

# Environmental factors distress housing development in Nigeria and other regions of the world

Olusola Oladapo Makinde\*<sup>1</sup>, Odunola Olayinka Onigbogi<sup>1</sup>, Olubukunmi Temitope Makinde<sup>2</sup>, Olabode Oludayo Akangbe<sup>1</sup>

<sup>1</sup>Department of Architecture, Ladoko Akintola University of Technology, Ogbomosho, Nigeria

<sup>2</sup>Department of Estate Management, Osun State University, Osogbo, Nigeria

E-mail: [makindeolusola2012@yahoo.com](mailto:makindeolusola2012@yahoo.com)

**Abstract.** A clean and healthy environment forms a crucial aspect of our daily living, which becomes a vital factor for a healthy lifestyle. Global warming, flood, deforestation, overexploitation of natural resources, climate change, pollution, among others are some of the environmental challenges that most nation is facing. This study aims to increase the consciousness of environmental factors distress housing development. The methodology used involved the analysis and review of previous related literature in reverence to the issue in Nigeria and other regions of the world with a view to develop a guide for housing development. The study looked at environmental factors in housing using Nigeria and other regions of the world as a case study. This study carried out a general overview of environmental factors in housing, environmental issues, and challenges in this area. The study used secondary sources of data from relevant literature to obtain information related to these objectives. The study also looked at the control measures to alleviate the impacts of environmental factors on housing in each continent and the way forward in building a sustainable environment. The results from the finding shows that promoting effective clean housing production, reduction of noise, water and air pollution, and reduction of solid waste, will alleviate environmental issues in cities around the globe. Also, effectively improving the environmental consciousness of people will significantly reduce environmental factors distress housing development in Nigeria and other regions of the world. The study recommended and concluded that there is a need to focus on designing eco-friendly buildings, sustainable building operations, and limiting the negative impacts of housing on the environment, such as noise, air, and water reduction and focusing on nature conservation.

**Keywords.** Environmental factors, distresses, housing development, Nigeria, world.

## 1. Introduction

Environmental factors are an obvious issue in housing development, and these substances have adverse effects on the images and milieu at large. It is an exposure to substances that exist in the neighborhood, where we live or work [1]. It can be behavioural, habitual, and can expand an individual risk of disease, which affects the milieu and influences man, flora, and fauna, either positively or negatively. Hussaini and Hussain, (2023), in their study examined the impact of environmental factors on student's educational background, upbringing, and their future academic performance. The study described environmental factors has having both negative and positive impacts on students' educational growth and their future development for example moral, physical, peer influences and parental involvement, and socioeconomic status. The study classifies strategies to create conducive learning environment and need to raise awareness about the significance of environmental factors in education development. Lastly, the study developed interventions system to alleviate negative environmental impacts [2]. Environmental challenges have always been a major concern to human beings. Overexploitation of natural resources is affecting the environment, which directly leads to overconsumption of energy, which causes global warming and climate change ([3,4]). Construction has a major influence on the environment in it's over consumption of energy, both directly and embodied in building materials. Pollution, waste production and disposal, and depletion of vital reserves are the negative effects of housing production on the environment [5]. In addition, construction equipment generates loads of carbon dioxide, which contributes to global warming from the greenhouse effect (GHG), ([6,7]).

Ecosystems have changed sporadically and rapidly in the past 50 years extensively, through human activities [8], which has led to the loss of some vital ecosystem functions [9]. Human daily activities have become insensitive to their natural habitat [10]. However, environment and ecology are the two major powerful factors that influence the design process and render it inhabitable daily. Environmentalism is a social and environmental movement that addresses environmental challenges through advocacy, legislation education, and activism ([11,12]). Environmental protection is therefore the practice of protecting our natural habitat through individual, organizational or governmental levels for the benefit of both humans and the environment at large. Furthermore, the government intervened by establishing several strategies towards advancing sustainable human environment, such as environmental impact assessment, international awareness of the potentially bleak ecological future of the planet, systematic monitoring through relevant agencies, efforts towards sustainable forest management, mitigating the problems related to desertification and drought, a hazardous chemicals and toxic wastes dump programme, local environmental action plans ([13,14]). Despite the relentless effort made, there are still numerous tangible challenges, which include uncoordinated policies, a weak data base, lack of training and upgrading by the building expertise team, inadequate enforcement, institutional conflicts/funding, lack of public awareness, and many others that hinder the effectiveness of the movement [15]. Close to half of all non-renewable resources human consumes are used in construction, which renders housing production one of the least sustainable industries in the nation [16]. As a result, the United Nations Environment Programme Finance Initiative Property Working

Group expressed deep concerns that the housing production industry was far behind in addressing its environmental challenges [17].

Housing has received considerable attention from building professionals and decision makers ([18,19]). Quality housing requires privacy, shielding and protection from harsh climatic conditions, and protection from crime. One of the most vital development issues is housing because it embraces the consideration of psychological and social significance to man. Good housing environments should provide a place of safety, refuge, and a comfortable and supportive environment from which each person plans their day-to-day activities ([20,21]). Housing, as a natural human territory, is an important factor that acknowledges the validity and existence of a society's progress among nations. The accessibility and attainability of a satisfactory house for each family explain the stages of evolution that the nation has attained. Social and economic wealth can only co-exist with good housing that protects and is design against the environmental factors like air pollution, carbon dioxide, and other toxic gases and materials. References [22,23] reported that housing represents a concrete indication of asset in a community and is directly related to physical development and social and economic outcomes. Housing is a national boost and the only vital factor influencing the standard of human life. Housing showcases itself as a moderate and strong channel for investigating and observing the progress of the social, physical, environmental, and economic features of the community ([24,25]). Housing in the evolution of humanity is a basic need, offering protection against extreme weather events, natural calamities, pest and insect invasion, and serving as a threat from other species; initially from wild animals and thefts. As industrialisation expands and population increases, the challenges of environmental issues surface. This is directly proportional to the significant challenges of housing such as overcrowding, environmental degradation, inadequate infrastructure, inadequate services, and many more [15].

It was opined by [26,27] that embracing what is in free supply has the ultimate ability to replenish the environment from deterioration, such as air, water, sun, earth, and many others. He further established that natural building materials such as clay, gravel, sand, silt, soil, loam, and mud are everywhere that humans can absolutely use. The impact of housing production on the environment in the universe has not yet been established in the literature. This study is therefore an attempt to establish the extent to which housing construction activities affect the environment with a view to recommend appropriate mitigating measures for sustainable development in the nation. Therefore, this study will be of significance to architects, planners, housing authorities, design and policy development.

### **1.1 Previous Studies on Environmental Factors and Housing Development**

Reference [27] study Logical evaluation of climate change impact study in Nigeria: inference for sustainable development. The study shows that there is indication that Nigeria is at present experiencing environmental issues and challenges credited to climate change and its effects. The outcome of this study had obviously emphasized the need for knowledge-based approaches to help plan satisfactory adaptation and mitigation measures for the country. The outcome of the study suggests that it would be worthwhile to advance climate change enquiry in Nigeria away from perceptive methods and approaches to more qualitative and quantitative ones. This is particularly important for housing development, and for healthier planning of adaptation policies. Reference [25] study assessed the influence of development control enforcement undertakings on housing quality in Calabar, Nigeria. The result from the study specified that housing quality does not considerably hinge on development control measures. The results revealed that major problems of free-for-all development causing severe flooding and traffic congestion.

Reference [13] study looked at housing sustainability challenges in a Nigerian city. The study assessed appropriate sustainable urban regeneration approach for Nigerian cities, and thus highlights the aspect of government established urban renewal plan with a view to propagate the requirement for urban housing sustainability about emerging countries. The built environment in the study area was deplorable. The outdoor and indoor environmental quality elements were unsatisfactory to the uses and the vital services were not in functional condition. The study concluded that the uncomfortable and poor environmental and housing living conditions in the city essential and core areas revealed the stress of urbanization. The outcomes, nonetheless limited in scope to one typical Nigerian city, but provide understanding and insight that housing challenges and issues of urban core areas are in unsustainable condition. It was suggested that government to provide a more commitment policy to adequately provide far-reaching urban renewal programmes based on energy conservation, human comfort and sustainability. Reference [12] study looked at development environmental factors and performance of housing development in Kenya. This study providing practical approaches for reducing the influence of environmental factors on real estate development; the study points out those real estate development environmental elements affects the success of real estate building housing projects in Busia County.

Reference [7] looked at environmental pollution in Nigeria and the need for awareness and indigenous consciousness creation for sustainable development. The study examined the issue and challenges of environmental pollution and its associated consequences on the Nigerian civilization. The study shows that environmental challenges in Nigeria commonly are diverse in nature, many, and are initiated by user's interaction with natural surroundings (environment) for exploits and activities in a few ways, both in rural areas; where agriculture thrives and in the cities; where industrial and commercial activities dominate. The study shows that citizens harnesses water and land resources for commercial, domestic, agricultural, industrial, and other purposes and utilize air for survival. From these happenings; man, indirectly or directly generates problems and challenges, which are harmful to his survival/health, natural existence, well-being, and stability. These problems are a result of environmental pollution, which degenerates into environmental degradation and numerous other hazards for instant depletion of natural habitats, and widespread epidemics, consequently; hinder the

socio-economic growth of Nigeria. Therefore, the study suggests change in attitudes for effective resources and environmental management strategies and awareness creation as a solution.

Reference [4] study examined the effects of residential environmental factors on residents' housing satisfaction. The study emphasized the impacts of residential environments on residents' housing satisfaction in Ogun State. The study reveals that all environmental variables used in measuring and predicting users housing satisfaction were significant. It was further observed that the most significant environmental element predicting housing satisfaction is the perception of users about the feeling of their neighborhoods. The implication is that the neighborhoods community services and social environment features of housing environments were significantly related to housing satisfaction. Reference [28] study looked at the issue of the environmental development of housing construction in the integrated land use management. The study evaluated environmental issues and problems emanated during the implementation and execution of housing schemes for the integrated development of spaces by multistory buildings. The need to evaluate the quality of the environment in the functional zoning of areas is acknowledged and a calculation of the index of the ecological probable of the areas is recommended. The introduction of resource-saving and energy-saving technologies at the regional level is recommended and formulated.

Reference [1] studied impacts of noise pollution on residential property value in Enugu urban, Nigeria. The study identified several unorganized informal sector activities such as road traffic, recreational, religious and household activities, incompatible uses in space, operation of power generating sets, among others that are the sources of noise pollution in residential areas. The study finds out whether noise pollution has significant impact on housing rental values. The study revealed that residential properties affected negatively by noise pollution had lower rental value likened to those unaffected. The study recommended that property value spatial index of noise pollution can be use and built as a template for urban management system to attain sustainable development. Reference [14] study reviewed the sustainable practices and environmental laws in Nigeria and the Legal duties for businesses. To support welfare and health today and in the future, it is essential to protect global ecosystems and preserve natural resources. Environmental sustainability has come to be important today. Governments all over the world had legislated a variety of regulations and environmental laws to address these concerns as pertain to pollution, climate change, and resource depletion that are continuously grow. It is legally obligatory for businesses to stand by these rules. This study assessed the relationship between sustainable business practices and environmental laws, highlighting the legal responsibilities that organizations must satisfy to secure a sustainable future and save the environment. The study in is suggestion resolved that sustainable business practices and environmental regulations work hand in hand, with corporations possessing big legal duties to protect their own long-term survival and the environment. Abiding with laws will result in innovation in addition to helping to reduce legal concerns and cost savings. It will also develop into an optimistic public image. According to [14] businesses must take their legal duties seriously as the world combats with environmental concerns and recognize the vital role played in developing a sustainable future.

Reference [29] study assesses housing development and the deterioration of the environment in Nigeria. It highlights that there is enormous deficiency and problems in housing in Nigeria's urban areas because of population increase, which is because of the instantaneous rate of urbanisation arising in the country. Many houses are situated in unhygienic environments and are inadequate qualitatively. The study asserts that urban restoration and development should be a main concern of government to lessen the environmental strain experienced in the urban area. It recommends that most Nigerian urban areas need widespread urban regeneration programmes. Reference [30] on climate action hiatus reported that despite 30 years of global climate diplomacy and advocacy, the global body has struggled to make the mandatory progress and development on climate change. Currently, atmospheric levels of methane, nitrous oxide, and carbon dioxide, have all reached record highs. A Failure to alleviate climate change is categorized as severe threats in the short term. Nevertheless, it is the worldwide risk we are perceived to be the least ready for, with 71% of respondents' assessment existing measures to prevent or prepare for climate change as "highly ineffective" or "ineffective". In line with the Intergovernmental Panel on Climate Change (IPCC), the chance of breaching the 1.6 °C mark by 2030 stands at 50%. Present promises made by the G7 private sector indicate an upsurge of 2.8 °C by mid-century, far above the aims delineated in the Paris Treaty. Current events have exposed a discrepancy between what is politically useful and what is scientifically compulsory. Present pressures should bring about a turning point, encouraging energy importing nations to invest in "safe", cheaper and cleaner renewable energy sources.

## 2. Study Area

The continent is a large, continuous expanse of land on earth. They constitute around one-third of the total surface of the universe. The landmasses of the earth are not distributed equally; more than two-thirds of the planet is filled with water, and two-thirds of its landmass is located in the Northern Hemisphere. Furthermore, a continent is one of the earth's seven main divisions of landmasses. The continents range from largest to smallest: Asia, Africa, North America, South America, Antarctica, Europe, and Australia.

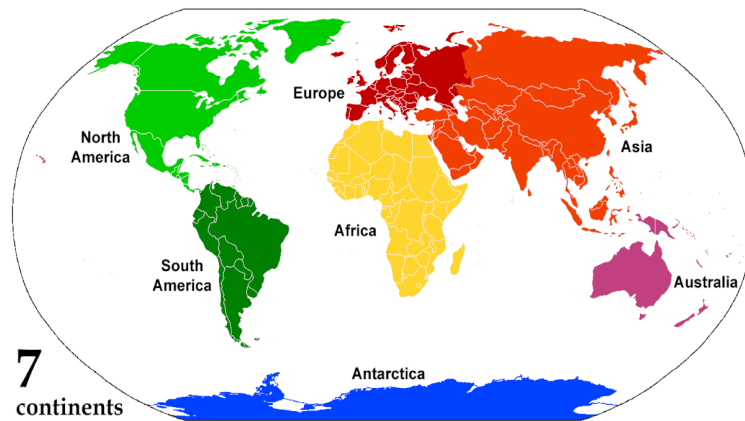


Figure 1. Map of the World's Continents. Source: [31].

### 3. General Overview of Environmental Factors in Housing

Massoudi and Simonian, (1978) explain the degeneration of the environment as a pathway of compromising the human habitat either naturally or through human involvement, which has hazardous results on human health and the ecosystem at large. According to the [32], the production of buildings directly influences climate and accounted for 19% of global greenhouse gas emissions and one-third of global black carbon emissions in 2010. Buildings are responsible for 39% of global energy-related carbon emissions: 28% from operational emissions and 11% from building materials and construction processes. In 2022, the operations of buildings will account for 30% of global final energy consumption and 26% of global energy-related emissions of which 8% are direct emissions in buildings and 18% are indirect emissions from buildings. With the above assertion, there is a decrease in direct emissions from building production compared to previous years.

The use of adequate and sustainable building technologies is advancing. Building energy codes are widening in range and inflexible across countries, yet the sector still needs intensified guidelines and measures to keep pace with the Net Zero Emissions by 2050 (NZE) Scenario [33]. Environmental degeneration is a crucial threat to human living which was recognised by several local and international organisations. Appropriate measures and regulations are adopted to reduce the effect because humans only have one planet to live in; therefore, compromising on the measures adopted will not be taken because it could lead to death [34]. There are various means by which environmental degeneration evolves, such as the overexploitation of natural resources through human activities such as air, water, and soil. Challenges related to the environment due to the production of buildings can be summarised as follows: ecosystem and biodiversity loss, impacts from the global consumption of natural resources, depletion of vital ecosystems, deforestation, flooding, climate change, greenhouse emissions, pollution and many more. Furthermore, degradation of the surrounding habitat can be over-generated from the lack of adequate application of the established measures, guidelines, and policies by the construction team. Human health and the quality of the surroundings habitat are closely related. Adopting sustainable design and materials should be the goal of the housing production team and every personnel working towards a better environment, to achieve quality environment and improved immeasurably the well-being of human and bio-diversity at large.

### 4. Environmental Issues and Challenges on Each Continent

Ecosystem disruption emanated from environmental issues [35]. Environmental issues are caused by human involvement in the habitat. Environmental degeneration is the output of human negligence and is a global, ongoing problem [36]. The bulk of environmental challenges are caused by excessive consumption of energy through industrialisation and overpopulation ([37-39]). Key planetary crises such as; pollution, climate change, and loss of biodiversity as discussed by [40]. It was established that a habitable environment is achievable if the professionals concerned, the government, to every step and guideline given [40].

#### 4.1 Africa's Environmental Issues and Challenges

Advancement in the population of African countries and rapid growth of the economy contributed to several environmental degeneration in Africa, which include: climate change, biodiversity loss, overuse of modern design, flooding, and pollution.

##### 4.1.1 Climate Change

The adverse effect of overpopulation that led to the consistent production of houses. These are the effects of pollutants associated with building production, such as greenhouse gas effect, biodiversity loss, global consumption of natural resources, depletion of vital ecosystem services, and deforestation [41]. Furthermore, trees are cut down for industrialisation purposes, thus clearly affecting the local and global climate and disrupting weather patterns, which lead to hot weather, thus increasing drought and desertification, crop failures, coastal flooding, wind flows, and energy absorption [42].



#### **4.1.2 Overuse of Modern Design**

The overexploitation of modern Architecture for housing production risk vulnerability to location- and weather-specific events such as floods and earthquakes. Modern houses during sunny climates become very hot and create a need for active energy for the occupant and users' comfort, which contributes to an increase in global energy consumption and leads to environmental degeneration, while traditional buildings become more comfortable even in hot weather because their design revolves around passive energy [41].

#### **4.1.3 Air Pollution**

Through the construction of houses, atmospheric pollutants are generated. The pollutant compositions include sulphur dioxide, carbon monoxide, nitrogen oxides, and hydrocarbons. The atmospheric pollutants are dust, fuel burnt by construction workers, and exhaust gas generated by different types of construction machinery and other construction equipment [41]. The pollutant generated during the production of houses mainly diffuses to the atmosphere and has adverse effects on the respiratory layer and affects the urban landscape, eventually leading to low visibility and incessant traffic disruption. Furthermore, a reduction in the use of locally available building materials increases air pollution through material transportation [43].

#### **4.1.4 Deforestation**

According to the [44], deforestation is the cutting down of trees for non-forest purposes. Deforestation is the conversion of land forest to urban use. It is the adverse effect of population growth, economic growth, infrastructure development, and industrialisation. It is the conversion of a forested area to a permanent non-forested land ([45,46]). Deforestation is a serious challenge in developing countries [47]. Deforestation has a negative influence on the environment, such as biodiversity loss, enhancing the greenhouse effect, and so on. Deforestation occurs highly in tropical rainforests, with around 31% of Earth's land surface filled with forests [48]. This is one-third less than the forest covers before the expansion through industrialisation and urbanisation, with half of that loss occurring in the past century [49].

#### **4.1.5 Soil Degradation**

Influx of population leads to housing production development, which leads to some forms of land pressures and later leads to land pollution (solid product dumping and especially construction waste), which has a major adverse risk of desertification and drought [41].

#### **4.1.6 Flooding**

Flooding is a natural incidence, it is a crucial environmental challenge affecting majorly developing countries, and it is caused by heavy rainfall. Flooding is the condition of housing becoming filled with enormous amounts of water, an overflow of water that submerged dry land and is commonly caused by heavy downpours of rain on flat ground [50]. Flooding is aggravated by numerous factors, such as moderate to severe winds, unusual high tides, tsunamis, human-made menaces that destroy soil, and failures of dams and other infrastructure that hold water [41].

Overpopulation, industrialisation and economic growth led to increased production of houses, which are therefore the major factors for the removal of part of the forest that opens chances for flooding. Once the forest is gone, the area lacks the capacity and strength to retain much water, causing a drier climate. In addition, water that flows from rivers has no capacity to be structured and regulated, which eventually results in downstream flooding and soil erosion, and causes environmental challenges in many parts of Africa [42].

### **4.2 Europe's Environmental Issues and Challenges**

Environmental problems in Europe include: greenhouse gas emissions, fresh water consumption, solid pollution, air pollution, and noise pollution. According to the [51], housing consumes about 50% of the materials extracted in Europe, and is globally responsible for more than half (53%) of greenhouse gas emissions. Building materials alone have an annual CO<sub>2</sub> footprint of 250 million tonnes. Housing is directly responsible for around 60% of global energy use and requires about 33% of fresh water consumption for the production of housing. In addition, the construction and demolition of houses and infrastructure generate a lot of waste, accounting for 35% of the total waste generated [41].

### **4.3 Asia Environmental Issues and Challenges**

Asia is the largest continent in the world; various environmental challenges are the result of population increase and industrialisation. These include Deforestation, water scarcity, pollution, global warming, and climate change. In 2022, the most polluting region in the world was Asia, followed by America; 5.9 billion metric tons of CO<sub>2</sub> were emitted. Climate change is the next most critical factor Asia is affected by, with approximately more than 57 million people affected in 2021 (International Federation of Red Cross and Red Crescent Societies). Asia's governments are very proactive in setting guidelines, they prioritised sustainable project and set aggressive policies such as green targets for their construction sector, because Southeast Asia has seen sea levels rising faster than any other part of the world due to

the number of low-lying countries in the region [52]. Heavy traffic, industrialisation and the usage of coal as a fuel source in some cities are challenges affecting the Asian environment. In 2022, it was established that the Asia-Pacific region will release 17.96 billion metric tons of carbon dioxide, which is significantly greater than the total combination of carbon dioxide emissions of all other regions in that particular year. It was recorded that Asia (China) accounted for up to 60% of Asia-Pacific carbon dioxide emissions and 31% of the global total [53].

As opined by the United Nations (UN), the production of houses is a crucial factor that affects climate change and is solely responsible for about 50% of climate change. The construction industry also affects landfills and pollution. However, the sector is focusing on how to set positive guidelines/policy that will assist in setting positive output to methods of production, to reduce the negative effects of the sector and protect the environment for future generations [54].

#### **4.4 American Environmental Issues and Challenges**

The planet's resources are the major anchors for all living things dependent on for survival, and the environment participates in a crucial role in planet sustainability. Therefore, if pollution of the environment carries by human involvement and over-exploitation of resources, the earth may be completely wiped out in a couple of years. Environmental factors have risen to new horizons, affecting economies and policies worldwide. In America, environmental challenges include: air pollution, depletion of non-renewable resources, deforestation, global warming, and pollution. It was recorded that the frequent environmental challenge in the US is air pollution, which is the world's second-largest emitter of carbon dioxide, followed only by Asia [55].

##### **4.4.1 Deforestation:**

Population growth in the US is very rapid and swift; the population is currently more than 1.7 M, and the high rate of population has increased the quest for urbanisation, leading to a high-rise demand for deforestation to have more vacant land for construction. Increased production of houses to accommodate more people is directly proportional to less open land and farmland. Other consequences of deforestation include overcrowding and high loss of biodiversity and animal habitats [55].

##### **4.4.2 Air Pollution**

In the past 50 years in the US, air quality has tremendously improved, although in some major cities with a high influx rate of population, it still remains a problem [56]. Dust, exhaust gas, earthwork, piling works, road construction, cement, sand, gravel, and other materials during loading, unloading, transporting, and many more are various activities that are done during construction that generate air pollutants into the atmosphere. Pollution factors include sulphur dioxide, carbon monoxide, nitrogen oxides, and hydrocarbons, which are hazardous gases that threaten both human and animal survival. The generated air pollutants are jumbled and diffuse to the respiratory layer, which negatively contributes to the surrounding atmosphere in sunny, dry, and windy weather [43].

##### **4.4.3 Global Warming**

The United States is currently faced with numerous environmental challenges, of which global warming is one of the most notable because of its colossal implication on the surrounding environment. Global warming also contributed to air pollution through spikes in temperature and sparking wildfires across nations. From melting glaciers to intense hurricanes, the Earth's rising temperatures, negative effects on both local climates, and weather patterns are causes of global warming [55].

##### **4.4.4 Water Pollution**

The Environmental Protection Agency (EPA) is doing great in regulating the quality of drinking water, while water from lakes, oceans, and rivers is still highly polluted. It was reported on a global channel that residences dump two million tonnes of sewage into waterways daily [55]. Housing construction projects are a major trigger of water pollution through wastewater for washing vehicles, domestic wastewater pollutes surface water, groundwater systems in the surrounding areas if not treated properly, and many others. There are numerous organic substances pollutants in domestic sewage and catering wastewater from the production of houses, including oil, paint scrubber, and suspended solids. In addition, there is water pollution generated from underground excavation through various activities such as construction machinery, washing wastewater, and permeation of water that contains suspended solids, such as sand, mud, and mineral oil [43].

#### **4.5 Australia's Environmental Issues and Challenges**

Reported by [56], The Production of houses is one of the huge industries in Australia which adversely is affecting the surrounding environment immensely, such as pollution, climate change, habitat loss, deforestation and resource extraction. The construction industry is booming the economy of Australia excellently and has approximately 9% of Gross Domestic Product, which is also about 40% of global carbon emissions annually. As opined by the Federal Government's 2020 National Waste Report, 27 million tons of annual waste are produced from Australia through the construction industry

alone. Each year in Australia, 20 million tons of waste is dumped in landfills out of 44% generated, which results in terrible environmental challenges to the surroundings [56].

However, the construction industry in this country is recommending and advocating for a sustainable environment and working towards the output. As reported by [56] it was recorded that higher residents of Australia (48%) embraced the idea of sustainable building practices and building an environmentally friendly environment, while 43% embraced the idea that the energy efficiency of buildings should be improved and energy consumption should be decreased towards achieving a sustainable practice. Currently in Australia, the climate target of a 43% reduction in emissions of energy consumption is legislated by Anthony Albanese's Federal Government to be executed and become a reality before 2030. Sustainable environmentally friendly laws and targets are also legislated and embraced by the populace to meet the 2030 target and look forward to a better environment.

## **5. Control Measures to Alleviate the Impact of Environmental Factors on Housing**

### **5.1 Promoting Effective Clean Housing Production**

In the present allotment of housing, their major goal is centred around profits, whereby dissipating little or no effort on clean housing production, which leads to degeneracy of the surrounding environment. It is expected that the government should embrace the responsibilities of creating a clean environment through adequate monitoring, proper guidance, and supervision. In addition, they should be saddled and take up the challenge of disseminating adequate information to the public about the benefits and advantages attached to embracing Environmental Impact Assessment (EIA) towards achieving an effective clean house [43].

### **5.2 Noise Pollution Reduction**

Effective reduction of noise at every stage of production of houses is imperative. Completion of surrounding walls should be highly encouraged before any commencement of construction on site. Sharp noise should be eliminated. Adoption of noise-reducing safety curtains should be encouraged by the contractor. Construction workers on site should be noise conscious. Machinery that is capacitated with noise-reducing equipment should be adopted. Unwanted noise can be reduced through strengthening of maintenance units [43].

### **5.3 Air Pollution Reduction**

Effective establishment of an analysis of the quantity of excavation before any construction work should be encouraged, and the use of excavated earthwork for backfilling to avoid pollution of the natural habitat is expedient. Transport vehicles should be strictly managed and maintained to avoid air pollution. Improvement of transportation routes, all resources required should be allocated to spray water often on transportation routes. Dedicated floor garbage passages should be attached to high-rise buildings for transportation. Installed dense mesh safety nets should be fixed in the outer facades of houses to reduce dust. Furthermore, the adoption of advanced technologies is highly encouraged to speed up the construction process and concurrently embrace environmental protection towards attaining a sustainable environment [43].

### **5.4 Solid Waste and Water Pollution Reduction**

Construction generates considerable amounts of waste, which can be washed away and drained in bodies of water, resulting in water pollution. There are various types of vehicles and equipment that produce oil during construction, such as fuel, engine oil, and lubricating oil. The oil should be correctly surveyed not to discharge into municipal rainwater pipes and nearby rivers. Wastewater from construction collected by sedimentation tanks, as well as domestic sewage, is treated by a sewage treatment plant and discharged into the municipal sewage pipe network, which is strictly illegal. Transportation and piling of construction waste along roads should also be regulated; measures for construction projects should be adopted and executed promptly. Adoption and strengthening of control waste discharge and management of site and material quality management will be of great importance in reducing solid waste and water pollution in our environment [43].

### **5.5 Effectively Improving the Environmental Consciousness of Construction Staff**

Construction processes produce different types of pollution that adversely affect the atmosphere and are always energy inefficient. This is the major reason why environmental awareness must be in building team consciousness to reduce the negative impact [57]. The environmental consciousness of construction staff should be enhanced and they should possess a strong sense of environmental protection. Also, they must have complete understanding with accurate sensitisation with related regulations of the state. Onsite construction processes should be orderly and systematic, including construction site sanitation, material stacking, onsite accommodation, and management of living facilities. Building construction should not be encouraged at night, except for repair operations and other special urgent attention that will assist in effectively reducing pollution in urban areas. In addition, reception systems that deal with environmental pollution should be encouraged to assist in the record keeping of issues tendered by relevant parties [43].

## **6. Way Forward: Building a Sustainable Environment**

### **6.1 Focus on Designing Eco-Friendly Buildings**

A building that maximizes absolute usage of recycled materials and produces less CO<sub>2</sub> in the production terrain is called an eco-friendly design. They are buildings that possess the strength for structural durability, energy longevity, and waste production. This aspect of the production process is very important, and total consideration must be done effectively because the impact each building project has on the natural habitat is enormous and could be threatening to human life if not carefully integrated. Designers consider a building's design to be eco-friendly through the adoption of smart appliances, solar panels, and passive energy [57].

### **6.2 Focus on Sustainable Building Operations**

It is of the most expedient that buildings should be as efficient as they can be because they are created to last and positively affect the environment. Durable materials are also important; residents of the houses should also be trained on how to sustain beautiful environmental practices that delimit the degeneracy of the environment, such as recycling, managing waste, and efficient use of energy [57].

### **6.3 Limiting the Negative Impacts of Housing on the Environment**

According to [57], there are several methods for limiting the negative effects of housing on the environment. These comprise:

#### **6.3.1 Noise Reduction**

Building construction should be highly considered by applying various processes such as using quieter equipment, as a paradigm metal, equipment should be discouraged through adoption of rubber panels and fences should be built around noisy sites to reduce the noise impact on the environment [57].

#### **6.3.2 Focused on Nature Conservation**

Despite the high rate of deforestation, countries are progressing through the establishment of sustainable practises, such as restoration of forests and promotion of reforestation. Technology advancement makes room for better monitoring of conservation efforts, and promoting global consciousness provides hope for a sustainable future. Several initiatives have been established to promote reduction of carbon emissions for a better environment. There are several adoptions of goals towards carbon reduction, including setting up a certified environmental and carbon assessment tool for the building industry, namely the Building Environmental Assessment Method (BEAM) Plus. The Hong Kong's Climate Action Plan for carbon reduction emissions by 2030 sets targets of 26%-36%. Also, the 4th edition of the Green Building Master plan was launched in 2021 and updated in July 2022 in Asia. 80-80-80, which are simplified, has greening 80% of the buildings in Singapore, attaining energy rating that is super low for 80% of current developments; and achieving 80% improvement in productivity of energy for outstanding green buildings by 2030 are the three targets aim in adopting and achieving green building [56].

Furthermore, in Malaysia, as recorded by the Green Technology Master Plan 2017-2030 published by the Ministry of Energy, Green Technology and Water in 2017, they possess few cogent factors that serve as a drive for reduction of carbon emission, which includes design that are green; sustainable practices in construction; and adoption of building materials that are green [55].

## **7. Recommendations for Mitigating the Impacts of Environmental Factors on Housing**

(a) Sustainable strategies set towards a reduced carbon emission building and resilient buildings and the housing production sector by building alliances with national stakeholders.

(b) There is a need to ensure construction projects make use of energy-efficient buildings. materials through evaluation using environmental social governance (ESG) indicators And ensure an increase in investment in energy efficiency between governments and Non-state actors. Furthermore, establishing a sustainable target for green design, green Materials, management of energy, management of waste; improved technology support; and reporting transparently and accurately.

(c) To mobilise, ensure and implement effective policies that will assist people Diversity, staff diversity, and the community within the construction supply chain.

(d) Establish a compulsory energy code for building construction industries to meet the goal of net zero carbon emission standards via coalitions within national and sub-national governments.

(e) Implementation of policies that promote the shift to circular material economies by governments and established strong knowledge of sustainable values; promoting Sound sustainable leadership by developing policies

(f) Implement strong procedures and quality practises throughout the construction stages.



## 8. Conclusions

The condition of the global environment is rapidly degenerating. Human growth and development has resulted in a series of environmental challenges. Industrialisation and overpopulation, which are significant factors of land expansion, have contributed immensely to environmental challenges in the world. Our environment directly affects human activities, and its negative impact is on the high rise. However, if necessary, caution and measures are not rapidly adopted; the environment will soon become inhabitable for human beings. The world is faced with various challenges through environmental crises, such as climate change, air pollution, water pollution, natural hazards like floods, storms, drought and many others, which have adverse effects on human life.

To achieve a habitable and sustainable environment, these two major strategies in improving environmental factors and housing sustainability are important. The first strategy is to encourage a coalition of professionals, systems, and data through connected technology, which will facilitate teams to find ways to promote sustainability through improved processes and transparency. The second strategy deals with tracking and reporting the impact on the environment and carbon reduction efforts. Construction teams are encouraged to track and report how sustainable they are during the production of buildings.

### Author Contributions

Olusola Oladapo Makinde carried out supervision, literature review, conceptualization and methodology. Odunola Olayinka Onigbogi carried out interpretation and contributed in area of visualization, formal analysis, Olubukunmi Temitope Makinde carried out investigation and original draft preparation, Olabode Oludayo Akangbe writing manuscript review and editing.

### Conflicts of Interest

The authors declare no conflict of interest.

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