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Examination of the effects of industrial air pollution on real estate investment in Warri, Delta state

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ABSTRACT
This study was necessitated by the need to improve measures for controlling industrial air pollution on real estate investments. It examined the effect of industrial air pollution on real estate investment in Warri, Delta State. Four research questions guided the study and one null hypothesis was tested at 0.05 level of significance. Descriptive survey research design was employed for the study. The population consisted of 205 industrial workers, designated staff in the Federal and State Ministries of Health and Environment, Estate Surveying and Valuation firms and occupiers and owners of commercial properties in the industrial air polluted areas of Warri Delta State. A sample of 135 was drawn from population of 205 using Taro Yamane's formula. The instrument for data collection was a structured questionnaire. The instrument was validated by three experts. Cronbach Alpha method was used to determine the reliability of the instrument. The hypotheses were tested using Pearson Correlation Coefficient. Findings of the study revealed that major causes of industrial air pollution in Warri among others are burning coal; burning fossil fuels like oil, natural gas, and petroleum. It was also revealed that the effects of industrial air pollution on the value of properties are: increase in maintenance cost; decrease in real gross income; poor infrastructure or territorial development system; high tax rate and local payment; interest rate applied to a credit; and difficulties for construction investment. The study concluded that air pollution results to less competition on the property and rent market which reduces property value and price. High maintenance cost; poor management of the pollution affects the profitability of properties in the area. Industry Site Selection and Planning; Proper Treatment of Industrial Waste; Stricter environmental Laws and Enforcement; adopting new technology for industrial waste management; regular environmental impact assessments; rebuilding habitats and afforestation; modern recycling and drainage system, are the measures for proper controlling of industrial air pollution. It was recommended among others that Industry Site Selection consideration of location of the sites and the potential impact on the surrounding environment and proper treatment of industrial waste by developing and implementing adequate treatment facilities for handling industrial waste and proper habits can reduce air pollution thereby improving property values in the area.

KEYWORDS
Industrial Air Pollution; Real Estate Investment

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INTRODUCTION

Growth in industrialization has created a tremendous increase in waste byproducts. The indiscriminate discharge of untreated industrial and domestic wastes into waterways, the spewing of thousands of tons of particulates and airborne gases into the atmosphere, the "throwaway" attitude toward solid wastes, and the use of newly developed chemicals without considering potential consequences have resulted in a lot of environmental disasters throughout the world. Although industrialization is inevitable, various devastating ecological and human disasters which have continuously occurred over the years implicate industries as major contributor to environmental degradation and pollution processes of various magnitudes (Dan'azumi and Bichi, 2010cited in Dudek-Dyduch and Raczka,2011).

Pollution as defined by Mba (2014) is seen as the action of polluting or the state of being polluted, or an area or masses of substances or another thing that polluted. According to him pollution is often a slow, continuous process; it could be the presence of high qualities of any entity in the wrong place. This indicates that a specific substance cannot in itself be labeled a pollutant. It becomes a pollutant when concentrations of the substance are too great to sustain health in any given place. Pollution is one of the most serious problem facing humanity and other life form on our planet today. Pollution can also be defined as the contamination of the physical and biological components of the earth/ atmosphere system to such an extent that normal environmental processes are adversely affected exact

Pollutants may cause primary damage, with direct identifiable impact on the environment, or secondary damage in the form of minor perturbations in the delicate balance of the biological food web that are detectable only overlong time periods (Anayogu,2016). In addition, according to Nwachukwu and Ugwuanyi, (2010), they may be natural or man-made. Pollutants can be classified as primary or secondary. Usually, primary pollutants are directly produced from a process, such as ash from a volcanic eruption, the carbon monoxide gas from a motor vehicle exhaust or sulphur dioxide released from factories. Secondary pollutants are not emitted directly rather, they form in the air when primary pollutants react or interact. An important example of a secondary pollutant is ground level ozone; one of the many secondary pollutants that make up photochemical smog. Some pollutants may be both primary and secondary: that is, they are both emitted directly and formed from other primary pollutants (British Property Glossary, 2013).

According to Tawari and Bowie (2012), environmental Pollution is any discharge of material or energy into water, land, or air that causes or may cause acute (short-term) or chronic (long-term) detriment to the Earth's ecological balance or that lowers the quality of life. Air pollution is the introduction into the atmosphere of chemicals, particulates, or biological materials that cause discomfort, disease, or death to humans, damage other living organisms such as food crops, or damage the natural environment or built environment. A substance in the air that can be averse to humans and the environment is known as an air pollutant. Pollutants can be in the form of solid particles, liquid droplets, or gases. Pollutants may cause primary damage, with direct identifiable impact on the environment, or secondary damage in the form of minor perturbations in the delicate balance of the biological food web that are detectable only over long time periods. Environmental pollution means all the surrounding conditions which influences growth and development (air, water, land, atmosphere and space) against pollution (DERID 2000). Udoudo (2006) observed that in some localities in Nigeria, especially among the river line communities of the Niger Delta region, one can hardly find modern toilet facilities. In this context, pollution is any discharge of material or energy into water, land, or air that causes or may cause acute (short-term) or chronic (long-term) detriment to the Earth's ecological balance or that lowers the quality of life.

According to Olujimi, Adewumi, and Odunwole (2011) pollution can be grouped into; Water pollution, Thermal pollution, Land pollution, Radiation Pollution, Noise pollution and Air pollution Air pollution is believed to be severe in some of the world's fastest-growing urban regions, where greater economic activity is contributing to higher levels of pollution and to greater exposure. Majority of industries in Nigeria continue to depend on burning solid and liquid fuels such as wood, charcoal, coal, dung, diesel, kerosene and petrol in their industrial production, cooking and heating. The health risk posed by the industrial air pollution is believed to have affected the life and real estate values of industrial areas. In 2013, about 93 percent of deaths and non-fatal illnesses attributed to air pollution worldwide occurred in African countries, where 90 percent of the population was exposed to dangerous levels of air pollution (Forouzanfar 2015).

Also, air pollution is the accumulation in the atmosphere of substances that, in sufficient concentrations, endanger human health or produce other measured effects on living matter and other materials. The Major primary air pollutants produced by human activities according to Berry and Watson, (2012) include:

(1) Sulphur oxides (SO) - especially sulphur dioxide, a chemical compound with the formula

(2) SO2. SO2 is produced by volcanoes and in various industrial processes. Coal and petroleum contain sulphur compounds, therefore their combustion generates sulfur dioxide. Further oxidation of SO2, usually in the presence of a catalyst such as NO2, forms H2SO4, and thus acid rain. This is one of the causes for concern over the environmental impact of the use of these fuels as power sources.

(3) Nitrogen oxides (NO) - especially nitrogen dioxide is expelled from high temperature combustion and are also produced naturally during thunderstorms by electric discharge. They can be seen as the brown haze dome above or plume downwind of cities. Nitrogen dioxide (NO2) is one of the several nitrogen oxides. It is a reddish-brown toxic gas with a sharp, biting odor. NO2 is one of the most prominent air pollutants.

(4) Carbon monoxide (CO) – is an odorless, non-irritating but very poisonous gas. It is a product formed by incomplete combustion of fuel such as natural gas, coal or wood. Vehicular exhaust is a major source of carbon monoxide.

(5) Volatile organic compounds- VOCs are important outdoor air pollutants. In this field, they are often divided into the separate categories of methane (CH4) and non-methane volatile organic compounds (NMVOCs). Methane is an extremely efficient greenhouse gas which contributes to enhance global warming. Other hydrocarbon VOCs are also significant greenhouse gases via their role in creating ozone and in prolonging the life of methane in the atmosphere, although the effect varies depending on local air quality. Within the NMVOCs, the aromatic compounds benzene, toluene and xylene are suspected carcinogens and may lead to leukemia through prolonged exposure. 1 3butadiene is another dangerous compound which is often associated with industrial uses. It is a colorless gas that is easily condensed to a liquid and is important industrially as a monomer in the production of synthetic rubber.

(6) Particulates, alternatively referred to as particulate matter (PM), atmospheric particulate matter, or fine particles, are tiny particles of solid or liquid suspended in a gas. In contrast, aerosol refers to particles and the gas together. Sources of particulates can be manmade or natural. Some particulates occur naturally, originating from volcanoes, dust storms, forest and grassland fires, living vegetation, and sea spray. Human activities, such as the burning of fossil fuels in vehicles, power plants and various industrial processes also generate significant amounts of aerosols. On average over the globe, anthropogenic aerosols—those made by human activities – currently account for about 10 percent of the total amount of aerosols in our atmosphere. Increased levels of fine particles in the air are linked to health hazards such as heart disease, altered lung function and lung cancer.

(7) Persistent free radicals connected to airborne fine particles could cause cardiopulmonary disease.

(8) Toxic metals, such as lead and mercury, especially their compounds.

(9) Chlorofluorocarbons (CFC) - harmful to the ozone layer emitted from products currently banned from use.

(10) Ammonia (NH3) - emitted from agricultural processes. Ammonia is a compound with the formula NH3. It is normally encountered as a gas with a characteristic pungent odor. Ammonia, either directly or indirectly, is also a building block for the synthesis of many pharmaceuticals. Although in wide use, ammonia is both caustic and hazardous.

(11) Odors – from garbage, sewage, and industrial processes.

(12) Radioactive pollutants– produced by nuclear explosions, nuclear events, war explosives, and natural processes such as the radioactive decay of radon.

Secondary pollutants according to Britannica (2017) include particulates created from gaseous primary pollutants and compounds in photochemical smog. Smog is a kind of air pollution; the word "smog" is a portmanteau of smoke and fog. Classic smog results from large amounts of coal burning in an area caused by a mixture of smoke and sulphur dioxide. Modern smog does not usually come from coal but from vehicular and industrial emissions that are acted on in the atmosphere by ultraviolet light from the sun to form secondary pollutants that also combine with the primary emissions to form photochemical smog. Ground level ozone (O3) which forms from NO and VOC, is a key constituent of the troposphere. It is also an important constituent of certain regions of the stratosphere commonly known as the Ozone layer. Photochemical and chemical reactions involving it drive many of the chemical processes that occur in the atmosphere by day and by night. At abnormally high concentrations brought about by human activities (largely the combustion of fossil fuel), ground level ozone is a pollutant and a constituent of smog.

Previous work shows alarming results on the severe impacts of outdoor and indoor air pollution and in particular on the large number of premature deaths it causes. The most recent Global Burden of Disease (GBD) study estimates that air pollution –indoor and outdoor combined – was the cause of 5.5 million premature deaths globally in 2013 Brauer et al. (2016); implying that air pollution is the top cause of environmentally related deaths worldwide. The 2010 GBD study (Lim et al. 2012), WHO (2014) and Lelieveld et al. (2016) estimate that outdoor air pollution alone kills in the order of magnitude of 3 to 4 million people a year globally. The precise numbers generated by different studies under the Global Burden of Disease initiative are variable, reflecting refinements for example with respect to exposure modelling and alternative positions for example with respect to the slope and shape of response functions. However, the studies are consistent in showing that air pollution has not only a substantial effect on health and several million of human deaths each year but also on real estate market.

The major real estate investments in Nigeria are in offices, retail, industrial, and residential real estate. The major cities are Lagos (commercial capital), Abuja (Federal Capital), Port Harcourt, and Kano. These cities have in recent times experienced a high level of urbanization like other African Countries and according to UN-HABITAT data, the proportion of Africans living in urban areas grew from 32% in 1990 to 40% in 2010 and might rise to 47% in 2025. Knight Frank (2013) stated that there are few international investors investing in the Nigerian real estate market due to its undeveloped nature, and that there is evidence that there is increased demand from some South African funds seeking exposure to markets in sub-Saharan Africa.

Generally, there is a short supply of good quality office space meeting the specification of international companies in Nigerian cities, with very few providing spaces of more than 1000 square metres. The office real estate market is most active in Lagos where prime office rents are as high as US$85 per square metre per month. Also, the availability of good quality space is gradually improving with a lot of top-grade construction in progress. It is expected that the Eko Atlantic scheme will create a new commercial district south of the current CBD. Port Harcourt and Abuja have less choice office real estate and do not experience the high rents of Lagos. (Knight Frank, 2013) stated that office real estate in Abuja let for US$65 per square metre per month and yield a return of 10% per annum. It is hoped that new schemes like the Abuja World Trade Centre and the Greater Port Harcourt City, will create new commercial neighbourhoods that will meet pent up demand and provide high quality of spaces.

Retail real estate in Nigeria's major cities appears to be transiting from traditional markets into western-style retail and leisure malls (Knight Frank, 2013). Some notable developments are the South African giant Shoprite in Ikeja City Mall, Lagos, and Palms Mall at Lekki. In Abuja there are mostly medium-sized malls, though Shoprite Supermarket has since 2012 opened at the new Grand Towers. Port Harcourt is the least developed with modern retail properties, though Spar Supermarket has since early 2014 opened near the CBD. Knight Frank (2013) stated that Lagos retail rents are about US$65 per square metre per month, indicating a yield of 11% per annum while Abuja retail real estate also fetch US$65 per square metre per month and yield a return of 13% per annum.

Industrial real estate has been increasing outside Lagos State, with many multinational companies creating secondary manufacturing hubs in the south east. Poor power supply has been the bane of manufacturing in Nigeria, leading to some manufacturers relocating from the country and discouraging new investments. The few that exist, in Lagos let for about US$12 per square metre per month and yield 13% return per annum and Abuja industrial rents are about US$9.50 per square metre per month and yield a return of 13% per annum (Knight Frank, 2013).

Real estate is a real or tangible asset in the sense that it has physical components (Ifediora (2015). Real estate is also bestowed with a bundle of rights (i.e. right to enjoy, occupy, use and transfer), the scope of which is determined by legal/political processes that have jurisdiction over it. From a professional perspective, the real estate discipline is an umbrella field, spanning a number of disciplines that focus on various elements of the real estate process. From an academic perspective, real estate is an area of practice that is taught at the university level and is the subject of research and publication activities by faculty members. In an applied sense, the field draws on a broad array of ancillary disciplines including appraisal, brokerage, construction, development, finance, investment, management and transactions. Thus, when looked at from an aggregate perspective, real estate is an interdisciplinary field of inquiry.

According to Heosli, and Macgregor (2009) most other disciplines that are built around physical assets can refer to the natural or physical sciences for a theoretical foundation. This is not the case in real estate which is a hybrid area comprised of both tangible and intangible elements. That said, real estate is often approached as a financial asset that can be bought, developed and sold, making it comparable to other transaction-oriented businesses. In reality, real estate is both a financial asset and a physical resource, a resource that is comprised of the site itself and the externalities that surround it and connect it to other parcels or activities. The value of this resource is determined by the submarket that is drawn to the unique space that it represents, with the prices set as a result of individual negotiations rather than some listing price that is offered to the broader market. Furthermore, although portions of it operate in the public domain, real estate remains a largely private market. As such, information flows and market knowledge are inconsistent, with transaction prices based on individual negotiations among the direct participants rather than a broader market of participants. Thus, the real estate discipline is fundamentally different from other business disciplines in the sense that the market is inefficient and as such, must be approached as a behavioral science (Egbokhare, Francis, Oyetade, and. Oluwole, 2012).

Given its behavioral nature, understanding the real estate discipline is predicated on the ability to understand the information processing and decision-making processes applied by segments of space producers, space users, and space facilitators. It is the interaction of these players which ultimately determine what is built, where it is built, and what it is worth. In the United States the real estate industry operates in a free-market system with some interventions to protect the public safety, health and welfare. Thus, the outcomes of real estate decisions should be both market-based, and socially responsible. The importance of market-based solutions is to ensure that real estate development satisfies demand today, and demand well into the future. The importance of social responsibility recognizes the externalities (i.e., environmental effects, congestion) that can be caused by real estate usage decisions.

There are three major participants in the real estate process: space producers, space users, and space facilitators or infrastructure providers. As noted in Exhibit 2-1 the roles of these groups of participants overlap creating the real estate market. They are linked by the transfer of ownership or usage in return for some economic payments. Within each category, there are a number of segments of players. Some of these players are directly engaged in the market, and some of them are indirectly involved. The category of space producers includes those who operate on the spatial side of the market (e.g., contractors, developers, designers) and those who operate on the capital side of the market (e.g., investors, lenders, brokers). The category of space consumers includes those who directly consume the space (e.g., tenants, owners), as well as those who indirectly consume space (e.g., the shoppers, clients) and pay for goods and services rendered by or made available at a particular facility. In addition, the indirect consumers include the neighbors, community and society at large who collectively consume the larger urban form of which a project is a component (Enever, 2013). These groups all consume the externalities a project may generate. The space facilitators and infrastructure providers operate outside of the realm of real estate but have a significant impact on the built environment in general and in particular, on the utilization of individual parcels. They include governmental entities that provide amenities and services, as well as those who create the regulatory environment within real estate.

Over time, the real estate market tends towards a balanced state, although it goes through cyclical phases in which the advantage shifts from the space producers to space consumers. With some noteworthy exceptions, the transitions from one phase to another are fairly smooth with the market adjusting to changes in supply and demand. However, there are times where one of constituent groups either exerts undue influence or is subjected to external forces that create turmoil in the market. This occurred in the 1980s when excess capital flows led space producers to overbuild commercial space. It also occurred in the early 2000s when easy and cheap credit flooded the market and created over-pricing and some over-building. Going through cycles in a balanced market, each group acts in a manner consistent with their relative strength in the market. That is the essence of a market-based economy. At times however, interventions or external forces may create dramatic changes in the interaction between space users and space producers. This is particularly true with respect to space facilitators and infrastructure providers. For example, changes in amenities (i.e. roads, mass transit, and parks) and services (e.g. police, fire, schools) can change the essence of real estate consumed by the market, creating windfalls and wipeouts. Similarly, changes in land use regulations, growth management and other interventions can be imposed on the market by planners, urban designers or regulators seeking to create a better urban form while not unacceptable per say, the impact of these interventions on the markets' ability to function should be scrutinized to identify unintended consequences that might render them unacceptable.

The relationship between industrial pollution and real estate values has been the focus of many studies (for example, Dewees, 1976; Damm et al, 1980; Wolf, 1992; Singh, 2015). Some of the earlier studies returned positive relationship between industrial pollution and property values while others showed negative relationship.

In Delta state, industrial air pollution, have not only affected the life and health of the citizens, it is believed to have affected the incomes and real estate investment level of the polluted areas. Industrial air pollution can have a lasting effect on productivity in other ways as well—for example, by stunting plant growth and reducing the productivity of agriculture, and by making cities less attractive to real estate investors, thereby reducing cities' competitiveness. Property investors and buyers' preferences relating to the choice of location is based on their previous experiences and environmental condition of the area. This study, therefore, is imperative as it will x-ray effect of industrial air pollution on real estate investment in Warri, Delta Sate.

Aim and Objectives of the Study

This study seeks is to examine the effect of industrial air pollution on real estate investment in Warri, Delta State with a view to make necessary suggestions towards measures for controlling industrial air pollution. In order to achieve the above stated aim; specifically, the study seeks to:

i. Determine the causes of industrial air pollution in Warri, Delta State.
ii. Determine the effects of industrial air pollution on the value of properties.
iii. Assess whether air pollution had a measurable effect on price of properties.

Research Questions

The following research questions guided the study

i. What are the causes of industrial air pollution in Warri, Delta State?
ii. What are the effects of industrial air pollution on the value of properties?
iii. Does air pollution have a measurable effect on price of properties?

Research Hypotheses

Based on the objectives of this research, the following null hypothesis was formulated and was tested at a significance level of 0.05.

H_{01}: There is no significant difference in the responses of the respondents on the impact of air pollution on real estate investment in Warri, Delta State?

RESEARCH METHODOLOGY

The study adopted the descriptive survey research design. According to Nworgu (2015), descriptive survey design is a design in which a group of people or items are studied by collecting and analyzing data from only a few people or items considered to be the representative of the entire group. The population consisted of 205 industrial workers, designated staff in the Federal and State Ministries of Health and Environment, Estate Surveying and Valuation firms and occupiers and owners of commercial properties in the industrial air polluted areas of Warri Delta State. A sample of 135 was drawn from population of 205 using Taro Yamane's formula. The instrument for data collection was a structured questionnaire. The instrument was validated by three experts. Cronbach Alpha method was used to determine the reliability of the instrument. Simple percentages and mean scores were used in answering the research questions. The hypothesis was tested using Pearson Correlation Coefficient.

DATA PRESENTATION AND ANALYSIS

Research Question 1: What are the causes of industrial air pollution in Warri, Delta State?

TABLE 1: To discuss and describe the causes of industrial air pollution in Warri, Delta State.
Respond using the scale: 1= strongly disagree, 2= disagree, 3= uncertain, 4= agree, 5= strongly agree.

S/N	causes of industrial air pollution	5	4	3	2	1	Rank	Mean	S D
1	Burning coal	71	41	23	-	-	1	4.08	1.48
2	Burning fossil fuels like oil, natural gas, and petroleum	58	58	11	5	3	2	4.00	1.28
3	Chemical solvents used in dyeing and tanning industries	58	58	11	5	3	2	4.00	1.28
4	Untreated gas and liquid waste being released into the environment	43	51	-	20	21	4	3.92	1.26
5	Improper disposal of radioactive material	33	61	13	17	11	5	3.83	1.17
	Cluster Mean							**3.90**	**1.18**

Source: Field Survey, 2021

Table 1 presents the mean ratings and standard deviations of the respondents on the causes of industrial air pollution in Warri, Delta State. The table shows that the mean responses of the respondent ranged from 3.75 to 4.08. All the items had mean values greater than 2.50 which is the criterion mean. The clusters mean scores on the causes of industrial air pollution in Warri, Delta State is 3.90 for respondents. Based on the fact that the cluster mean scores were above the criterion mean of 2.50, the respondents agree that the listed items 1-5 describe the causes of industrial air pollution in Warri, Delta State.

Research Question 2: What are the effects of industrial air pollution on the value of properties?

TABLE 2: Using a score of 0 – 12, rate the effects of industrial air pollution on the value of properties.

S/N	effects of industrial air pollution on the value of properties	5	4	3	2	1	SD	Mean Score	Rank
1	decrease in market value of the properties	30	20	23	31	31	1.45	2.58	11
2	Crushing, screening and haulage produce a lot of dust which increase maintenance costs	71	41	23	-	-	1.48	4.08	1
3	Decrease in real gross income	70	41	19	3	2	2.03	4.29	2
4	interest rate applied to a credit	55	56	-	11	13	2.01	4.75	5
5	credit repayment period	50	50	31	2	2	1.88	4.23	7
6	Imbalance ratio between credit and investment value	33	32	10	30	30	1.58	3.08	10
7	Decrease tax allowance	33	61	13	17	11	1.67	4.19	8
8	High tax rate and local payment	58	58	11	5	3	2.04	4.85	4
9	Poor return on investment	32	49	21	21	13	1.74	3.69	9
10	difficulties for construction investments	50	61	3	11	10	1.93	4.42	6
11	Falls in property values	71	41	23	-	-	1.48	4.08	1
12	Poor infrastructure or territorial development system	58	58	11	5	3	1.28	4.00	3
13	Poor Social environment	30	30	23	31	31	1.45	2.58	11
	Cluster						**1.84**	**4.14**	

Source: Field Survey, 2021

Table 2 presents the mean ratings and standard deviations of the respondents on the effects of industrial air pollution on the value of properties. The table shows that the mean responses of the respondent ranged from 2.58 to 4.75. All the items had mean values greater than 2.50 which is the criterion mean. The clusters mean scores on the effects of industrial air pollution on the value of properties is 3.90 for respondents.

Based on the fact that the cluster mean scores were above the criterion mean of 2.50, the respondents agree that the listed items 1-13 are the effects of industrial air pollution on the value of properties.

Research Question 3: Assess whether air pollution had a measurable effect on price of properties.

TABLE 3: Using a score of 0 – 13, rate the effect of air pollution on price of properties

S/N	effect of air pollution on price of properties	5	4	3	2	1	SD	Mean Score	Rank
1	Less competition on the property and rent market as result of air pollution	61	41	18	4	10	2.05	4.86	1
2	High tenant turnover as result of air pollution, reduces property price	57	56	14	3	5	1.93	4.41	5
3	High maintenance cost due to the damage from the air pollution.	43	51	-	20	21	1.26	4.00	7
4	The health implication of the air pollution affects the price of properties in the study area.	58	58	11	5	3	2.01	4.75	3
5	Limited/low social class which affect the price of property in the area.	60	41	19	4	10	2.04	4.85	2
6	The control of air pollution is too expensive which affects the price of property	58	55	14	5	3	1.93	4.42	4
7	Poor management of the pollution affects the profitability of properties in the area	71	41	23	-	-	1.48	4.08	6
	Cluster						**1.83**	**4.16**	

Source: Field Survey, 2021

Table 3 presents the mean ratings and standard deviations of the respondents on theeffect of air pollution on price of properties. The table shows that the mean responses of the respondent ranged from 4.00 to 4.86 All the items had mean values greater than 2.50 which is the criterion mean. The clusters mean scores on theeffect of air pollution on price of properties is 3.90 for respondents.

Based on the fact that the cluster mean scores were above the criterion mean of 2.50, the respondents agree that the listed items 1-7 are the effect of air pollution on price of properties.

Hypothesis One

H_{01}: There is no significant difference in the responses of the respondents on the impact of industrial air pollution on real estate investments in Warri, Delta State.

TABLE 4: Chi-Square Test

	Value	df	Asymp. Sig. (2sided)
Pearson Chi-Square	18.649	9	.029
Likelihood Ratio	12.271	9	.019
Linear-by-Linear Association	0.629	1	.038
N of Valid Cases	135		

Source: Field Survey, 2021

TABLE 5: Chi-Square Test Symmetric Measures

		Value	Asymp. Std. Error	Approx. T	Approx. Sig.
Nominal by Nominal	Phi	.022			.030
	Cramer's V	.013			.030
	Contingency Coefficient	.021			.030
Interval by Interval	Pearson's R	.511	.057	.171	.043
Ordinal by Ordinal	Spearman Correlation	.619	.064	.932	.024
N of Valid Cases		135			

Source: Field Survey, 2021

From table 4, the value of Pearson chi-square is computed as 10.70 with a degree of freedom. However, comparing them with critical value of chi-square at 9 degree of freedom and 5% level of significance, it is clear that the computed value of 18.65 is greater than the critical value at 9 degree of freedom with 5% level of significance. Hence, the null hypothesis is hereby rejected. The implication of this is that there is a significant difference in the responses of the respondents on the impact of industrial air pollution on real estate investments in Warri, Delta State.

Furthermore, this finding is corroborated by table 5 above where the symmetric measures were also computed to support the analysis.

From the table, it can be seen that the Crammer's value is significant at 0.03 which is less than 5% level of significance. Similarly, the contingency coefficient is also significant at 0.03 just like the Crammer's V. Both Pearson's R and Spearman's are significant at 5% with the values of 0.043 and 0.024 respectively.

Summary of Finding

The study revealed that the major causes of industrial air pollution in Warri are Burning coal; Burning fossil fuels like oil, natural gas, and petroleum; Chemical solvents used in dyeing and tanning industries; Untreated gas and liquid waste being released into the environment; and Improper disposal of radioactive material.

The study revealed that other causes of industrial air pollution in the study area are: Lack of Policies to Control Pollution; Unplanned Industrial Growth; Use of Outdated Technologies; Presence of a Large Number of Small-Scale Industries; Inefficient Waste Disposal; and Leaching of Resources from Our Natural World which ranked sixth in the analysis.
The study also revealed that the effect of industrial air pollution on the value of properties are: increase in maintenance cost; decrease in real gross income; poor infrastructure or territorial development system; high tax rate and local payment; interest rate applied to a credit; and difficulties for construction investment.

CONCLUSION

In the capital market, one of important criteria for investment decision is the issue of selecting sources, possibilities and methods of raising the value of the investment object. Familiarity with sources of value as well as factors of which determine the value and impact upon the attractiveness of a capital market segment in question, allows capital owners to make effective and rational investment decisions. Issues concerning economic and physical properties of the estate that constitute its value, are of great importance for prospective investors on the real estate market. One of the crucial aspects that defines current and future value of the estate is the local authorities' policy on town and country planning. Moreover, what should not be disregarded is the country overall economic environment and the situation on the real estate market.

Air pollution can have lasting effects on productivity in other ways as well—for example, by degrading natural ecosystems. Pollutants may settle in the air or mix with precipitation and be deposited on plants, in soils, or in waterways. Atmospheric deposition of pollutants has acidified soils and reduced the diversity of plant species and the productivity of grasslands in places such as Warri.

RECOMMENDATIONS

The study made the following recommendations:

(1) Industry Site Selection: consideration of location of the sites and the potential impact on the surrounding environment can help reduce harmful consequences industrial air pollution in Warri.

(2) Proper Treatment of Industrial Waste by developing and implementing adequate treatment facilities for handling industrial waste and proper habits can reduce air pollution whereby improving property values in the area.

(3) Rebuilding Habitats and Afforestation: rebuilding habitats by planting more trees and plants can help give wildlife back their homes, and the trees can help purify the air with enough oxygen, and act as a buffer against the environment. This in return will increase property values and price.

(4) Stricter Laws and Enforcement: there should be more stringent rules to take action against the companies who do not follow proper protocol and more significant rewards for the companies who operate properly. It requires creating policies that prevent misuse of land.

(5) Regular Environmental Impact Assessments: government should subject industries to regular environmental impact assessments that are reported for evaluation. If there are harmful impacts discovered during the review, necessary actions to correct the negative consequences should be developed and enforced.

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