OSUN GEOGRAPHICAL REVIEW

Journal of the Department of Geography,
Osun State University, Osun State, Nigeria

Volume 6, 2024

ISSN: 2695 - 1959

Published by the
Department of Geography, Osun State University,
Osun State, Nigeria

CONTENTS

OSUN GEOGRAPHICAL REVIEW
Published by the Department of Geography, Osun State University, Osun State, Nigeria
ISSN: 2695 - 1959 Volume 6, 2024; 38 - 47

EFFECTS OF COTTAGE INDUSTRIES ON AMBIENT AIR POLLUTION IN NIGER SOUTH, NIGER STATE, NIGERIA

[1*]N. Ndako, [2]S. A. Mashi and [2]J. Y. Magaji
[1]Department of Geography Niger State College of Education, Minna.
[2]Department of Geography and Environmental Management, University of Abuja, Nigeria
Corresponding author's e-mail: nmandako@yahoo.com

Abstract
The impacts of cottage industry operations on the ambient air quality in Niger South, Niger State. Pollutants such as NO_2 (Nitrogen dioxide), SO_2 (Sulphur dioxide), CO (Carbon monoxide), NH_3 (Amonia), H_2S (Hydrogen Sulphide), CO_2 (Carbon dioxide) and PM (Particulate matter) were measured within ten (10) days at three (3) consecutive intervals across eight cottage industries, brass, pottery, sheabutter, blacksmith, locust bean, cassava processing, glass-work and kernel processing using the handheld mobile gas detectors. The generated data were presented in mean and compared with the National Environmental Standards and Regulations Enforcement Agency (NESREA) permissible limit for outdoor pollutants. The result showed traces of air pollutants (NO_2, SO_2, CO, NH3 and CO2) as well as particulate matter at the vicinity of the industries, which reflected the impacts of the cottage industries on the release of harmful pollutants into the immediate environment. Accordingly, the mean concentration of NO_2 within and 50m proximity to the glasswork processing industries (1.05 and 0.7μgm^3) were above the NESREA limit (0.5μgm^3). Similarly, SO_2 at the vicinity of the pottery (1.13μgm^3), blacksmith (1.54μgm^3), locust bean (2.21μgm^3) and glasswork (24.85μgm^3) were above the 1μgm^3 recommended by NESREA. The mean concentration of $PM_{2.5}$ at the vicinity of brass (140.6 ppm), pottery (131.2 ppm), blacksmith (122.5 ppm), shea-butter (106.4 ppm) and glasswork (95.4 ppm) were above the NESREA limit (80 ppm). The P-value of 0.000, 0.023 and 0.000 μgm^3, for the ambient mean concentration of CO_2, $PM_{2.5}$, and PM_{10} portrayed significant difference with respect to proximity (within, 50m and 100m buffer) to the cottage industries. In conclusion, the various production activities at the existing cottage industries in Niger South were contributing to the present-day air pollution at trace levels. This was due to the reliance of fuelwood, charcoal and the use of fossil fuel as energy sources. It is important that this cottage industries were linked to the national grid hydroelectricity to limit the rate of emission. In addition, financial credit support should be provided to the various actors in the cottage industries to enhance production and use of low-pollution technological tools in carrying out their operation.

Keyword: Cottage industries, Niger South, Pollutant

Introduction

The pressure to embrace a responsible environmental behavior, is increasingly considered as essential to sustainable growth and welfare of mankind (Liboni and Cezarino, 2012; Ávila-Romero and Albuquerque, 2018; Muzaffar *et. al.,* 2019). As such, concerns are always expressed about the socio-environmental impacts of all activities that human beings undertake as they can seriously challenge achievement of sustainable development. One area where environmental impacts are of much concern to sustainable development is production activities, which can occur at cottage, small, medium and large scales.

At the lowest level of the production ladder are the cottage industries which constitute an enterprise where products are made or services are rendered mostly from home or from a work-shed, generally by the owner or with the help of family members or limited number of wage earners, using simple technologies with very little or no formal organizational structure. Cottage industrial activities represent the commonest production system across many areas of the world producing myriad range of products such as leather and cotton goods, ceramic handicrafts, gems and jewelry, clothing and dresses, metal goods, etc. Among their key features include use of simple equipment and indigenous technology in producing goods; use of private resources and small capital to organize production process, and very little or complete absence of formal regulations and guidelines to allow production of unique products (Grigsby, 2015).

Cottage industries have shown their impacts on national and regional economies throughout the world. In both developed and developing countries, cottage industries have been recognized as an effective instrument for creating employment opportunities with a small amount of capital investment, equitable distribution of national income, balanced regional growth and development of rural and semi urban areas (Government of Gujarat, 2016). Beside this, cottage industries have aided the conservation of cultural heritage and indigenous knowledge. As a matter of fact, cottage industries have been widely acknowledged as the spring-board for sustainable economic development. Products from cottage industries are cherished as works of art, and are bought as presents and souvenirs by tourists.

In most parts of Africa, cottage industries of various items have been an important economic activity of local craftsmen (Ofune, 2010). In Nigeria, Mutabazi (2013) has argued that, the future of the country depends on the rural communities, that is why it is important to have indigenous industries improved. However, the activities of cottage industries have been reported to have some negative environmental footprint (Penadés-Plà *et. al.,* 2020; Casamayor *et. al.,* 2021). Hiralal, (2010) posited that cottage industries are associated with landuse/cover changes, water, soil and air pollution, most of which are localized environmental problems. As such this paper aimed to assess the impacts of cottage industry operations on the ambient air quality in Niger South, Niger State.

Methodology

Study Area

Niger South area of Niger State is located in the central part of Nigeria. It lies between longitude 4° 30' and 7° 00' east and latitude 8° 10' and 11° 8' north. It covers an area of 24, 741km^2. It is bordered by Paikoro, Bosso, and Wushishi local government to

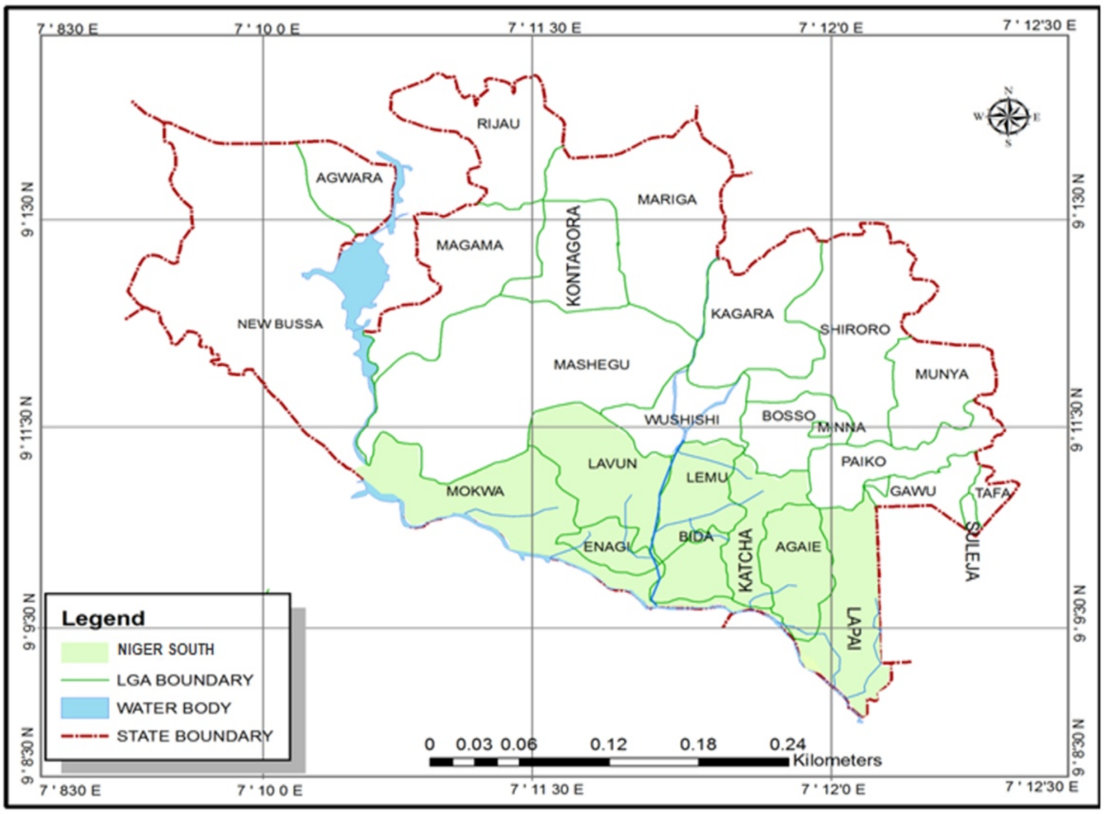

Figure 1: Niger State, highlighting Niger South

the West, Suleja Local Government, Federal Capital Territory to the East and River Niger to the south. It borders between Kogi and Kwara state (Osayande *et. al.,* 2016). The area lies within the tropical savanna climate, also called tropical wet and dry climate. The climate exhibits a well-marked rainy season and a dry season with a single peak known as the summer maximum due to the distance from the equator. Temperature is above 24°C throughout the year. The area has temperature range of 8°C and annual rainfall of 1,500mm with a single rainfall maximum in September (Osayande *et. al.,* 2016). Figure 1 showed the study area.

Study Materials

The air quality assessment was conducted in the dry season across eight cottage industries (brass, pottery, sheabutter, blacksmith, locust bean, garri processing, glass-work and kernel processing) when the cottage industry activities are pronounced. Using the handheld mobile gas detectors, measurement of harmful pollutants from the operations in the various cottage industries was examined. Particular pollutants include NO_2 (Nitrogen dioxide), SO_2 (Sulphur dioxide), CO (Carbon monoxide), NH_3 (Amonia), H_2S (Hydrogen Sulphide), CO_2 (Carbon dioxide) and PM (Particulate matter).

The measurement was taken for 10 days at three (3) consecutive interval within the concession of the cottage industries, 50meters away from the industrial vicinity and 100 meters away. This was to determine the variation of air pollution within the various cottage industries. The measurement was taken during active operations at the respective industries using the handheld mobile meteorological device. The results were compared with the NESREA (National Environmental Standards and Regulations Enforcement Agency) permissible limits for 24hours concentration of these gases in the ambient environment. This was to determine the compliance level of emission from the industries and to evaluate the industries with greater environmental and public health concerns.

Analysis

Both descriptive and inferential statistical tools were used to give meaningful explanation to the data obtained from the processes explained above. Descriptively, tools such as mean and standard deviation, were used to present the data for easy understanding (see equation 1 and 2).

Mean

$$\bar{X} = \frac{\sum X}{N} \quad eq1$$

Where: $\bar{X}$ = Mean
$\sum$ = Summation of the entire data points in the data set
N = Number of data points in the data set

Standard Deviation

$$\delta = \sqrt{\sum \frac{(X - \bar{X})^2}{N}} \quad eq2$$

Where: δ = Standard Deviation
$\sum$ = Summation of the entire data points in the data set
X = Value of the with point in the data set
$\bar{X}$ = The mean value of the data set
N = Number of data points in the data set

Anova

One-way anova statistical test was employed to check for the significant variation of air pollutants across the various cottage industries and the immediate environ (50 and 100m away). The equation is presented herein:

$$TSS = \Sigma_i \Sigma_j (X_{ij} - X_{++})^2$$

$$BSS = \sum_j n_j (X_{+j} - X_{++})^2$$

$$WSS = \Sigma_j \Sigma_j (X_{ij} - X_{Xj})^2$$

Where:

TSS = total sum of squares
BSS=between sum of squares
WSS=within sum of squares
X = individual observation
N= total numbers of observations

Table 1: Adopted Instrument

S/N	Instrument	Model	Purpose
1	Global Positioning System	GPSmap 60Cx	To obtain sampling points
2	HAZE Dust Particulate Monitor	GAXT-D-DL	To record PM concentration
3	BW Technologies Microclip X3	MCXL-XWHM-Y-NA	To record NO_2, SO_2, CO, CO_2, NH_3 and H_2S
4	Notepad/Pen	40 leaves/bic	For writing

Result Presentation and Discussion

The mean ambient air concentration levels of the pollutants were compared with the Nigerian standards established by National Environmental Standard Enforcement Regulatory Agency (NESREA).

Compliance Level of NO_2 Emission from the Respective Industries

The compliance level of average concentration of NO_2 recorded at the respective industries was presented in Figure 2.

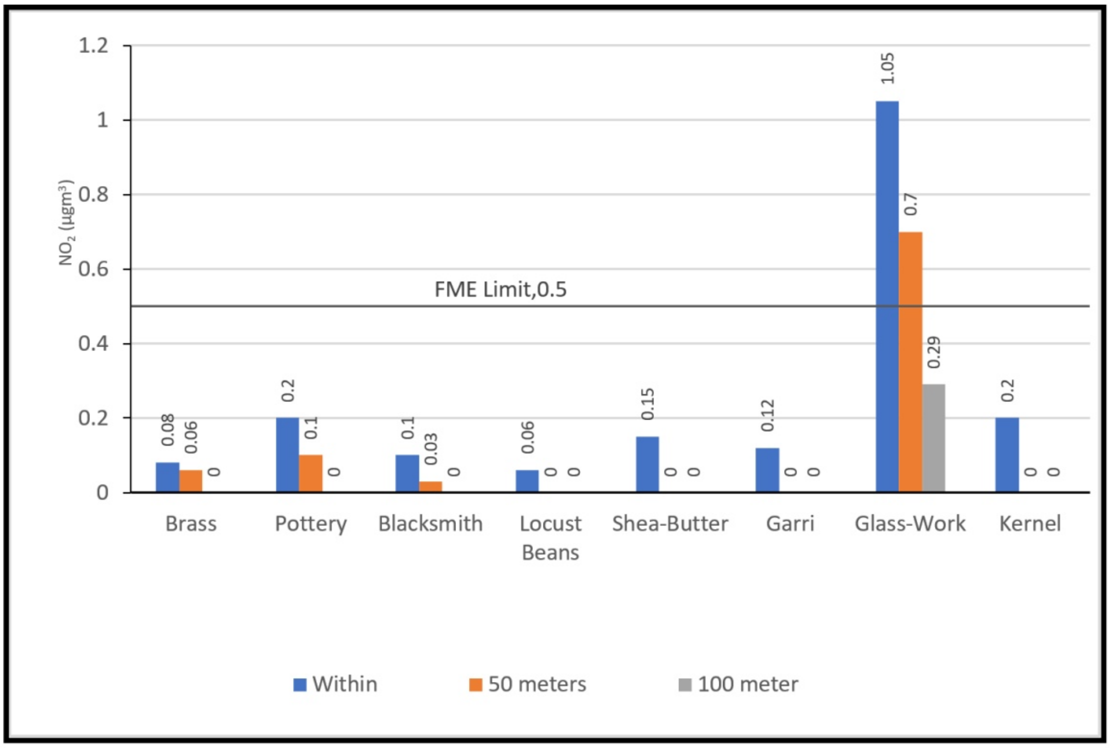

Figure 2: Compliance level of NO_2 to NESREA standard

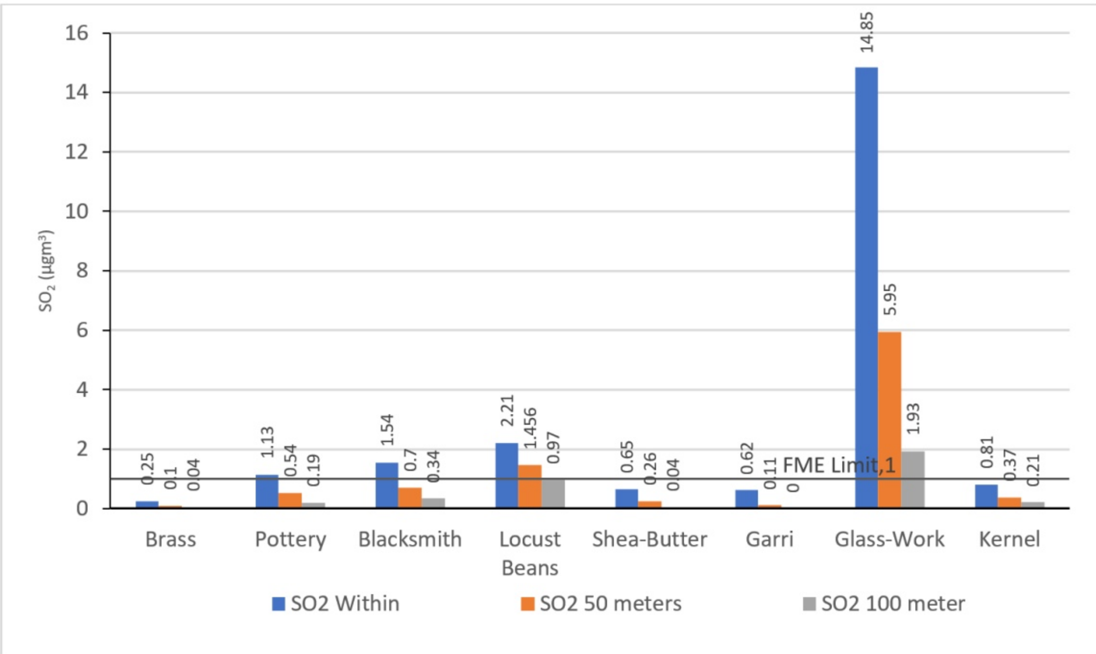

Figure 3: Compliance level of SO_2 to NESREA standard

The mean concentration of NO_2 measured at the respective industries were within the environmental standard set by NESREA

($0.5\mu gm^3$). However, the mean concentration of NO_2 within ($0.7\ \mu gm^3$) and at 50m buffer ($1.05\ \mu gm^3$) to the glasswork industry exceeded the NESREA standard. This implied that constituent of NO_2 pollutant from the industry was of significant concern to the immediate environment. This would go a long way to affect the health of workers and local practitioners of glasswork as well as inhabitants in the local communities.

The traditional process involved in glasswork processing encompassed smelting of existing glass and bottles obtained from different waste stream such as medical, beverages and cosmetics. These materials in turn were made of different chemicals which when subjected to furnace and heating the toxic chemicals were forced to expel into the air under open furnace heating, which was common among local glasswork industry in the area. This afterward increased emission of gaseous pollutants into the immediate environment.

Compliance Level of SO_2 Emission from the Respective Industries

The compliance level of average concentration of SO_2 recorded at the respective industries was presented in Figure 3. The mean concentration of emitted SO_2 at the brass industry, pottery industry, shea-butter industry, garri processing plant and kernel industry were all within the ambient permissible standard for outdoor SO_2 ($1\mu gm^3$). However, at the immediate vicinity of the blacksmith industry, the mean concentration of SO_2 ($1.54\mu gm^3$) exceeded the NESREA standard. Similarly, the mean concentration of SO_2 within ($2.21\mu gm^3$) and at 50m buffer ($1.46\mu gm^3$) to the locust-bean industry were above the set standard established by NESREA. An outlier of ambient mean concentration of SO_2 was recorded at the glasswork industry. This ranged from $14.85\mu gm^3$ within the industry to $5.95\mu gm^3$ and $1.093\mu gm^3$at 50m and 100m buffer to the glasswork industry. This obviously meant that concentration of SO_2 observed at the blacksmith and locust-bean industry could be attributed to the high reliance of fuelwood energy as major source of heating at the respective industries. The emission of SO_2 above recommended standard at the glasswork industry could be attributed to the material choice that fed the production process, which included bottle and glass obtained from waste stream –particularly cosmetics, beverages, drinks, and medicals. Research showed that the use of clean energy for industrial activities would invariably eliminate the rate of pollution of gaseous element into the environment (Perera, 2018).

Compliance Level of CO Emission from the Respective Industries

The juxtaposed standard for outdoor standard concentration of CO postulated by NESREA and the ambient mean CO recorded at the various industries was presented in Figure 4. Accordingly, the mean concentration of ambient CO recorded at the brass industry, locust-b bean industry and kernel processing industry concurred with the standard set by NESREA ($2\mu gm^3$).

In contrast, the ambient mean concentration of CO recorded at the vicinities of the Pottery industry ($3.45\ \mu gm^3$), blacksmith industry ($2.84\ \mu gm^3$) and shea-butter industry ($2.08\ \mu gm^3$) were slightly above the permissible limit for safe atmosphere set by NESREA. At the immediate vicinities and 50m buffer, the ambient concentration of CO at the garri processing industry (8.55 and $2.87\ \mu gm^3$) and the glasswork industry (5.69 and $2.71\ \mu gm^3$) were obviously greater than the recommended standard. Thus, dwellers within these industries would inevitably be exposed to this pollutant. Study document that increases level of exposure to CO could lead to health complications (Allen *et. al.,* 2015). For vulnerable groups such as children and adult as well as persons with health challenges, effects from long-term exposure could lead to chronic obstruction, pulmonary diseases, asthma as well as lower respiratory tract infections and possible lung cancer (Woodward *et. al.,* 2014).

Compliance Level of NH_3 Emission from the Respective Industries

Trace of NH_3 was only recorded at the locust-bean, shea-butter and garri processing industries (Figure 5). The mean concentration of NH_3 at these industries was below the permissible standard for daily concentration of NH_3 established by NESREA ($2\mu gm^3$). Thus, the emission of NH_3 from the respective industries was insignificant and was expected to pose no health challenges to both workers at the industries as well as the general local populace.

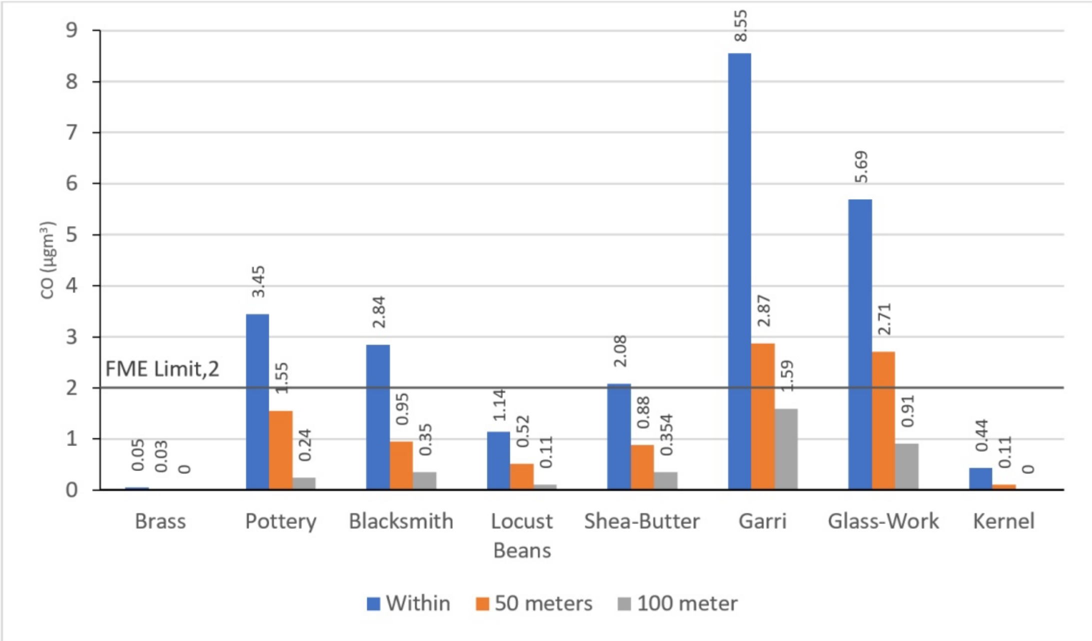

Figure 4: Compliance level of CO to NESREA standard

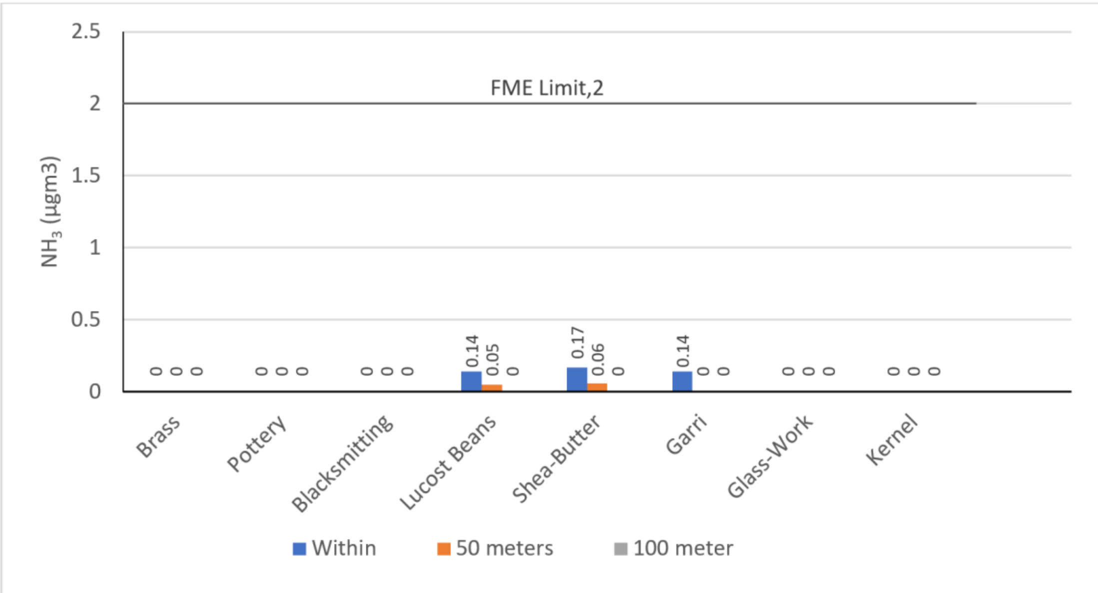

Figure 5: Compliance level of NH_3 to NESREA standard

Compliance Level of CO_2 Emission from the Respective Industries

Figure 6 showed that the mean concentration of CO_2 recorded at the respective industries were well below the recommended standard for daily outdoor CO_2 concentration established by NESREA (500μgm^3). However, at the immediate vicinity of the glasswork industry, average recorded concentration of CO_2 (641.6μgm^3) was well above the recommended standard. Source of contribution to the high rate of CO_2 emission could be associated with traditional fuelwood energy used to power the furnace as well as the foundering of various glass materials with toxic constituents. This is particularly worrisome to workers' health. Significant body of literature have shown that exposure to CO_2 at less than the permissible levels could triggered much health complications, which could lead to death (Allen *et. al.,* 2016).

Compliance Level of Particulate Matter Emission

Mean concentration of $PM_{2.5}$ at 50m to 100m buffer to the various industries were within the NESREA established standard of 80 ppm (Figure 7). However, within the concession of the brass industry (140.6 ppm), pottery industry (131.2 ppm), blacksmith industry (122.5 ppm), shea-butter industry (106.4 ppm) and glasswork (95.4 ppm), the recorded mean concentration of $PM_{2.5}$ were above the NESREA standard. Accordingly, the observed mean concentration within these industries could be attributed to the over reliance on fuelwood for energy.

This result was indifferent to the findings of Enotoriuwa *et. al.,* (2016) in Obigbo area of River State. Their findings showed that ambient concentration of $PM_{2.5}$ ranged from 86-108 ppm, exceeding the established standard. Accordingly, a lot of health burden may abound. According to

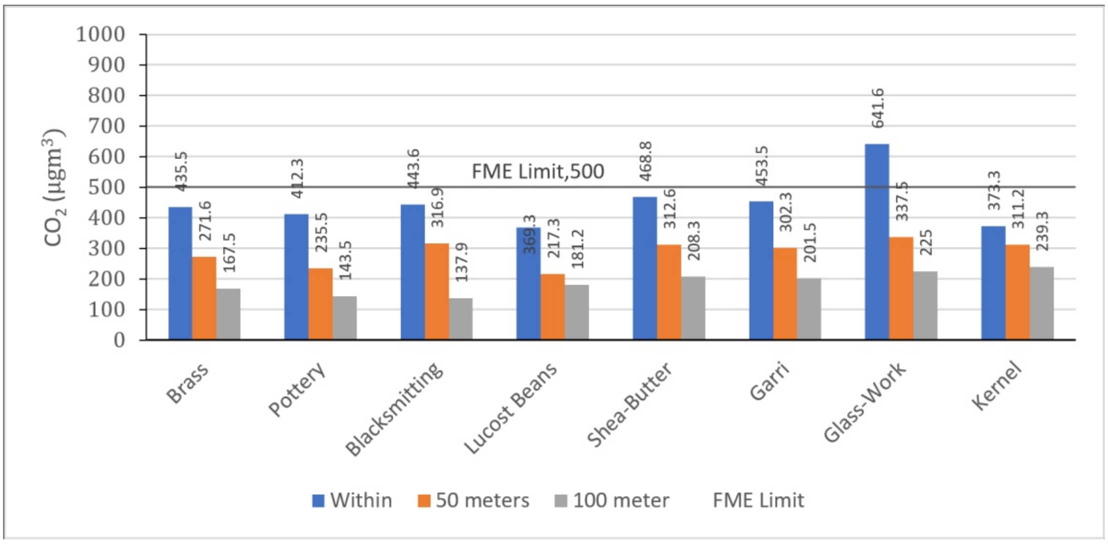

Figure 6: Compliance level of NH_3 to NESREA standard

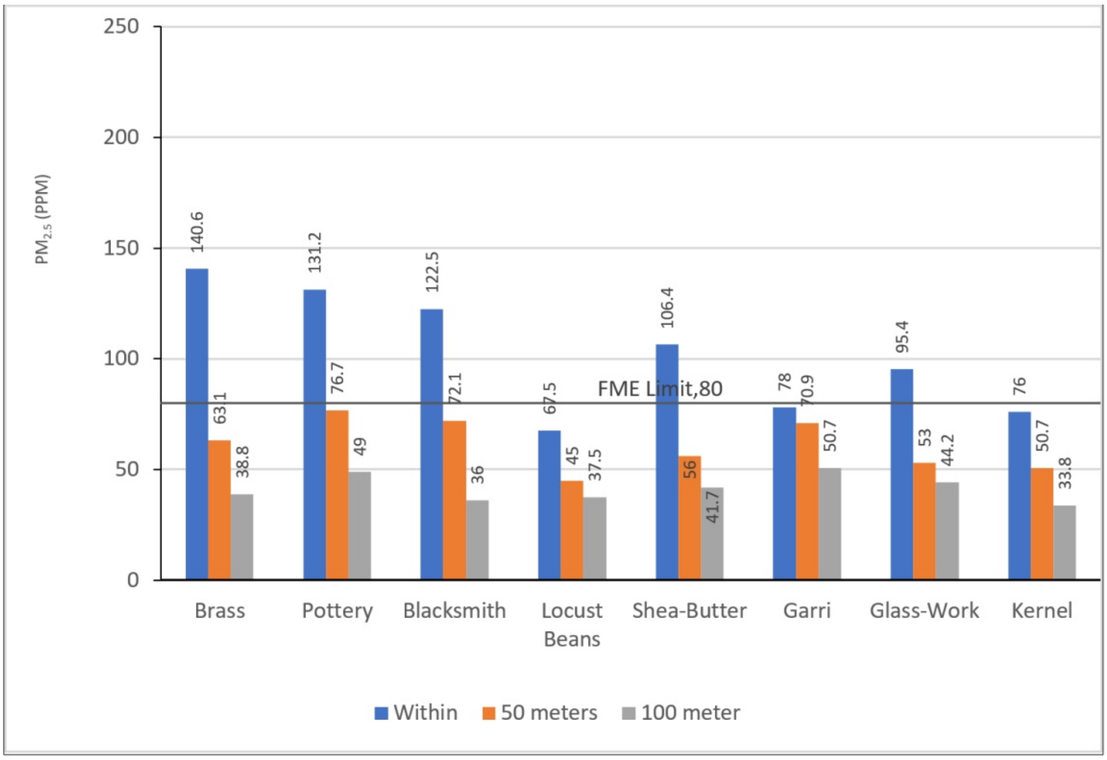

Figure 7: Compliance level of $PM_{2.5}$ to NESREA standard

Quian (2017), even in areas where $PM_{2.5}$ met federal standards, medicare recipients who were exposed to more air pollution might have higher mortality rate. Contrary to the high amount of ambient mean concentration of $PM_{2.5}$ in contradiction to the NESREA standard, the observed ambient mean concentration of PM_{10} within and around the respective industries were below the recommended standard established by NESREA (Figure 8).

Hypotheses Testing

The mean variation of gaseous pollutant from source points (Industries) to the immediate environment showed considerable distinction. As discussed earlier, the rate of emission differed from the immediate industrial areas to as far as 50m to 100m buffer zone to the industries. However, conclusion on this fact was drawn with a postulated null hypothesis (Ho: There is no significance difference in the mean concentration of pollutants from the respective cottage industries) tested at 95% confidence level using the variance test (Anova statistics) as shown in Table 2.

Table 5.37 showed that mean concentration of pollutant measured at three distance intervals (within, 50m and 100m buffer) in the studied industries. The result showed that mean concentration of NO_2 was not statistically significant given the *P-value* of 0.273 μgm^3. Similarly, given the result of '$F = 1.398$, $d.f = 2$, $P\text{-}value = 0.338\ \mu gm^3$', the mean recorded ambient SO_2 at the distance interval in the respective industries was also not statistically significant.

Likewise, ambient-recorded mean NH_3 was not statistically significant at the respective industries in respect to distance intervals. This was in reflection to the statistical results ($F = 3.25$, $d.f = 2$, $P\text{-}value = 0.062\ \mu gm^3$). The result also depicted that the recorded ambient mean CO at the respective intervals within the studied industries was not significant ($F = 5.137$, $d.f = 2$, $P\text{-}value = 0.017\ \mu gm^3$). In contrast, given by the P-value of 0.000, 0.023 and 0.000 μgm^3, the ambient mean concentration of CO_2, $PM_{2.5}$, and PM_{10} were statistically significant. This portrayed that the mean concentration of CO_2, $PM_{2.5}$, and PM_{10} recorded with respect to proximity (within, 50m and 100m buffer) to the respective industries varied statistically with higher concentration recorded within the vicinity of the industries, which invariably decreased significantly with increase in distance from the source point (industry).

This finding indicated that people living less than 50m proximity to the respective industries were potentially at risk to the exposure of CO_2, $PM_{2.5}$, and PM_{10} pollutants as well as the associated health

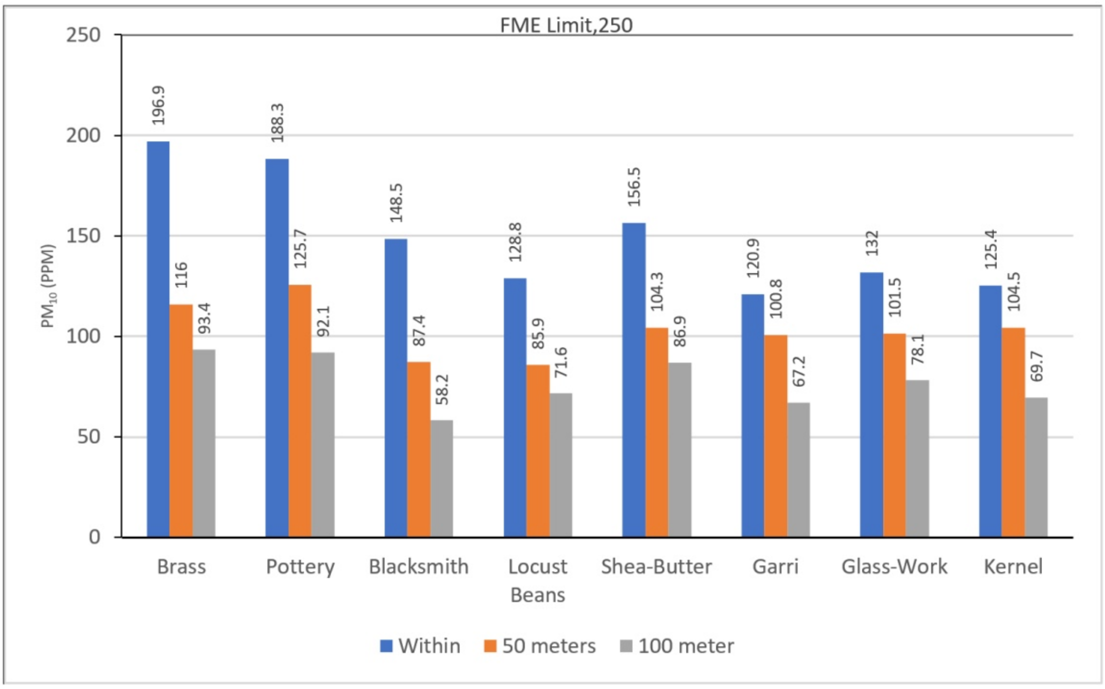

Figure 8: Compliance level of PM_{10} to NESREA standard

Table 2: Results of Analysis of Variance of the various parameters analysed

	SV	*SS*	*df*	*MS*	*F*	*P-value*	*F crit*
NO_2	BG	0.19	2	0.09	1.398	0.273	3.555
	WG	1.20	18	0.07			
	Total	1.39	20				
SO_2	BG	24.6	2	12.3	1.1544	0.338	3.555
	WG	191.4	18	10.6			
	Total	216.0	20				
NH_3	BG	0.02	2	0.008	3.25	0.062	3.555
	WG	0.04	18	0.002			
	Total	0.06	20				
CO	BG	32.16	2	16.1	5.137	0.017	3.555
	WG	56.35	18	3.13			
	Total	88.51	20				
CO_2	BG	242538.0	2	121269.0	30.18	0.000	3.555
	WG	72327.6	18	4018.2			
	Total	314865.6	20				
$PM_{2.5}$	BG	2822.6	2	1411.3	4.658	0.023	3.555
	WG	5453.8	18	303.0			
	Total	8276.3	20				
PM_{10}	BG	16482.4	2	8241.2	28.22	0.000	3.555
	WG	5256.6	18	292.0			
	Total	21739.0	20				

Source: Authors work (2022)

effects to increasing level of exposure to CO_2, $PM_{2.5}$, and PM_{10}. Most worrisome was the workers at these industries. It is believed that they might be exposed to the harmful effects of these pollutants on a daily basis.

Conclusion

Traces of air pollutants (NO_2, SO_2, CO, NH3 and CO2) as well as particulate matter are recorded at the vicinity of the respective industries, which reflect the impacts of the cottage industries on the release of harmful pollutants into the immediate environment. Accordingly, the mean concentration of NO_2 within and 50m proximity to the glasswork processing industries (1.05 and 0.7µgm^3) are above the NESREA limit (0.5µgm^3). Similarly, SO_2 at the vicinity of the pottery (1.13µgm^3), blacksmith (1.54µgm^3), locust bean (2.21µgm^3) and glasswork (24.85µgm^3) are above the 1µgm^3 recommended by NESREA.

Mean values of CO at the vicinity of pottery and blacksmith industries (3.45µgm^3) are above the NESREA limit (2.84µgm^3) as well as the mean value recorded at the vicinity and at 50m away to the garri (8.55 and 2.87 µgm^3) and glasswork (5.69 and 2.71µgm^3) industries. Similarly, mean concentration of CO_2 in the respective industries is within the NESREA limit (500ppm) except for glasswork, which have high concentration (641.6 ppm). The mean concentration of $PM_{2.5}$ at the vicinity of brass (140.6 ppm), pottery (131.2 ppm), blacksmith (122.5 ppm), shea-butter (106.4 ppm) and glasswork (95.4 ppm) are above the NESREA limit (80 ppm).

The P-value of 0.000, 0.023 and 0.000 µgm^3, for the ambient mean concentration of CO_2, $PM_{2.5}$, and PM_{10} portray significant difference with respect to proximity (within, 50m and 100m buffer) to the respective cottage industries.to conclude the various production activities at the existing cottage industries in Niger South are contributing to the present-day air pollution at trace levels. This is due to the reliance of fuelwood, charcoal and the use of fossil fuel as energy source. It is important that this cottage industries are linked to the national grid hydroelectricity to limit the rate of emission. In addition, financial credit support should be provided to the various actors in the cottage industries to enhance production and use of low-pollution technological tools in carrying out their operation.

References

Allen, J.G., MacNaughton, P., Satish, U., Santanam, S., Vallarino, J., and Spengler, J.D. (2015). Associations of Cognitive Function Scores with Carbon Dioxide, Ventilation, and Volatile Organic Compound Exposures in Office Workers: A Controlled Exposure Study of Green and Conventional Office Environments. *Environmental Health Perspectives*, 124(6). doi:10.1289/ehp.1510037

Ávila-Romero, A., Albuquerque, J. (2018). *Socio-environmental impacts of African oil palm cultivation*: mexican and Brazilian. Economía Sociedad vol. 23n. 53.

Casamayor, H.F., Martínez, J.L.M., Mora-Rodríguez, J., Delgado-Galván, X. (2021). *Assessing Industrial Impact on Water Sustainability in El Bajío, Guanajuato State, Mexico. Sustainability 1*3: 6161. https://doi.org/10.3390/su13116161

Enotoriuwa, R.U., Nwachukwu, E.O., and Ugbebor, J.N. (2016). Assessment of Particulate Matter concentration among Land Use Types in Obigbo and Environs in Rivers State Nigeria. International Journal of Civil Engineering and *Technology*, 7(3): 252-261.

GoG (Government of Gujarat) (2016). Cottage & Rural Industries Policy 2016. Office of the Commissioner, Cottage and Rural Industries Industries and Mines Department Government of Gujarat Gandhinagar, India. GR No.: CIP/102016/151/Kh Sachivalaya, Gandhinagar.

Grigsby, M., Jeanetta, S., Jivetti, B. (2015) Benefits and challenges of micro-enterprise participation: women's cottage industry in Kaimosi, Kenya. *Development in Practice*, 25(8), 1146-1159.

Hiralal, K. (2010). The "invisible" workers of the informal economy—A case study of home-based workers in Kwazulu/Natal, South Africa. Journal of Social Science 23: 29–37.

Liboni, L.B. and Cezarino, L.O. (2012). Social and environmental impacts of the sugarcane industry. *Future Studies Research Journal*, 4(1), 196 – 227.

Mutabazi K. Wiggins, S and Mdoe, N (2013). Commercuialization of African small holder industries: the case of small holder industrialists in central Tanzania; *Future Agruicultural/Industrial working paper* 072; 2-32.

Muzaffar, A., Khurshid, A., Malik, M.N., Azhar, A. (2019). Sustainable development across the supply chain: The missing link of socio-environmental effect. *Sustainable Development,* 27(5), 976-981.

Ofune, J.A. (2010). *Modern Regional Geography,* Idodo Umeh Publishers Ltd.

Osayande, P.E., Oviasogie, P.O., Orhue, E.R., Udoh, J.J. and Awanlemhen, B.E. (2016). Distribution of Forms of Potassium in Soils Cultivated to Shea (Vitellaria Paradoxa C.F. Gaertn) Trees at Bida, Niger State, Nigeria. *Nigerian Journal of Soil Science*, 26, 325 -333.

Penadés-Plà, B.V., Martínez-Muñoz, D., García-Segura, T., Navarro, I.J., and Yepes, V. (2020). *Environmental and Social Impact Assessment of Optimized Post-Tensioned Concrete Road. Sustainability* 2020, 12, 4265; doi:10.3390/su12104265

Perera, F. (2018). Pollution from Fossil-Fuel Combustion is the Leading Environmental Threat to Global Pediatric Health and Equity: Solutions Exist. Int J Environ Res Public Health, 15(1): 16.

Quian, D. (2017). Air Pollution and Mortality in the medicare population. New England Journal medicine, 376(26), 2513-2522.

Woodward, A., Smith, K. R., Campbell-Lendrum, D., Chadee, D. D., Honda, Y., Liu, Q., … Haines, A. (2014). Climate change and health: on the latest IPCC report. *The Lancet,* 383(9924), 1185–1189. doi:10.1016/s0140-6736(14)60576-6