traditional process of melting, casting, scraping, and polishing is resource-intensive and has measurable ecological consequences.

- **Soil Contamination with Potentially Toxic Elements (PTEs):** Academic studies on the playground and open-space soils in Khagra have revealed alarmingly high concentrations of heavy metals such as Lead (Pb), Tin (Sn), Copper (Cu), Zinc (Zn), and Cadmium (Cd).

The Impact: These metals settle into the topsoil due to atmospheric deposition from the small furnaces. Because these elements have high mobility factors, they pose a severe health risk to the local community, especially children playing in contaminated areas.

- **Air Pollution and Metal Fumes:** The production units typically operate without chimneys, exhaust fans, or filtration systems.

The Impact: The burning of coal or wood to melt the alloys releases carbon monoxide and suspended particulate matter. Furthermore, heating copper and tin produces toxic metal fumes. This not only degrades the immediate ambient air quality but directly harms the respiratory health of the artisans and nearby residents.

- **Solid Waste and Resource Inefficiency:** The industry heavily relies on dyes made of local alluvium soil for casting.

The Impact: These clay molds are gutted and rendered useless after a single use, leading to high amounts of solid waste. Additionally, scraping and motorized buffing/polishing generate a large amount of black metallic dust that is often dumped indiscriminately in the locality.

- **The Brush-Making Industry**

The brush industry in Murshidabad ranges from household utility brushes to industrial-grade brushes. Its environmental footprint is driven primarily by the transition from natural to synthetic materials.

- **Non-Biodegradable Plastic Waste:** While traditional brushes utilized natural fibers (like hog hair, coir, or jute) and wooden handles, modern commercial brushes heavily utilize synthetic polymers like nylon, polypropylene, and plastic bodies.

The Impact: The manufacturing process yields microplastic trimmings. Furthermore, because these products are cheap and have a finite lifespan, their disposal significantly adds to the local municipality's non-biodegradable landfill burden.

- **Chemical Pollution from Processing:** The treatment of bristles (especially animal hair or natural fibers) requires washing, bleaching, and dyeing to meet market standards.

The Impact: The untreated chemical effluents from these small washing and dyeing units are frequently discharged into local drains, ultimately finding their way into local water bodies and wetlands, causing water pollution and harming aquatic life.

2. Database and Methodology:

Database:

Sources of Data: Primary Data: In this assignment, only primary data have been used which have been collected during field survey (April, 2017 & July 2025).

Secondary Data: Secondary data have collected from Berhampore Municipality, which have been used for location map and ward map.

2.2 Methodology:

2.2.1 Selected Indicators:

Purposively the present study covers only the Khagra area of Murshidabad District of West Bengal. Again, systematic random sampling is taken from the whole artisans of these cluster, were first has been taken randomly. To satisfy the objectives of this study, mainly descriptive statistics of Literacy and Illiteracy Rate, Dependency Ratio, Child Dependency Ratio, Aged Dependency Ratio have been incorporated.

2.2.2 Sample Size:

At present, 200 families are engaged in Brass and Bell metal work in Khagra.60 households have been surveyed which is 30% of the total households. Selection of households was based on random sampling technique

LOCATION MAP OF THE STUDY AREA, KHAGRA, BERHAMPORE MUNICIPALITY, MURSHIDABAD.

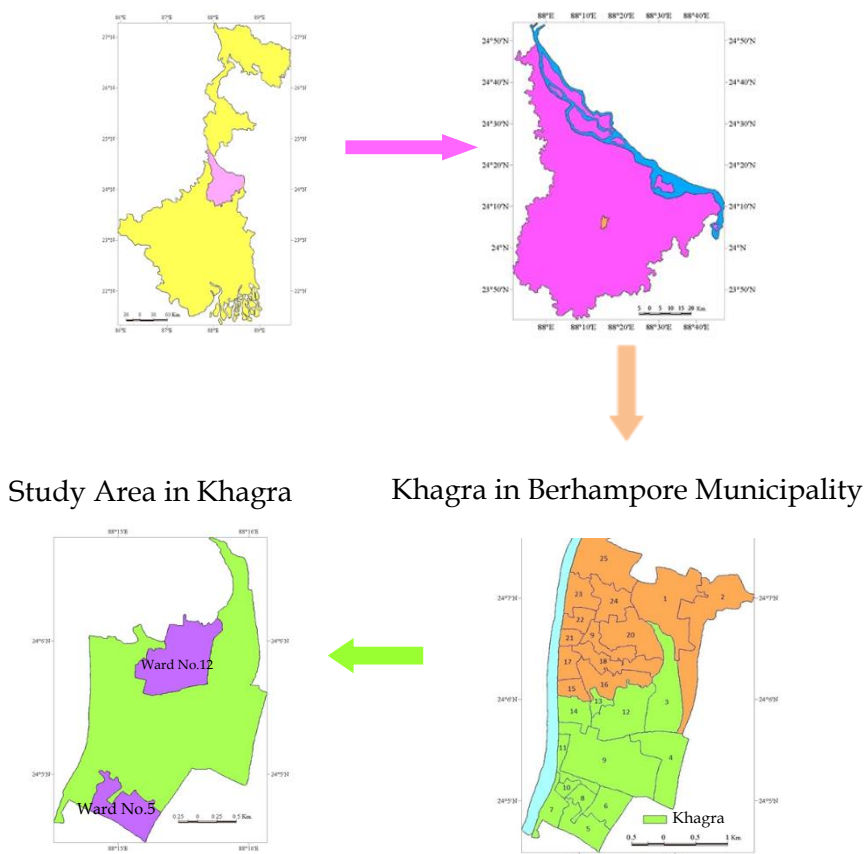


Fig No. 1

Source:
 i) Berhampore Municipality,
 ii) National Atlas and Thematic Mapping Organization, Government of India.

Case Study:

3. Decline Nature of Brass Bell Metal Industry:

It has been found during field survey that the Brass and Bell Metal work in Khagra, is declining from the past status.

3.0 Factory:

In the according to sampling survey, there was approximately 40 factories in Khagra, but most of the factories have been closed for some problems. Today, only few factories (18 factories) are in Khagra region. The factories have been closed for lack of available land, pollution problem, bad economic condition of artisans. The COVID-19 pandemic in 2020 severely affected the industry, and since then, the condition of the industry and artisans there has been very poor, so there is not enough data available.

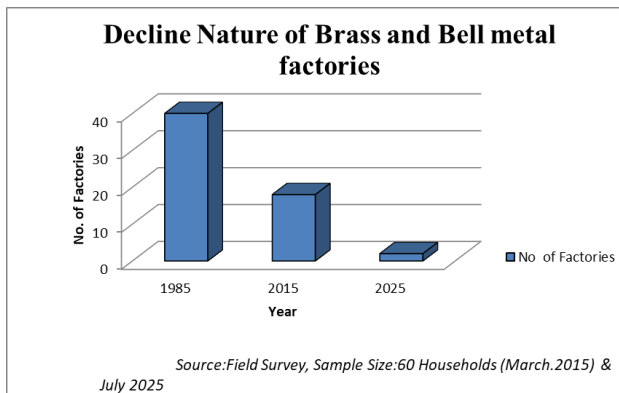


Fig No: 2

3.1 Decadal variations of amount of selling for Brass and Bell metals in Khagra, Berhampore Municipality

In the Fig No.3, it has been reported that in the past time shop-owners are use to sold their utensils which had been made in their own factory and approximate in 1975 had been sold 3000 Kg. Brass and Bell metal utensils in Khagra per year. But, in present time, productivity rate of utensils in khagr is very low for badly decreasging of factory. As a result,now shop owners are selling mostly imported utensils. In Fig No.3,according to sample survey,it is reported as 500 Kg. of Brass and Bell metal utensils are sold in 2015 where 1500 Kg. of imported Brass and Bell metal utensils are sold in 2015. In 2025 survey showed that production in this industry of Khagra has decreased significantly. Therefore, sufficient data was not available.

Table No.1: Decadal variation of amount of selling for Brass and Bell metal utensils in Khagra, Berhampore Municipality

| Year | Selling amount of Khagra's utensils | Selling amount of Imported utensils |
|------|-------------------------------------|-------------------------------------|
| 1975 | 2500 | 600 |
| 1985 | 1500 | 800 |
| 1995 | 1000 | 1200 |
| 2005 | 800 | 1350 |
| 2015 | 500 | 1500 |

Source: Field Survey, SamplingSize: 60 Household (March, 2015).

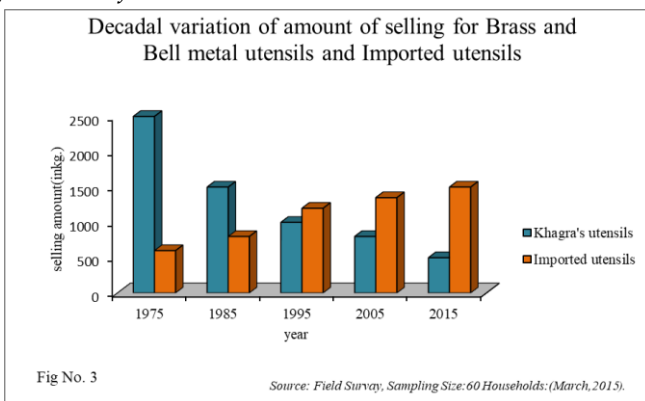


Fig No.3

3.2 Low Production and high rate of Bell Metal utensils in Khagra, Berhampore Municipality.

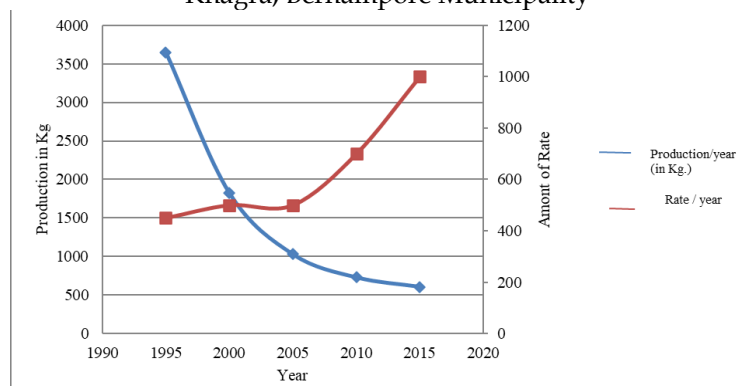
In Fig No.4, according to field survey it has been notified that production of Bell metal utensils becoming very low from past to till now, where rate of Bell metal utensils becoming very high from past to till now. This have been created by lack of Bell metal factories, lack of technologies, badly deceasing of artisan’s economic conditions and may be lack of Bell metal artisans. The COVID-19 pandemic in 2020 severely affected the industry, and since then, the condition of the industry and artisans there has been very poor, so there is not enough data available.

Table No.2: Inverse Relationship between production and amount of Rate of Bell Metal utensils in Khagra, Berhampore Municipality

| Year | Production/year (in Kg.) | Rate/year (Rs in Kg.) |
|------|--------------------------|-----------------------|
| 1995 | 3650 | 450 |
| 2000 | 1825 | 500 |
| 2005 | 1030 | 500 |
| 2010 | 730 | 700 |
| 2015 | 608 | 1000 |

Source: Field Survey, Sampling Size:60 Households (March,2015).

Inverse Relationship between production and Amount of Rate of Bell metal utensils Khagra, Berhampore Municipality



Source: Field Survey, Sampling Size:60 Households (March,2015).

Fig No. 4

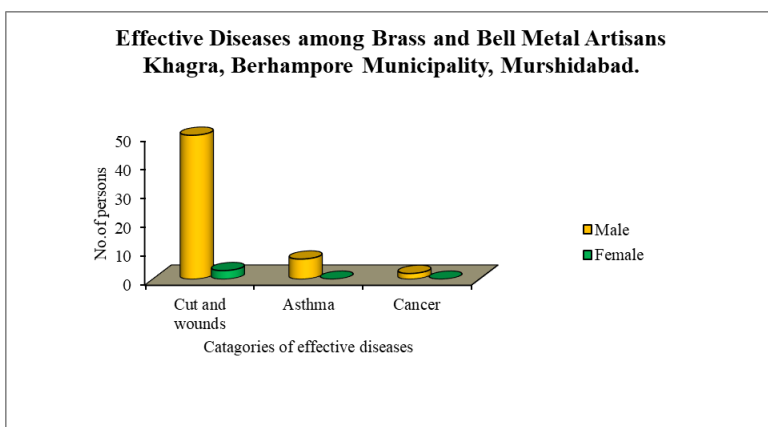
4. Effects of Brass and Bell metal Industry:

4.1 Effective Diseases: In the Fig No.5, according to field survey effective diseases have been seen mostly among the Brass and Bell metal artisans as they are manufactured the utensils. In the Ward No.5 (Brass & Bell metal artisans) 85% of artisans affected by cut and wounds, 12% artisans are affected by asthma and 3% artisans are affected by cancer.

Table No.3: Effective Diseases among artisans in Khagra, Berhampore Municipality

| Effective Diseases | Male | Female |
|--------------------|------|--------|
| Cut &wounds | 50 | 3 |
| Asthma | 7 | 0 |
| Cancer | 2 | 0 |

Source: Field Survey, 2017, 2025



Source: Field Survey, 2017

Fig No. 5

4.2 Environmental pollution from Brass & Bell metal Industry:

Air pollution:

To manufacture the utensils in this factory, pollute the air through fossil fuel emission. These emissions include Carbon dioxide, methane, and nitrous oxide. Combustion creates these toxic pollutants. While all of these are naturally occurring substances, it is the high level of emission which are of concern.

It's not only creating air pollution but also it would be becoming more dangerous for the artisans.

Soil pollution:

Soil contamination or soil pollution as part of land degradation is caused by the presence of chemicals. In this industry, create a kind of chemical (Xenobiotic) is very much effective for the soil pollution. Its typically caused by the industrial activity.

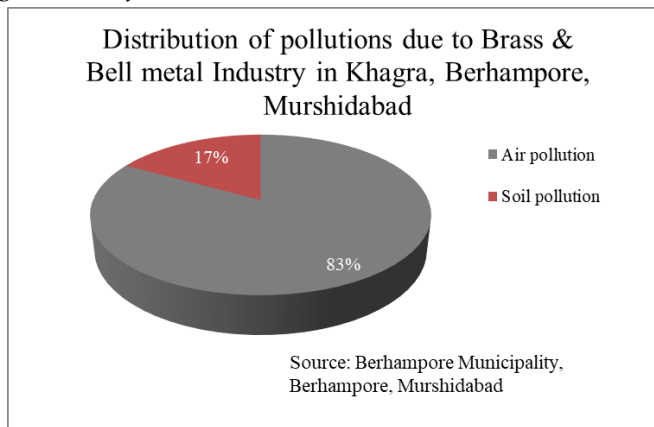


Fig No. 6

5. Strategies of Environmental Management:

“Earth provides enough to satisfy every man’s needs, but not every man’s greed.”

— Mahatma Gandhi

Pollution prevention is a major global concern because of the harmful effects of pollution on a person’s health and on the environment. There are a few measures which can be very effective to control environmental pollution. Industries have always a two-sided impact on our earth. One is obviously positive and another one is negative (i.e. environmental pollution). Some of the measures of environmental management are discussed below.

Policy of 4R:

- Refuse
- Reuse
- Reduce
- Recycle

If all these measures are applied, then the number of wastes can be controlled which will lead to a better atmosphere.

More Afforestation in Industrial Area:

The best way of reducing the air-pollutants is to plant more and more trees in the industrial area. Only trees have the ability to soak pollutants to give us a fresh environment.

Separation of Bio-degradable and non-biodegradable items before throwing into the environment:

This process is really effective to reduce soil pollution.

Awareness among the workers:

To generate self-consciousness, it’s really necessary to inject awareness among the industrial workers. If they become conscious, then our environment will get automatic boost of good health.

Use of Mask during Work:

Use of mask during work will reduce health problems among the workers.

Conclusion:

“If we heal the earth, we heal ourselves.”

– WangariMaathai

If there are no pollutants, there will be no pollution. Certain bad habits are entrenched and industrial development somehow carries with it the concomitant burden of pollution. Breathing is life. We know that we will survive without food for several weeks and without water for few days, but without oxygen, we will die in a matter of minutes. The oxygen, the air we breathe sustains us. So, let us make today and everyday a good day for everyone. Allow the earth to have more clean air. Industry is the sign of development. But, the development should be eco-friendly.

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