

Chapter II

II.1 Review of Literature

Bricks are considered to be as integral part of construction activities. In modern society also brick industry is gaining importance day by day specially in developing world (Alaa and Muhammad 2013). As a result, the number of the brick industry is increasing day by day to meet the demand of bricks for the urban expansion and infrastructure development. The rapid growth of the brick industry in the developing world has brought number of opportunity for the landless labourer, small and marginal farmers as well as challenges in relation to agricultural land degradation, air, soil and water pollution.

To understand and address these issues, emerged from the functioning of the brick industry; a considerable number of scholars and agencies have done their study taking into account different issues ranging from land degradation, water and air pollution, environmental changes and the socio-economic aspects of the brick industry. Therefore, this chapter discusses notable works that have been done on the brick industry to understand major debates emerging out of scholarship over the time and space. The whole work of different scholars is broadly divided into two categories:

- Works done by the scholars outside India.
- Works done by the Indian scholars within India.

The works done at outside India again sub divided into two sub categories:

1. Works on environmental consequences of brick industries.
2. Socio-economic consequence of brick industries.

Similarly, the works of Indian scholars are sub divided into two categories;

1. Studies on environmental consequences
2. Socio - economic consequences of brick industries.

II.2 Works conducted on brick industries outside India

II.2.1 Works on physical and environmental aspects of brick industry

Pandey (1997) conducted a study on brick industries and mentioned that the inefficient combustion of coal in kilns is responsible for generation of huge amount of Sulphur dioxide. His study further demonstrated that the addition of such huge amount of sulphur dioxide with air reduces the quality of air; especially in winter season.

Gutschow and kreutzman (2002) carried out a study on the brick industry from the socio- environmental perspective. Their study narrates how significantly large tract of agricultural land around the valley is getting severely affected, due to top soil quarrying to meet the rising demand of bricks for urban expansion of Kathmandu valley. In fact, the implementation of new brick making techniques to improve the production efficiency further exerted the pressure on existing agricultural land. As a result, more and more agricultural land turns into quarrying field. The use of agricultural land for brick making has reduced the net agricultural land which has directly affected the food production and food security in the valley.

Their study found a clear societal/class division between the owners and labourers. Almost all the owners are from the upper class of the society but all the labourers belong to socially lower caste people, especially from untouchable groups. Among the owners, few of them from the valley and the rest are from India. This study also noted that the benefits generated from the brick industries are at the expense of poor farmers' lands; consumed by the socially influential upper caste/class people.

USAID (2003) published a report on the brick industry to highlight the environmental as well as a health hazards emerging from the function of brick kiln industry. This report mentions that, the toxic dust is the main by-product of brick and tile industry.

When this toxic dust mixed with water, it contaminates the water and pollutes it. Later on, this contaminated water makes its way into the local drinking water supplies and affect the health of the people. Another important issue has highlighted by this report is that the people working in brick kiln inhale the toxic dust. This dust enters into their human body through inhaling and remains the cause of silicosis among the workers; a disease that affects the lungs and breathing, and ultimately lead to death.

Khan, Rahaman, Rouf, Sattar, Oki and Adachi (2007)'s study on the brick industry in Bangladesh tries to assess the role of brick industrial top soil quarrying and burning in changing the soil quality and agricultural land degradation. Their study has noted that brick industrial top soil quarrying activity is responsible for removal of top soil up to two meters deep as well as changing chemical composition. They pointed out that quarrying activity is responsible for the destruction of large track of agricultural land. Their study further mentions that burning of top soil at kiln is responsible for significant changes of available chemical compound not only in the soil of kiln area but also a few meters away from the kiln. Their works further noticed that the extreme heat of the kiln has destroyed the soil's microbial organism at large.

Joshi and Dudani (2008) carried out their study on brick kiln industry to understand the negative environmental impacts that emerged from brick kiln industry and its subsequent impact on human health. Their study noted that the use of low grade coal and rubber tyre scraps as fuel for brick burning is responsible for generating huge amount of carbon dioxide, carbon monoxide, sulfur dioxide and other gases. Apart from these harmful gases, brick kiln burning is also responsible for the production of large amount of dust, suspended particulate matters. The addition of such amount of gases and dust particulate materials into the environment is responsible for air and water pollution in the valley. The people living in such polluted environment are

suffering from bronchitis, asthma, cough, fibrosis, silicosis due to inhaling of micro dust particles. Their study further noted that the children of the area are suffering from tonsil, inflamed pharynx, pharyngitis, emphysema, allergic rhinitis etc. due to inhaling of such micro dust particles.

The study of Heilrili and Maithel (2008) on the brick industry highlighted the present status of the brick kiln industry in Asia. Their study has shown that Asian traditional brick kiln industry produced about 1000 billion bricks annually to meet the demands of 4 billion Asian. Their study further noted that the traditional way of burning is responsible for producing 180 million tons of carbon dioxide by consuming 110 million tons coal. The main objective of their study was to analyze the feasibility of the introduction of new technology to reduce the pollution keeping production level static. Their study has also suggested that only switching in Vertical Shaft Brick Kiln (VSBK) technology could reduce the fuel consumption by 30 percent to 60 percent as well as pollution level.

The study of Ishaq, Khan, Jan and Ahmed (2010) on the brick industry in Peshawar, Pakistan tries to understand the impact of brick kiln industry on soil and plants of surrounding areas. Their study has pointed out that the continuous burning of soil at kiln adversely affected the availability of soil elements like copper, organic carbon, zinc, cobalt, manganese, lead, nitrogen, chromium and others.

Their study found that availability of copper, chromium and nickel increase significantly in the soil with increasing depth of the soil/land as well as increasing distance from the brick industry. The reduction of Cobalt and Zinc in the soil is responsible for poor plant growth. Beside poor plant growth, they also argued that the people working in the brick industry or living close to the brick kiln industry suffered from many health hazards.

Avitia, Antonio & Mora (2012) in their works on brick industry have discussed about role of brick kiln in environmental changes from the perspective of landscape ecology. Their study revealed that, the traditional way of burning, open casting and use of low grade coal as fuel are responsible for producing huge amount of smoke, carbon dioxide, total suspended particulates, heavy metals, nitrogen oxides, carbon monoxide, sulfur dioxide, hydrocarbons and ozone etc. and it is largely due to the incomplete combustion process and the different types of fuel used in the kiln. Their study further mentioned that there are few heavy metals which remains in its original form after burning or may react to create new compounds such as metal oxides, chlorides or fluorides.

Their study also has shown that the incineration of these metals and bioavailability of toxic metals is greatly increased in comparison with the original waste. The most common form of transport of the pollutants is air. Sometimes, these pollutants travel thousands of miles and deposits on the soil in a distant area and ultimately affect the health of the people in distant places.

Ismail, Muhammad, Khan, Munsif, Ahmad, Ali, Khalid, Haq and Ahmad (2012) have done their study on the brick industry and found that brick kiln burning is responsible for the generation of huge dust and smoke. These dusts and smoke are the main sources of heavy metals in the surrounding soil and plants. Their study has also noted that wind is an important player in spreading these dust and heavy metal in wider distance from the brick kilns.

The soil and plants located in the wind ward side of brick kiln received more heavy metals as compare to soil and plants located in the leeward side of the kilns. Their study further noted that these heavy pollutants find their way to plant bodies through the roots of plants and subsequently enter into ecosystem and adversely affect it.

II.2.2 Works on Socio- Economic aspects of Brick Industry

Sebesvari, Sehiller and Ortelepp (2015) conducted an important study on brick industry to understand its impact on food security in south Asian countries. Their study have noted that brick industry and its top soil extraction is responsible for the shrinking of fertile agricultural land, in densest part of South Asia as well as in other developing countries of the world. Their study noted that the rapid population growth and faster growth of urbanization are responsible for large scale use of fertile agricultural top soil extraction and non agricultural activity to meet the physical demand of urban or city centre.

The use of top soil has reduced the fertile agricultural land and put serious question about food production and food security in front of the poor rural people of South Asian nations. The study further suggested that an effort should be made to identify and use of substitute suitable building materials according to local climatic condition which could reduce the pressure on available fertile agricultural land.

The study of Plant (2004) has highlighted the problems of migrant labourers of the brick industry in Pakistan. He mentioned that the workers of brick industry mainly constitute of poor and marginal people who migrate from their native villages every year to work in brick industry with their family. He further argued that these labourers are the buyers of food and depending on daily wage for the major share of their yearly income. He has also found that the workers are recruited through labour contractors with advance payment to the workers for a specified period of employment. This way of advance payment is responsible for bonding the entire family of labourers comprising husband, wife and children. They move to the brick industry and works until operating season is over. The industry treated them with all forms of slavery and bonded labour in history; this is a systematic worked out phenomenon.

II.3 Works Conducted on Brick Industries within India

India with its second largest population in world also provides the well established narratives of brick industries and its ethos. The brick industry in India has also drawn attention from the researchers and other agencies over the time and space. The renowned Indian scholars also conducted their study on the brick industry to understand its impact on the society, land and the environment. These Indian scholars' works mainly discussed about the functional impact of the brick kiln industry on the agricultural land, agricultural practices, land degradation as well as changing soil fertility, natural vegetation covers, river bank erosions, air and water pollution etc.

There are also notable eminent Indian scholars whose works mainly focuses on socio- economic aspect of the workers of the brick industry. In the social section, their studies tried to understand the religion and caste background of the workers. In the economy section, their studies tried to explore the economic background, occupation structure, labour relation, labour markets, etc. in addition, their studies also tried to incorporate the issues of the migrant labourers. The notable works of Indian scholars and agencies could be grouped into two broad domains, such as work on:

II.3.1 Works on Environmental aspects of Brick Industry

Grewal & Khud (2002) tried to understand the role of the brick industry in soil desurfacing of Haryana state. Their works highlighted that the top soil removal activity is responsible for the changing bulk density, loss of soil organic carbon, losing hydraulic conductivity, water holding capacity, loss of soil nitrogen, soil nutrients, agricultural productivity and yields.

Yadav (2003) conducted a remote sensing database study on the brick industry located around the JNU campus, Delhi. His study found out that the brick industrial activity is responsible for degradation of large track of fertile land in an around Delhi.

His study has also mentioned that a considerable amount of agricultural land steadily used by the brick industry for the top soil quarrying purposes. His study further noted that the injudicious quarrying of top soil not only responsible for changing physical landscape of the area; but also has an impact on the fertility status of the soil. His study also noted that, quarrying of top soil has changed the chemical composition of soil and turns the acidic soil into 'alkaline'. His study also noted that apart from quarrying, brick kiln burning activities severely reduce available amount soil moisture as well as change the water table. The lack of soil moisture and changing water level is responsible for the limited growth of herbs and shrubs in the study area.

Asger (2004) explored the impact of brick industry on environmental degradation in Aligarh city. His study shows that the brick industry is an important source of carbon dioxide, carbon monoxide, dusts, smoke etc and air pollution. His study further demonstrated that the people living in and around brick industry suffers from number of health problems due to pollution emerge from the function of brick industry. And the range of studies proves that medical problem remains perennial.

Ghoshal (2008) unfolded the spatial distribution of brick industries in India. His study demonstrated that the majority brick industries of India are spread over northern plain region. His study further noted that the states like Panjab, Haryana, Uttar Pradesh, Bihar and West Bengal are the major producer of clay bricks and these states produced about 65 percent country's bricks by using agriculture top soil. His study also shows that the top soil quarrying activity of brick industry is responsible for degradation and destruction of considerable area of agricultural soil in the country.

Bera (2010) conducted a study on brick industries to understand the problems and future prospects of brick industry in West Bengal. His study shows that the brick industries of West Bengal facing acute problems of shortage raw materials, fuel and

capital. His study also revealed that the demand for bricks as building material is increasing day by day but shortage of raw materials forced number of brick industry to exploit the fertile agricultural land. His study further shows that the shortage of raw materials forced to close down many brick industries. His study further indicated that the financial crisis is another important challenge faced by the brick industry as none of financial institution agrees to give support by offering loan to owner of brick industries.

Gupta & Narayan (2010) in their work on brick industry talks about the rapid urban expansion, rising brick industry and its impact on ecosystem. Their study mainly concerned about the anthropocentric transformation of the natural environment. They had mentioned that, material demand of the city in the form of brick has been fulfilled by the brick industry. Their study has mentioned that a huge chunk of fertile agricultural land has been transformed into wasteland due to top soil quarrying.

Their study further noted that, brick industry not only responsible for increasing amounts of wasteland, but also plays a vital role in changing the physical and chemical property of soil and water of the quarrying area. Their study further noted that the new type of species of weeds is evolved on quarrying land and alter the natural ecological setting of the area.

On the other hand, brick burning is responsible for dust accumulation on plant leaves and heat stress for the plants located nearby kiln. Dust accumulation on plants and heat stress is responsible for invasion of native species by the new species. The appearance of new species has disturbed the area's natural ecosystem.

Sapkale (2011) works on brick kiln discusses about the consequence of topsoil extraction conducted by the brick industry in the lower reaches of Tarali river of Umbraj. His study found that rapid excavation of top soil not only change the slope of

the area, but also responsible for top soil erosion of unexcavated land. His study further mentioned that, unplanned quarrying of agricultural land located nearby the river has raised the risk of diversion of river channel during monsoon and poses the number of threats to the nearby agricultural land. Beyond this, evacuation of soil as a raw material has changed the slope of existing land surface and modifies the direction of streams every year and sometimes cause of severe flooding.

Das (2014) tries to evaluate the role of the brick industry on changing characteristics of the River Nadia in Nadia district of West Bengal. He found that the soil cutting on river bed is the main cause of river bank erosion, channel diversion, river meandering, bar formation and gradual shifting of the river channel in the downstream of river. His study also revealed that the gradual shifting of the river channel lead to the river meandering and sometimes eroded the fertile agricultural land as well the houses of the people residing near the bank of the river. Hence, challenging both nature and human beings.

Islam (2014) conducted a study to examine the impact of brick industrial top soil quarrying and affecting it also with brick burning process. His study revealed that quarrying activity largely contributes to rising soil pH value of top soil quarrying agricultural field and turns it from neutral to basic soil. On the other hand, burning of soil at kiln reduces the soil pH and turns it into acidic soil. His study further reported that the large scale quarrying of top soil is responsible for the significant reduction of available soil nutrients like organic carbon, nitrogen, phosphorus and potassium etc.

Purkait (2015) conducted a study to examine the impact of brick industries on environment in Hugli, Haora and Nadia of West Bengal. His study revealed that physical environment like air, water and land is adversely affected due to function of brick industries.

His study also suggested few remedial measures to reduce the harmful impact of brick industries on the surrounding environment.

Das (2015) carried out a study on brick industry to examine the role of brick industry to pollute the air at micro level in at *Khejuri* Community Development Block of coastal Medinipur, West Bengal. His study found that brick industry is responsible for air pollution in coastal region of the block. His study also revealed that the brick industry is responsible for large scale land degradation in the *Khejuri* block of Medinipur district of West Bengal.

II.3.2 Works on socio- economic aspects of brick industry

Gulati (1979) has conducted her study on female labourers of brick kiln in Kerala. In her case study, she has noted about the daily working routine of a female brick kiln workers and her struggle in life. She further argued that how a poor old aging woman performs her inhuman work to carry out her family expenditure and livelihood. She found that the division of work based on gender in the brick kiln industry wherein female workers are exclusively involved in carrying head loads. Women are restricted from doing work like brick making, moulding of clay and firing of brick etc. Thus, women are only employed for carrying weight on their head; as a result, their earning is very less as compared to a man.

Rao (1981) has conducted a study on labourers of brick industry in Punjab from the perspective of the political establishment. He has unfolded the nexus between the political party and the brick kiln industrial owners. He argues that the government and the political establishment are very much bias in the context of protecting the right and interest of the labourers. His study clearly states how State Government frequently ignores the order of Central Government regarding bonded labourers of the brick industry in Haryana. Further, his study disclosed that the owners of brick

industry use police to arrest the people those are fighting against merciless exploitation and protecting their right of the migrant brick kiln labourers. In addition, he argues that how owners of the brick kiln manage to keep the exploitative system by giving bribe to the local authority and police. His study also revealed that labourers who are trying to escape from the brick industry, false charge are putting on them by using the local police.

Another study on brick industrial labourers carried out by the Dharmalingam (1995) has tried to understand the social dimensions of brick industrial labourers in south India (Tamil Nadu). His work has mentioned about the condition of work, the level of wages, as well as societal position of the workers. His study has stated that the people working in the brick industries have important caste relation. Almost all the brick industrial workers are belonging to a lower caste. On the other hand, the entire owners are from the economically sound middle and upper class people.

His study further noted that brick industrial labourers are always underpaid. His study also found that the exploitative nature of these affluent brick industrial owners towards the lower caste labourers putting these people more vulnerable situation. His study further demonstrated that the brick industry is responsible for creating of small affluent groups within the village.

Singh & Asger (2002) have tried to understand the impact of the brick industry on the surrounding environment and the health of the workers. Their study revealed that the high temperature of kiln surface is the cause of pulmonary disorder, burn, heat cramp, heat stress, heat exhaustion, heat stroke, headache, irritation of eyes and skin among the workers. Their study also reveals that, the people living in the surrounding villages also suffered from a number of health related problems due to dust laden atmosphere.

Gupta (2003) has unfolded the issue of migrated labourers of brick kiln industry. Her study reveals that the brick kiln workers belong to marginal to landless labourers; most of them are net buyers of food items and substitute their income by the daily wage labourer. Her study also mentioned that the workers are recruited by the agents. After recruiting, they are brought by these agents with their family to the brick kiln during the agricultural lean period at their home. The agents maintain their influence on the workers by putting the burden of advance payment.

Her study further mentions that, only male member is registered at the work place and whole family work as a team. This study pointed out that the demand factor plays an important role in determining the amount of advance payment by the agent. Her works further mentioned that the low daily wage, limited employment period in agriculture in their village and lack of basic skills forced these people to work on such hazardous environment.

A report published by Prayas (2004) to estimated the employment capacity of the brick industry as an informal sector of the economy in India. It has mentioned that each brick kiln industry has the capacity to employ on an average about 100 workers. It also reported that the brick kiln industry exploiting the migrant labourers by only counting the male workers and ignoring the contribution of women and others in social production.

Another important study on brick industrial workers has been carried out by Kumar & Sindu (2005) in Punjab. Their study tries to unearth the causes of migratory labourer in brick kilns in Punjab. Their study has pointed that the pull factors are more pronounced and worked as a driving force in respect to migrant labourers in Punjab. Their study has revealed that, better job opportunity and comparatively higher wages as compared to the native place attract the migrant labourers to migrate in brick kilns

in Punjab. In addition to this, their study further noted that, besides high wages and better opportunity; freedom from family, desire to get free from debts, improving standard of living and attraction towards urban amenities, higher agricultural development in Punjab and diverse nature of work in Punjab attract large number of families to migrate in brick kilns in the state.

Isabelle, Bhukuth, Augerndra, Parthsaasrathy & Subramanian (2007) work on brick kiln labourers have tried to understand the nature of bondage of brick industrial labourers. Their study revealed that, bondage is influenced by demand as well as supply factors. Their study noted that during the off season, the owners of brick kiln have given some amount of money in advance to the workers through labour contractors. Further, they raised the question of surviving, poverty; lack of alternative source of livelihood as factors which forces the lower class labourers to take advance during off season.

In addition, their study observed that the working condition in brick industry is cyclic in nature. Therefore, nature of work, works as a mechanism behind getting into debts trap and soft bondage of labourers. Their study further noted that lack of credit market, inaccessibility to the bank and high rate of interest prevent the workers from getting free from the cycle of bondage, because a large number of labourers spend their income to repay the loan. To repay the loan and gets free from the debts these labourers reach to contractors for advance money. Once they are taken in advance from labour contractor they get tied to the cycle of bondage.

Tomorrow Foundation (2009) prepared a report to estimate the seasonally migrated child labourers in the brick kiln industry spreading over *Shyampur* block of West Bengal. This study tries to understand the social and the spatial dimension of the migrant child labourers in the brick kiln industry. This report reveals that the migrant

child labourers working in brick kilns in West Bengal are mostly coming from two states like Bihar and Jharkhand (especially from lower castes and adivasis origin). The report further mentioned that these migrant children are coming from particular parts of this state as well as particular section of the society. The report mentioned that these children mostly belong to tribal families of Bihar and Jharkhand state.

It also reported that these children are recruited mainly for transporting of raw bricks from drying field to the kiln and firebrick from kilns to selling point. These children are working in the brick kiln industry to support their family to cope the poverty. Like every industries in India, child labour holds its importance; in spite of legal prohibitions.

Manga, Singh, Bhardwaj and Singh (2012) have conducted a study to understand the nature of brick kiln dust related respiratory health hazard among labourers. Their study has shown that the brick dust comprises of SiO_2 , Al_2O_3 and Fe_2O_3 and other suspended particulate matters which is produced during unloading and shipping process. These dust particles enter into the human body through inhaling as well as high temperature in the kiln causes of serious disease and cancer among the workers.

Das (2015) conducted a study on the female workers of brick industries in *Khejuri* block of Medinipur district of West Bengal. His study unfolded that majority of these female workers belong to schedule caste and schedule tribe community and are migrant workers. They are coming from nearby districts during agricultural lean period for search of employment.

His study further noted that the poor socio-economic condition, lack of working opportunity at their respective localities and higher daily wages at brick kiln are the main driving force for these poor women to joins in brick industries. Poverty undermines the health issues that emanates from industrial zones.

The work of Majumder (2015) study pointed out the fundamental problems faced by the rural labourers working with the un-organized sectors. His study has revealed that low wage and limited period of employment in the rural agricultural sector forced the unskilled landless labourers to migrate in under privileged sectors for surviving and brick kiln industry is the prime destination of a major section of these rural unskilled migrant laborers in India.

His study has also revealed that the prior arrangement of work for the rural migrant labourers have controlled by the labour contractors and manages their influence over migrant labourers by giving an advance payment. Once the labourers trapped by the labour contractors, the cycle of bonded captivity continue year after year and are getting circulated from one kiln to others and possibly coming back to their previous kiln. Issues regarding functional impact of brick industries highlighted on the above studies by different scholars are as follows:

Themes	
Physical and Environmental Issues	Socio- Economic Issues
<p>The existing works mainly highlights the functional outcomes in the form of air and water pollution, agricultural land degradation, loss of top fertile soil and crop yields. Study demonstrated how kiln burning is an important source of sulphur dioxide, carbon dioxide, carbon mono oxide, SPM and other gases and responsible for air and water pollution, acid rain etc.</p>	<p>Among the socio- Economic issues, studies mainly highlighted the issue of migrant labourers, small and marginal farmers and the people living around the brick industry. Studies unfolded that how (Local and Migrant) labourers are trapped by the labour contractors and brick industry and reason behind get trapped by the brick industries and its vicious cycle of exploitation.</p>

<p>Studies further revealed that how top soil quarrying is responsible for loss of soil fertility and degradation of large tract of fertile land which is severely affected the soil quality, crops practices and yields. In addition, study also unfolded that brick industry also responsible for emergence of new herbs and weeds on quarrying which is responsible for changing natural ecosystem.</p>	<p>Studies unearthed the mechanism of labour recruitment mechanism in brick industries. It further tries to highlight the social class dimensions workers. Further studies to unearth causes of migration of labourers from agriculture sector to brick industry as well as its spatial dimensions. In addition, studies also unfolded the role state Government in relation to the brick industry.</p>
<p><u>Horizontal relation across the studies:</u></p> <p>Studies on brick industries outside India demonstrated that the function of brick industries causes of environmental pollution and human health hazard among the people not only involved in it but also people residing around it. A study further highlights that, the loss of agricultural land due to top soil quarrying causes raising food security among poor of South Asia.</p>	<p><u>Horizontal relation across the studies:</u></p> <p>Studies on brick industries with India also demonstrated similar story related to function of brick industries. Studies within India further highlighted socio-economic, Class, Caste, gender and political dimensions of brick industrial workers. Studies trying to unfolded how poor farmer's agricultural land turns into degraded and waste land and destroyed their source of livelihood.</p>
<p>Linkages across the studies</p>	
<p>Therefore, studies demonstrated that the function of brick industries have important outcome in relation to different aspects of environment and society. The function of</p>	

brick industries have significant stake in pollution of air, water, soil, etc. The degradation of these physical resources not only affects physical environment, but also largely affects the society. The different sections of society affected in different ways; small and marginal farmers' loss their agricultural land due to top soil quarrying which subsequently reduced availability of agricultural land in the study area. The landless labourers and their production behaviour are changed and turned them as informal industrial labourers from agricultural labourers. So, studies on function of brick industry have tried to demonstrate the very complex outcome in relation to physical environment and society as whole.

Thus, studies on brick industries across the globe mainly emphasises on the adverse aspects of the brick industries on society and environment. Their studies have given additional focus on the issues related to the land degradation and environmental pollution. Particularly, studies conducted by scholars outside India given little attention on class and caste dimensions of the brick industries. Their studies simply ignore the class and caste dimension of the labourers of the brick industry. The studies confined within the socio-economic issue of the labourers. In addition to it their studies also ignored the changing production behaviour of landless labourers in relation to the brick industry in larger context. They can be considered as the legal heir of orientalist discourse.

On the other hand, studies by Indian scholars tries to highlight the issues of class, caste, gender and little bit political dimension of the brick industry. However, these studies paid attentive to causes of development and changes in social and production relation of the labourers with regard to brick industry. Therefore, existing research on the brick industry either outside India or in India, mainly focuses on the issue like

impact/outcomes of the brick industry on the physical aspect of environment like on land, air and water. The existing works also highlighted the health issues of the workers, those who directly involved in the industry and people residing there. Further, studies also highlighted the condition of female, child labour and migrant labourers.

So far, the fundamental questions regarding brick industry have not been addressed by any scholars. Their study doesn't pay attention to the factors behind the emergence of brick industries or their works that as follows; how the brick industry came into existence? Who are the owners of the industry and why they are interested in brick industry? Which agencies are involved in the emergence of brick industry? How they are interlinked? What are the consequences for the brick industry of the agrarian relation? How brick industries target new areas for conducting soil quarrying and industrial expansion?

Why most of the land givers belong to small and marginal farmers? How industry changes the social fabric of the village society, especially the socio economic condition of the landless labourers? How and to what extent the brick industry influence the livelihood of the people involving in the industry?

Further, how agricultural practices and cropping pattern of the area are affected due to industrial expansion? What is the government policy towards brick industry? This study addresses these questions in effort to understand the agencies, processes and outcome of brick kiln industry in the Murshidabad district of West Bengal.

References

- Alaa, A. S., & Muhammad, A. A. (2013). Manufacturing of bricks in the past, in the present and in the future: A state of the art review. *International Journal of Advances in Applied Sciences*, 2(3), 145-156.
- Avitia, A. Y. C., Antonio, D. L. & Mora, C. (2012). Environmental assessment of brick kilns in Chihuahua State, Mexico: Using digital cartographic technique. *The Functioning of Ecosystems*, 261 – 281.
- Asger, M. S. (2004). *Land degradation and environment pollution: Impact of brick kiln*. New Delhi: B. R. Publishing House.
- Bera, R. (2010). *Brick industry in West Bengal: Problems and prospects*. (Unpublished PhD thesis). West Bengal: University of Calcutta, Department of Commerce.
- BUET (2007). *The small study on air quality of impacts of the North Dhaka brick field cluster by modelling of emissions and suggestions for mitigation measures including financing models*. Dhaka: Bangladesh University of Engineering and Technology: Chemical Engineering Department.
- Das, C. B. (2014). The impact of in-bed and on-bank soil cutting by brick fields on moribund deltaic rivers. A study of Nadia river in West Bengal. *Hill Geographer*, XII (2), 101 -111
- Das, R. (2015). Causes and Consequences of land degradation in an around the brick industry. *International Journal of innovative research & Development*, 4(2), 185-194
- Das, R. (2015). Socio- economic standing of female workers in brick kilns: Mistreatment to social wellbeing; an assessment on Khejuri CD blocks in Purba Medinipur district, West Bengal. *International Journal of Humanities and Social Science Invention*, 4(1), 39-49
- Dharmalingam, A. (1995). Conditions of brick workers in south Indian villages. *Economic and Political Weekly*, 30 (47), 3014 -3018.
- FAO. (1993). *Status and development issues of the brick industry in Asia*. Bangkok: Regional Wood Energy Development Programme in Asia.
- Ghosh, R. (2004). Brick industrial workers: Migration labour process and employment. Noida, New Delhi, India: V.V Giri National Labour Institute.
- Grewal, M.S., Kuhad, M.S. (2002). Soil de-surfacing impact on productivity and its Management. Beijing, China: 12th ISCO Conference.
- Gulati, L. (1979). Female workers in the unorganised sector: Profile of a brick worker. *Economic and Political weekly*, 14 (16), 744 – 752.

- Gupta, J. (2003). Informal labour in brick kilns: Need for regulation. *Economic and Political Weekly*, 3282- 3292.
- Gupta, S. & Narayan, R. (2010). Brick kiln industry in long-term impacts biomass and diversity structure of plant communities. *Current Science*, 99 (1), 72-79.
- Gupta, R. (2012). A comparative study between organised and unorganised manufacturing sectors in India. *The Journal of Industrial Statistics*. 1 (2), 222-240.
- Gutschow, N. & Kreutzman, H. (2002). Urbanization requires brick production: A case study of Kathmandu valley, Nepal. *Erdkunde*, 56 (1), 15-36.
- Heierli, U., and Maithel, S. (2008). *Brick by brick: The herculean task of cleaning up the Asian brick industry*. Berne, Switzerland: Swiss Agency for Development and Cooperation.
- Ishaq, M., Khan, A. M., Jan, F. A., and Ahmed, I. (2010). Heavy metals in brick kiln located area using atomic absorption spectrophotometer: A case study from the city of Peshawar, Pakistan. *Environmental Monitoring and Assessment*, 166, 409-420.
- Ismail, M., Muhammad, D., Khan, F. U., Munsif, F., Ahmad, T., Ali, S., Khalid, M., Haq, N. U., and Ahmad, M. (2012). Effect of brick kiln emission on heavy metal contents of contiguous soil and plants. *Sarhad Journal of Agriculture*, 28(3), 403-409.
- Islam, R. (2014). Land degradation and environment impact assessments of the brick industry of selected blocks of Murshidabad district, West Bengal. *Commonwealth Associations for Education, Administration and Management*, 2 (8), 201 – 212.
- Isabelle, G., Bhuthuk., Augerdra., parthasarothy & Venkata., S. (2007). Labour in the brick kiln: A case study in Chennai. *Economic and Political Weekly*, 42 (7), 599- 606.
- Jayachandran, U. (2001). Taking school to the child: Bhonga shoals. *Economic and Political Weekly*, 36 (35), 3347-3350.
- Joshi, SK., and Dudani, I. (2008). Environmental health effects of brick kilns in Kathmandu valley. *Kathmandu University Medical Journal*, 6 (1& 21), 3-11.
- Khan, H. R., Rahaman, K., Rouf, A., Sattar, G. S., Oki, Y. & Adachi, T. (2007). Assessment of degradation of agricultural soils arising from brick burning in selected soil profiles. *Int. J. Environ. Science and Tech*, 4 (4), 471-480.
- Kumar, S. & Sindu, A. S. (2005). Pull and push factor in labour migration: A case study of brick kiln workers in Punjab. *Economic and Political Weekly*, 41(2), 221- 232.

- Maithel, S., Uma, R., Kumar, A. and Vasudevan., N. (1999). *Energy conservation and pollution control in brick kilns*. New Delhi: Tata Energy Research Institute.
- Manga, V., Singh, P. L., Bhardwaj, A., and Singh, H. (2012). Respiratory health in brick kiln workers. *International Journal of Physical and Social Sciences*, 2 (4), 226-244.
- Majumdar, D. (2015). Forced migration of labourers to brick kilns in Uttar Pradesh. *Economic & Political Weekly*, 1 (26 & 27), 19 -25.
- Ortlepp, R., Sevesbari, Z., and Schiller, G. (2015). *Building material substitutes vs top soil harvesting – technical considerations with a focus on developing countries*. Germany: Dresden Nexus Conference, 25th- 27th March 2015.
- Pandey, G. N. (1997). *Air pollution and control: Environmental Management*. New Delhi: Viskas Publishing House.
- Pandit B., Basnet, P., and Joshi, I. B. (2004). *Stack energy monitoring of pilot demonstration of VSBK in Kathmandu Valley*. Institute of Environment Management.
- Prayas (2004). Migrant labour at brick kiln in Andhra Pradesh: A Human Right perspective.
- Plant, R. (2004). *Unfree labour in Pakistan: Work, debt and bondage in brick kilns*. Pakistan: Institute of Labour Education & Research.
- Purkit, P. (2015). *Impact of brick kiln industry on environment: Case study in Hugli, Nadia and Haora districts, West Bengal*. (Unpublished PhD thesis) Calcutta: department of Geography, University of Calcutta.
- Rao, A. (1981). Brick kiln labour in poverty and bondage. *Economic and Political Weekly*, 1181-1183.
- Sapkale, B. J. (2011). *Brick kilns of umbraj and its impact on the lower reaches of river Tarali: A healthy environment for the healthy economy*. New Delhi: Serial Publication.
- Tomorrow Foundation. (2009). Mapping of the seasonal migrating children to brick kiln of the Shyampur blocks of West Bengal. 1- 22.
- USAID. (2003). *Brick and tile production: Resource efficient and cleaner production briefing and resource guide for the micro & small enterprise*. The United States: Global Environmental Management Support,
- Yadav, S. K. (2003). Remote sensing based management of degraded soil due to brick Industry for sustainable development: A case study. *Journal of Human Ecology*, 14 (6), 451- 455.