*Received: 30 April, 2024* *Revised: 30 May, 2024* *Accepted: 30 June, 2024*

# Impact of Brick Factory on Socio-economic and Livelihood of People

- Indra Mali Malakar[1]

DOI: https://doi.org/10.3126/ssmrj.v1i1.71261

**Abstract**

*The means and resources individuals employ to sustain their lives and support their families is called livelihood. This paper aimed to analyze the impact of brick factories on the socio-economic and livelihood of people in Koicha ward no. 22, Bungmati, Lalitpur. The study population was the workers, non-workers, local people, and the local authorities around the brick factories. This study adopted the census method as the sample design and descriptive study as the research design and followed both quantitative and qualitative methods. The respondents were workers in brick factories including 55.6 percent female and 44.4 percent male whereas the mean age of respondents was 47.33 (± 5.03) and the majority of them (88.9%) were 40-45 years old. Most of them were married (83.3%), Buddhist (83.35), and Newars (88.9%). The mean monthly earnings of the respondents was Rs19722.2 and this income was stated as not sufficient by the majority of the respondents (83.3%). They managed their livelihood by different sources rather than their monthly income in different ways. The regression model, which includes years of working in brick factories, earning by land lease to brick factory, and monthly salary as a predictor, is not significant on brick factories impacting positively in the socio-economic and livelihood of people. The R-square and adjusted R-square are 97.2 percent and 88.8 percent explaining the strong proportion of the variance in the dependent variable is due to the independent variables. However, the p-*

[1] Assistant Professor, Department of Population, Patan Multiple Campus, TU.

*value (0.214) is greater than 0.05 evidenced by the null hypothesis supporting the conclusion that the model is statistically not significant. With the increasing air pollution, less productivity of land, and health problems, respondents viewed brick kilns as the negative aspect whereas due to employment creation, and upliftment of the livelihood some viewed it as the positive aspect. The FGD and KII conducted in the study area resulted in one voice of removing the brick kilns as it has created health problems rather than socio-economic improvement. Further study in this regard has to be conducted to get a closer view of the problems associated with brick kilns.*

**Key words:** Livelihood, brick factory, uplift, health hazards, production.

## Introduction

Livelihood encompasses various activities, both economic and social, that people undertake to secure basic necessities such as food, shelter, clothing, and healthcare. The concept of sustainable livelihood was put forward in in Brundtland Report, World Commission on Environment and Development (WCED), (Our Common Future, 1987). Livelihood is defined as adequate stocks and flow of food and cash to meet basic needs. The Brick-making industry has been one of the cornerstones of the economic growth and growth of the modern lifestyle. The term "brick" itself has become synonymous with building blocks. Clay brick manufacturing involves firstly the sourcing of raw materials, which is clay. Then preparing, molding, and drying the clay. The dried clay then gets into a furnace or kiln where it is fired, giving it the signature red color. Then once it is out of the furnace or kiln, it is cooled and stored (Wanjule, et al., 2015). Brick manufacturing is a seasonal work process as environmental factors like rain, lack of sunshine, and other factors that hinder its' making process could stop the production of the clay brick (Aniyikaiye, et al., 2021).

The history of brick itself is not very clear and there is a lack of information about its origins. The oldest brick to be found by humans is dated 7000 BC

from the ancient city of Jericho which is currently modern-day Turkey (Johnson, 2021). Other ancient civilizations like Ancient Egyptians have a history of making sun-dried bricks out of clay. Around 3500 BC, the ancient method then changed and thus came the furnace or kiln as we know of today. From this time forward, brick makers began to use furnaces or kilns with burning coal to fire the bricks and cook them rather than having them dry in the sun (Johnson, 2021). In the context of Nepal, it is similarly not well documented where the use of bricks or its production began. Remains of ancient temples like Maya Devi Temple aged around 2600 years have bricks, the claim that bricks are part of the ancient times of present-day Nepal is not unfounded (Sharma, et al., 2019). Today, there are more than a thousand brick kilns in Nepal. The industry of brick making in Nepal is estimated at around 37 million USD and employs more than 140,000 people (Sharma, et al., 2019). According to the latest figures from Federation of Nepal Brick Industries (FNBI), there are over 950 Fixed Chimney Bull's Trench Kilns in Nepal. There are 38 Vertical Shaft Brick Kiln (VSBKs) with 81 shafts in Nepal from which 28 VSBKs are currently in operation (Sharma, et al., 2019). The brick sector of Nepal is predominantly labor-intensive with a very low level of mechanization in the production process. A traditional brick kiln employs about 150 to 300 laborers and a VSBK can employ about 70 to 200 laborers depending upon the number of shafts (Sharma, et al., 2019). The brick-making industry, however, is often under criticism due to the prevalence of child labor, child trafficking, poor working conditions, lack of basic workplace facilities, labor exploitation, and other social issues (Sharma, et al., 2019). It is also important to observe that the brick factories should not be operated or where most of the people are dwelling. The health hazards, environmental hazards and others can create problems for human beings. Therefore, this study could fulfill the gaps of such queries.

Who Ambient Outdoor air pollution study (2022) estimates the negative impact of the brick-making industry on the livelihood of people. According to WHO, 99 percent of people in the world are living nearby or in places

where WHO air quality guidelines levels are not met. One of the major contributors to air pollution in rural areas is brick Kilns (Skinder, 2014). Studies like Manisalidis, Stavropoulo, Stavropoulos & Bezitzoglou (2020) and Bickerstaff & Walker (2001) have consistently shown that air pollution is the largest environmental risk to health. Air pollution increases the chances of stroke (Lee, Miller & Shah, 2018), heart disease (Lee, Kim & Lee, 2014), lung cancer (Berg, et al. 2023), and chronic and acute respiratory diseases (Jiang, Mei & Feng, 2016). The combined effects of ambient air pollution and household air pollution have influenced over 6.7 million premature deaths every year (Fuller et al., 2022). Moreover, 89% of those premature deaths have occurred in low-and middle-income countries (Glencross et al., 2020). The economic influence of brick kiln factories is demonstrated by the fact that it is a multi-million-dollar industry in Nepal (Bhattacharya, 2018). Moreover, due to regulations, most of the brick kilns are present in rural areas which has resulted in the injection of significant amounts of money towards the rural local economy through market activities. In the context of increasing urbanization and recovery from the collapse of thousands of buildings from the 2015 earthquake, the brick industry has played a large role in reconstructing the country (Shrestha & Thygerson, 2019). The presence of brick industries can impact traditional livelihoods in the area. As people seek better income opportunities, they may shift away from traditional agricultural or practices (Mallick & Mohanty, 2019). Brick kilns are a significant source of air pollution, releasing harmful particulate matter and gasses like sulfur dioxide and nitrogen oxides. Studies have linked the emissions from brick industries to adverse health effects on local populations (Sarkar et al., 2017). Brick kilns often require substantial amounts of clay and other natural resources, leading to land degradation and deforestation in some cases (Kumar et al., 2021). This can result in habitat loss for local fauna and reduce ecosystem services. Studies have examined the effectiveness of various policy interventions, such as emission standards, technology up gradation, and labor rights protection (Mitra & Sharma, 2020). With the rapid growth of population and urbanization, brick industries are booming

in Nepal. Clay, which is available at a very low cost, is the main raw material for brick making. Hand molding of green bricks is widely practiced in Nepal and there is no mechanization of this process. At present, around 1,200 registered brick kilns are estimated to be operating throughout the country (Global Fairness Initiative, n.d.) whose brick production capacities range from 15,000 to 50,000 bricks per day. However, as brick industries are still considered as an informal industry sector, the number may further rise when included unregistered brick kilns (Groot, 2010).

Large amount of studies relating to brick-making industries are conducted on the pollution impact of the industry. While there are both negative and positive impacts outside of pollution, as pollution is such a large factor in the brick-making industries, there is a lack of study on the economic and social impact of the industries in the areas where they are settled. While research shows sufficient evidence to conclude that the environmental and economic factors are negatively influenced by the presence of brick making industry, there is insufficient data to identify the social and economic influence due to the presence of the industry.

## Objective of the Study

I. To explore the socio-economic and livelihood impact made by brick factory of in the study area.

II. To identify possible measures and options in order to addressing gaps, issues and challenges for overcoming negative impact brought by brick factories.

## Literature review

The Sustainable Livelihoods Approach is forwarded by the Department of International Development (DFIF). The livelihood assets are human capital, social capital, environment capital, and financial capital, represented by health factors, social factors, environmental factors, and economic factors (Serrat & Serrat, 2017). “A livelihood comprises the

capabilities, assets and activities required from stresses and shocks and maintain or enhance its capabilities and assets both now and in the future, while not undermining the natural resource base" (Chambers & Conway, 1991). The Keynesian theory of employment argued that during economic downturns, markets may not efficiently adjust to ensure full employment, leading to prolonged periods of high unemployment. According to his theory, aggregate demand plays a crucial role in determining the level of economic activity and emphasized the importance of government intervention, particularly through fiscal policy, to stimulate demand and drive economic growth. ILO (2015) estimated that every year around two million occupational deaths occur due to work-related cancers, circulatory and cerebrovascular diseases, and some communicable diseases worldwide. The overall annual rate of occupational accidents, fatal and non-fatal, is estimated at 270 million (Nenonen et al., 20014). The reviewed policies encompass a range of regulations that have been implemented and are under consideration in Nepal. The existing policies include the Industrial Enterprises Act of 2049 (1992) and the Industrial Enterprises Act of 2073 (2016), which have shaped the framework for industrial operations. Additionally, the Land Use Policy of 2069 (2012) and the Environment Protection Act of 2053 (1996) serve as crucial guidelines for sustainable development and environmental conservation. Several draft policies, including the Social Security Act, Minimum Occupational Health and Safety (OHS) Standards for Brick Industry Workers, and the Child Labour Inspection and Monitoring (CLIM) Guideline, are currently in the pipeline for future consideration and implementation. These policies collectively underscore Nepal's commitment to fostering sustainable and responsible development practices in various sectors.

Poor and unskilled workers who work seasonally in an agricultural or a construction sector choose to work in the brick factories (Shah, 2006). Few studies suggest that inequality, lack of proper job opportunities, lack of interest in the study, and facility where whole family members work together play a vital role for people to decide to work in brick kilns. The

work environment lacks job security and social benefits, provides lower wages, have long working hours, poor living conditions and no legal protection from the government (Goto, 2011, Sharma & Dangal,

2019). Moreover, people choose to work or send their children to work in the brick kilns due to the debt they usually take from contractors in advance (Rupakheti et al., 2018). As brick kilns operate only during winter and summer seasons, labour is recruited through contractors (Sharma & Dangal, 2019). Workers also come directly to the brick kilns. Those with a prior work experience, register their labour in advance for the next season. Once they sign a contract confirming their labour and accept money in advance from a broker, they are obliged to work to pay back the debt (Rupakheti et al., 2018). If they fail to pay the debt, they are bound to return to the same brick kilns for work at least to clear their debt. Otherwise, they have to pay the debt with a higher interest, which is almost impossible for a majority of the workers (Bhukuth, 2006). Exploring the perceptions and coping strategies of communities living near brick industries is essential in understanding how livelihoods are affected. Some studies have shown that communities develop resilience strategies to adapt to the changing socio-economic and environmental conditions (Roy et al., 2019).

There are massive negative impacts of the presence of brick kilns or brick factories on the environment. Bungamati, which is a part of Kathmandu Valley, carries a natural hazard towards pollutant air accumulation. Due to the topography of the valley, which is bowl-shaped, the airflow is restricted causing the pollution to accrue inside. This natural landscape of a valley makes it a higher risk for environmental consequences and suggests that emission-prone industries like brick-making should have a limited presence in the valley (Raut, 2003). The World Bank Study in 1996 revealed the major contributing sources for total suspended particles in the air were cement factories (36%), and brick kilns (31%) (Bhat, et al., 2014).

The importance of brick-making factories is highlighted in the economic development of the cities. Brick factories are a large job-providing industry

due to their massive labor-intensive nature. It helps in the economic up-liftment of laborers and provides laborers with stable and consistent wages (Jerin, et al., 2016). Unlike the economic impact, the socio-economic impact of the brick-laying factories is conflicted. On one hand, it provides job opportunities to semi-skilled and unskilled laborers. Studies also show that the working and living conditions of workers in the brick kiln are worse in most cases (Lelia & Maria, 2012). The presence of brick-making factories leads to pollution in major areas of life like air, water, and land. This, over a long period of exposure, negatively influences the health of the people living in the surrounding (Raza & ali, 2021). Brick kiln operations induced air pollution is one of the severe problems worlds facing today, especially for developing countries like Nepal. Brick industries are growing rapidly in Bangladesh, India, and Nepal where more than 108,000 brick kilns are in operation and, thus, air pollution increases along with it; resulting in degradation of ecological condition, acute and chronic effects on human health and also property damages (Fatima, 2011 & Pariyar, 2013). School children nearby brick kilns were had the worse condition of health and they were suffered for higher prevalence of upper respiratory tract infections like pharyngitis and tonsillitis (Joshi, 2008).

**Method and Data Sources**

A descriptive research study design was employed for this research. Ward number 22 of Lalitpur Metropolitan City, located half a kilometer from Bungamati bus park, was selected as the study site. Despite being part of Lalitpur Metropolitan City, this area, known as Koicha, is underdeveloped compared to the typically associated image of Lalitpur. Koicha hosts four brick kilns: 'UK Brick Kiln,' 'Newa Brick Kiln,' 'Shree Brick Kiln,' and 'Om Brick Kiln.' The presence of these brick-making factories has spurred development in Koicha (Mishra et al., 2020). Unlike many areas in the Kathmandu Valley where brick kilns have ceased operations, Koicha's kilns remain active, making it a suitable site for data collection. Koicha comprises 45 households (Municipality Profile, 2023). Out of these, 18 individuals, both male and female, work in the brick factories. These

workers constituted the sample size for analyzing the impact of brick factories on their socio-economic conditions and livelihoods. A census method was used to collect data from these 18 respondents. Additionally, 10 respondents, including local farmers not employed by the brick factories, were randomly selected for Focus Group Discussions (FGDs). Two FGDs were conducted with two groups of five local residents each. For Key Informant Interviews (KIIs), five individuals were selected: the ward chairperson, a male and a female ward member, a former ward chairperson, and a representative from Bungamati-22.

Primary data were collected through scheduled interviews with all group members and leaders. Secondary data were obtained from various published documents and relevant organizational records and minutes. Ethical approval for the study was granted by the Department of Rural Development, Patan Multiple Campus, Tribhuvan University. Data were analyzed using SPSS version 21.

**Results**

Of the total respondents, most of the respondents (55.6%) were female and above two-fifth (44.4%) were male respondents. Similarly, the age group "40-50" (88.9%) shared the highest proportion followed by age group "30-40" (5.6%), and "50-60" (5.6%). In the same way, the most of the respondents (83.3%) were "Married" followed by "Unmarried "(11.1%) and "Divorced" (5.6%), "Buddhist" (50.0%), followed by "Hindu" (38.9%) and Christian (11.1%) respectively. Moreover, most of the respondents (72.2%) have worked for "More than 15 years" followed by "10-15 years" (27.8%).The more number of the respondents were “Labourer” (55.6%) followed by “Driver/helper” (16.7%), “Management” (16.7%), and “Accountant” and “Office staff” (5.6%) respectively (Table 1).

**Table 1: Distribution of respondents by socio-economic characteristics**

| **Gender** | **No.** | **Percent** |
|---|---|---|
| Male | 8 | 44.4 |
| Female | 10 | 55.6 |
| **Age group** | | |
| 30-40 | 1 | 5.6 |
| 40-50 | 16 | 88.9 |
| 50-60 | 1 | 5.6 |
| **Marital Status** | | |
| Married | 15 | 83.3 |
| Unmarried | 2 | 11.1 |
| Divorced | 1 | 5.6 |
| **Religion** | | |
| Hindu | 7 | 38.9 |
| Buddhist | 9 | 50.0 |
| Christian | 2 | 11.1 |
| **Years of working** | | |
| 10-15 years | 5 | 27.8 |
| More than 15 years | 13 | 72.2 |
| **Job Position** | | |
| Accountant | 1 | 5.6 |
| Driver/helper | 3 | 16.7 |
| Management | 3 | 16.7 |
| Labourer | 10 | 55.6 |
| Office staff | 1 | 5.6 |
| **Earnings** | | |
| 10 - 15 thousand | 5 | 27.8 |
| 15 - 20 thousand | 7 | 38.9 |
| 25-30 thousand | 6 | 33.3 |
| **Total** | **18** | **100.0** |
| Mean | 19722.2 | |
| Median | 19000.0 | |
| Std. Deviation | 5038.7 | |
| Minimum | 14000.0 | |
| Maximum | 30000.0 | |

Source: Field Survey, 2023.

Table 2 reveals that of the total respondents 5 have given land in lease to the brick factories. Among them, 40 percent earned Rs.10,000, Rs.15,000

by 20 percent and Rs.30,000 by 40 percent per month respectively. The majority of the respondents (83.3%) opined about the insufficiency of the earning where as it was few (16.7%) respondents opined about the sufficiency from the brick factory earnings. Those who opined insufficiency of the earning from the brick industries reported that they were managing their livelihood by "Agriculture & retail kirana shop" (46.7%) sharing the highest proportion followed by "Daily wage labor in local area" (20.0%), "Spouse as employee in carpet/ hospital/ other industries' (13.3%), "Agriculture as well as wage labor", "Small hotel" & "Goat and duck farming" with equal sharing (6.7%) respectively.

Of the total respondents, most of the respondents were "Labourer"(55.6%) sharing the highest proportion followed by "Driver/helper" (16.7%), "Management" (16.7%), "Accountant" (5.6%) and "Office staff" (5.6%) respectively.

**Table 2: Distribution of Respondents by Land Lease, Earning from Land Lease, Sufficiency or Insufficiency of Earning monthly and Managing Livelihood**

| **Land lease** | **No.** | **Percent** |
|---|---|---|
| 2 ropani | 2 | 40.0 |
| 3 ropani | 1 | 20.0 |
| 5 ropani | 2 | 40.0 |
| **Earning from Land Lease** | | |
| Rs10000 | 2 | 40.0 |
| Rs15000 | 1 | 20.0 |
| Rs30000 | 2 | 40.0 |
| **Sufficiency or Insufficiency** | | |
| Yes | 3 | 16.7 |
| No | 15 | 83.3 |
| **Managing Livelihood** | | |
| Agriculture & retail kirana shop | 7 | 46.7 |

| Land lease | No. | Percent |
|---|---|---|
| Spouse as employee in carpet/ hospital / other industries | 2 | 13.3 |
| Daily wage labor in local area | 3 | 20.0 |
| Agriculture as well as wage labor | 1 | 6.7 |
| Small hotel | 1 | 6.7 |
| Goat & duck farming | 1 | 6.7 |
| **Total** | **15** | **100.0** |

Source: Field Survey, 2023.

Table 3 reveals that the majority of the respondents means of earning was “Direct salary only” (72.2%) followed by “Direct salary & indirectly land lease (both)” (27.8%).The respondents, who opined satisfaction of the earning from the brick factory that the reason of satisfaction was " In overall it is OK to say sufficient, at least my land has been used by brick factory otherwise it would be barren" (83.3%) and "Personally saying I have got job & it has helped me to fulfill hand to mouth (16.7%) respectively. Similarly, respondents who opined dissatisfaction of the earning from the brick factory was "The work is risky so salary is not enough for us" (33.3%) sharing the highest proportion followed by "Not enough money for family expenditures" (25.0%), "Just enough for hand to mouth" (25.0%) and "Earning is not sufficient for medical treatment for my family" (16.7%) respectively.

**Table 3: Distribution of Respondents by satisfaction of earning from brick factory**

| Means of Earning | No. | Percent |
|---|---|---|
| Direct salary & indirectly land lease (both) | 5 | 27.8 |
| Direct salary only | 13 | 72.2 |
| Total | 18 | 100.0 |
| **Satisfaction status** | | |
| Yes | 6 | 33.3 |
| No | 12 | 66.7 |

| **Means of Earning** | **No.** | **Percent** |
|---|---|---|
| **Total** | **18** | **100.0** |
| **Reasons of Satisfaction** | | |
| In overall it is ok to say sufficient, at least my land has been used by brick factory otherwise it would be barren. | 5 | 83.3 |
| Personally saying I have got job & it has helped me to fulfill hand to mouth | 1 | 16.7 |
| **Total** | **6** | **100.0** |
| **Reasons of Dissatisfaction** | | |
| Not enough money for family expenditures | 3 | 25.0 |
| Just enough for hand to mouth | 3 | 25.0 |
| Earning is not sufficient for medical treatment for my family | 2 | 16.7 |
| The work is risky so salary is not enough for us | 4 | 33.3 |
| Total | 12 | 100.0 |

Source: Field Survey, 2023.

The respondents were asked to give their opinion whether brick factories had impacted positively on socio-economic and livelihood aspect of respondents. Most of the respondents opined "Local people & workers have suffered from different health problems so these places not appropriate for brick kilns" (33.3%) sharing highest proportion followed by "By looking air pollution, less productivity of land these kilns should be removed from here" (16.7%), ""Both positive (employment opportunities) & negative (health & environmental problem)" (11.1%), 'Due to environmental pollution these brick factories should not be here" (11.1%), "It is good opportunity for employment" (5.6%), "Good for me since it has helped me for livelihood" (5.6%), ”Bad for me since it has created many health problems like eye infection, cough etc" (5.6%), " There kilns have created health problem so need to remove from here" (5.6%), and " Shree Brick Kiln has paved road time to time and the kiln has also financially helped for society so it is ok" (5.6%) respectively (Table 4).

**Table 4: Distribution of Respondents by the opinion of brick factories impacted positively in the socio-economic and livelihood**

| Opinion | No. | Percent |
|---|---|---|
| Both positive (employment opportunities) & negative(health & environmental problem) | 2 | 11.1 |
| It is good opportunity for employment | 1 | 5.6 |
| Good for me since it has helped me for livelihood | 1 | 5.6 |
| Bad for me since it has created many health problems like eye infection, cough etc | 1 | 5.6 |
| Due to environmental pollution these brick factories should not be here | 2 | 11.1 |
| There kilns have created health problem so need to remove from here | 1 | 5.6 |
| Local people & workers have suffered from different health problems so these places are not appropriate for brick kilns | 6 | 33.3 |
| Shree Brick Kiln has paved road time to time and the kiln has also financially helped for society so it is ok | 1 | 5.6 |
| By looking air pollution, less productivity of land these kilns should be removed from here | 3 | 16.7 |
| **Total** | **18** | **100.0** |

Source : Field Survey, 2023.

## Regression Analysis

Multiple linear regression is a statistical technique that investigate the correlation between a dependent variable and multiple independent variables, aiming to understand and quantify the relationship, predict the dependent variable's value based on the independent variables values and identify the strength. For this purpose, "Respondents by opinion on brick factories impacted positively in the socio-economic and livelihood" was taken as dependent variable and "Salary", "Land earn", and "Long work/ years of working" were taken as independent variables.

**Model summary related to dependent and independent variables**

Model summary provides statistical measure (such as R-squared and p-values) that help to determine the goodness of fit of the model and the significance of the relationship.

**Model Summary**

| Model | R | R Square | Adjusted R Square | Std. Error of the Estimate | Change Statistics | | | | |
|---|---|---|---|---|---|---|---|---|---|
| | | | | | R Square Change | F Change | df1 | df2 | Sig. F Change |
| 1 | .986[a] | .972 | .886 | 1.10827 | .972 | 11.391 | 3 | 1 | .214 |

a. Dependent variable: brick factories impacted positively in the socio- economic and livelihood of people

b. Predictors: (constant) how long have you works in brick factory? How much do you earn from land lease to brick factory? How much are paid salary?

$R^2$ value of 0.75, 0.50 and 0.25 is characterized as strong, moderate and weak on academic research study (Sarstedt & Mooi, 2014). The R-square and adjusted R-square value are 97.2% & 88.6% explains the strong proportion of the variance in the dependent variable (total variation in dependent variable i.e. "brick factories impacted positively in the socio-economic and livelihood is due to independent variables viz. salary, land lease earning, long/years of working). The above table revealed that the model is fitted. The R-square value 97.2 % explains that a strong level of explanation for the dependent variable. The three dependent variables jointly effect the dependent variable.

**ANOVA table**

| Model | | Sum of Squares | df | Mean Square | F | Sig. |
|---|---|---|---|---|---|---|
| 1 | Regression | 41.972 | 3 | 13.991 | 11.391 | .214[b] |
| | Residual | 1.228 | 1 | 1.228 | | |
| | Total | 43.200 | 4 | | | |

a. Dependent Variable: brick factories impacted positively in the socio- economic and livelihood of people?

b. Predictors: (Constant), how long have u worked in brick factory? How much u earn by giving land on lease to brick factory? How much are u paid salary?

The ANOVA table indicates that the regression model, which includes years of working in brick factories, earning by land lease to brick factory and monthly salary as a predictor, is not significant on brick factories impacting positively in the socio-economic and livelihood for people. The p-value (0.214) is greater than 0.05. The evidence is for the null the hypothesis supporting the conclusion that the model is statistically not significant.

## Coefficient table

A coefficient table is a statistical model's tabular presentation of estimated coefficients, used in regression analysis to provide detailed information about the impact of each independent variable in dependent variable.

| Model | | Unstandardized Coefficients | | Standardized Coefficients | t | Sig. | Collinearity Statistics | |
|---|---|---|---|---|---|---|---|---|
| | | B | Std. Error | Beta | | | Tolerance | VIF |
| 1 | (Constant) | 13.248 | 3.679 | | 3.601 | .172 | | |
| | how much are you paid salary?(A) | -.001 | .000 | -.820 | -3.506 | .177 | .520 | 1.923 |
| | how much you earn by giving land on lease to brick factory?(B) | 3.463 | .632 | 1.054 | 5.478 | .115 | .768 | 1.302 |
| | how long have you worked in brick factory?(C) | .453 | .339 | .299 | 1.339 | .408 | .570 | 1.755 |

a. Dependent Variable: brick factories impacted positively in the socio- economic and livelihood of people?

**Note**: How much are you paid salary?: A
How much you earn by giving land on lease to brick?:B
How long have you worked in brick factory?: C

The unstandardized coefficient (B) for dependent variable is 13.248. This implies that, on average, one unit increase in independent variable is associated with 13.248 unit increase in the dependent variable. Similarly, the one unit change in the independent variable "A", makes -0.001 times change, one unit change in independent variable "B" makes 3.463 times

change in and one unit change in independent variable "C" makes 0.453 times change in dependent variable respectively. The unstandardized coefficient provides a specific estimate of the change in the independent variable while the standardized coefficients offers a standardized measure for comparison across the variables. Furthermore, the p-values 0.177, 0.115 and 0.408 for independent variables A, B and C respectively indicate that there is no significance association between the dependent variables and independent variables A, B and C. The value of VIF(variance inflation factor) is less than 5, so there is no problem of multicollinearity.

**Focus Group Discussion: Response from Local People**

The participants of Focus Group Discussion (FGD) asserted that brick factories were not contributing adequately to social improvement activities. Specifically, it was mentioned that Shree Brick Kiln was only seen paving roads by providing bricks, while other brick kilns remained passive regarding development efforts. Local residents highlighted that the brick factories did not offer regular health check-up facilities and reported the absence of health camps for both the community and the laborers, despite prevalent health issues caused by air and water pollution.

The number of brick kilns in the study area had increased significantly, severely impacting agriculture. While the brick factories had somewhat boosted the economy for those employed by them, the negative aspects, such as increased air and water pollution, led to the recommendation that these brick factories should be relocated. Participants noted that due to the loss of topsoil and various pollutants from the brick kilns, farmers had to change the types of crops they produced. Consequently, local farmers and residents involved in agriculture reported a significant reduction in land productivity near the brick factories.

**KII: Response from Local Authorities**

The current chairperson of the ward, Sagar Tuladhar, reported that the brick kilns have not followed to government regulations regarding their

operation. He noted that the local people are unaware of these regulations and the health problems associated with the brick factories. According to Tuladhar, there have been numerous issues caused by the brick factories in the area, but local residents do not recognize the severity of these problems. He explained that many locals find agricultural work too tedious and unprofitable, leading them to lease their land to brick factories. "I cannot do anything about such decisions," he said. He emphasized that if the land were not leased to brick kilns, these operations would not continue in the area. Additionally, he mentioned that while the brick kilns occasionally coordinate with the ward office, he has been in discussions with all the brick factories to ensure their participation in the ward's programs and to seek their assistance for the community.

The former chairperson of the ward, Prem Bhakta Maharjan, reported that brick kilns should be located far from human settlements. He suggested that if brick kilns are to remain, modern technology should be utilized to benefit both the community and the industry. Maharjan acknowledged that the brick kilns had contributed to the community by providing bricks at a reduced cost for park construction and by donating to local programs. He also emphasized that brick factories should adopt the Vertical Shaft Brick Kiln (VSBK) technology to operate more sustainably within human settlements.

According to the female ward member, Sukumaya Tamang, the brick factories have provided scholarships to some of the employees' children. She noted that no sectors or individuals have advised the brick factories to use modern technology to control air pollution. Tamang further added that the brick factories should adopt Vertical Shaft Brick Kiln (VSBK) technology to mitigate pollution.

Moreover, the ward male member Umesh Sthapit of Bungamati-22 reported that the brick kilns in this area have not adhered to the government's factory operation regulations. He mentioned that they have repeatedly informed the concerned authorities about the need to stop operating kilns within human settlements. Sthapit highlighted that, except for Shree Brick Kiln, which has provided bricks for road construction and social funding, other kilns have not contributed to the community or coordinated with the ward.

**Response from Clinics and Pharmacies**

Four pharmacies and clinics nearby told that laborers came with complaints about eye infection, skin problems, and breathing problems which are common issues associated due to the reduction of quality of air and water according to the pharmacists. The pharmacies also pointed out that these issues are not unique to laborers working in brick factories, and instead, is common amongst people of Khoicha. These issues are high in areas like Khoicha in compare to other places where large brick production factories are located. They

**Conclusion**

Based on findings, it is clear that respondents near brick factories were empowered by employment. Even most of the respondents working in brick factory were getting discount price while buying brick. Not only this, some of them had given their land for brick factories in lease and earning from the land also. While with these results, it is seen that brick factory has economically uplifted the life of respondents working in the concern. However, when satisfaction and dissatisfaction, management of livelihood by other means and opinion on impact of brick factory positively on people's socio-economic and livelihood aspects are seen then local people and respondents viewed these brick factories were not appropriate to operate in the study area as these kilns had been creating different health problems like eye infection, long cough, itching problem, reduction in the land productivity and even the resources such as water and land had been

mostly utilized by the factories. The majority of the respondents had negative views about brick production that is going on at the expense of public health and the natural environment. The local authorities were with one voice of removing the brick kilns from the study area. The in-depth physiological study is needed to be carried out for the better assessment of the effects of brick kiln emission. In such condition, eco-friendly brick kiln should be established. In the meantime, training programs for kiln workers and local inhabitants on health and safety measures should be organized regularly in order to raise environmental awareness as well as to maintain workers health and safety.

## REFERENCES

Aniyikaiye, T. E., Edokpayi, J. N., Odiyo, J. O., & Piketh, S. J. (2021). Traditional brick making, environmental and socio-economic impacts: A case study of Vhembe District, South Africa. *Sustainability*, *13*(19), 10659.

Berg, C. D., Schiller, J. H., Boffetta, P., Cai, J., Connolly, C., Klinke, A., Kitts, A. B., Lam, D., Mohan, A., Myers, R., Suri, T. M., Tammemägi, M. C., Yang, D., & Lam, S. (2023). Air Pollution and Lung Cancer: A review by International Association for the Study of Lung Cancer Early Detection and Screening Committee. *Journal of Thoracic Oncology*, *18*(10), 1277–1289. https://doi.org/10.1016/j.jtho.2023.05.024

Bhat, M. S., Afeefa, Q. S., Ashok, K. P., & Bashir, A. G. (2014). Brick kiln emissions and its environmental impact: A Review. *Journal of Ecology and the Natural Environment*, *6*(1), 1-11.

Bhattacharya, M. (2018). Physical and Socio-Economic Environmental Consequences of Brick Industry: A Case Study of Domohani Village. *J. Adv. Sch. Res Allied Educ*, *15*, 192-197.

Bickerstaff, K., & Walker, G. (2001). Public understandings of air pollution: the 'localisation' of environmental risk. *Global Environmental Change*, *11*(2), 133–145. https://doi.org/10.1016/s0959-3780(00)00063-7.

Chambers, R., & Conway, G. R. (1988). Sustainable rural livelihoods: *Practical concepts for 21st century*. IDS. https://www.ids.ac.uk/download.php?file=files/Dp296.pdf

Dangal, M. R., Sharma, b & Bartaula, B. (2021). Worker and workers' perception on existing labor laws in Nepal: A case of brick kilns worker of Lalitpur District. Labour Journal of Nepal. Vol.1 No.. https://ljn.gefont.org/.

Fatima, I. Impact of brick kiln emissions on the ambient air quality and vegetation: A case study of district Budgam. [MPhil. Dissertation] Department of Environmental Science, University of Kashmir, India 2011

Fuller, R., Landrigan, P. J., Balakrishnan, K., Bathan, G., Blüml, S., Bräuer, M., Caravanos, J., Chiles, T., Cohen, A., Corra, L., Cropper, M., Ferraro, G., Hanna, J. L., Hanrahan, D., Hu, H., Hunter, D., Janata, G., Kupka, R., Lanphear, B. P., . . . Yan, C. (2022). Pollution and health: a progress update. *The Lancet Planetary Health*, *6*(6), e535–e547. https://doi.org/10.1016/s2542-5196(22)00090-0.

Glencross, D. A., Ho, T. R., Camina, N., Hawrylowicz, C. M., & Pfeffer, P. E. (2020). Air pollution and its effects on the immune system. *Free Radical Biology and Medicine*, *151*, 56-68.

Government Of Nepal. (1992). Labour Act, 2048 (1992). Kathmandu: Government Of Nepal.

Government Of Nepal. (1993). Labour Rules, 2050 (1993). Kathmandu: Law Commission, Government Of Nepal.

Government Of Nepal. (2017). Labour Act, 2074. Kathmandu: Nepal Law Commission.

Grant, C., & Osanloo, A. F. (2014). Understanding, selecting, and integrating a theoretical framework in dissertation research: Creating the Blueprint for your "House." *Administrative Issues Journal*, *4*(2). https://doi.org/10.5929/2014.4.2.9.

Jerin, M. F., Mondol, S. K., Sarker, B. C., Rimi, R. H., & Aktar, S. (2016). Impacts of Brick Fields on Environment and Social Economy at Bagatipara, Natore, Bangladesh. *Journal of Environmental Science and Natural Resources*, *9*(2), 31-34.

Jha, A., Shakya, S., Zang, Y., Pathak, N., Pradhan, P. K., Bhatta, K. R., Sthapit, S., Niraula, S., & Nehete, R. (2017). Identification and treatment of Nepal 2015 earthquake survivors with posttraumatic stress disorder by nonspecialist volunteers: An exploratory cross-sectional study. *Indian J Psychiatry*, *59*(3), 320-327.

Jiang, X., Mei, X., & Feng, D. (2016). Air pollution and chronic airway diseases: what should people know and do? *PubMed, 8(1), E31-40*. https://doi.org/10.3978/j.issn.2072-1439.2015.11.50

Johnson, D. (2021*). Brickmaking: History and Heritage*. Amberley Publishing Limited.

Joshi SK, Dudani I. Environmental health effects of brick kilns in Katmandu valley. *Katmandu Uni Med J 2008; 6(1):3-11.*

Lee, B., Kim, B., & Lee, K. (2014). Air pollution exposure and cardiovascular disease. *Toxicological Research*, 30(2), 71–75. https://doi.org/10.5487/tr.2014.30.2.071.

Lee, K. K., Miller, M. R., & Shah, A. (2018). Air pollution and stroke. *Journal of Stroke, 20(1), 2–11*. https://doi.org/10.5853/jos.2017.02894.

Lelia, C., & Maria, S. (2012). Benefits and costs of the informal sector: the case of brick kilns in Bangladesh. *Journal of Environmental Protection, 2012.*

Manisalidis, I., Stavropoulou, E., Stavropoulos, A., & Bezirtzoglou, E. (2020). Environmental and Health Impacts of Air Pollution: *A review. Frontiers in Public Health,* 8. https://doi.org/10.3389/fpubh.2020.00014.

Mishra, A. L, Sah, D. P., Chaudhary, S., & Shakya, R. (2020). Status of Brick Kilns Stack Emissions in Kathmandu Valley of Nepal.

*Journal of Advanced Research in Civil and Environmental Engineering, 6(3 & 4),* 1-9. http://dx.doi.org/10.24321/2393.8307.201906.

Nenonen, N., Hämäläinen, P., Takala, J. & Saarela, K. L. (20014). Global estimates of occupational accidents and work-related Illnesses, World Congress, Frankfurt. doi: 10.13140/2.1.2864.0647.

Organization, W. H. (2023). WHO ambient air quality database, 2022 update: status report. World Health Organization.

Pariyar, S.K., Das, T., & Ferdous, T. (2013). Environment and health impact for brick kilns in Kathmandu Valley. *Int J Sci Tech Res 2013*; 2(5): 184-7.

Randolph, J. (2009). A guide to writing the dissertation literature review. Practical assessment, research, and evaluation, 14(1), 13.

Raut, A. K. (2003). Brick Kilns in Kathmandu Valley: Current status, environmental impacts and future options. Himalayan Journal of Sciences, 1(1), 59–61. https://doi.org/10.3126/hjs.v1i1.189.

Raza, A., & Ali, Z. (2021). Impact of air pollution generated by brick kilns on the pulmonary health of workers. Journal of Health and Pollution, 11(31). https://doi.org/10.5696/2156-9614-11.31.210906.

Serrat, O., & Serrat, O. (2017). *The sustainable livelihoods approach. Knowledge solutions:* Tools, methods, and approaches to drive organizational performance, 21-26.

Sharma, B. & Dangal, M. R. (2019). Seasonal child labour in Nepal's Brick Kilns: A study of its educational impact and parents' attitudes towards it. *Education and Work, 32(4), 586-597.* https://doi.org/10.1080/13639080.2019.1673886

Sharma, S., Gurung, K., Mishra, A., Bajracharya, S., Mathema, L., Hussain, A., ... & Pradhan, B. B. (2019). Industry under the Open Sky: An Exploration of the Political Economy of Brick Making in Nepal. International Centre for Integrated Mountain Development (ICIMOD).

Shrestha, S., & Thygerson, S. M. (2019). Brick kilns of Nepal: a non-governmental organization perspective. Open Journal of Safety Science and Technology, 9(01), 1.

Skinder, B. M. (2014). Brick kilns: Cause of Atmospheric Pollution. ResearchGate. https://doi.org/10.4172/jpe.1000112.

Snyder, H. (2019). Literature review as a research methodology: An overview and guidelines. *Journal of Business Research, 104, 333-339.*

Valentine, G. (2013). *Tell me about...: using interviews as a research methodology*. In Methods in human geography (pp. 110-127). Routledge.

Wanjule, P. B., Chandanshiv, S. B., & Aswale, S. (2015). Brick making in India–history. *International Journal of Marketing, Financial Services & Management Research, 4(11), 11-16.*