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UNIVERSITY OF CAPE COAST

RESIDENTS' PERCEPTIONS OF AIR POLLUTION IN THE ACCRA METROPOLIS, GHANA

BY

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Thesis submitted to the Department of Geography and Regional Planning, Faculty of Social Sciences of the College of Humanities and Legal Studies, University of Cape Coast, in partial fulfillment of the requirements for the award of Master of Philosophy degree in Geography and Regional Planning

OCTOBER, 2023

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DECLARATION

Candidate's Declaration

I hereby declare that this thesis is the result of my own original research and that no part of it has been presented for another degree in this university or elsewhere.

Candidate's Signature…… Date…….

Name: Magdalene Adei Nikoi

Supervisor's Declaration

We hereby declare that the preparation and presentation of the thesis were supervised in accordance with the guidelines on supervision of the thesis laid down by the University of Cape Coast.

Supervisor's Signature: ……. Date……..

Name: Dr. Ogunleye-Adetona, Comfort

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ABSTRACT

Air pollution is one of the most serious of all environmental issues confronting mankind today. People's knowledge of air pollution's existence helps them to be more prepared, and their attitudes based on the decisions they make are crucial in reducing its threat to human health. This study sought to assess residents' perception of Air pollution in the Accra Metropolis. Quantitative research methods in the form of structured questionnaires were distributed to 400 randomly selected households in the Accra Metropolis. Descriptive statistics and regression analysis of residents' demographic characteristics and their perceptions were conducted using Statistical Package and Service Solutions (SPSS) version 26. The study concluded that most of the respondents used for the study were aware of air pollution. However, awareness about many sources of air pollution was low in some groups like the less educated and elderly. The study also showed residents of the study were willing to improve their attitude by constantly using personal protective measures like masks and handkerchief since it has a role in protecting against air pollution hazards. A statistically significant positive relationship was observed between environmentally friendly practices and attitudes in the study area. It is therefore recommended that educational campaigns among residents should be intensified with the focus being on perceptional change helping them to become more knowledgeable about air pollution. Also, environmental authorities should dedicate resources to long-term monitoring and maintenance of monitoring stations located in residential areas and also have a way to track local air quality management.

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KEY WORDS

Urban Air Pollution

Perceptions

Residents

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DEDICATION

This work is dedicated to my loving family, especially my dad, Mr. Richard T. Nikoi.

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LISTS OF ACRONYMS

AP-	Air Pollution
PM_{10}-	Particulate Matter Less than 10
$PM_{2.5}$-	Particulate Matter Less than 2.5
CO-	Carbon Oxide
O_3-	Ozone
EPA-	Environmental Protection Agency
WHO-	World Health Organization
CIEL-	Center for International Environmental Law
SDG-	Sustainable Development Goals
AM-	Accra Metropolis
GSS-	Ghana Statistical Service
NO_2-	Nitrogen Oxide
SO_2-	Sulphur Oxide
UV-	Ultra Violet
VOC-	Volatile Organic Compound
GBD-	Global Burden of Diseases
AOG-	Air Quality Guidelines
CAWI-	Computer-Assisted Web Interview
DCM-	Discrete Choice Model
PPM-	Personal Protective Measure
OR-	Odds Ratio
SPSS-	Statistical Package and Service Solutions
RAT-	Reasoned Action Theory
ERB-	Environmentally Responsible Behaviour
TPB-	Theory of Planned Behaviour

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CHAPTER ONE

INTRODUCTION

Background of the Study

Pollution which is as old as civilization is defined as substances (pollutants) introduced into the environment, and it's detrimental to humans and other organisms. Harmful pollutants include solids, liquids, or gases that are produced in greater-than-normal concentrations and therefore deteriorate our environment's standard (Manisalidis et al., 2020). Among the numerous environmental issues confronting mankind today, air pollution is of particular interest because it has a direct impact on man's health, buildings, supplies, and other cultural heritage items, likewise, an overt effect on coastlines, forests, rivers, and other recognized ecosystems. One of the most serious environmental problems is air pollution, which poses a major threat to the well-being and health of countless numbers of people as well as the world's ecosystems (Ma et al., 2021).

Quality air is a basic necessity for human well-being, however, the increasing amounts of industrial–related waste discharged into the atmosphere due to the rapid economic growth in some developing countries have made air pollution a serious threat to public health (Liao et al., 2015). Through both natural phenomena and human actions, significant quantities of hazardous gases and particulate matter are released into the Earth's atmosphere (Manisalidis et al., 2020). According to the World Health Organization (WHO, 2006), research on the quality of air revealed that some developing countries faced the highest levels of , whilst many developed countries, like the United States and Japan over the past decades have made improvements

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their air quality. Economic development cannot exist without urbanization. Urbanization is therefore defined as the process by which a country's urban population not only grows faster than its rural population, accompanied by the cultural importance of cities, and a rapid rise in economic and political interest (Byulegenova & Turemuratov, 2023). It brings with it a slew of demands, including overpopulation, the rise of urban settlements, and increased industrialization activities within urban limits and its surroundings, an increase in moving vehicles, and elevated buildings contributing to pollution of the environment. According to (Hime et al., 2018), Particulate matter is one of the very dangerous and commonly occurring pollutants made up of a category of toxins consisting of different mixtures of particles both solid and liquid suspended in the air which represent an ample threat to the health of humans in urban cities with rapid economic growth being a factor (Mirzaei et al., 2021).

Countries with low and middle incomes are the result of rising populations, rising non-communicable disease fatalities, and rising pollution levels, which have risen over the last 25 years due to significant environmental exposure to the global disease concern (O'Donnell et al., 2017). According to (Beatty & Shimshack, 2014) it was confirmed that children's respiratory system diseases were caused by CO and O_3 in polluted air, and as of September 2018, WHO, (2018) revealed that Ghana's heavily unclean air had claimed the lives of over 28,000 deaths. Other studies have found that air pollution has significant economic consequences in Ghana. Again, a study revealed that preventing fossil fuel emissions in the United States has

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improved the economic benefit of health problems between 2.5 and 6.0% of GDP annually (Perera, 2018).

Ghana's increasing rural-urban migration and population growth are likely to challenge and outpace the country's already inadequate pollution-management infrastructure. The city of Accra has seen fast urbanization with continuous growth of cities due to the rise in population, resulting in ongoing challenges with air quality (Mudu & Organization, 2021). Activities including industrial processing, electronic waste recycling, heavy traffic of vehicles, and waste burning, have been associated with the release of various air pollutants into the atmosphere, including heavy metal dust, carbon monoxide, carbon dioxide, and tenacious toxins, all of which have been linked to health issues (Nafrah, 2017).

Among all ecosystems, urban areas produce roughly 78 percent of all significant airborne pollutants and carbon emissions, which adversely affect over half of the global population (Liang & Gong, 2020). If nothing is done to reduce projected and current future levels of air pollution, this figure is expected to rise to around 4,600 by 2030. In recent years, fine particulate matter ($PM_{2.5}$) has drawn significant public attention due to its association with hazy weather and considerable health risks for urban populations. Various factors contribute to differences in how urban residents perceive air pollution.

Perceptions are shaped by our beliefs, knowledge, norms, and resources but they can also be formed without prior experience with the person or object (Mariwah et al., 2010) and this influences not only their decisions but also their behaviours and attitudes toward pressures of the environment

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and therefore, our knowledge, attitude, and practices on urban air pollution are determined by our decisions we make. (Peng et al., 2019), argues that public perception of air pollution is crucial for affecting emotional and behavioural reactions to air pollution because they are the most prevalent subject indicator of environmental performance at the local level.

Contrary to expert judgments of air quality that depend on numerous scientific measurements, perceptions of air pollution seem to vary and be impacted by a number of important elements and mechanisms (T. Liu et al., 2018). Perception is the primary cognitive contact that a man has with the world around him (Rubin et al., 1996), therefore setting a limit to ones capability with regards to what one can do and also what can be achieved. To understand public perception and attitude with regard to air quality and its regulation, the involvement of new technologies and management alternatives will be very important for a successful citizen. In this regard, the more knowledge one acquires on urban air pollution, the clearer our opinions tend to be and the stronger our perceptions (Agyapong et al., 2012)

Problem Statement

Air pollution is a major threat to global society because it has a cascading effect on individuals, ecosystem health, and economies in both developing and developed countries. Approximately 90 percent of global citizens live in areas where air quality exceeds the accepted standard of World Health Organization (Organization, W.H. 2007).

Despite the presence of laws and regulations addressing urban air pollution, none of these initiatives or plans have been able to raise the air quality in the district. The cities of Accra and Tema hold the majority of the

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nation's industries, some of which are old and pollute the environment. According to EPA Ghana, evidence shows that air pollution claimed the lives of 2,800 people in the Greater Accra Region in 2015 due to its significant regional variation in air pollution levels.

Based on a global survey encompassing 499 cities, the annual average concentration of fine particulate matter ($PM_{2.5}$), with particles measuring less than 2.5 micrometers in diameter, was found to be nearly 20 times greater in the most polluted city compared to the cleanest city as of 2019. 31.1g/m3 was Ghana's PM in 2016, considerably exceeding the annual recommended threshold of 10 ug/m^3. This demonstrates Ghana's deteriorating air quality and its consequences for human health. The situation appears not to be different in the Accra Metropolis (the study area of this research) as the PM is 49 ug/m^3. This is not surprising since activities such as elevated buildings, recycling of electronic waste, car traffic congestion, and increased industrialization activities within urban limits and its surroundings appear to be contributing to the pollution of the environment.

A few studies have demonstrated how pollution of air has harmed and continues to have a negative impact on human health, the built environment, and the ecosystem as a whole; A 2007 World Health Organization (WHO) research highlighted considerable disparities in the impact of the environment on health, as well as ways to enhance public health by lowering environmental dangers such as pollution, occupational hazards, and climate and ecosystem changes. Again, (Nafrah et al., 2018) discovered that the majority of female vendors at Agbogbloshie market in Accra, Ghana showed signs of colds, coughs, sore throats, and frequent sneezing, among other respiratory

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conditions (next to a sizable e-waste recycling site). Aside from the vendors, street sellers, and market women who work Accra's main, crowded streets, residents are people who live within specific boundaries of location and may have common traits and/or values, including close familial relationships, responsibility, respect, and reciprocal behaviour considering the various physical, social, and economic factors in the environment (Delong, 2023) are also subjected to air pollution caused by both natural and human activities.

Notwithstanding all the problems identified, available literature on ways of preventing the health long-range effects of polluted air in the environment of Accra is not much. Moreover, gaps in the literature still remains on both knowledge level of residents and the measures taken to prevent air pollution considering how dreadful it is harmful to humans and other kinds of creatures. Without having a general concern to understanding urban air pollution, will intend lead to various diseases, such as cardiovascular and respiratory diseases, death of animals and plants and financial losses in Ghana and as a whole (Kassa & Grace, 2019). To enhance the achievement of SDG 3, 9, 11 and 12, this study is focusing on assessing residents' perception of urban air pollution. This will therefore help minimize or eliminate urban air pollutants from the environment so that humans would enjoy and breathe air which will most likely not aggravate an already worsened medical condition or influence ill health.

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Figure 1.1: Air Pollution in the Environment
Source: CIEL, (2019)

Purpose of the Study

The main aim of this study is to assess residents' perceptions of air pollution in the Accra Metropolis (AM).

Specifically, the following will be pursued;

1. To explore residents' knowledge of air pollution.
2. To examine the attitudes of residents towards urban air pollution.
3. To ascertain the environmentally friendly practices they engage in.
4. To analyse the effect of attitude on environmental practices

Research Questions

1. How do residents of AM acquire knowledge about air pollution?

2. How can the attitudes of residents of AM influence urban air pollution?

3. What environmentally friendly practices do residents of AM engage in?

4. What effect does the attitude of residents of AM have on environmental practices?

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Significance of the Study

This research integrates the potential to increase public awareness of urban air pollution and also aims at gathering information to assist governments and stakeholders in developing and implementing policies that are effective to regulate air pollution and improve the air quality.

It also entails modeling and analyzing the data to determine their level of knowledge about urban air pollution in the designated areas. Again, the study's findings will aid in the development of a strategy for implementing the action plan in their jurisdiction, as well as maintaining their authority to evaluate the monitoring procedure and closely regulate all or parts of the air quality action plan until the concerned can accept the duty of enforcing a set of standards.

Finally, the study will assist the researchers in exploring the possibility of creating educational and preventative programs for their students and coworkers that will ensure that they benefit from increased awareness of air pollution. In addition, the findings of this study will aid future researchers in their research. It will serve as a guide for them as they plan and select their research topic, as well as work on it.

Scope of the Study

The study will cover the three sub-metros (Ablekuma South, Ashiedu Keteke, and Okaikoi South) in the AM. Specifically, it is delimited to six towns namely Korley Gonno, Old Dansoman, Accra Central, Usher Town, Kaneshie, and Darkuman, and not the whole of Accra Metropolitan. It is emphasized that the towns considered for the study are somehow clustered due to their economic activities. Also, several dimensions of urban air pollution

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call for an investigation. However, this study focuses, among others, on how of urban air pollution is perceived in the Accra Metropolis.

Limitations of the study

Time and financial restrictions are predicted as limitations during the study period. Data gathering for the study is also anticipated to present difficulties due to recollection bias. Furthermore, some residents appeared uninterested in the study and reluctant to take part while others demanded money before they would take part in answering the questions. To solve this, respondents were explained the research's objectives and purpose before being invited to participate.

Organization of the Chapters

The research is systematically organized into five distinct chapters. Chapter One serves as the introduction, laying the groundwork for the study by delving into the background, articulating the problem statement, outlining the research objectives and questions, highlighting the significance of the investigation, and defining the study's scope. Chapter Two provides a comprehensive synthesis and critique of relevant literature, offering a contextual foundation for the research. Precisely, subsections such as the concept of perception, an overview of urban air pollution, knowledge level, attitudes towards urban air pollution, and environmentally friendly practices and theories and models relevant to the research.

The methodology is described in Chapter 3, and it comprises of the paradigm or design of the research, study area, study populations, the methods of sampling, the instruments used for the research and how it was administered, important ethical issues, and pretesting/pilot study. Chapter Four delves

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deeply into the study's discoveries, offering a comprehensive analysis of the data and unveiling the insights derived from the research process. Chapter Five serves as the concluding section, presenting a synthesized overview of the findings, a thoughtful conclusion, and actionable recommendations for future applications or further study.

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CHAPTER TWO

LITERATURE REVIEW

Introduction

This study was aimed at assessing residents' perceptions of air pollution in the Accra Metropolis. The chapter aims to review a few of the relevant studies conducted by organizations, academics, and researchers on urban air pollution. It reviews the literature on the following themes: concepts of perception; urban air pollution; knowledge, attitudes, and environmentally friendly practices; and the framework, both theoretical and conceptual.

Conceptual Perspective of the Study

Concept of Perception

According to Robbins (2005), perception is defined as the process through which people organise and interpret their sensory experiences to give their world meaning. According to Afiah, N. (2020), perception requires choosing which information to focus on and how to classify and interpret it. Van den Ban, (1996) asserts, "We live in the same world and acquire identical perceptions of it through our eyes and hearing and, to a lesser extent, through our senses, e.g., touch, taste, and smell." It takes a lot of cognitive effort to perceive the world since we analyze and extract noisy signals from it (Raviv et al., 2012). Internal noise, which impairs our ability to distinguish physically similar stimuli, is generally thought to be the cause of perceptual resolution limitations.

Our interpretations of our experiences vary. (p.45). Therefore, people regulate and interpret their sensory illustrations through the act of perception, which utilizes our senses, including seeing, hearing, smelling, and tasting, to

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give their surroundings meaning. "The process by which we collect information or stimuli from our environment and transform them into our psychological awareness," is therefore termed perception (p.46). While it is impossible to fully comprehend the intricate psychology of human perception, it is important to understand why people perceive their environment differently and how this has affected how they interact with others. We must emphasize once more that our senses are not absolute.

According to (Faradina, 2007), perception has a broad and narrow understanding. Perception, in its broadest sense, is a point of view or understanding: how one sees or suggests something, and in the narrowest sense, is vision: how one senses something. It is a form of thinking that allows us to analyze as well as understand our surroundings (Kreitner et al., 2001). Perception varies from one person to another and it's also subjective. Although the technique by which sensory data reaches the brain is the same, the message varies depending on the individual. Mc Shane and Von Glinow (2000:166) cited in (Afiah, 2020) argued that the process of receiving information about our surroundings and making meaning of it is known as perception.

(Barsalou, 2003) defines environmental awareness as the ability to structure and make sense of sensory data from one's surroundings. This processing takes place outside of conscious awareness because it is dependent on intricate neural system processes that seem to be relatively effortless. (Munn, 1972). Although we cannot know whether a message is heavier, lighter, larger, or smaller than other smaller items when developing communications, we should keep in mind that a person's impression of any

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part of the message will be influenced by the segment immediately before it. Perception plays a significant role in the public's reaction to environmental exposures and is also a key component of behaviour change. As a result, interventions that promote protective behaviour must improve people's perceptions and knowledge. In addition, we assign different meanings to what we perceive, and the meanings we assign may vary depending on the person since the only way to experience or encounter anything is through your mind's filter.

Concept of Urban Air Pollution

The existence of materials in the surrounding atmosphere, often originating from human actions, present for a long enough period, and under conditions that considerably impede people's ability to enjoy their property or live comfortably is known as air pollution (Junker et al., 2000). In the same way, the air is essential for the existence and development of all species on Earth. It has an impact on health and the economy's growth. Air quality is declining and air pollution is getting worse in our modern world following the combustion of fossil fuels, the expansion of private ownership of cars and industrialization. People who live in urban settings are more likely than those who live in rural regions to suffer from allergic respiratory illnesses in the majority of industrialized nations.

A large number of scholars from around the world have studied air quality forecasts and air pollution, with a focus on contaminant forecasting. Pollutants are made up of different chemicals and toxic wastes, causing pollution in the atmosphere. Major pollutants include Sulfur Oxide ($SO_{2,}$), Nitrogen Oxide ($NO_{2,}$), Carbon ($CO_{2,}$), Monoxide, Volatile Organic Compounds, Particulates

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($PM_{2.5,}PM_{10,}$), Toxic Metals, Chlorofluorocarbons, Ammonia and odor (Najjar, Y. 2011). A major issue that has an impact on people's lives and may potentially endanger human survival is air pollution. Pollution is any change to the physical, chemical, or biological composition of the atmosphere. It occurs when toxic gases, smoke, or dust enter the environment and contaminate the air, making it impossible for any living things to survive (Bağçivan et al., 2009). There may be harmful quantities of this mixture of particles and gases both inside and outside. The radioactive fall-out is one of the substances that pollute the environment and has a natural origin. It can contaminate surface and ground waters, vegetation, and the air. Other substances include minerals, decomposing animal or plant carcasses, and pathogenic microbes.

During the Industrial Revolution, the use of coal by industries and households increased dramatically, and significant illness and death were brought on by smog, particularly when stationary atmospheric conditions were present. In 1952, there was extreme pollution in London for five days, resulting in at least 4,000 deaths. (Ferreira et al., 2013). It has existed in numerous civilizations ever since humanity first started using fire. It is the existence of toxic substances in the atmosphere of the earth. The gaseous system of our atmosphere is what makes our planet habitable. It is a crucial element in the existence of life on earth (Nwankwoala, 2015). Although this incident highlighted the connection between air pollution and health, it remains a pressing issue in numerous cities and households worldwide. Air pollution occurs when gases and particles are released into the atmosphere in harmful quantities, whether through natural processes or human activities Kemp et al (2011). As "criteria" air pollutants, the EPA has identified the

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following six pollutants of particular concern: ground-level ozone, carbon monoxide, nitrogen dioxide, lead, sulphur dioxide, and particulate matter. These pollutants have regulatory standards based on scientific evidence of their negative health effects.

Sources of Air Pollutants

Pollution of air in Accra arises from a variety of sources, each contributing to the deteriorating air quality in distinct ways. This includes area sources, mobile sources (vehicles), and industrial sites both occurring naturally (sea salt and dust from the Harmattan wind) and man-made sources, such as cook fires and opened waste burning sources. While some sources are typical of African developing towns, others are unique to Accra or the coast of the continent of West Africa. There are two categories into which pollutants can be classified:

Natural Sources

Natural pollution sources are events that occur in the natural world and release harmful substances into the atmosphere (Semenova, 2020). Some natural sources are organic substances from suspended salt from the sea, plants, dust, and other natural phenomena like forest fires and volcanic eruptions. Massive emissions of smoke and toxic gases can raise background pollution levels for years, even in locations far from the source. One of the most common natural air pollutants is ozone.

(1) Anthropogenic (Man-Made) Sources

Anthropogenic activities are the predominant cause of environmental air pollution even though many natural events (fires, volcanoes, etc.) can release a variety of pollutants into the environment. While it is possible for dangerous

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substances to unintentionally seep into the environment, other operations and industrial facilities can produce a variety of air pollutants that could be harmful to both human health and the ecosystem. The primary contributors to air pollution are human-made activities including burning fuels, spills from industrial manufacturing, and emissions from vehicles. Man-made pollution sources emit pollutants such as hydrogen, oxygen, nitrogen, sulphur, metal compounds, and particulate matter. (Saxena & Sonwani, 2019).

The global energy demand has substantially expanded as a result of the world's rising population and the emerging global economy. The widespread usage of fossil fuels worldwide has not only exacerbated environmental degradation but also posed significant risks to public health, contributing to a range of pressing ecological and societal challenges. (Song et al., 2015). Air pollution, according to Wang et al., is a significant problem with two main impacts that affect both human health and the environment: global warming, acid rain, and climate change are examples of how it affects human health. It also affects many places of the world (2016). Below is a description of these environmental effects.

A. Climate change

Fossil fuel consumption and other human activities increase the amount of greenhouse gases in the atmosphere, which causes global warming. The greenhouse effect is caused by certain chemicals that are released into the atmosphere as a result of human activity. These include N_2O, CO_2,CH_4, and chlorofluorocarbons (CFCs), which are best represented by Freon-12 (Çelikler & Kara, 2011). This causes sea levels to rise, more glaciers, and extreme weather, and ice caps to melt. According to Desonie (2007), as temperatures

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continue to rise, more environmental changes are unavoidable. Indoor wood, gas, or kerosene stoves, lamps, or heaters are additional possible sources of CO toxicity, particularly in the wintertime when heating device use tends to increase and home ventilation tends to decline.

B. Ozone Hole

The main purpose of the layer of the ozone, which has a relatively high concentration in the stratosphere, ozone is to absorb UV light. It shields vegetation, animals, and people from UV rays that are short-wave, one of its most significant roles in protecting the Earth from harmful effects. Additionally, it prevents global warming since ozone absorbs UV radiation from the sun and transforms it into heat energy, which warms the atmosphere (Solomon, 1999). As a result of their reaction with stratospheric ozone, halo hydrocarbons like Freon and oxygen can both produce the greenhouse effect and deplete and damage the ozone layer. Anthropogenic ozone depletion is widely regarded as one of the most serious environmental issues (Peterson et al., 2001). The hole in the ozone layer is harmful to both the wellbeing of humans and the ecosystem. This can result in serious illnesses like eye damage, genetic mutations, and skin cancer (Anwar et al., 2016). Research shows that a 1 percent decrease in stratospheric ozone concentrations increases UV radiation by 2 percent and cataract incidence by 0.2-0.6 percent. In addition, ozone depletion threatens the health of people, animals, and plants, and even destroys the biosphere and the biological balance of the oceans.

Categories of Pollutants

The alteration in the composition of the atmosphere is primarily driven by the burning of fossil fuels for transportation and energy production. A number

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of air pollutants have been reported, each having its own chemical traits, emission and reaction characteristics, persistence of the environment, ability to move over short or long distances, and possible consequences on human and/or animal health. They can be divided into four categories, nevertheless, due to their similarities:

A. Gaseous pollutants

Gaseous pollutants, which significantly change the composition of the atmosphere, are mostly produced by the combustion of fossil fuels (De Sario et al., 2013). Nitrogen oxides (NO) combine quickly with other airborne radicals or ozone to generate NO_2. Stationary and mobile combustion sources are principal anthropogenic sources of pollution. Additionally, sunlight triggers a chain of events involving NO_2 and volatile organic molecules that result in the formation of ozone in the lower atmospheric layers. On the other hand, incomplete combustion results in the production of CO. The main source of it is also the road system. "Although human activities such as the smelting of ores containing sulfides and the combustion of fossil fuels, notably coal and heavy oils, contribute significantly to anthropogenic SO_2 emissions, the primary natural sources of sulfur dioxide are the oceans and volcanic eruptions." Only two percent (2%) of all emissions are produced by the latter. Volatile organic compounds are a broad category of substances that fuel combustion, notably those involved in the creation of energy and the movement of vehicles (VOCs). Chemical species of an organic origin, like benzene, fall under this category of substances. Although the majority of gaseous pollutants are inhaled and predominantly affect the respiratory

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system, they can also result in hematological problems (CO, benzene) and cancer (Kampa & Castanas, 2008).

B. Heavy metals

The elements of basic metals, such as manganese, chromium, mercury, cadmium, lead silver, nickel, and vanadium are examples of those found in heavy metals. They are organic elements that make up the crust of the planet; they cannot be destroyed or damaged; they may be carried by air and also be found in water and food sources for people. They also come into contact with the environment through a variety of sources, such as manufacturing plants, wastewater discharges, and combustion. They sporadically make their way into our bodies, where they serve as trace components that are necessary to keep our metabolic processes functioning normally. But at larger (albeit still quite low) quantities, they can be poisonous (Järup, 2003). The majority of heavy metals are harmful because of their propensity to bio-accumulate in living things. The process by which a chemical's concentration in a biological organism rises over time relative to its concentration in the environment is referred to as bio-accumulation.

Persistent organic pollutants

A harmful class of chemicals is composed of persistent organic pollutants. As they ascend the food chain, they remain in the environment for longer and have greater effects (bio-magnification). They comprise dioxins, furans, and PCBs (Polychlorinated biphenyls) are referred to as "dioxin-like chemicals" and can function similarly when it comes to toxicity of the dioxin kind, and pesticides (Schecter et al., 2006). When chlorine-containing products (like plastics) are burned, incomplete combustion and other processes can produce

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dioxins. Dioxins are airborne pollutants that commonly accumulate in water and on soil, due to their insoluble nature, they avoid contaminating sources of groundwater. They are mostly produced by plants from air, dust, or pesticides. Because they can stably bind to lipids, they can bio-accumulate and enter the food chain.

C. Particulate matter (PM)

Solid or liquid granular particles make up atmospheric particulate matter. (Zhang et al., 2021). PM stands for particulate matter, which is a general term for a class of air pollution made up of variable combinations and complex particles suspended in the air. These particles, which vary in size and composition, are generated through a wide range of natural and human-made processes, contributing to their complex and dynamic nature (Pöschl, 2005). The main causes of particle pollution include motor vehicles, factories, power plants, waste incinerators, building sites, fires, and naturally occurring wind-blown dust. Particles range in size (PM_{10} and $PM_{2.5}$ for aerodynamic diameters less than 10 mm and 2.5 mm, respectively), and different classifications have been made: fine particles with an aerodynamic diameter smaller than 1 mm, tiny particles with a diameter that is aerodynamic smaller than 0.1 mm, and coarse particles larger than 1 mm aerodynamic diameter.

Most cities throughout the world experience thick smog and particulate matter regularly (Qin et al., 2015). Medical research demonstrated that the human immune, cardiovascular, central nervous, and respiratory systems, as well as genes, are all adversely affected to varying degrees by PM. (Chahine et al., 2007). Accra, the country's main emerging city, has drawn considerable attention from throughout the world due to its rapid economic growth and air

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pollution. Ghana experienced very high levels of air pollution in 2018 with most cities having air quality that was worse than the national standard (Odonkor & Mahami, 2020). High particulate matter concentrations have drawn more attention recently in Ghana.

In general, air pollution damages the environment globally as well as locally and regionally. They have the potential to harm the entire world. The protective ozone layer of the globe has been harmed by some man-made compounds, which have increased harmful solar radiation levels that reach the surface of the Earth (Faiz, 1993). Despite the phase-out of their use, these chemicals' negative impacts will continue for many more years (Andersen & Sarma, 2012).

Air pollution and its health effects

Quantifying the detrimental effects of air pollution on human health has become a serious concern, particularly in areas where the problem (air pollution) is prevalent. This is because the air we breathe in contains a lot of particles and gases that come from both natural and man-made (anthropogenic) sources (Olstrup, 2019). For persons exposed to such situations, the health implications of exposure to these gases and particles could offer major health risks or issues. It is well established that anthropogenic particles are typically, and to varying degrees, hazardous to human health (Olstrup, 2019). There are significant questions about the causal relationships between exposure to several contaminants and various health effects. Since exposure, the pollution of air poses a severe danger to health, it is crucial to determine the degree of its impact on people to raise essential

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awareness and reduce the health hazards resulting from such exposure (Olstrup, 2019).

Additionally, the Global Burden of Disease (GBD) report states from 2016, $PM_{2.5}$ is thought to be the sixth-largest global risk factor for early mortality. Meanwhile, there are several studies (Olstrup, 2019;Ogunbayo, 2016: Dehbi et al., 2017; Xue et al., 2019; Mokona et al., 2020; Yap et al., 2019) that espouse that environmental air pollution offers substantial health risks to people, with the most common effects being cancer, cardiovascular illness, and respiratory ailments.

For instance, in 2016, Ogunbayo conducted a study on a retrospective study of health effects of air pollution. The purpose of this research was to identify air pollutants that are harmful to the health of humans and determine their effects, undertake retrospective investigations to see if hospital visits for respiratory illness symptoms are correlated with exposure to environmental air pollutants, and determine whether exposure to environmental air pollution has a significant impact on hospital visits for respiratory disease symptoms and also to determine whether hospital visits brought on by the signs and symptoms of respiratory disorders are significantly impacted by exposure to outdoor air pollution. A total of 229 medical records, from patients who sought care between February 1 and March 22, 2016, were examined following the ethical committee's approved guidelines. The hospital file number, sex, age, diagnosis, comorbidity, the month of the most recent hospitalization, a positive family history of the diseases, exposure to toxic substances at work, occupation, working in a toxic environment, smoking, years of smoking, and how many packets of cigarettes per day were smoked

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are all gathered. The data reveals a remarkable correlation of 0.99 between the presence of environmental air pollutants and the overall frequency of hospital visits, suggesting a profound relationship. Furthermore, with a 95% confidence level, the two-tailed P value of 0.004 indicates a noteworthy correlation between exposure to environmental air pollution and the total frequency of hospital visits due to illness-related symptoms. These findings support the notion that being exposed to air pollution has a negative impact on one's health, especially in terms of how quickly illnesses and symptoms develop.

Krishna, (2021) carried out a study on the relationship between air pollution and health in Delhi, India: short-term effects on health and policy implications. Daily mortality statistics from Delhi were used in the analysis. The East, North, and South Delhi Municipal Corporations as well as the New Delhi Municipal Council, which collectively comprise about 97-99 percent. of all documented fatalities in the city each year, provided death records from June 2010 to December 2019. Data for the specified period were gathered to calculate daily death counts, both overall and across different subgroups. Since exposure data from January 2017 to June 2019 have not yet been analyzed, the analysis was confined to the period from June 2010 to December 2016. In that period, there were approximately 700,000 non-accidental deaths, with 53 percent occurring in men, and 34 percent of these deaths being recorded at medical facilities.

The study's findings revealed that across four municipal corporations with available data, there were 700,512 non-accidental deaths between June 2010 and December 2016. The median age at death was 60 years (interquartile

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range [IQR]: 40 to 72 years), while the median 2-day average of $PM_{2.5}$ exposure was 90.7 µg/m³ (IQR: 70.1 to 126.2 µg/m³). On average, there were 288 daily non-accidental deaths (IQR: 258 to 320). $PM_{2.5}$ concentrations exhibited significant seasonal fluctuations, with a minimum of 27 µg/m³ (above the World Health Organization's daily exposure limits) and a peak that exceeded safe levels by more than tenfold. Regression analysis showed that for every 25 µg/m³ increase in $PM_{2.5}$ exposure, the relative mortality risk increased. Specifically, there was a 0.8% rise in non-accidental mortality for every 25 µg/m³ increase in $PM_{2.5}$ exposure across various demographic subgroups.

There was significant age-related variability, with every increment in exposure of 25 g/m3 associated with a 1.5 percent (95% CI: 0.8, 2.2%) increase in death among those 60 and older and a 0.3 percent (95% CI: 0.1, 0.5%) increase in mortality among those 40 to 59. Each increase in exposure of 25 g/m3 was associated with a significant effect in 31 males and females, resulting in an increase in mortality of 0.9 percent and 0.7 percent, respectively. The study also investigated how daily mortality in an Indian environment is affected by $PM_{2.5}$ exposures. It was realized in Delhi that changes in $PM_{2.5}$ exposures are strongly correlated with an increase in deaths, with the effect being much more pronounced in older persons than in younger age groups. Additionally, the effects of sex varied. Finally, the whole research population's exposure-response data showed a significant rise in risk at lower exposure levels and a decline at levels above 125 g/m3. Other strata of interest showed comparable heterogeneities as well.

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Also worth considering is a report developed by Mudu and the World Health Organisation (2021) at the Department of Environment and Climate Change on health and ambient air pollution in Accra. The primary objective of the report was to determine Accra, Ghana's air pollution's effect on health Ghana. Different sources, such as official monitoring stations and satellites, were used to collect data on air pollution. Two values were gathered and taken into consideration for the health risk assessment namely: Accra city had PM_{10} average equal to 81.1 g/m3 (converted into $PM_{2.5}$ 49.47 g/g/m3 mean concentration value), in 2014 and 2015, the Greater Accra region had an average of 36.02 g/m3 from residential monitoring sites, while the entire Greater Accra region had an average of 36.02 g/m3 from satellite data. Data on the population were derived from the 2010 census. Also accessible were mortality statistics from the Ghana Statistical Services. To calculate the impact of air pollution, various scenarios were tested. A 10 percent reduction in existing $PM_{2.5}$ levels was also considered in scenarios. These scenarios included the study of present levels in order to meet WHO Air Quality Guidelines (AQG) ($PM_{2.5}$ = 10 g/m3) and interim targets ($PM_{2.5}$ = 15 g/m3, $PM_{2.5}$ = 25 g/m3, and $PM_{2.5}$ = 35 g/m3). In all, the study result revealed that the pollution of air increases the danger of cardiovascular and respiratory conditions among those exposed to it. The result further established that since the world is battling with the COVID-19 pandemic, air pollution could cause a surge in COVID-19 deaths. The study's findings clearly show that air pollution and health are negatively correlated.

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Empirical Review

The purpose of this part was to further explain the study's goals by reviewing the body of literature on knowledge, attitudes, and environmentally friendly activities related to urban air pollution. This section was divided into sub-sections to give literature reviews about each goal.

Knowledge of Urban Air Pollution

Knowledge is created by interacting with the environment, where people undertake their own learning experience of the world. By transforming practical and theoretical knowledge into new knowledge, its exchange is a crucial component of learning and aids the person in shaping his or her skills. The majority of human knowledge is obtained through communication and its processes. Again, knowledge refers to a person's cognitive state as well as the development of scientific and historical inquiry. (Hyman, 1999). According to a 2018 report from the World Health Organization (WHO), air pollution was ranked first among the top ten threats to human health (The World Health Organization). Even though there has been a lot of advancement in recent years due to efforts to improve air quality, many challenges remain in terms of health issues to be addressed, such as geographical differences in pathophysiological responses to polluted air. In this context, air pollution control and related health risks have gained recognition in both academic research and strategic agendas around the world.

Lai et al. (2016) completed a study on the public's knowledge of Nanchang's primary air pollution sources as well as how they view the factors influencing the air quality in Nanchang. A total of people who took part in the survey was 989 parents with children ranging from 2 to 20 years old. The

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study used the face- face interviews in collecting the data and the characteristics of the participants were summarized using the descriptive statistics. Multi-variable logistic regression analyses were then carried out to identify the factors that were connected to the participants' perceptions of air pollution. The study's findings indicate that parents under 40 who had been abroad and had greater educational attainment were more aware of air pollution. Therefore, men are unlikely to be aware of air pollution than women. To more effectively and efficiently reduce air pollution, the study's findings point to the necessity for the government to raise knowledge of the primary causes, particularly among people of lower education levels in rural areas.

Maione et al. (2021) evaluated how Europeans perceived air pollution sources. The geographical and sociodemographic factors were used to stratify a sample of 16101 respondents from the seven nations, which is typical for gender, age, and degree of urbanization. Data were gathered for the study utilizing the computer-assisted web interviews (CAWI) method. Based on the SEFIRA survey, which used a discrete choice model (DCM) to analyse policy drivers for air quality, they are influenced by individual choices. The participant characteristics were summarised using measures of descriptive statistics like mean scores and standard deviations. The Chi-square (χ^2) test of independence was also used to see whether the participants' perspectives on the most significant causes of air pollution were related to their age, gender, place of residence, level of education. The study's findings showed that the majority of the participants' educational level, age, area of residence, or gender in the seven surveyed European nations had a negligible impact on how they

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perceived the air pollution sources. Finally, the results demonstrate that all countries consider traffic and industry as the most polluting sectors, whilst agricultural and home activities are perceived as the least polluting. This indicates that there is a lack of knowledge and awareness regarding the causes of air pollution and that those with more knowledge did not always fully understand the sources of air pollution.

Ramírez et al. (2017) investigated citizens' perceptions of local air pollution, its causes, and its impacts in Colombia. There were 994 participants in the descriptive survey sample for this study. To gather relevant data, the researchers developed a questionnaire and validated it using professional judgment. The data were analysed using logistic regression, its odds ratio (OR), and a Chi-square test to determine the relationships between demographic factors and perceptions of air quality. The results of the study identify particulate matter as the main local air contaminant, emphasizing its detrimental consequences on the health of humans as the primary effect of air pollution. Additionally, this study found that the only thing that correlates statistically significantly is the size of the cities with how polluted the local air is perceived to be. Finally, findings indicate that people recognize the dire consequences of the current state of the air quality on health.

Odonkor & Mahami, (2020) aimed to explore the public's awareness, perceptions, and attitudes toward air pollution. The research adopted a cross-sectional design. Participants were chosen using a multistage sampling method, leading to a sample size of 1,404 individuals from Accra. The level of awareness of air pollution was assessed using descriptive statistics, such as mean scores and frequencies. The statistically significant differences in

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knowledge levels by demographic characteristics were evaluated using non-parametric inferential statistics. The knowledge level was found to be significant for all sociodemographic variables. The results show that, even though most participants are concerned about air pollution and how it impacts their health, awareness rates were low in certain demographic categories, including the aged and those with lower levels of education.

Sarker et al. (2018) investigated people's perceptions of air pollution in Mymensingh Sadar Upazila's rural and urban areas. The study was performed using a cross-sectional research design. Six hundred (600) respondents were chosen in Mymensingh Sadar Upazila at random from six study sites to gather data. The socio-characteristics were calculated using descriptive statistics such as mean scores and frequencies. Also, Pearson's product Moment Correlation Co-efficient 'r' was used to test the null hypotheses concerning the relationship between respondents' perception level and awareness of air pollution. Based on the study's findings, most of the participants in rural areas were less aware of air pollution compared to those in urban areas. However, according to Pearson's product-moment correlation coefficients, out of five, three independent variables—education level, place of residence, and exposure to communication had a significant and positive relationship. The results further showed that age had a negative and significant relationship with their perception and awareness of air pollution, while family size had no effect.

Howel et al. (2003) researched how public perceptions of the relationship between air pollution and health changed depending on the context of the people and their location. A sample of 2744 adults living in five Northeast England neighborhoods was stratified based on sociodemographic

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and geographic characteristics, specifically for gender, health status, and locality variables such as district, proximity to industry, and relative deprivation. Data was collected via postal surveys. The responses to the questionnaire items were modeled using multiple logistic regression (Collett, 1991). According to the study's findings about sociodemographic factors, the gender and age distributions of the respondents in the selected neighborhoods were similar, and they showed differing levels of material deprivation. Furthermore, there was little change in perception on air pollution and linkages in health between neighborhoods, with the greatest differences identified when comparing individuals living near or distant from industry, as well as between the two districts. Finally, the findings showed that location and population factors should be the main focus of research when examining public views of the relationships between air quality and health.

Attitudes towards Urban Air Pollution

Atkinson et al. (2003) defined attitude as the extent to which a person has positive or negative feelings about an interest's behaviour, or "a set of emotions, beliefs, and behaviors toward a specific object, person, or event." Comparatively, Kollmuss & Agyeman (2002) define attitude as "the enduring positive or negative sensation towards some person, objective, or issues."

(Zelezny & Schultz, 2000) emphasised that an individual's self-perception and how they have their own view as an essential part of the natural world are the root causes of their attitude toward the environment. Behavior is defined as what people do, whether or not it is appropriate for the environment (Hernandez & Monroe, 2000).

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Numerous studies have shown that knowledge does not, by itself, change people's attitudes or even inspire them to adopt new behaviours (Stern, 2000; P. Schultz, 2002), even though knowledge gaps prevent behavioural changes (De Young, 2000; P. Schultz, 2002). This implies that a person's awareness of their surroundings is influenced by several variables such as knowledge, attitudes, and values, as well as social, cultural, and psychological factors. According to (Newhouse, 1990), ignorance regarding a particular area of life might be a hindrance to changing one's perspective. The only things that can influence conduct are attitudes that are developed through education and life experiences (Oweini & Houri, 2006).

According to Warner & Åberg, (2006), three fundamental parts make up attitude: cognition (thinking), behavioral attitude to act, and perception (emotional impression). He continues by stating that cognition is rational thought while perception is an emotional reaction that is (are) not logical or reasonable, and the inclination to act in a certain way that is also influenced by culture is known as behavioral predisposition. Warner argues that outside of a specific cultural context, there is no such thing as right or wrong behavior or attitude. However, a range of factors, some of which change over time, can impact human behavior even within the same culture.

Understanding attitude is important for conserving the environment as well as other elements of human life. Contrarily, environmental attitude describes people's attitudes and behavior toward environmental issues and activities (P. W. Schultz et al., 2004). Typically, people's perceptions of reality frequently serve as triggers for their behaviour (Ferris et al., 1996). As a result,

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according to social psychology theory, attitude is a reliable indicator of behaviour and intentions (Ajzen & Fishbein, 1975).

According to Cider, (1993), attitudes remain constant unless they are influenced by external factors like peer pressure. People have just recently recognized the environment, and everyone appears motivated to take action as a result of the environmental threat. Nearly everyone wants to assign responsibility and offer a solution to the environmental crisis. Environmental attitude is defined as "the combination of beliefs, affect, and behavioral intentions a person possesses regarding ecologically connected activities or situations" (Schulz & Northridge, 2004). They assert that relationships between residents of the home and the larger community and the environment have a significant effect on and define attitudes toward the environment. On the other hand, Turner et al., (2009) argued that people are considered to be environmentally literate when they exhibit positive attitudes toward the environment, are aware of environmental issues, and are themselves environmentally friendly and knowledgeable.

Duraisamy et al. (2017), carried out a study on the perception of air pollution health hazards among roadside shop-keepers in selected areas of Bangalore city- Cross Sectional Study. The purpose of this study was to assess roadside shops' knowledge, attitudes, and practices regarding health hazards of outdoor air pollution and how to prevent it in selected areas of Bangalore. A cross-sectional, semi-structured questionnaire based on interviews was used among 150 roadside shop owners who were selected using a systematic-random technique in Bangalore near the Victoria Hospital region from September to December 2015, and the summary of participant characteristics

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was achieved through the use of descriptive statistics. Based on the results this study reveals that regarding attitudes, about 32 percent of respondents believed that staff protection equipment, such as masks, aprons, head caps, and glasses, may guard against risks related to air pollution, while about 24 percent of respondents thought that maintaining personal cleanliness can do the same. Nearly 99 percent of people were found to be ignorant of the fact that applying oil and wet mopping reduces the absorption of pollutants. And 19 percent concurred that keeping grocery stores covered helps guard against the dangers of air pollution. Only 10 percent of people thought that frequently washing one's hands and eyes could protect one from air pollution. However, majority (99 percent) of the respondents strongly agreed that the hazards associated with air pollution can be reduced when stringent legislative actions have been adopted and put in place. Moreover, to more effectively and efficiently reduce air pollution, the study's findings point to strict legal restrictions, along with reducing pollution generation through various means, shopkeepers, vendors, and the general public. This should focus on the health risks of prolonged exposure to air pollution and the preventive measures that can be implemented in daily life.

Odonkor & Mahami, (2020) examined attitudes toward air pollution and the findings revealed that more than half of the respondents were pleased with the air quality in their community. The research design used for the study was cross-sectional. A multistage sampling process was used to sample 1404 respondents in Accra. About 70 percent of the participants had been concerned about air pollution in their neighbourhood, while only 29.9 percent had not. Compared to 35.2 percent of the participants who did not, over 50 percent of

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the participants were concious of the cause of the air pollution in their neighborhood. 1.5 percent of participants strongly disagree, while there is a strong consensus among more than 50 percent of participants that everyone should work to improve the environment.

Environmentally Friendly Practices of Urban Air Pollution

Environmental practices are defined as the use of the best combination of environmental control measures and strategies. A type of system in which a collection of distinct but interconnected activities, functions, and processes are aimed at attracting, developing, and sustaining human activity in the environment (Haslinda, 2009). Population explosions, combined with urban areas with poor air quality are dense due to widespread urbanisation in developing cities such as Accra. According to Wahid, (2006) as a result of urbanization, economic growth, and industry, there has been a significant decline in air quality. Simply said, leading a more ecologically responsible lifestyle is being environmentally friendly.

Berg et al. (2001) defined these practices as "activities involved in maintaining, developing, and retaining the environment." In recent years, it has become increasingly clear that the ever-increasing population of developing countries is the primary driver of significant air pollution from activities aimed at enhancing their living conditions. Rising air pollution has a detrimental effect on the environment, damaging ecosystems, exacerbating climate change, disrupting photosynthesis, reducing crop yields through soil acidification, and leading to a loss of biodiversity (Paoletti et al., 2010).

Assi et al. (2022) conducted a survey evaluating the awareness, attitudes, and behaviors of Lebanese physicians regarding air pollution. The

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study was observational in nature, employing a descriptive cross-sectional correlational design. An online survey that was self-administered and distributed to the Lebanese Order of Physicians, consisting of 874 members, was used to gather the information. Descriptive statistics were used in the results presentation. that included percentages and absolute counts. A chi-square test was used to examine the relationship between the sample's demographics and knowledge about air pollution. A p-value of 0.05 or lower was deemed significant. The statistical software package SPSS v. 27.0 served as the tool for performing the statistical analysis. According to the study's findings, living, working, and household conditions are a frequent causes of ambient air pollution due to the increased exposure of humans to harmful substances.

Practices Contributing to Urban Air Pollution

Burning Fossil Fuels

Fossil fuels have been the primary source of energy since the industry's boom. Nearly 90 percent of the world's energy (e.g. coal, oil, and natural gas) comes from fossil fuels. It is noteworthy that they are not a renewable energy source even though we use them widely and extensively to power our homes and automobiles. Although it is inexpensive and simple to mine, it takes millions of years to develop fossil fuels. As humans are unable to generate fossil fuels, they cannot be replenished if they run out. Burning fossil fuels is the only way for them to generate energy. In the form of atomic bonds, the hydrocarbons found in fossil fuels store energy that can only be released during combustion.

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However, the burning of fossil fuels causes the atmosphere to be filled with harmful substances, which significantly worsens the problem of air pollution. The primary contributor to CO_2 atmospheric emissions, which are today's primary cause of global warming, is fossil fuels. As population and housing density continue to rise on the limited amount of land available, air pollution from cookstoves and vehicle emissions is probably going to get worse. While the availability of electricity is increasing in Ghana, which is a sign of economic progress and a chance to concentrate emissions at larger power plants, it may also point to the need for regulations on emissions control at these power generation facilities as well as the expansion of the use of diesel generators in residential and commercial settings.

Greater Accra's increasing demand for electricity has mostly exhausted the hydropower system. As a result, a combination of strategies, such as expanding the use of fossil fuel-based generation (which entails higher emissions), expanding the use of renewable power generation, and improving energy efficiency, are required to meet the demand. It is commonly acknowledged that controlling and reducing air pollution is a serious problem.

Biomass Burning

Hazardous gases are produced when biomass is not completely burned. Burning wood, household garbage, leftover food from farms, waste, and charcoal are the main sources of these emissions. the burning of biomass often involves utilizing biofuels in small-scale stoves or heaters for essential activities like cooking, warming spaces, and providing illumination. These devices are commonly used in households where access to modern energy sources may be limited.

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Transportation

Fossil fuel use raises problems with transportation as well. When fossil fuels are used by vehicles like cars and airplanes, smog is created. Major cities like Beijing, Los Angeles, and London frequently have lingering smog. The EPA published an air quality index to indicate how bad the smog is in major cities. Smog levels between 85 and 104 ppb (parts per billion volume) are considered unhealthy for sensitive people, 105 and 124 ppb are considered unhealthy, and 125 and 404 ppb are considered extremely unhealthy. Smog may also worsen during hotter weather because the air becomes too warm to allow proper vertical circulation. As a result, when smog settles so close to the ground, the risk of respiratory diseases increases. And, as transportation becomes more prevalent in major cities, it exacerbates the problem of air pollution.

According to Lindau (2015), the quick movement of people and products around the city is like the oxygen that keeps it alive. The quality of urban life is severely compromised when this circulation is restricted. For instance, while making up less than one-third of all trips made in cities around the world, private cars are responsible for 73 percent of the pollutants found in the city air. Private automobiles produce three times as many greenhouse gas emissions per person as public transportation like buses. The transport industry in Brazil was responsible for 46.9 percent of the country's carbon dioxide emissions in the previous year.

It is well acknowledged that transportation is a substantial and growing cause of air pollution worldwide. As a result, the majority of transportation sources today produce comparable levels of pollutants, though their relative

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abundance varies according to the precise fuel composition and details of the combustion conditions (Colvile et al., 2001). The two transport emissions that add the most mass to the atmosphere are carbon dioxide (CO2) and water vapour, which are produced during the complete burning of the fuel.

According to two previous systematic reviews, Karanasiou et al. (2014) found that commuters who use motorised transportation such as private or public cars, trains, metro, trams, buses, or subways are more exposed to air pollution than active commuters (i.e., pedestrians or cyclists). The number of pollutants that are inhaled and deposited is higher among cyclists and pedestrians than among motorised commuters, though, when the higher breathing parameters and shorter trip time of an active commute are taken into account. (Panis et al., 2010).

Industry

Industrial operations will be riskier in densely populated areas, such as densely populated cities (Matejicek, 2005). These activities have negative effects on health and safety, as well as the environment and agriculture. The industrial process emits huge amounts of organic compounds carbon monoxide, chemicals, and hydrocarbons into the air. Dust can be carried over long distances and, if it contains heavy metals and air pollution, can degrade soil because of its small size (small volume ranges between 0.01 and 200 microns). Small suspended solid particles float around in the atmosphere for a very long time (Al-Hasnawi et al., 2016). Due to this, these tiny particles worsen respiratory conditions, particularly asthma, and may harm lung tissue. Due to their weight, relatively larger particles (nuisance dust) disperse more quickly than smaller ones because air turbulence cannot maintain their

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suspension for an extended period. Additionally, it appears that smaller particles seem to interact adversely with other air pollutants, resulting in serious harm.

Concerns about clean air and a healthy lifestyle are growing as a result of rapid industrialization (Klæboe et al., 2008). The widespread release of industrial toxins makes the physical and biological environment in the natural world unsafe, unstable, and uncomfortable. Chemicals and energy sources are polluted as a result. Human needs expanded and became more diverse as population growth resulted in aggregation into larger communities and the expansion of socialization. As population growth caused people to congregate into bigger communities and socialise more, human needs grew and diversified. The need to find alternatives to natural resources to meet these needs subsequently arose, which resulted in the creation of industries.

Industries were created to provide the products and services required for human advancement and comfort in order to meet man's complex needs, fishing, crop farming, animal farming, manufacturing, lumbering, and other industries are now well-developed. Due to the variety of goods and services offered by the industries, a wide range of raw materials and production techniques are needed, which results in a variety of waste that needs to be disposed of. Waste is produced by almost every manufacturing industrial enterprise in modern civilization. These industrial wastes can be solid, liquid, or gaseous. For instance, when purifying morally acceptable drugs, the pharmaceutical industry produces waste solvents and discards finished goods or raw materials that don't meet standards.

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According to a recent study, aerosols formed by the oxidation of sulfur dioxide emissions from industries in North America and Europe may have caused severe droughts in the Sahel region of Africa in the 1980s. In industries like the textile and food industries, where leftovers like yams, dyes, and leftover foods are produced along with large amounts of hot water that contain other materials, significant amounts of solid waste are generated. Consequently, the effluents from modern manufacturing industries contain a large variety of chemicals and other contaminants, some of which are leftovers of raw materials used in production. Without a doubt, human activity is currently what causes the most serious type of pollution in any settlement.

Agriculture

Agriculture may not raise many eyebrows, but current trends indicate a greater usage of pesticides that damage the soil and water. Almost all pesticides are made of chemical substances intended to keep pests away from crops (Özkara et al., 2016). Additionally, their use has expanded to meet the demand as a result of globalization's growing demand for food production. Furthermore, agriculture can contribute to the disturbance of biodiversity and resource depletion by clearing more land to grow pastures and crops (M. Liu et al., 2019). Agriculture-related activities are another significant source of air pollution. The use of chemical fertilisers and the spreading of manure on agricultural land resulted in a significant amount of ammonia being released into the atmosphere. Ammonia is a damaging gas that can cause eutrophication and acidification and impact water and flora.

According to Bjerg et al. (2013), agricultural activities resulted in the atmospheric release of 3.6 million tonnes of ammonia, accounting for 93

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percent of all ammonia emissions in 2013. Over the past few decades, particulate concentrations have dramatically decreased in many cities across North America and Europe, but they are still high in many large urban centers and industrial zones. Although particulates primarily reduce light interception, some of them (like cement dust) have chemical characteristics that may lead to more precise harm. High concentrations of heavy metals, like zinc and lead may be present in other particulates. These contaminants can either directly harm foliage or add to the burden already present in the soil. In and around major industrial and urban areas, air pollution from many sources can have a significant impact on crop production. Ozone is most likely the primary air pollutant affecting agricultural production in more isolated rural areas because it spreads in high concentrations over large areas (Ashmore, 1991)

Theoretical Perspective of the Study

The environment has given a home for humans and a wide range of organisms for ages, yet because of their never-ending desire, humans have had to devise methods of survival and adaptation. Many of these strategies, especially the ones that make use of technology, have negatively impacted the surrounding environment both directly and indirectly, leading to its deterioration. Nevertheless, it remains true that the health of the world's population and economy are directly linked to the well-being of the environment. An effective tool for tackling the growing environmental problems of the twenty-first century is environmental education. To achieve this, it is helpful to have a solid understanding of and use of behavioral models and theories. A theory presents a systematic way of understanding behaviors, events, and/or situations. It is a set of interrelated, concepts, definitions, and

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propositions that explain or predict situations or events by defining relationships between variables (Riley, 2017).

Thus, a research study's theoretical theory can be expressed on a platform provided by the theoretical framework. It presents and describes the theory that explains why the research problem under study exists (Swanson & Chermack, 2013). These theories and notions contribute to a better understanding of why people engage in various environmentally affecting activities. The various factors that shape human behavior in relation to environmental conservation are intricately interconnected, and no single theory can offer a comprehensive explanation. This study will examine and assess several key theories and models, including the Behavioral Change Model, the Environmentally Responsible Behavior Model, the Reasoned/Responsible Action Theory, and the Theory of Planned Behavior.

1. Behavioural Change Model (BCM)

This reasoning was strongly tied to the notion that better information would raise people's awareness of environmental problems and motivate them to take environmentally responsible actions. Numerous other comparable models connect behavior to attitudes and knowledge to attitudes, as will be covered in more detail later. Attitudes that are environmentally favorable results in responsible environmental behaviour and are thus developed as knowledge increases, as shown in Figure 1 (Hungerford & Volk, 1990). Figure 1 illustrates the relationships emanating from the models proposed at that time (Boudreau, 2010).

Subsequent research, however, disproved the claims made by those who believed that this model captured the fundamentals of human behavioral

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change. This meant that for a very long time, no one acknowledged or endorsed the validity of such an overly straightforward linear model (Hungerford & Volk, 1990). Despite its simplicity, the model of behaviour provides a framework for exploring the potential connections between environmental knowledge, awareness, and attitude, and how these elements may influence an individual's decision to act or refrain from acting. Good and sustainable environmental behavior may not always follow from having a solid understanding of environmental variables. On the other hand, a lack of environmental knowledge or awareness may also not necessarily imply poor environmental practice. Thus, it is necessary to take into account additional intervening factors such as locus of control, intention to act, and personal responsibility. Although this model deciphers a line of potential relationships, reality is much more complex than this linear trend; therefore, a more sophisticated model that incorporates this line of relationships is required to provide a concise explanation of the interacting variables of human behavior in environmental preservation.

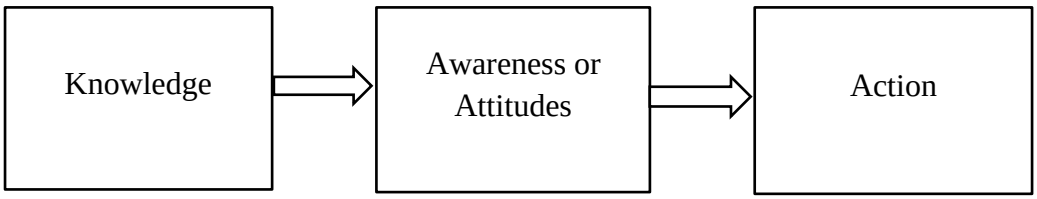

Figure 2.1: Behavioural Change Model
Source: Hungerford and Volk (1990)

2. Reasoned/Responsible action theory (RAT)

This theory was proposed by Ajzen and Fishbein (Ajzen, 1975). The Reasoned Action Theory assumes that human conduct is rationally motivated, and the model incorporates the Principle of Compatibility, which suggests that

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attitudes align with behavior only when both are directed toward the same valued outcome (evaluative disposition) (Schifter & Ajzen, 1985). According to the theory, the intention to act directly influences behavior and can be predicted by attitudes. These attitudes are shaped by subjective norms and beliefs, with situational factors affecting the relative importance of these variables. Reasoned Action Theory explains instances where individuals have positive intentions, but their ability to convert these intentions into action is hindered by a lack of confidence or a sense of control over the behaviour (Hanna, 1995). Figure 2 provides a graphic representation of these interactions.

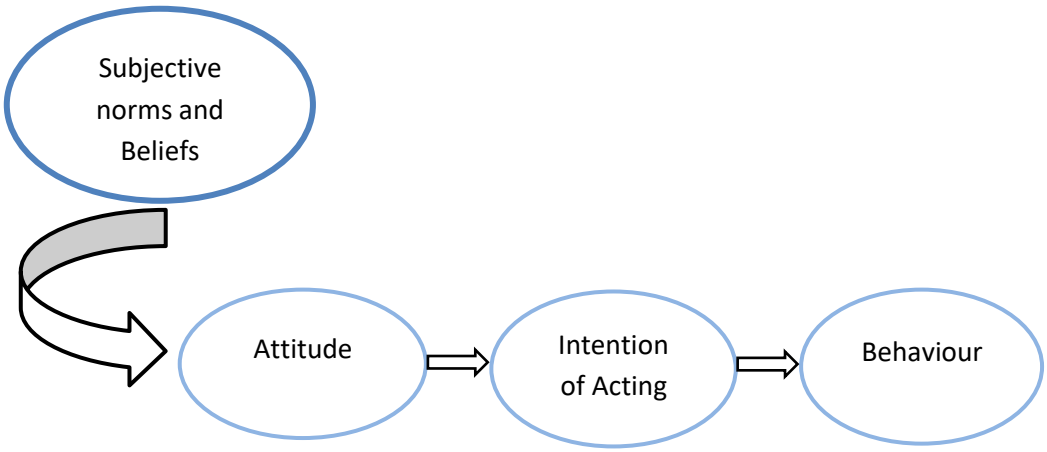

Figure 2.2: Theory of Reasoned/Responsible Action
Source: Ajzen and Fishbein (1985)

3. Theory of Planned Behavior (TPB)

The Planned Behavior Theory was proposed by (Ajzen, 2002), provides a framework for understanding pro-environmental actions by emphasizing the pivotal role of behavioral intentions and external situational influences. According to this theory, the intention to engage in a specific behavior arises from a complex interaction of cognitive components such as an individual's knowledge of environmental issues, the strategies available to address them,

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and their personal abilities. Additionally, personality traits, including locus of control, attitudes, and a sense of personal responsibility, further shape these intentions. Building upon the earlier Theory of Reasoned Action, the TPB posits that human actions are determined by three core belief dimensions: the perceived consequences of behavior, social pressures or expectations, and the perceived ease or difficulty of carrying out the behavior, influenced by various external factors (Hammond & Institute, 1995). The model states that "attitudes are a function of beliefs," not that knowledge is a specific component." (Schifter & Ajzen, 1985); since beliefs here relate to the awareness of a particular behavior. Ajzen's model, therefore, allows influences on beliefs and also represent cognitive elements through affective elements. For instance, when a person understands that they have control over a situation, their behavioural intentions reflect this understanding, just as much as their beliefs about the outcome of a particular behaviour. The following is a description of the relationship between intention and behavior (Sheeran, 2002): "People do what they intend to do and do not do what they do not intend."

Over the past two decades, both theories have consistently demonstrated their effectiveness in forecasting various behaviours. They have been applied to predict health-related actions, recycling habits, and driving patterns. Additionally, their predictive capacity has been validated in the fields of consumer behaviour and entrepreneurship (Sommer, 2011). The integration of these diverse factors culminates in the creation of a behavioural intention. (Ajzen, 2002).

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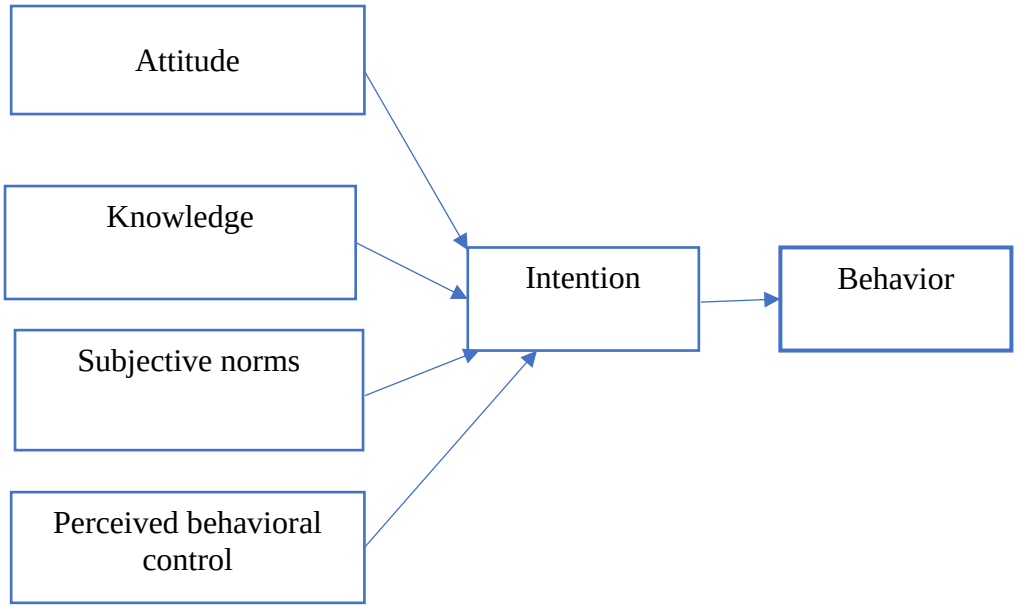

Figure 2.3: Theory of Planned Behaviour
Source: Ajzen, (2002)

Key Concepts and Dimensions

Behavioural intention

It could be described as "… instructions that people give to themselves to behave in a certain way" (Sommer & Haug, 2012). In essence, intention refers to the conscious drive or determination behind an individual's decision to direct effort toward a specific action. It can be viewed as a direct precursor to behaviour (Ajzen, 2002). Figure 1 offers a visual representation of the dynamic relationship between various factors, such as background influences, beliefs, aggregates, intentions, and the resulting behaviour (Ajzen & Fishbein, 2005).

Attitude toward Behavior

This refers to the degree to which a person has positive or negative feelings about the behavior of interest or "a set of emotions, beliefs, and behaviors towards a particular object, person, thing, or event." It involves taking into consideration the results of carrying out the behavior. Studies on

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attitudes suggest that although they are prone to change over time due to new information, attitudes are seen to be persistent (Parveen & Ahmad, 2020).

Subjective Norm

This refers to the belief about whether significant others think he or she will perform the behavior. It relates to a person's perception of the social environment surrounding the behavior. The beliefs that shape the subjective norms are called normative beliefs (Ajzen, 1991).

Perceived Behavioral Control

This concept pertains to how a person evaluates the ease or difficulty of carrying out a specific behaviour (Ajzen, 1991). It is influenced by the individual's belief in having access to adequate resources and a sense of self-assurance, with an increase in these perceptions leading to a greater sense of ease (Cheon et al., 2012).

4. Theory of Environmentally Responsible Behavior (ERB)

Prior to pro-environmental conduct, there existed early models of ecologically responsible behavior that relied on a linear link between environmental knowledge and environmental attitudes, and between environmental attitudes and environmentally responsible behavior (Burgess et al., 1998). These models need to be further developed because these models are now very simplistic. To explain the connections between different elements and ecologically conscious behavior, numerous scholars responded by putting forth alternate models. Ajzen presented the Theory of Planned Behavior and the Theory of Reasoned Action. Rather than directly influencing conduct, attitudes have an impact on the intentions behind behavior. Subjective standards and perceived behavioral control influence behavioral

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intentions in addition to attitudes (Froehlich et al., 2013). Moreover, Ajzen pointed out that behavior has an immediate precedence to behaviour (Ajzen, 1985). The Model of Environmentally Responsible Behavior was created by Hines, Hungerford, and Tomera (Farrell & Twining-Ward, 2004). They found the factors linked to environmentally conscious behavior by doing an in-depth analysis of 128 studies on behavioral research that supported environmental protection. According to their model, situational conditions and the intention to act determine ecologically responsible behavior.

The model argues that having an intention of acting is a major determinant influencing environmentally responsible behaviour (ERB). The Model of Responsible Environmental Behavior identifies several variables- intention to act, locus of control (an internalized sense of personal control over the events in one's own life), attitudes, sense of personal responsibility, and knowledge suggest whether a person would adopt a behavior or not. The intention to act is influenced by one's knowledge, skills, and personality. In addition, as Figure 4 illustrates, personality characteristics include attitudes, locus of control, and personal responsibility (Hines et al., 1987). Based on this research, Kollmuss and Agyeman created a complex pro-environmental behavior model that shows how several factors interact to ultimately impact pro-environmental behavior. External and internal factors are the two categories into which the influential elements are split. These include exterior elements including politics, society, culture, and economy. The internal elements are sentiments, beliefs, attitudes, and environmental knowledge (Kollmuss & Agyeman, 2002). Oliver proposed four continuous phases of developing loyalty, including cognitive sense, emotional, conative sense, and

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behavioral senses (Oliver, 1999). An individual model or diagram cannot adequately capture the complexity of the factors that influence environmentally conscious behavior. However, these theories and models suggest that affective and knowledge aspects play a role in shaping environmentally conscious behavior. Therefore, the aim of this research is to examine how behavioral intentions are influenced by these affective and knowing aspects.

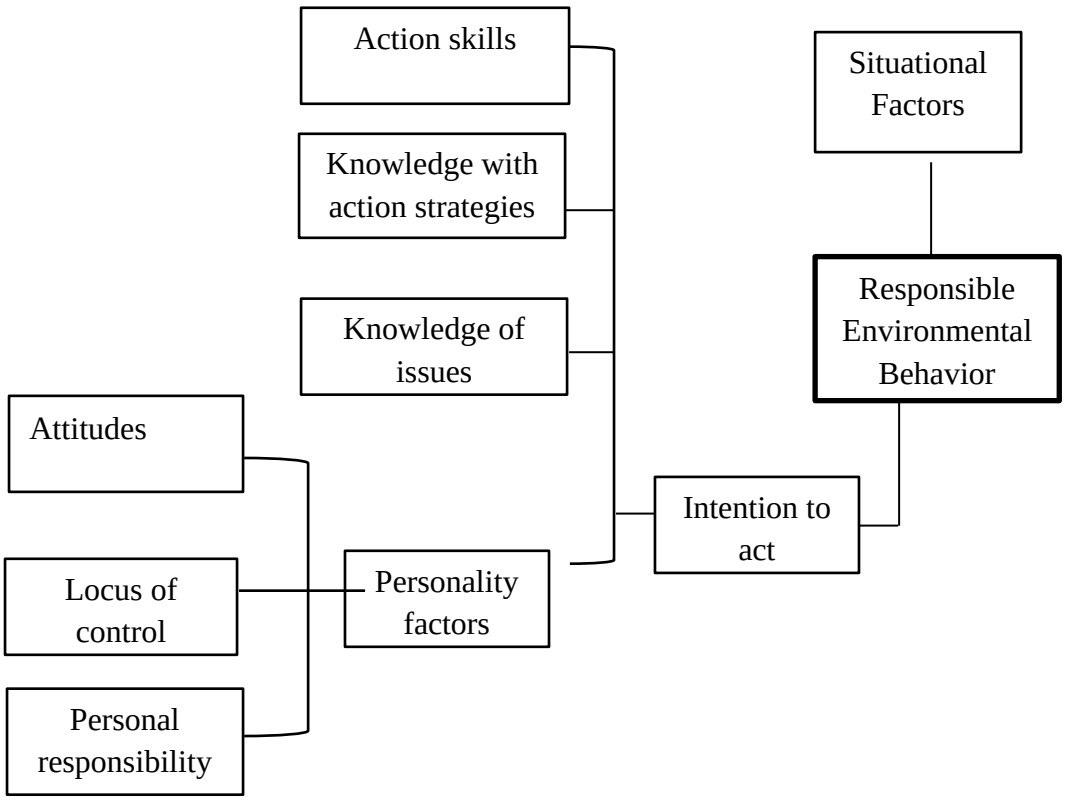

Figure 2.4: Theory of Environmentally Responsible Behavior
Source: Hines, Hungerford, and Tomera (1987).

Conceptual Framework of the Study

All four theories serve as a guide for the study, but the TPB's elements will be used in particular since it provides a foundation for understanding human behaviour (Figure 2.5). Ajzen, (1991), identified three factors that influence an individual's behavioural intentions: their attitude toward

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behaviour, their perception of behavioural control, and subjective norms. A core element of the theory is the idea that, on a conceptual level, the connections between factors influencing behaviour and their outcomes are encapsulated within specific components or relationships of the model. Individual behaviour is therefore driven by behaviour intentions. Beliefs are formed as a result of a variety of factors in one's life. Behavioral beliefs produce attitudes toward behavior, normative beliefs produce subjective norms, and control beliefs produce perceived behavior control.

Therefore, perceptions can form without experience or firsthand knowledge, but they can also form in response to knowledge, intentions, and values, just like behavior. Thus, the more knowledge we have on urban air pollution, the clearer our opinion tends to be and the stronger our (feelings) perception (R. Agyapong, 2012). Besides, being informed about an issue relating to our health in the environment is considerably more likely to have an impact on our decisions when we acquire knowledge from personal experience (Suleman et al., 2015). Thus, environmental issues relating to urban air pollution are influenced by people’s knowledge, attitudes, and practices.

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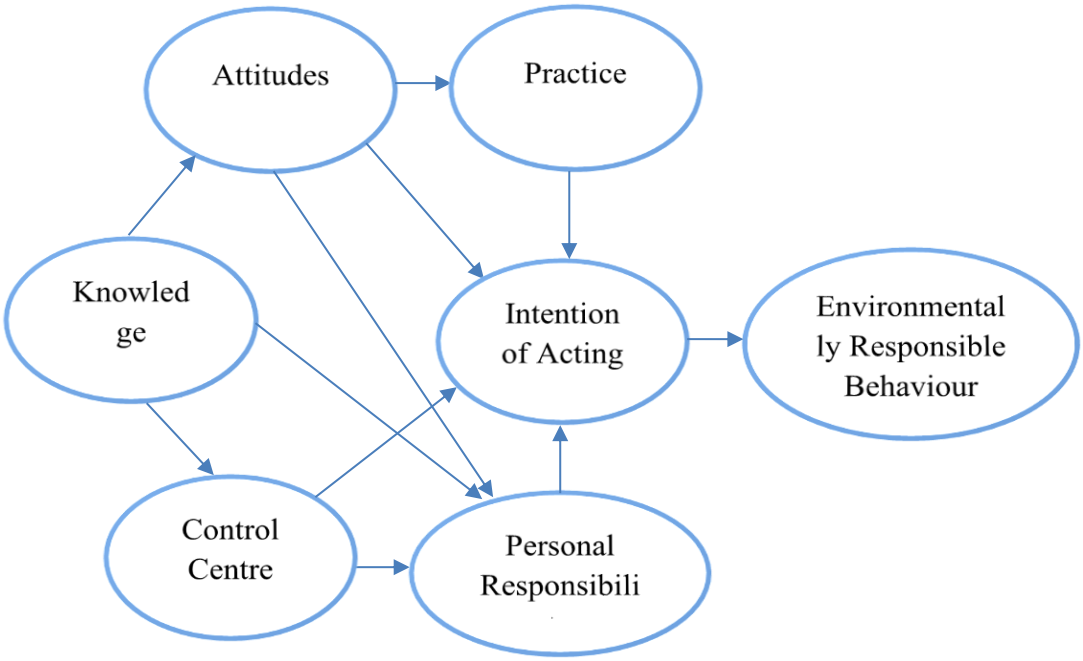

Figure 2.5: The Study's Conceptual Framework

Chapter Summary

This chapter looked at the overview of the study-related literature. Precisely, subsections such as the concept of perception, an overview of urban air pollution, knowledge, attitudes, environmentally friendly practices, theories and the conceptual framework relevant to the research.

The next chapter will deal with the research philosophy, the research design utilised, the study area and sampling procedures.

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CHAPTER THREE

METHODOLOGY

Research Design

The research design serves as a blueprint that guides the research process to ensure maximum exercise power over issues that are likely to jeopardize the study's validity and its findings (Walker, 2005). A cross-sectional descriptive design is used in this investigation. This design will let the researchers select a sample that is typical of the population so that the results can be applied to the study population (Omair, 2015). According to (Mann, 2003), sited in (Mensah, 2010), a cross-sectional design helps to enrich a study since it allows for the examination of a greater number of persons in a short amount of time, which is not possible with other study designs. While there are numerous advantages to conducting a descriptive study, there are challenges to be aware of and these include; it does not provide information on flings, and it works best when the population as a whole is represented.

Research Philosophy

Various philosophical paradigms drive social science research, encompassing methodological questions, such as how data is acquired for a study, ontological issues, such as the nature of reality, and epistemological issues, such as how reality is known (MacIntosh & O'Gorman, 2015). A mixed approach method with a stronger focus on the positivist research philosophy underpinned the study. This combines both qualitative and quantitative methods while emphasising positivism's methodical, objective, and quantifiable elements.

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According to interpretivism, the study paradigm focuses on understanding how individuals form their subjective meanings and social realities. It also focuses on people's lived experiences, perspectives, and interpretations in their respective circumstances (Pulla & Carter, 2018). Based on the qualitative method, a letter was sent to the Environmental Protection Agency to request data on particulate matter together with an interview schedule designed for two key informants on questions relating to the perceptions of air pollution in some selected towns, which was later used to generate questions for the respondents.

On the other hand, the positivism is the objective of science that can be observed and measured, and the goal of knowledge is to provide a description of the circumstances people have experienced (Trochim et al., 2006). Again, if the theory cannot explain the facts, it must be updated in order to provide more accurate predictions about reality and if scientific procedures are used in study, it is contended that science is considered as a means of discovering the truth and of ruling the world. Positivists thinkers contend that reality exists and can be verified (Creswell & Creswell, 2017). This is because, it claimed that using what can be observed and quantified is the best way to accomplish science's goals. Positivists concur that there is a single objective reality to a scientific phenomenon and that the world is external (I. Black, 2006). Researchers can better understand how different elements affect public opinion by using this quantitative data to find trends and correlations. In the end, it helps with the development of focused initiatives for raising awareness and successfully resolving air pollution challenges.

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Study Area

This research was carried out within the Accra Metropolis (AM), located in the Greater Accra region of Ghana. The Accra Metropolis covers a 60 square kilometer (23 square mile) total amount of land. Its northern, western, and eastern boundaries are formed by the Okaikoi North Municipal District and the Ayawaso West Municipal District, respectively. Its western, Ablekuma West Municipal District, and eastern, La Dade Kotopon Municipal District, respectively, from its western and southern boundaries. The Gulf of Guinea marks the southern boundary, defining the region's maritime frontier. The Accra Metropolis is one of the 26 such districts in the Greater Accra Region and one of Ghana's 254 Metropolitan, Municipal, and Districts.

As of March 2018, its sub-metro includes Ablekuma South, Ashiedu Keteke, and Okaikoi South sub-metro councils. Since 1961, Coterminous with Accra, the nation's capital, it has always existed. The Accra Metropolis (AM) is one of the ten districts that comprise the Accra Metropolitan Area, which includes Ghana's capital and most populous metropolis. This is due to policymakers' use of urban-focused development plans since the colonial period. The area has become more urbanized as a result of the concentration of industries, corporate operations, educational institutions, and political and administrative tasks. Fishing is the most important economic activity in this urban and seaside city.

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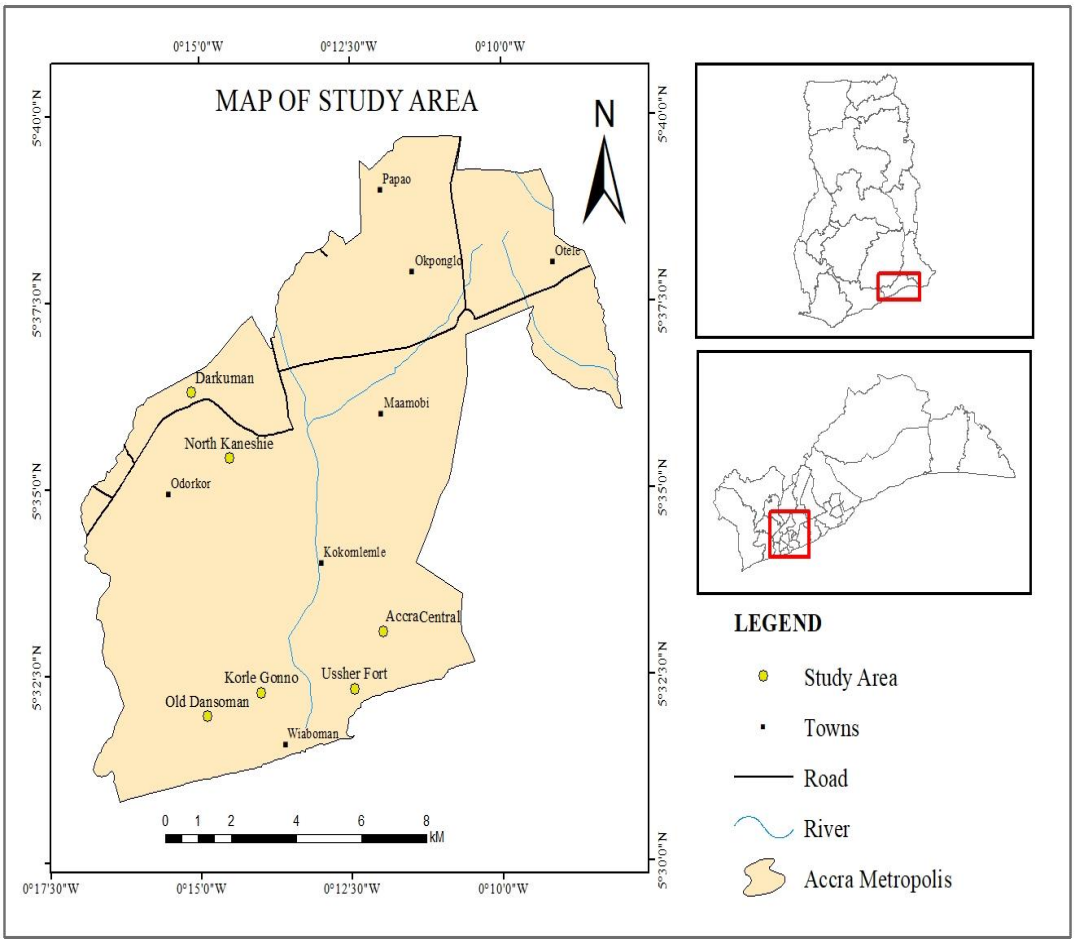

Figure 3.1: Map of Study Area
Source: Author (2023)

Population

Saunders et al. (2012) refer to population as the entire set of cases from which a sample was drawn. Accra consists of people from various ethnic and racial backgrounds. Youth, children, adults, and the aged all move around due to their socio-economic activities daily to and from Accra. As a result, the population for this study had a wide range of traits. Thus, the study population is 284,124 (GSS, 2021).

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Table 3.1: Population of the sub-metros

Sub- Metros	Population
Ablekuma South	110,158
Ashiedu Keteke	88,633
Okaikoi South	85,333
Total	**284,124**

Source: GSS (2021)

Sampling Size

(Degu and Yigzaw (2006) define sampling as choosing a number of research units from a specified study population. The sample size for this study will be 400 samples taken from the total population of Accra Metropolis (AM). This is based on the mathematic model by Yamane Taro, 1973 formulae;

Where: $n = \frac{N}{1+N\,(e)^2}$

$$n = \frac{284124}{1+284124\,(0.05)^2}$$

$n = 399.4 \approx 400$

n = Sample Size

N = The population of the Study area

e = Level of Significance (0.05) and t = Constant

Therefore, the Total population =284,124 and the Sample size= 400. The following are the Selected Towns with their sampled size.

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Table 3.2: Selected Towns with their Sample Size

Sub-Metro Districts	Population	Selected Towns	Sampled size
Ablekuma South	110,158	Korley Gonno/ Old Dansoman	155
Ashiedu Keteke	88,633	Accra Central/ Usher Town	125
Okaikoi South	85,333	North Kaneshie/ Darkuman	120
Total	**284,124**		**400**

Source: GSS (2021)

Sources of Data

The study was conducted using primary data and secondary data. The primary data is mainly fieldwork that involves first-hand data gathering from participants in their natural settings and it was obtained through the use of questionnaires in a structured form to know the perceptions of residents towards urban air pollution. Also, the secondary data was obtained from empirical studies, journals, articles, Ghana Statistical Services, Environmental Protection Agency, and published and unpublished works/sources related to this research.

Sampling Procedure

The research made use of multi-stage sampling techniques. This sampling method is made of a cluster, purposive, simple random sampling, and convenience sampling. The study was grouped into three sub-districts which are referred to as clusters. Also, purposive sampling was used to select two towns from each of the three sub-metros. This was to ensure that results obtained from the sample were approximate to what was arrived at if the whole population was measured (Cook et al., 2002) and convenience sampling

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was utilised to select the households based on their proximity, availability, and willingness to participate. It is often used when researchers need to collect data quickly and cost-effectively (Winton & Sabol, 2022). Meanwhile, the selection criterion that was adopted for the sample size of the study was done at three levels. Firstly, the residents of Accra Metropolis (AM) were placed into three clusters according to Sub-Metro districts which were made up of Ablekuma South, Ashiedu Keteke, and Okaikoi South. The sampling used to select the towns was purposive. This sampling technique was employed because it allows the researcher to use his judgment in the selection process, and also saves time and money (Black, 2019). Next, the residents of AM were placed into six towns based on their geographical location, continuous increase in the economic activities and population density, and the convenience sampling technique was then used at this stage to select households based on ease of access because it helps minimise biased samples which may affect the quality of data negatively (Creswell & Hirose, 2019). The model was then applied to the sample size according to the selected towns (Korley Gonno, Old Dansoman, Accra Central, Usher Town, North Kaneshie, and Darkuman) to determine the residents of AM selected for each Sub-Metro district. Therefore, 155 residents were selected in the Korle Gonno and Old Dansoman towns, 125 residents in Accra Central and Usher Town, and 120 residents in North Kaneshie and Darkuman. Lastly, the approach employed to select the participants for the study involved a straightforward method of simple random sampling. This technique was used because it gives all units of the population an equal chance of being selected. It is also appropriate when a population of study shares similar characteristics (Creswell & Hirose, 2019).

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A sampling frame was constructed to cover the 284,124 residents of Accra Metropolis then appropriate tables of random numbers were elected after which the lottery method which is one of the simple random sampling procedures was utilized to select 400 which is in line with what Sarantakos, (1998) and Simon and Goes, (2011) proposed. They espoused that 10 to 30 percent of the population is an appropriate sample for the survey study. This procedure was adopted to allow each resident equal chance of inclusion.

Data Collection Instrument

The use of Questionnaire

As a quantitative research method, questionnaires primarily draw on positivism, empiricism, and the natural science paradigm for doing research. The goal is to standardize tests for tight comparability, minimize subjectivity by removing the researcher from the study and by using conventional statistical tests, and establish dependability and validity by replication and such a maximization of objectivity.

Questionnaire Design

The study made use of questionnaire consisting of open and close-ended questions. The reason for choosing this instrument was that it is able to gather lots of data in less time and easy to administer to participants. The questionnaire comprises four (4) main parts: part "A" based on demographic data of participants, part "B" was based on residents' level of knowledge on urban air pollution, part "C" was also focused on attitudes of residents towards urban air pollution, and part "D" concentrated on their environmentally friendly practices of urban air pollution.

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Validity and Reliability

The questionnaire was tested through the face, content and construct validity to ensure validity. Face and content validity was reviewed by the supervisor. With construct validity, the instrument was developed based on the literature and past study findings. Reliability was ensured by clear and understandable explanations of words and concepts, the collecting of relevant information, and the application of systematic procedures.

Pilot testing/Pre- testing of Questionnaire

Pilot Testing took place on 14th November, 2022 among fifty (50) residents of Kaneshie, and Odorkor since these towns share similar characteristics with the main selected towns. This was necessary to check the reliability and consistency of the questions been asked, also the accuracy of the questionnaire and the aligning of the questions. Pilot testing data collection tools has the benefit of potentially revealing areas where research protocols might not be followed, where the main study could fail, or whether suggested methodologies or instruments are inefficient or unduly complicated. Following the pre-testing, it ensured that the questions were examined in accordance with the information acquired during the pre-testing with the supervisor before the main survey.

Data Collection Procedure

A period of one month was devoted for this exercise as indicated above. Week one of data collection was focused on Korle Gonno and Accra Central. While week two witnessed data being collected in Darkuman and Ussher Fort. Week three then focused on Old Dansoman and North Kaneshie. The fourth week which constitutes the last week of data collection was then

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utilized for a mop-up exercise, where errors and oversights were corrected and crosschecked. Before data collection proper, the researcher contacted the participants through phone calls and spend at least three days to administer an informed consent form which was expected to begin from June 5 to June 7, 2023, after obtaining a list of participants (residents of AM) from the Ghana Statistical Services. Before administering the informed consent form, the researcher informed the participants that their participation in the study is voluntary and that they were at liberty to quit at any time they so wish without prior information. Again, the researcher explained to participants the purpose of the study and how important their participation is. This the researcher did for about two weeks so to prepare the minds of the participants adequately towards the exercise. To this end, the participants were be informed about the duration of the exercise and the time the exercise was to start and end. Each participant is expected to use 15-20 minutes to complete the questionnaire. Lastly, it was possible that some participants of this study might not be in a position to read and understand the survey instrument. The researcher therefore made a provision to translate questions on the questionnaire to such category of participants in the local dialect. Such participants were also be guided by the researcher regarding how they could respond to the questionnaire effectively so they were not left out of the study. This the researcher did that by reading and interpreting/translating the questions to such participants so they could respond appropriately.

Ethical Consideration

When dealing with Social Sciences research, ethics is of crucial importance, particularly when it involves human elements (Bhattacherjee,

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2012) espoused that in social research, the researcher needs to pay attention to informed consent, anonymity, harmlessness, and confidentiality. These constitute the main ethical issues in conducting social research. Ethically, exposure of residents to air pollution may lead to an unethical behaviour that is likely to cause anxiety and psychological stress according to Lu et al., (2018). This further confirmed that combining archival and experimental research demonstrates that immoral behaviours like crime and dishonesty are associated with exposure to pollution, either physically or mentally which constitute ethical or moral contamination. In this regard, the researcher communicated the results of the study to the appropriate authorities for action in order to minimize the negative effects of air pollution on the residents. Also, ethically, the respondents were made to participate willingly in the research and therefore no pressure, fear or intimidation will be put on any participants. The reason for carrying out the study has been explained to participants to obtain their consent. The participants won't be identified, but the data was therefore combined and analysed guaranteeing anonymity. The researcher seek permission from the concerned authorities by presenting an introduction letter to them from the Geography and Regional Planning Department. The principal investigator had on her protective equipment such as nose masks and hand sanitizers to ensure that everyone is safe during the exercise.

Statistical and Data Analysis

The data gathered from participants was carefully reviewed, accurately edited to do away with errors, and then analyzed. The collected data was then coded to enable a thorough analysis. The researcher coded the data before

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entering it into Statistical Package and Service Solutions (SPSS) version 26 for data analysis. First, descriptive statistics, frequency and charts was be used to analyze research question 1, 2, and question 3 where the researcher compared and contrast the results before arriving at the mean of means. Again, the regression analysis (linear regression) was used to analyze research question 4 to examine the relationship between the variables.

Chapter Summary

This chapter looked at the research philosophy, the research design utilised, and the area of study. It also described the target population, sampling process, and sample size determination, data collection tool, and pre-testing (pilot testing). Furthermore, the sources of data, the procedure for data collection, ethical issues, and statistical data analysis were captured in this chapter as well.

The next chapter will deal with results and discussion of data collected from the field.

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CHAPTER FOUR

RESULTS AND DISCUSSION

Introduction

This section of the study presents the results obtained from fieldwork with regards to residents' perception of urban air pollution. As previously mentioned in the chapters, the researcher used the quantitative method approach to analyze the respondents' responses. 400 respondents in all completed the questionnaires.

The outcomes that were displayed have two aspects. First, the respondents' socio-demographic characteristics were discussed. The presentation of the findings centred on the research objectives that were looked at in light of the reviewed literature covered in the second.

Socio-Demographic Characteristics of Respondents

The socio-demographic characteristics of the respondents from each of the six towns where the data was collected are described in this section. The purpose of this study's section on relevance is to identify some characteristics which include gender, age, place of residence, level of education, and marital status of respondents with respect to their perception of urban air pollution.

Out of 400 respondents for the study of all the six towns, 52.5% (210) were females who constituted more than half of the respondents and 47.5% (190) were males. One reason for the high proportion of female responders could be that female residents are culturally assigned to daily activities like cooking, and also being care takers of the house. However, Chen et al (2005) define the female group as the group of residents who are more sensitive to airborne pollution and thus may be more sensitive to toxicological influences of air

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pollutants than of male residents are therefore able to express their perception of what air pollution is. The age categorization of respondents showed that 31% (124) were between the ages of 18-29 years, 28.2% (113) were in between the ages of 30-39 years, 27.5% (110) were in between 40-49 years and 13.3% (53) were above 50 years. This indicates that the majority of respondents who were young adults are able to perceive what air pollution is as compared to the aged.

The demographic information of respondents regarding education level shows that 3.8% (15) had no education, 30% (120) had basic level education, 49.5% (198) had secondary/vocational/technical level of education and 16.8% (67) had tertiary level of education. This implies that a higher proportion of the respondents had their secondary/vocational/technical education with only a few not having any form of education and therefore are likely to understand what air pollution is. Concerning the results on marital status, 44.8% (179) of the respondents were single, 49% (196) were married, 3.8% (15) were divorced and 2.5% (10) were widow/widower. This shows that the majority of the respondents were married.

Also based on the results on the employment status of residents, it was observed that more than 34.3 percent (137) of the respondents were traders, 103(25.8%) were private workers, and 77(19.3%) were unemployed. Meanwhile, 62(15.5%) of the respondents were civil/public workers and the remaining 21(5.3%) were students (Table 4.1).

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Table 4.1: Demographic characteristics of respondents
Total number of respondents = 400

Demographics		Frequency	Percent (%)
Gender	Male	190	47.5
	Female	210	52.5
Age	18-29 years	124	31.0
	30-39	113	28.2
	40-49	110	27.5
	Above 50	53	13.3
Level of Edu.	None	15	3.8
	Basic	120	30.0
	Secon/Voc/Tec	198	49.5
	Tertiary	67	16.8
Marital Status	Single	179	44.8
	Married	196	49.0
	Divorced	15	3.8
	Widow/widower	10	2.5
Employment Status	Student	21	5.3
	Civil/public servant	62	15.5
	Private Worker	103	25.8
	Trader	137	34.3
	Others	77	19.3

Source: Field survey, 2023

Knowledge on Urban Air Pollution

This section presented the results of research objective 1 with regards to the level of knowledge of residents have on urban air pollution within the selected towns in Accra Metropolis.

Analysis of the data showed that, 8.3% of the respondents stayed in the study area for less than 3 years while the length of stay of respondent between 4 to 6 years were 15.8%. Also, 24.3% of the respondents have lived in the area between the period of 7 to 9 years and 51.7% lived in the area for over 10 years

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in Table 4.2. This implies that, 51.7% of respondents who have stayed longer in the study area for more than 10 years are expected to have adequate knowledge on urban air pollution and can therefore provide the study with reliable and relevant information to achieve the purpose of the study.

Table 4.2: Length of stay of respondents

Length of stay	Frequency	Percent (%)
Less than 3 years	33	8.3
4-6 years	63	15.8
7-9 years	97	24.3
Above 10 years	207	51.7
Total	400	100

Source: Field survey, 2023

Concerning the status of air pollution in the towns, the survey revealed that out of 400 respondents, 47.8% (191) of the respondents perceived that the level of air pollution in their town is high, 44.3% (177) of the respondents revealed that it was moderate while 8% of the respondents said the status of air pollution was not high as shown in figure 4.1. This implies that almost half of the respondents indicating that the status of air pollution in their town of residence was high were females as compared to males. The finding correlates with Ramírez et al. (2017) indicating that about 80% of the respondents said that air quality in their town of residence is either high or moderate.

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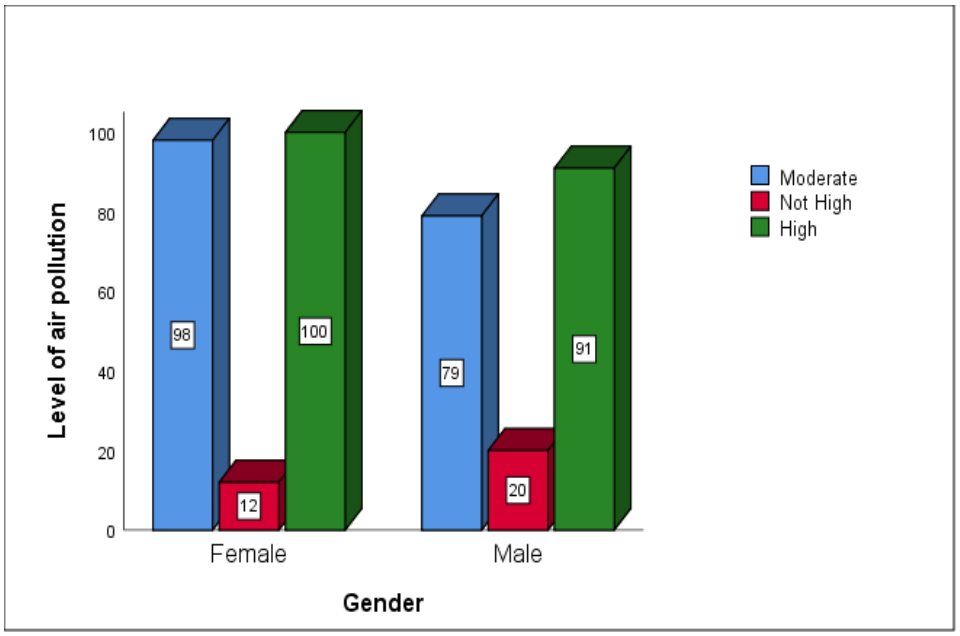

Figure 4.1: Perceived level of air pollution distribution of respondents
Source: Field survey, 2023

Table 4.3 revealed that 43.9% of the respondents agreed that they had heard of air pollution from their friends or relatives. Whereas, 37.7% of the respondents said they had heard of air pollution on television and also on the internet, 15% of the respondents said they heard of air pollution through a technical report, and 3.4% the least said they had heard of air pollution from the radio, personal observation, and school. The results show that majority (81%) of the respondents indicated that they have heard of air pollution from either friends or relatives and also on television and the internet. This could be attributed to the fact that most adults or young residents are more interested in exploring media sources for general information and also prompt each other on matters that arise in their place of residence. The finding correlates with other studies as follows; a study by Odonkor & Mahami (2020) revealed that the most of the respondents are aware of air pollution and its protective measures, though in some demographic groups, like the elderly and the less educated, the

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rates of awareness were low. Similarly, Liao et al. (2015) found that a greater proportion of respondents were informed of air pollution and also indicated that men tend to have lower knowledge of air pollution as compared to women. This is because women were more sensitive and concerned about the environment in which they lived and what went on around them as compared to men.

Table 4.3: Number of residents who have heard of air pollution

Variable	Frequency	Percent (%)
TV and Internet	151	37.7
Friends/Relatives	175	43.9
Technical Report	60	15.0
Other	14	3.4
Total	400	100

Source: Field survey, 2023

Out of the 400 respondents, most 67.8% (271) of the respondents perceive that the air quality in the last 5 years has been deteriorating. While 24.3% (97) perceive that the air quality in the last 5 years of their place of residence has improved but initially deteriorated. Also, 5% concluded that the air quality in their town of residence deteriorated initially and then improved and 3% were of the view that the air quality has been improving as shown in Table 4.4. This confirms the finding by Amegah & Agyei-Mensah, (2017) that air quality in cities of Sub-Saharan African (SSA) countries has deteriorated and this is due to a variety of factors, including rapid population growth, poor waste management practices, and the increased use of solid fuels for cooking and heating which in this study most residents especially the females gave their

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views on with regards to the air quality in their town of residence.

Table 4.4: Perceived air quality in the last 5 years

Air Quality	Frequency	Percent (%)
Deteriorated initially then improved	20	5.0
Has been deteriorating	271	67.8
Has been improving	12	3.0
Improved initially then deteriorated	97	24.3
Total	400	100

Source: Fieldwork, 2023

Table 4.5 shows that most of the respondents during the survey knew that every citizen has a responsibility to improve the environment as 53.75% (215) of respondents were aware that it was the duty of every citizen to improve the environment. While 45.5% (182) were strongly aware and those who were somewhat aware and not aware were 0.25% and 0.5% respectively. It might be inferred from the result that the most of the respondents were aware that it was their responsibility to improve the environment. Again, this confirms the finding by (Odonkor & Mahami, 2020) that among the respondents, more than half strongly agreed that every citizen is responsible for improving the environment, with just 1.5% strongly disagreeing.

Table 4.5: Responsibility of every citizen

Variable	Frequency	Percent (%)
Strongly aware	182	45.5
Aware	215	53.75
Somewhat aware	1	0.25
Not aware	2	0.50
Total	400	100

Source: Fieldwork, 2023

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About the response on the increase in the perceived levels of air pollution linked to the occurrence of some aliment or disease in Figure 4.2, more than (46.25% of respondents) perceived that a lot of illnesses/diseases are linked to air pollution levels, 32.75% thought air pollution levels were extremely linked to illness or disease. Moreover, 20.25% perceived that it was moderate, and 0.75% not at all linked to air pollution. It was concluded that the majority (79%) of the respondents were strongly aware that the increase in urban air pollution levels is linked to the increase in the occurrence of certain illnesses or diseases. It was concluded that most (79%) of the respondents were strongly aware that the increase in urban air pollution levels is linked to the increase in the occurrence of certain illnesses or diseases. Also, the age classification revealed that older people are more likely to face more difficulties with certain diseases associated with air pollution. This view corroborates with the study by O'Donnell et al. (2017) which shows that polluted air, which has increased over the past 25 years, is in fact a significant environmental risk factor for the global disease burden, owing to rising pollution levels and rising population and rising rates of non-communicable disease-related death in middle-class and low-income countries. Moreover, Accra being a city that has experienced fast urbanization with a continuous creation of sprawls due to an increasingly significant variation in air pollution levels.

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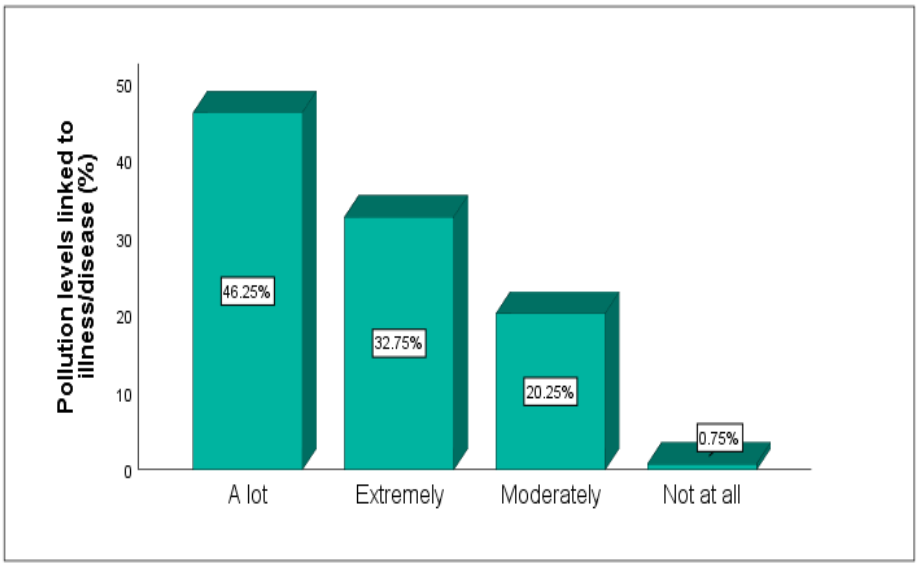

Figure 4.2: Distribution of perceived air pollution levels associated with an illness or disease.
Source: Field survey, 2023

Attitudes towards Urban Air Pollution

Attitude is defined as "the enduring positive or negative sensation towards some person, objective, or issues (Kollmuss & Agyeman, 2002). Again, Zelezny & Schultz (2000) emphasised that a person's self-perception and the degree to which they see themselves as an essential part of the natural world are the root causes of their attitude toward the environment.

During the survey, it was noted that 66.3% rated the overall air quality in their town as poor whereas 30.8% rated the air quality in their town as fair. Moreover, 2.5% of the respondents admitted that the air quality was good and 0.5% of the respondents said that the air quality in their town was worse (Table 4.6). Again, in the level of education categorisation, it was concluded that most of the respondents who had some form of education expressed a poor view of the overall air quality in their area. This confirms the finding by Amegah & Agyei Mensah, (2017) on air quality in cities of Sub-Saharan African (SSA)

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countries as being deteriorated.

Table 4.6: Overall perceived air quality in your town

Variable	Frequency	Percent (%)
Good	10	2.5
Fair	123	30.8
Poor	265	66.3
Other (Worse)	2	0.5
Total	**400**	**100**

Source: Field survey, 2023

People's perceptions based on their attitude of what constitutes an environmental problem vary, thus in Table 4.7, respondents were asked to choose the main sources of urban air pollution in their towns. Evaluating from results in Korle Gonno, 38.9% of respondents the identified exhaust from vehicles as the main source of air pollution, followed by 29.3% smoke from the burning of waste at dump sites to be a source of air pollution in the area. About, 19.8.% and 10.2% of respondents identified electronic waste burning and fume chambers as another source of air pollution in the area, and about 1.8% of respondents indicated industries or factories as being the least sources of urban air pollution in the area. Concerning the results in Old Dansoman, majority (32.8%) of respondents identified smoke from the burning of waste at dump sites as the main source of air pollution, followed by 30.1% of electronic waste burning to be a source of air pollution in the area. About, 21.4% and 11.8% of respondents identified exhaust from vehicles and fume chambers as another source of air pollution, and about 3.9% of respondents indicated industries or factories as being the least sources of urban air pollution in the area.

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Table 4.7: Main sources of Air pollution in Sub-Metro A

Sources	Korle Gonno	Old Dansoman
	Percent (%)	Percent (%)
Vehicle Exhaust	38.9	21.4
Dumpsites Smoke	29.3	32.8
Industries/factories	1.8	3.9
Fume chambers	10.2	11.8
Electronic burning	19.8	30.1
Total	**100**	**100**

Source: Field survey, 2023

Evaluating the responses in Accra Central as illustrated in Table 4.8, it was realized that almost half (32%) of the respondents perceived exhaust from vehicles as the main source of air pollution, followed by 27.4% smoke from the burning of waste at dump sites to be an air pollution source in the area. About, 22.3.% and 11.4% of respondents identified fume chambers and electronic waste burning as another source of air pollution in the area, and about 6.9% of respondents indicated industries or factories as being the least of sources of urban air pollution in the area. Also based on the results in Usher Town, 34% of respondents identified smoke from the burning of waste at dump sites as the main source of air pollution in the area, while 33.3% agreed on exhaust from vehicles. Followed by 24.7% indicated fume chamber as another source of air pollution. About 4.7% and 3.3% identified electronic waste burning and industries or factories as air pollution source in the area.

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Table 4.8: Main sources of Air pollution in Sub-Metro B

Sources	Accra Central	Usher Town
	Percent (%)	Percent (%)
Vehicle Exhaust	32	33.3
Dumpsites Smoke	27.4	34
Industries/factories	6.9	3.3
Fume chambers	22.3	24.7
Electronic burning	11.4	4.7
Total	**100**	**100**

Source: Field survey, 2023

Almost half (44.4%) of the respondents in Darkoman identified smoke from the burning of waste at dump sites as the main air pollution source, while 40.5% agreed that exhaust from vehicles is a source of air pollution in the area. About, 10.5% of respondents identified electronic waste burning as another source of air pollution in the area, and about 2.3% of respondents indicated fume chambers and industries or factories as being the least sources of urban air pollution in the area. Also, 29.4% of respondents in North Kaneshie identified exhaust from vehicles as the main source of air pollution, while 27.1% identified smoke from the burning of waste at dump sites to be a source of air pollution in the area. About, 20% and 17.6% of respondents identified electronic waste burning and industries or factories as another source of air pollution, and about 5.9% of respondents indicated fume chambers as being the least sources of urban air pollution in the area as illustrated in Table 4.9.

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Table 4.9: Main sources of Air pollution in Sub-Metro C

Sources	Darkoman Percent (%)	North Kaneshie Percent (%)
Vehicle Exhaust	40.5	29.4
Dumpsites Smoke	44.4	27.1
Industries/factories	2.3	17.6
Fume chambers	2.3	5.9
Electronic burning	10.5	20
Total	100	100

Source: Field survey, 2023

Supporting the findings by Odonkor & Mahami (2020) in Ghana, they also identified that exhaust from vehicles (33.1%) was the main source of urban air pollution and as against the least, fume chamber was reported as the least among the main sources of urban air pollution. Similar studies by Liao et al. (2015) in China and Ramírez et al. (2017) in Colombia concluded that (78.5%) motor vehicles followed by open burning of waste and industrial facilities contribute to the main sources of urban air pollution. Maione et al. (2021) in Europe however reported that industry and traffic are perceived as the most polluting sectors in all countries, while agriculture and households' activities are seen as the least polluting ones. Moreover, this study also concludes that in all the various six towns, most of the respondents perceived that the main sources of air pollution in their areas was exhaust from vehicles and dumpsites smoke, followed by electronic burning, while fume chambers and industries/factories are seen as the least polluting ones. This indicates that, all the six towns a homogeneous in terms of the economic activities that is being practiced in the area and how it contributes to air pollution as illustrated in

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Table 4.10.

Table 4. 10: Main sources of air pollution in the various six towns

Variable (%)	Accra Central	Darku.	Korle Gonno	North Kaneshie	Old Danso.	Ushe Fort
Vehicle Exhaust	32	40.5	38.9	29.4	21.4	33.3
Dumpsites Smoke	27.4	44.4	29.3	27.1	32.8	34
Industries/factories	6.9	2.3	1.8	17.6	3.9	3.3
Fume chambers	22.3	2.3	10.2	5.9	11.8	24.7
Electronic burning	11.4	10.5	19.8	20	30.1	4.7

Source: Field survey, 2023

Figure 4.3 shows the air pollutants that are associated with high levels of air pollution exposure. It was realized that a greater proportion (48.1%) of the respondents thought that dust particles were a pollutant with high levels of air pollution exposure whereas (36.08%) of respondents showed that the smell of sewage and gutter is also another air pollutant in their area. According to the respondents, they couldn't stand the smell of sewage whenever it's opened and it could sometimes take days before the smell is cleared as well as choked gutters which was filled with waste. Again, (13.42%) and (2.45%) of respondents also confirmed that water vapour and other pollutants led to the high levels of air pollution exposure in their areas. This may be related to the reason that some respondents close to the coastal areas complained more about the strong winds which come along with a lot of dust and the moving vehicles in the city. Liao et al. (2015) clarify that the difference is probably because there are more cars in the city on a daily basis and because living in an urban area exposes residents to automotive exhaust pollution more often. As a result, the majority of transportation sources today produce comparable levels of pollutants, though their relative abundance varies according to the precise fuel

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composition and details regarding the conditions of combustion (Colvile et al., 2001).

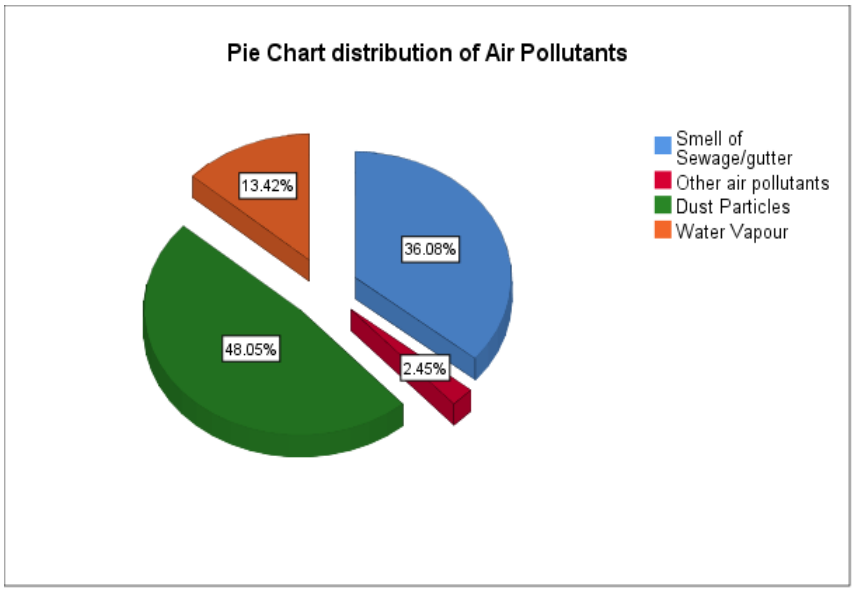

Figure 4.3: Distribution of Respondents' view on Air pollutants
Source: Field survey, 2023

Environmentally Friendly Practices of Urban Air Pollution

During the survey, all of the respondents believed that both natural and human-induced activities contribute to urban air pollution. Again, out of these, 99.3 % are aware that urban air pollution affects their health while 0.8% of respondents are not aware. For instance, pollutants like a mixture of harmful gases due to both natural and human activities are released in harmful amounts into the atmosphere when humans breathe them in and therefore, affect human health (Kemp et al. 2011 & Olstrup, 2019).

The data analysis showed that all the respondents gave their opinion on the effective means to protect themselves whenever the air is polluted. Out of these, 76.5% said they do nothing when the air is polluted while 11.8% of the respondents wear face masks. However, 9% of the respondents use handkerchiefs whenever the air is polluted and 2.8% of respondents specified

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that they normally move away from the polluted place (Table 4.11). Residents who do nothing to protect themselves whenever the air is polluted are attributed to the findings due to the length of stay a resident has lived in the area as most of them stayed over 10 years and therefore, they overlook the situation although there are some complaints about it. In contrast to these, Odonkor & Mahami (2020) in Ghana reported that the majority of the residents have safety precautions for indoors and about 63.8% of them discovered that the best way to shield themselves from the pollution was covering their noses with handkerchiefs, followed by face masks, which were used by 13.8% and 22.3% of the respondents do nothing. This could be as a result of geographical and sample size differences.

Table 4.11: The use of personal protective equipment.

Variable	Frequency	Percent (%)
I wear a face mask	47	11.8
I use handkerchief	36	9.0
I do nothing	306	76.5
Other	11	2.8
Total	**400**	**100**

Source: Field survey, 2023

Table 4.12 shows the outcomes for which it is thought that air pollution exposure is linked to living conditions. There was an overwhelming agreement that an open garbage dump, gas stations, a construction site, and living near a busy traffic intersection were all linked to air pollution exposure, as well as some dispute over air pollution exposure. Out of the 400 respondents, the majority 53.8% (215) of the respondents agreed that living near a busy traffic intersection is associated to increase in air pollution exposure, while 17.5%

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(70) respondents agreed that their practices based on their living conditions can expose them to air pollutants; a total of 71.3% ever agreeing to their exposure to air pollutants when they live near a busy traffic intersection. Also, 24.8% was uncertain. However, 4% disagreed with living near a hectic crossroads for traffic.

Regarding living near an open garbage dump shows that the majority 46.8% (187) respondents strongly agreed while 43.8% (175) respondents agreed to the fact that these living conditions can expose them to air pollutants; about 90.6% agreed to be exposed to air pollutants when they live near an open garbage dump. While 3.5% (14) were not sure. However, 3.5% (14) respondents strongly disagreed and 2.5% (10) also disagreed with living near a busy traffic intersection; a total of 6% never agreed to the fact that living near an open garbage dump leads to increased air pollution exposure. The conditions based on living near gas stations also show that the majority 47.5% (190) of the respondents agreed while 9.7% (37) strongly agreed that living near a gas station will increase exposure to air pollution, However, 3.3% (13) strongly disagreed and 1% (4) disagreed on these conditions. Also, 39.0% (156) of respondents were uncertain. This was because according to some residents, the idea of living near gas stations was dangerous, they did not have much idea of the mixture of gas being associated with increased exposure to urban air pollution. Furthermore, 27.8% (111) of respondents who constituted the majority strongly agreed that living near a construction site will lead to exposure to air pollution. Also, 48.8% (195) agreed that living near the construction site is associated with air pollution and a total of 5.6% (22) respondents are in disagreement with living near a construction site where

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18.0% (72) respondents were uncertain as to living near construction site is associated to urban air pollution or not. Assi et al. (2022) supports this assertion in the study that the conditions of living practices are mostly 60 percent who strongly agree that living near busy traffic intersection is associated with exposure of air pollution. This is due to the fact that individuals are subjected to a greater number of traffic-related pollutants in the majority of urban areas.

Table 4.12: Living Conditions linked to increased exposure to air pollution.
Total Respondents=400

Key= SA- Strongly agree, A= Agree, U= Uncertain, D= Disagree, SD= Strongly Disagree

Variables	SA	A	U	D	SD
Living near a busy traffic intersection	70	215	99	8	8
Living near an open garbage dump	187	175	14	10	14
Living near gas stations	37	190	156	13	4
Living near a construction site	111	195	72	15	7

Source: Field survey, 2023

The results in Table 4.13 indicate that household factors are believed to be linked to air pollution exposure. When surveyed about the household activities (smoke outlet, indoor cooking, wood burning, and use of pesticides) that could be a source of air pollution, it was revealed that 82.8% (331) agreed, 14.2% (57) were uncertain and 3.1% (12) disagreed on the household conditions regarding smoke outlet or chimney, 74.3% (297) agrees, 23% (92) uncertain and 2.8% (11) disagrees the opening of windows at home is associated to increased air pollution exposure, also based on

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responses on household conditions regarding indoor cooking, 80.5% (322) agrees, 17.8% (71) uncertain and 1.8% (7) disagrees. Moreover, 29% (116) agree, 66.5% (266) are uncertain and 4.6% (18) disagree that pesticides and insecticides are linked with an increased air pollution exposure whiles the household condition about waste burning, 95% (380) agrees and 3.3% (13) disagrees. Again, Assi et al. (2022) supports this assertion in the study that majority (83.6%) of the respondents perceived that the conditions of household practices based on smoke outlet and indoor cooking are associated with increased exposure to air pollution in most cities.

Table 4.13: Household conditions linked to exposure of air pollution. Total Respondents= 400

Key= SA- Strongly agree, A= Agree, U= Uncertain, D= Disagree, SD= Strongly Disagree

Variables	SA	A	U	D	SD
Smoke Outlet/ Chimney	159	172	57	3	9
Open windows at home	60	237	92	5	6
Indoor cooking	90	232	71	5	2
Pesticides/Insecticides	6	110	266	13	5
Wood burning	220	160	7	2	11

Source: Field survey, 2023

Figure 4.4 shows the health outcomes that have a significant association with Air pollution. Evaluating the responses, it was realized that about 21.74% identified heart disease as an adverse health outcome associated with air pollution, followed by 17.39% indicated that asthma is one of the adverse health outcomes associated with air pollution. Moreover, 13.04% of the respondents showed that increased respiratory

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symptoms such as difficulty in breathing, dry scratchy throat, headache, and drowsiness were the adverse health outcomes of air pollution whiles 10.87%, 6.52%, and 4.35% indicated chest pain, skin infection or rashes and allergies as an adverse health outcome of air pollution. Therefore, almost half (39.12%) of the respondents identified increased respiratory symptoms such as difficulty in breathing dry scratchy throat, headache, and drowsiness due to the signs and symptoms of respiratory disorders. Findings by (Olstrup, 2019;Ogunbayo, 2016: Dehbi et al., 2017; Xue et al., 2019; Mokona et al., 2020; Yap et al., 2019) also agreed that environmental air pollution offers substantial health risks to people, with the most common effects being cancer, cardiovascular illness, and respiratory ailments.

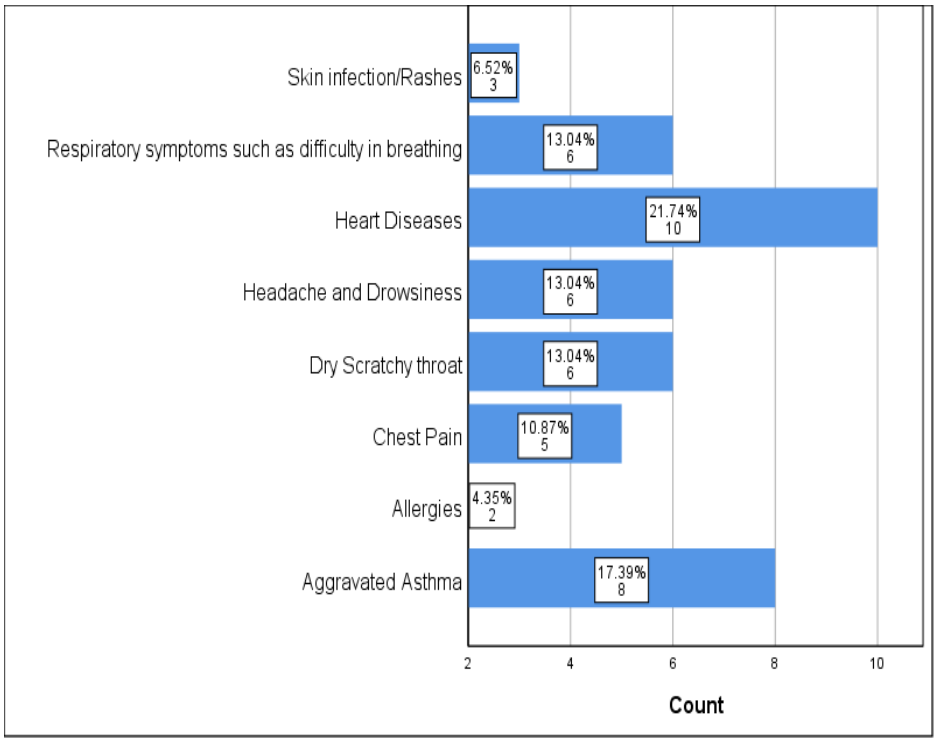

Figure 4.4: Adverse health outcomes associated with air pollution.
Source: Field survey, 2023

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Linear Regression Analysis of the Effect of Attitude on Environmentally Friendly Practices

From the literature reviewed, Zelezny & Schultz, (2000) emphasised that a person's self-perception and the degree to which they see themselves as an essential part of the natural world are the root causes of their attitude toward the environment. Moreover, environmental attitude is defined as "the combination of beliefs, affect, and behavioral intentions a person possesses regarding ecologically connected activities or situations" (Schulz & Northridge, 2004).

Generally, the method for estimating the value of a dependent variable from the value of an independent variable and for determining how two variables are related is called linear regression (Kumari & Yadav, 2018). It is a modeling technique where a dependent variable is predicted based on one or more independent variables. The relationships between the chosen variables are examined using a correlation matrix to determine if they are dependent or independent of one another. This explains the survey results in light of the theories and the conceptual theoretical framework. The regression test was performed to determine the statistical significance of the observed association between the independent and dependent variables for the categorical data analysis. Second, the rate at which the variables that influence the distribution and occurrence of the independent and dependent variables change is assumed to be mostly constant or to be generally constant over a given period and space in this research.

The linear regression model statistically represents the relationship between the dependent and independent variables:

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$y = a + b_1(x_1) + b_2(x_2) \ldots\ldots\ldots\ldots\ldots\ldots bn(xn) + e$

Where;

y = the dependent variable

a = Constant of the regression model

b = Regression coefficient of the independent variables

x = Variables of the Independent

e = Error Margin

Similarly, a linear regression model is developed in this study to explore the relationship between environmentally friendly practises (dependent variable) and attitude (independent variable) as:

$y = a + b_1(x_1) + b_2(x_2) + b_3(x_3)$

Where the e (margin of error) is considered insignificant.

That is:

Environmentally friendly practices = a +b (attitude)

Where:

Environmentally friendly practices = Dependent variable (y)

Attitude = Independent variable (x)

Table 4.14 provides an overview of the data on the correlation (R) between the variable that is dependent (environmentally friendly practices) and the independent variable (attitude) as well as the variability proportion (R^2) in environmentally friendly practices indicated by attitude in the area of study.

Table 4.14: A statistical model summary of the relationship between Environmentally friendly practice and attitudes.

Model	**1**
R	0.253
R Square	0.064
Adjusted R Square	0.057
Std. Error of Estimate	0.047961

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Durbin Watson	1.433

Source: Author's data analysis (2023).

(Kumari & Yadav, 2018) espoused that the R is the Pearson Correlation Coefficient (r) that describes the strength and direction of a linear relationship between two or more variables. From Table 4.14 above, the R-value of 0.253 shows a direct positive relationship (25.3%) that exists between environmental practices and attitude. This implies that, a change in the attitude of residents will have a direct positive influence on their environmentally friendly practices in the study area. This is also the same for the R-squared. The R^2 is used to measure the goodness of fit or the explanatory power of a model. Technically the R^2 gives a proportion or percentage of the total variation in the dependent variable that is explained by the independent variable(s). From the table, the R-squared (R^2) value of 0.064 shows that the linear regression model:

Environmentally friendly practices = a +b (attitude) accounts for 6.4 percent variability in the dependent variable. Since the variable of the independent (attitude) primarily explains the distribution and occurrence of the dependent variable, a relatively small percentage of variability explained by the resulting regression model is expected. This is because other health parameters were not covered in this study due to time constraints and the primary goal of the research. Furthermore, the evidence of autocorrelation in the residuals is measured by the Durbin- Watson statistic and the acceptable DW statistic ranges from zero to four, with a value of 2.0 indicating zero autocorrelation. Thus, the fitted regression line result showed that there is a positive autocorrelation as indicated by the DW statistic value of 1.433 since it's below the mean value of 2.

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Additionally, the coefficients were further assessed to ascertain the influence of each of the factors on the criterion variable (Environmentally friendly practises) illustrated in Table 4.15 below.

Table 4.15: The statistical coefficients of Regression showing the relationship between environmentally friendly practice and attitudes.

Model		Unstandardized Coefficients		Standardized Coefficients		
		B	Std. Error	Beta	t	Sig.
1	(Constant)	3.325	0.143			22.244
	0.000					
	Recycling	0.232	0.045	0.253	5.138	0.000
	Protective measures	0.021	0.043	0.024	0.483	0.629
	Polluting activities	-0.152	0.140	-0.053	-1.084	0.279

Source: Author's data analysis, (2023)

According to the studies on attitudes, attitudes are believed to be persistent, though they are also susceptible to change over time as a result of the information they acquire (Parveen & Ahmad, 2020). The Likert scale of measurement was used to derive some questions from attitude using recycling, protective measures and polluting activities as the independent variables.

From Table 4.15, the coefficients indicates that the rate of air quality in terms of recycling in the environment contribute in predicting the difference in environmental practices with the regression coefficient model (B) for the variable of the independent representing 0.232, and the significant value of the model constant (0.000) indicates that the coefficient of the constant of the computed regression model is statistically significant. This implies that a change in one's attitude will cause 0.232 improvement in their environmental

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practices. It was also discovered that this previous linear regression model's findings shows that using personal protective measure (PPM) has a favourable impact on practises and that an increase of 0.021 in PPM is likely to have a positive influence on environmental practises in the research area but turns out to be insignificant since the p-value is greater than 0.05.

In contrast, it was noticed that the polluting activities in the study area substantially had a negative predictor among the respondents and an insignificant impact on environmental practice (B= -0.152) with an associated p- value of 0.279 since the p-value is greater than 0.05 at 5% level of significance. It thus shows that a decrease in one's attitude will cause a 0.152 rise in environmental practises. Moreover, the poor intention to act will then intend influence the environmental practises engaged in the study area among residents in Accra Metropolis. With a comparatively higher level of confidence, this study's conclusion is that the statistical association between environmentally friendly practices and attitude is positive and that an improvement in one's attitude will therefore tend to improve in the various practices engaged in the study area, which will therefore lead to a decrease in polluting activities respectively. Hence, environmentally favorable attitudes will lead to responsible environmental actions being developed. (Hungerford & Volk, 1990).

Finally, the derived linear regression model represented in this study shows that the statistical relationship between environmentally friendly practises (dependent variable) and attitude (independent variable) as:

Environmentally friendly practices= 3.325+ 0.232 (recycling) + 0.021 (protective measures)- 0.152 (polluting activities)

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where there is insignificant error term (e)

This analysis concludes that the previous linear regression model was reliable and sound in terms of the resulting linear regression's goodness of fit model. This is further demonstrated by the significance of the model's regression coefficients and the normality plot residuals. The residual distribution of the resulting linear regression model around the P-P plot's normal line confirms the findings, in Figure 4.5.

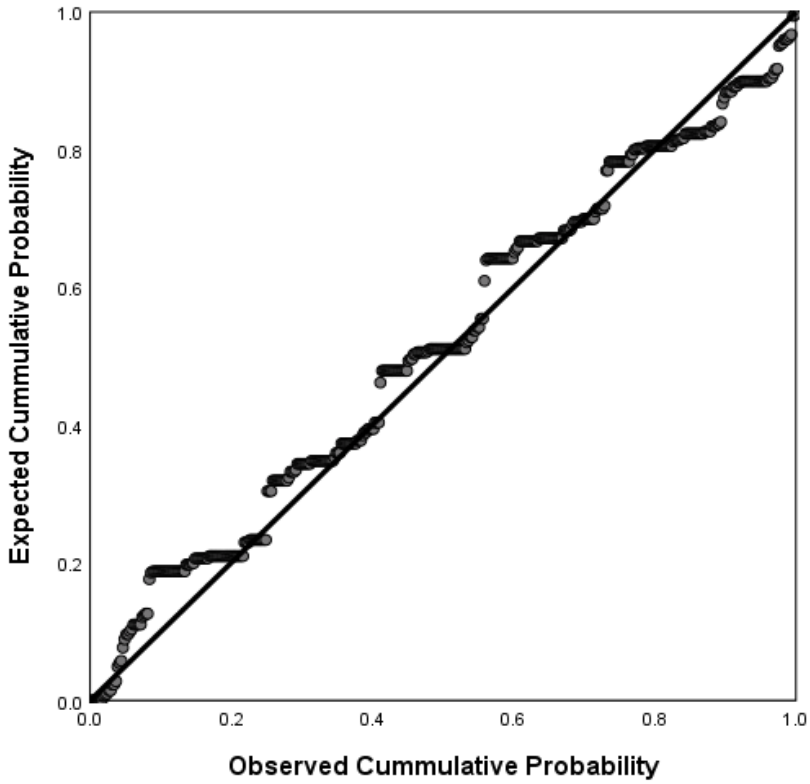

Figure 4.5: Environmentally friendly practices and attitudes: a normal P-P plot of the regression standardized residual.

Summary

The analysis and interpretation of data were covered in this chapter. The data acquired for this study showed that most respondents had a reasonable understanding of the health risks associated with air pollution. The majority of

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respondents shared their views that they had little knowledge about many sources of air pollution and also, the various health consequences of air pollution and its prevention. The chapter also discussed how respondents expressed their willingness to improve whenever they are exposed to polluted air and also with regards to some practices that contributed to the environment's pollution, they admitted that a change in one's attitude can help improve the environment's air quality since it was the responsibility of every citizen to make the environment a better place. Finally, the chapter demonstrated the strong positive relationship that exists between environmentally friendly practices and attitudes in the research area. The next chapter looks at the study's summary, conclusions, and recommendations.

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CHAPTER FIVE

SUMMARY OF FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

Introduction

This chapter provides an overview of the key findings, the conclusions based on the research objectives as well and recommendations for controlling air pollution effectively in the Accra Metropolis.

Summary

The purpose of the study was to assess residents' perceptions of air pollution in the six selected towns in the Accra Metropolis. Specifically, the following questions were developed:

1. How do residents of AM acquire knowledge about air pollution?
2. How can the attitudes of residents of AM influence urban air pollution?
3. What environmentally friendly practices do residents of AM engage in?
4. What effect does the attitude of residents of AM have on environmental practices?

The study's conceptual framework was based on the Theory of Planned Behaviour. A mixed approach method with a stronger focus on the positivist research philosophy underpinned the study and the design used was a cross-sectional descriptive due to the purpose of the study. The sample was chosen using multi-stage sampling techniques. There were 400 household respondents who were engaged in the study. Editing was done on the data gathered from the field survey to guarantee that responses were consistent, and the software programme used to analyse the data was the Statistical Product and Service Solutions (SPSS, version 26.0) which was then presented using charts,

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frequencies, percentages, and were further subjected to regression analysis to establish the existence of relationships between the chosen variables. The following section summarises the study's key findings.

Key Findings

The study's findings have provided pertinent data that might be used to guide policy. The study's key findings were as follows:

Regarding the respondents' demographic characteristics, the females constituted the majority of 52.5% (210), and 47.5% (190) males of the chosen sample while the majority of the respondents within the age cohorts were young and more respondents were also married. About fifty percent of the respondents have had a secondary/vocational/technical level of education and therefore, the knowledge of urban air pollution was scanty.

In relation to the first objective on residents' level of knowledge of urban air pollution, the study found that the respondents had a fair idea of what urban air pollution was and how harmful it is. Again, the majority (51.7%) of the respondents who have spent more than ten years residing in the study area were able to give reliable and relevant information concerning urban air pollution in their place of residence.

A greater proportion agreed that the level of air pollution was high. Concerning the question of respondents who have heard of urban air pollution and its harmful effects as they had cited, almost half (43.9%) of the respondents said they heard of it from their friends or relatives and about 39.7% said they heard it on the television, and the internet while a few said they heard of air pollution on the radio and the technical report. Considering the results, the majority of the respondents were adult or young residents who were interested

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in media sources unlike the elderly and the less educated, the rate of awareness was low.

It also emerged that the air quality in the last five years has been deteriorating with the percentage of 67.8% of respondents with the reason that there has been an increase in moving vehicles, burning of electronic waste, poor hygiene, and greater usage of solid fuels for heating and cooking leading to the pollution environment. Again, 95% of respondents agreed that each citizen had a responsibility to improve the environment.

In relation to the second objective on the attitude of residents towards urban air pollution, a greater proportion of respondents concentrated on polluted air in their area and concluded that the air quality in their area was poor. This indicated that most of the respondents felt that poor air quality negatively impacts their daily activities. Thus, the perception of people based on their attitude toward what constitutes an environmental problem varies.

Thus, respondents' reaction to the primary source of urban air pollution was exhaust from vehicles. Dust, open burning, fume chambers, and industries were also enumerated as the main air pollution sources. Majority (84%) of respondents complained poorly of several dust particles along the coast and the smell of sewage and gutters which also was a form of air pollutants in their towns. This indicates that most of the respondents showed poor attitudinal practices towards urban air pollution.

Regarding the third objective on the environmentally friendly practices residents engaged in, the research found that the majority of responders were informed that both natural and human-induced activities contributed to urban air pollution and they also agreed that there was health outcomes associated

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with it. Also, a few of the respondents agreed that they protected themselves from the polluted air by wearing a face mask or tying a handkerchief around their nostrils. On the other hand, a majority (76.5%) said they did nothing when the air was polluted.

Moreover, there was an overwhelming agreement about the conditions of living such as living near traffic intersections, open garbage, construction sites, and gas stations associated with exposure to air pollution. On the other hand, the majority of respondents were positive that open burning and smoke from outlets or chimneys were the most common household practices associated with exposure to air pollution.

With regard to the fourth objective based on the effect of attitude on environmentally friendly practices, a 95.0 percent positive and statistically significant relationship was found after statistical analysis. (significance value = 0.000) exists between environmental practices (dependent variable) and attitude independent variable). This implies that a change in one's attitude will cause a significant improvement in environmental practices.

Conclusion

The research assessed residents' perceptions of air pollution greatly embedded in and influenced by city-level economic, social, and political settings in the Accra Metropolis. It has provided considerable information that could be used to inform policies about urban air pollution being harmful to the residents of Accra Metropolis. The following conclusions could be drawn from the study's findings:

The study concluded that most of the respondents used for the study were aware of air pollution. However, some groups like the less educated and elderly

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had a low level of awareness. Most residents had little knowledge about many air pollution sources and also, the various health consequences of air pollution.

Moreover, attitudes are developed through education and life experiences. Hence, respondents of the study were willing to improve their attitude by making use of proper recycling methods and strongly willing to use personal protective measures like wearing masks and handkerchiefs when polluting activities occur in their areas. This will help play a role in protecting against air pollution hazards.

Residents expect that due to the cities' ongoing, fast growth and human-induced activities such as recycling of electronic waste, heavy vehicle traffic, increased industrialization activities, domestic heating and cooking, urban air pollution will continue for a very long time since the affective and behavioural aspect was found to have a great effect on practice with regards to the living and household conditions associated with an increased in air pollution exposure.

Finally, the results showed a statistically significant positive relationship between environmentally friendly practices and attitudes in the study area. Moreover, it was discovered that attitude had relatively higher influence on environmentally friendly practices. Therefore, every citizen has a responsibility to improve the quality of the air in the environment in Accra in particular and Ghana in general.

Recommendations

The study's main conclusions and findings provide the basis for the following suggestions to all environmental authorities both public and private organizations required to ensure wellness and safety of residents in the Accra

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Metropolis and Ghana as a whole.

- Educational campaigns among residents should be intensified with the focus being on perceptional change helping them to become more knowledgeable about air pollution. This should be carried out by EPA officials as well as other private environmental institutions.
- There should a requirement for suitable communication tactics that address multiple objectives since the majority of respondents acknowledged that it is everyone's duty to improve the quality of the air.
- Strict legislative measures should be provided to the general public as well as the residents, along with appropriate and ongoing health education and sensitization about the health effects of chronic exposure to air pollution and the fundamental preventive measures that can be adopted and practiced in daily life.
- The environmental authorities should commit resources to the upkeep and long-term observation of monitoring stations in residential areas and also have a way to track local air quality management. Priority should be given to measurements of $PM_{2.5}$
- Appropriate steps should be taken to lower exposure levels during dust occurrences. In particular, local emissions of pollutants that can worsen exposure during dust episodes should be reduced.
- Provide public health and air pollution data.

Areas for Future Research

This study focused on residents' perceptions of air pollution in the Accra Metropolis. Further studies can be carried out to look at the qualitative effect of air pollution on health and strategies taken to help control air

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pollution. Also, it suggests that more extensive investigation should be done in the future by including the environmental agencies in every region and not only in Accra since every individual stands a chance of being associated with it.

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REFERENCES

Afiah, N. (2020). Perceptions of English Education Program Students Towards The Profesionalism of English Education Lecturers in Online Learning at IAIN Parepare. *Asian Social Science and Humanities Research Journal (ASHREJ)*, *2*(2), 70–76.

Agyapong, R. (2012). *Residents' perceptions and attitudes towards urban solid waste management in the Berekum Municipality*. University of Cape Coast.

Agyapong, V. I. O., Ahern, S., McLoughlin, D. M., & Farren, C. K. (2012). Supportive text messaging for depression and comorbid alcohol use disorder: single-blind randomised trial. *Journal of Affective Disorders*, *141*(2–3), 168–176.

Ajzen, I. (1985). From intentions to actions: A theory of planned behavior. In *Action control* (pp. 11–39). Springer.

Ajzen, I. (1991). The theory of planned behavior. *Organizational Behavior and Human Decision Processes*, *50*(2), 179–211.

Ajzen, I. (2002). Perceived behavioral control, self-efficacy, locus of control, and the theory of planned behavior 1. *Journal of Applied Social Psychology*, *32*(4), 665–683.

Ajzen, I., & Fishbein, M. (1975). A Bayesian analysis of attribution processes. *Psychological Bulletin*, *82*(2), 261.

Ajzen, I., & Fishbein, M. (2005). *The influence of attitudes on behavior.*

Al-Hasnawi, S., Hussain, H. M., Al-Ansari, N., & Knutsson, S. (2016). The effect of the industrial activities on air pollution at Baiji and its surrounding areas, Iraq. *Engineering*, *8*(1), 34–44.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Amegah, A. K., & Agyei-Mensah, S. (2017). Urban air pollution in Sub-Saharan Africa: Time for action. *Environmental Pollution*, *220*, 738–743. https://doi.org/10.1016/j.envpol.2016.09.042

Andersen, S. O., & Sarma, K. M. (2012). *Protecting the ozone layer: the United Nations history*. Routledge.

Anwar, M., Weinberg, V., Seymour, Z., Hsu, I. J., Roach, M., & Gottschalk, A. R. (2016). Outcomes of hypofractionated stereotactic body radiotherapy boost for intermediate and high-risk prostate cancer. *Radiation Oncology*, *11*(1), 1–8.

Ashmore, M. R. (1991). Air pollution and agriculture. *Outlook on Agriculture*, *20*(3), 139–144.

Assi, H. I., Meouchy, P., El Mahmoud, A., Massouh, A., Zerdan, M. B., Alameh, I., Chamseddine, N., Kazarian, H., Zeineldine, S., Saliba, N. A., & Noureddine, S. (2022). A Survey on the Knowledge, Attitudes, and Practices of Lebanese Physicians Regarding Air Pollution. *International Journal of Environmental Research and Public Health*, *19*(13). https://doi.org/10.3390/ijerph19137907

Atkinson, K., Schattner, P., & Margolis, S. (2003). Rural secondary school students living in a small community: their attitudes, beliefs and perceptions towards general practice. *Australian Journal of Rural Health*, *11*(2), 73–80.

Bağçivan, G., Tosun, N., Kömürcü, Ş., Akbayrak, N., & Özet, A. (2009). Analysis of patient-related barriers in cancer pain management in Turkish patients. *Journal of Pain and Symptom Management*, *38*(5), 727–737.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Barsalou, L. (2003). Situated simulation in the human conceptual system. *Language and Cognitive Processes*, *18*(5–6), 513–562.

Beatty, T. K. M., & Shimshack, J. P. (2014). Air pollution and children's respiratory health: A cohort analysis. *Journal of Environmental Economics and Management*, *67*(1), 39–57.

Berg, J. W., Appelbaum, P. S., Lidz, C. W., & Parker, L. S. (2001). *Informed consent: legal theory and clinical practice*. Oxford University Press.

Bhattacherjee, A. (2012). *Social science research: Principles, methods, and practices*. University of South Florida.

Bjerg, B., Norton, T., Banhazi, T., Zhang, G., Bartzanas, T., Liberati, P., Cascone, G., Lee, I.-B., & Marucci, A. (2013). Modelling of ammonia emissions from naturally ventilated livestock buildings. Part 1: Ammonia release modelling. *Biosystems Engineering*, *116*(3), 232–245.

Black, A. J. (2019). Importance sampling for partially observed temporal epidemic models. *Statistics and Computing*, *29*(4), 617–630.

Black, I. (2006). The presentation of interpretivist research. *Qualitative Market Research: An International Journal*.

Boudreau, G. (2010). Behavioural change in environmental education. *J Environ Science Public Health 2017*, *1*(2), 120–133.

Burgess, J., Harrison, C. M., & Filius, P. (1998). Environmental communication and the cultural politics of environmental citizenship. *Environment and Planning A*, *30*(8), 1445–1460.

Byulegenova, B. B., & Turemuratov, O. Z. (2023). *Urbanization as a global trend: causes and consequences*.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Çelikler, D., & Kara, F. (2011). Determining the misconceptions of pre-service chemistry and biology teachers about the greenhouse effect. *Procedia-Social and Behavioral Sciences*, *15*, 2463–2470.

Chahine, T., Baccarelli, A., Litonjua, A., Wright, R. O., Suh, H., Gold, D. R., Sparrow, D., Vokonas, P., & Schwartz, J. (2007). Particulate air pollution, oxidative stress genes, and heart rate variability in an elderly cohort. *Environmental Health Perspectives*, *115*(11), 1617–1622.

Chen, L. H., Knutsen, S. F., Shavlik, D., Beeson, W. L., Petersen, F., Ghamsary, M., & Abbey, D. (2005). The association between fatal coronary heart disease and ambient particulate air pollution: are females at greater risk? *Environmental Health Perspectives*, *113*(12), 1723–1729.

Cheon, J., Lee, S., Crooks, S. M., & Song, J. (2012). An investigation of mobile learning readiness in higher education based on the theory of planned behavior. *Computers & Education*, *59*(3), 1054–1064.

Cider, L. (1993). Cleaning and reliability of smoke-contaminated electronics. *Fire Technology*, *29*(3), 226–245.

Collett, D. (1991). Models for binary and binomial data. In *Modelling binary data* (pp. 43–91). Springer.

Colvile, R. N., Hutchinson, E. J., Mindell, J. S., & Warren, R. F. (2001). The transport sector as a source of air pollution. *Atmospheric Environment*, *35*(9), 1537–1565.

Cook, T. D., Campbell, D. T., & Shadish, W. (2002). *Experimental and quasi-experimental designs for generalized causal inference*. Houghton Mifflin Boston, MA.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Creswell, J. W., & Creswell, J. D. (2017). *Research design: Qualitative, quantitative, and mixed methods approaches*. Sage publications.

Creswell, J. W., & Hirose, M. (2019). Mixed methods and survey research in family medicine and community health. *Family Medicine and Community Health*, *7*(2).

De Sario, M., Katsouyanni, K., & Michelozzi, P. (2013). Climate change, extreme weather events, air pollution and respiratory health in Europe. *European Respiratory Journal*, *42*(3), 826–843.

ng, R. (2000). New ways to promote proenvironmental behavior: Expanding and evaluating motives for environmentally responsible behavior. *Journal of Social Issues*, *56*(3), 509–526.

Degu, G., & Yigzaw, T. (2006). Research Methodology: lecture notes for health science students. *Addis Ababa: The Carter Center (Ethiopian Public Health Training Initiative)*, 45–50.

Dehbi, H.-M., Blangiardo, M., Gulliver, J., Fecht, D., De Hoogh, K., Al-Kanaani, Z., Tillin, T., Hardy, R., Chaturvedi, N., & Hansell, A. L. (2017). Air pollution and cardiovascular mortality with over 25 years follow-up: A combined analysis of two British cohorts. *Environment International*, *99*, 275–281.

Delong, S. (2023). Urban health inequality in shifting environment: systematic review on the impact of gentrification on residents' health. *Frontiers in Public Health*, *11*, 1154515.

Desonie, D. (2007). *Atmosphere: air pollution and its effects*. Infobase Publishing.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Duraisamy, S., Narayanappa, R. R., & Sobagiah, R. T. (2017). *Perception of Air Pollution Health Hazards among Roadside Shop-Keepers in Selected Areas of Bangalore City- Cross Sectional Study*. *8*(11), 8–11.

Faiz, A. (1993). Automotive emissions in developing countries-relative implications for global warming, acidification and urban air quality. *Transportation Research Part A: Policy and Practice*, *27*(3), 167–186.

Faradina, T. (2007). Gambaran persepsi supir bajaj daerah pangkalan blok M terhadap kesehatan berkendara di jalan raya tahun 2007. *Skiripsi. Depok: FKM UI*.

Farrell, B. H., & Twining-Ward, L. (2004). Reconceptualizing tourism. *Annals of Tourism Research*, *31*(2), 274–295.

Ferreira, A. F., Ribeiro, L. A., Batista, A. P., Marques, P. A. S. S., Nobre, B. P., Palavra, A. M. F., da Silva, P. P., Gouveia, L., & Silva, C. (2013). A biorefinery from Nannochloropsis sp. microalga–Energy and CO2 emission and economic analyses. *Bioresource Technology*, *138*, 235–244.

Ferris, G. R., Frink, D. D., Galang, M. C., Zhou, J., Kacmar, K. M., & Howard, J. L. (1996). Perceptions of organizational politics: Prediction, stress-related implications, and outcomes. *Human Relations*, *49*(2), 233–266.

Froehlich, J., Boivin, M., Rice, D., McGraw, K., Munson, E., Walter, K. C., & Bloch, M. K. S. (2013). Influencing university students' knowledge and attitudes toward breastfeeding. *Journal of Nutrition Education and Behavior*, *45*(3), 282–284.

Digitized by Sam Jonah Library

GSS, G. S. S. (2021). Population and housing census: Summary report of final results. *Accra: Ghana Statistical Service*.

Hammond, A. L., & Institute, W. R. (1995). *Environmental indicators: a systematic approach to measuring and reporting on environmental policy performance in the context of sustainable development* (Vol. 36). World Resources Institute Washington, DC.

Hanna, G. (1995). Wilderness-related environmental outcomes of adventure and ecology education programming. *The Journal of Environmental Education*, *27*(1), 21–32.

Haslinda, A. (2009). Evolving terms of human resource management and development. *The Journal of International Social Research*, *2*(9), 180–186.

Hernandez, O., & Monroe, M. (2000). Thinking about behavior. *Environmental Education and Communication for a Sustainable World. Handbook for International Practitioners*, 17–22.

Hime, N. J., Marks, G. B., & Cowie, C. T. (2018). A comparison of the health effects of ambient particulate matter air pollution from five emission sources. *International Journal of Environmental Research and Public Health*, *15*(6), 1206.

Hines, J. M., Hungerford, H. R., & Tomera, A. N. (1987). Analysis and synthesis of research on responsible environmental behavior: A meta-analysis. *The Journal of Environmental Education*, *18*(2), 1–8.

Howel, D., Moffatt, S., Bush, J., Dunn, C. E., & Prince, H. (2003). Public views on the links between air pollution and health in Northeast England. *Environmental Research*, *91*(3), 163–171.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Hungerford, H. R., & Volk, T. L. (1990). Changing learner behavior through environmental education. *The Journal of Environmental Education*, *21*(3), 8–21.

Hyman, J. (1999). How knowledge works. *The Philosophical Quarterly*, *49*(197), 433–451.

Järup, L. (2003). Hazards of heavy metal contamination. *British Medical Bulletin*, *68*(1), 167–182.

Junker, M., Kasper, M., Röösli, M., Camenzind, M., Künzli, N., Monn, C., Theis, G., & Braun-Fahrländer, C. (2000). Airborne particle number profiles, particle mass distributions and particle-bound PAH concentrations within the city environment of Basel: an assessment as part of the BRISKA Project. *Atmospheric Environment*, *34*(19), 3171–3181.

Kampa, M., & Castanas, E. (2008). Human health effects of air pollution. *Environmental Pollution*, *151*(2), 362–367.

Karanasiou, A., Viana, M., Querol, X., Moreno, T., & de Leeuw, F. (2014). Assessment of personal exposure to particulate air pollution during commuting in European cities—Recommendations and policy implications. *Science of the Total Environment*, *490*, 785–797.

Kassa, M., & Grace, J. (2019). The global burden and perspectives on non-communicable diseases (NCDs) and the prevention, data availability and systems approach of NCDs in low-resource countries. In *Public Health in Developing Countries-Challenges and Opportunities*. IntechOpen.

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Kemp, A. C., Horton, B. P., Donnelly, J. P., Mann, M. E., Vermeer, M., & Rahmstorf, S. (2011). Climate related sea-level variations over the past two millennia. *Proceedings of the National Academy of Sciences*, *108*(27), 11017–11022.

Klæboe, R., Amundsen, A. H., & Fyhri, A. (2008). Annoyance from vehicular air pollution: A comparison of European exposure–response relationships. *Atmospheric Environment*, *42*(33), 7689–7694.

Kollmuss, A., & Agyeman, J. (2002). Mind the gap: why do people act environmentally and what are the barriers to pro-environmental behavior? *Environmental Education Research*, *8*(3), 239–260.

Kreitner, R., Kinicki, A., & Buelens, M. (2001). *Organizational behavior, chapter 11: Individual and group decision making [Web page]. Retrieved December 1, 2001*.

Krishna, B. (2021). *Air Pollution and Health in Delhi, India: Health Effects of Short-Term Exposures and Policy Implications*. Harvard University.

Kumari, K., & Yadav, S. (2018). Linear regression analysis study. *Journal of the Practice of Cardiovascular Sciences*, *4*(1), 33.

Lai, C. K., Skinner, A. L., Cooley, E., Murrar, S., Brauer, M., Devos, T., Calanchini, J., Xiao, Y. J., Pedram, C., & Marshburn, C. K. (2016). Reducing implicit racial preferences: II. Intervention effectiveness across time. *Journal of Experimental Psychology: General*, *145*(8), 1001.

Liang, L., & Gong, P. (2020). Urban and air pollution: a multi-city study of long-term effects of urban landscape patterns on air quality trends. *Scientific Reports*, *10*(1), 1–13.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Liao, X., Tu, H., Maddock, J. E., Fan, S., Lan, G., Wu, Y., Yuan, Z. K., & Lu, Y. (2015). Residents' perception of air quality, pollution sources, and air pollution control in Nanchang, China. *Atmospheric Pollution Research*, *6*(5), 835–841. https://doi.org/10.5094/APR.2015.092

Lindau, T. (n.d.). *Transport Plays a Key Role in Urban Air Quality*.

Liu, M., Huang, X., Song, Y., Tang, J., Cao, J., Zhang, X., Zhang, Q., Wang, S., Xu, T., & Kang, L. (2019). Ammonia emission control in China would mitigate haze pollution and nitrogen deposition, but worsen acid rain. *Proceedings of the National Academy of Sciences*, *116*(16), 7760–7765.

Liu, T., He, G., & Lau, A. (2018). Avoidance behavior against air pollution: evidence from online search indices for anti-PM2. 5 masks and air filters in Chinese cities. *Environmental Economics and Policy Studies*, *20*(2), 325–363.

Lu, J. G., Lee, J. J., Gino, F., & Galinsky, A. D. (2018). Polluted morality: Air pollution predicts criminal activity and unethical behavior. *Psychological Science*, *29*(3), 340–355.

Ma, X., Zhang, T., Ji, C., Zhai, Y., Shen, X., & Hong, J. (2021). Threats to human health and ecosystem: Looking for air-pollution related damage since 1990. *Renewable and Sustainable Energy Reviews*, *145*, 111146.

MacIntosh, R., & O'Gorman, K. (2015). Research methods for business and management. *A Guide to Writing Your Dissertation*, *558*.

Maione, M., Mocca, E., Eisfeld, K., Kazepov, Y., & Fuzzi, S. (2021). Public perception of air pollution sources across Europe. *Ambio*, *50*(6), 1150–1158.

Digitized by Sam Jonah Library

Manisalidis, I., Stavropoulou, E., Stavropoulos, A., & Bezirtzoglou, E. (2020). Environmental and health impacts of air pollution: a review. *Frontiers in Public Health*, *8*, 14.

Mann, C. J. (2003). Observational research methods. Research design II: cohort, cross sectional, and case-control studies. *Emergency Medicine Journal*, *20*(1), 54–60.

Mariwah, S., Kendie, S. B., & Dei, A. L. (2010). Residents' perception of the solid waste problem in the Shama-Ahanta-East Metropolitan Area, Ghana. *Oguaa Journal of Social Sciences*, *5*(1), 21–43.

Matejicek, L. (2005). Spatial modelling of air pollution in urban areas with GIS: a case study on integrated database development. *Advances in Geosciences*, *4*, 63–68.

Mensah, C. A. (2010). *Causes and consequences of informal settlement planning in Ghana: A case study of Aboabo, a suburb of Kumasi metropolis*. University of Cape Coast.

Mirzaei, A., Tahriri, H., & Khorsandi, B. (2021). Comparison between AirQ+ and BenMAP-CE in estimating the health benefits of PM2. 5 reduction. *Air Quality, Atmosphere & Health*, *14*(6), 807–815.

Mokona, H., Yohannes, K., & Ayano, G. (2020). Youth unemployment and mental health: prevalence and associated factors of depression among unemployed young adults in Gedeo zone, Southern Ethiopia. *International Journal of Mental Health Systems*, *14*, 1–11.

Mudu, P., & Organization, W. H. (2021). *Ambient air pollution and health in Accra, Ghana*.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Munn, R. W. (1972). The local field and charge-carrier mobilities in molecular crystals. *Chemical Physics Letters*, *16*(2), 429–431.

Nafrah, J. E. (2017). *Effect of Ambient Air Pollution on Respiratory Health of Market Women at Agbogbloshie Food Market in Accra, Ghana*. University of Ghana.

Najjar, Y. S. H. (2011). Gaseous pollutants formation and their harmful effects on health and environment. *Innovative Energy Policies*, *1*, 1–9.

Newhouse, N. (1990). Implications of attitude and behavior research for environmental conservation. *The Journal of Environmental Education*, *22*(1), 26–32.

Nwankwoala, H. N. L. (2015). Causes of Climate and Environmental Changes: The Need for Environmental-Friendly Education Policy in Nigeria. *Journal of Education and Practice*, *6*(30), 224–234.

O'Donnell, M. R., Tallman, M. S., Abboud, C. N., Altman, J. K., Appelbaum, F. R., Arber, D. A., Bhatt, V., Bixby, D., Blum, W., & Coutre, S. E. (2017). Acute myeloid leukemia, version 3.2017, NCCN clinical practice guidelines in oncology. *Journal of the National Comprehensive Cancer Network*, *15*(7), 926–957.

Odonkor, S. T., & Mahami, T. (2020). Knowledge, attitudes, and perceptions of air pollution in Accra, Ghana: a critical survey. *Journal of Environmental and Public Health*, *2020*.

Ogunbayo, A. (2016). *Retrospective study of effects of air pollution on human health*.

Oliver, R. L. (1999). Whence consumer loyalty? *Journal of Marketing*, *63*(4_suppl1), 33–44.

Digitized by Sam Jonah Library

Olstrup, H. (2019). *Air pollution and health – Indicators, trends and impacts*. http://urn.kb.se/resolve?urn=urn:nbn:se:su:diva-168306

Omair, A. (2015). Selecting the appropriate study design for your research: Descriptive study designs. *Journal of Health Specialties*, *3*(3), 153.

Organization, W. H. (2006). *Air quality guidelines: global update 2005: particulate matter, ozone, nitrogen dioxide, and sulfur dioxide*. World Health Organization.

Organization, W. H. (2007). *Cancer control: knowledge into action: WHO guide for effective programmes* (Vol. 2). World Health Organization.

Organization, W. H. (2018). *World health statistics 2018: monitoring health for the SDGs, sustainable development goals*. World Health Organization.

Oweini, A., & Houri, A. (2006). Factors affecting environmental knowledge and attitudes among Lebanese college students. *Applied Environmental Education and Communication*, *5*(2), 95–105.

Özkara, A., Akyıl, D., & Konuk, M. (2016). Pesticides, environmental pollution, and health. In *Environmental health risk-hazardous factors to living species*. IntechOpen.

Panis, L. I., De Geus, B., Vandenbulcke, G., Willems, H., Degraeuwe, B., Bleux, N., Mishra, V., Thomas, I., & Meeusen, R. (2010). Exposure to particulate matter in traffic: a comparison of cyclists and car passengers. *Atmospheric Environment*, *44*(19), 2263–2270.

Paoletti, E., Schaub, M., Matyssek, R., Wieser, G., Augustaitis, A., Bastrup-Birk, A. M., Bytnerowicz, A., Günthardt-Goerg, M. S., Müller-Starck, G., & Serengil, Y. (2010). Advances of air pollution science: from

Digitized by Sam Jonah Library

forest decline to multiple-stress effects on forest ecosystem services. *Environmental Pollution*, *158*(6), 1986–1989.

Parveen, R., & Ahmad, A. (2020). Public behavior in reducing urban air pollution: an application of the theory of planned behavior in Lahore. *Environmental Science and Pollution Research*, *27*(15), 17815–17830.

Peng, M., Zhang, H., Evans, R. D., Zhong, X., & Yang, K. (2019). Actual air pollution, environmental transparency, and the perception of air pollution in China. *The Journal of Environment & Development*, *28*(1), 78–105.

Perera, F. (2018). Pollution from fossil-fuel combustion is the leading environmental threat to global pediatric health and equity: Solutions exist. *International Journal of Environmental Research and Public Health*, *15*(1), 16.

Peterson, A. T., Sánchez-Cordero, V., Soberon, J., Bartley, J., Buddemeier, R. W., & Navarro-Sigüenza, A. G. (2001). Effects of global climate change on geographic distributions of Mexican Cracidae. *Ecological Modelling*, *144*(1), 21–30.

Pöschl, U. (2005). Atmospheric aerosols: composition, transformation, climate and health effects. *Angewandte Chemie International Edition*, *44*(46), 7520–7540.

Pulla, V., & Carter, E. (2018). Employing interpretivism in social work research. *International Journal of Social Work and Human Services Practice*, *6*(1), 9–14.

Digitized by Sam Jonah Library

Qin, S., Liu, F., Wang, C., Song, Y., & Qu, J. (2015). Spatial-temporal analysis and projection of extreme particulate matter (PM10 and PM2. 5) levels using association rules: A case study of the Jing-Jin-Ji region, China. *Atmospheric Environment*, *120*, 339–350.

Ramírez, O., Mura, I., & Franco, J. F. (2017). How do people understand urban air pollution? Exploring citizens' perception on air quality, its causes and impacts in Colombian cities. *Open Journal of Air Pollution*, *6*(1), 1–17.

Raviv, O., Ahissar, M., & Loewenstein, Y. (2012). How recent history affects perception: the normative approach and its heuristic approximation. *PLoS Computational Biology*, *8*(10), e1002731.

Riley, W. T. (2017). Behavioral and social sciences at the National Institutes of Health: adoption of research findings in health research and practice as a scientific priority. *Translational Behavioral Medicine*, *7*(2), 380–384.

Robbins, S. P. (2005). *Organization Behavior, Chapter Five, Perception and Individual Decision Making*. Prentice Hall Inc.

Rubin, D. H., Erickson, C. J., Agustin, M. S., Cleary, S. D., Allen, J. K., & Cohen, P. (1996). Cognitive and academic functioning of homeless children compared with housed children. *Pediatrics*, *97*(3), 289–294.

Sarantakos, S. (1998). Sampling procedures. In *Social research* (pp. 139–164). Springer.

Sarker, R., Yeasmin, M., Rahman, M. A., & Islam, M. A. (2018). People's perception and awareness on air pollution in rural and urban areas of Mymensingh Sadar upazila. *Progressive Agriculture*, *29*(1), 22–32.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Saunders, C. T., Wong, W. S. W., Swamy, S., Becq, J., Murray, L. J., & Cheetham, R. K. (2012). Strelka: accurate somatic small-variant calling from sequenced tumor–normal sample pairs. *Bioinformatics*, *28*(14), 1811–1817.

Saxena, P., & Sonwani, S. (2019). Criteria air pollutants: chemistry, sources and sinks. In *Criteria air pollutants and their impact on environmental health* (pp. 7–48). Springer.

Schecter, A., Birnbaum, L., Ryan, J. J., & Constable, J. D. (2006). Dioxins: an overview. *Environmental Research*, *101*(3), 419–428.

Schifter, D. E., & Ajzen, I. (1985). Intention, perceived control, and weight loss: an application of the theory of planned behavior. *Journal of Personality and Social Psychology*, *49*(3), 843.

Schultz, P. (2002). Inclusion with nature: The psychology of human-nature relations. In *Psychology of sustainable development* (pp. 61–78). Springer.

Schultz, P. W., Shriver, C., Tabanico, J. J., & Khazian, A. M. (2004). Implicit connections with nature. *Journal of Environmental Psychology*, *24*(1), 31–42.

Schulz, A., & Northridge, M. E. (2004). Social determinants of health: implications for environmental health promotion. *Health Education & Behavior*, *31*(4), 455–471.

Scovell, M., 2Shane, C., Swinbourne, A., & Smith, D. (2022). Rethinking risk perception and its importance for explaining natural hazard preparedness behavior. *Risk Analysis*, *42*(3), 450–469.

Digitized by Sam Jonah Library

Semenova, G. (2020). Environmental disasters as a factor of environmental pollution. *E3S Web of Conferences*, *217*, 4007.

Sheeran, P. (2002). Intention—behavior relations: a conceptual and empirical review. *European Review of Social Psychology*, *12*(1), 1–36.

Simon, M. K., & Goes, J. (2011). *What is phenomenological research*.

Solomon, S. (1999). Stratospheric ozone depletion: A review of concepts and history. *Reviews of Geophysics*, *37*(3), 275–316.

Sommer, L. (2011). The theory of planned behaviour and the impact of past behaviour. *International Business & Economics Research Journal (IBER)*, *10*(1).

Sommer, L., & Haug, M. (2012). What Influences Implementation Intentions in an Academic Learning Context--The Roles of Goal Intentions, Procrastination, and Experience. *International Journal of Higher Education*, *1*(1), 32–61.

Song, D., Zhou, X., Peng, Q., Chen, Y., Zhang, F., Huang, T., Zhang, T., Li, A., Huang, D., & Wu, Q. (2015). Newly emerged porcine deltacoronavirus associated with diarrhoea in swine in China: Identification, prevalence and full-length genome sequence analysis. *Transboundary and Emerging Diseases*, *62*(6), 575–580.

Stern, P. C. (2000). New environmental theories: toward a coherent theory of environmentally significant behavior. *Journal of Social Issues*, *56*(3), 407–424.

Suleman, D., Simon, M., & Richard, A. (2015). Residents' perceptions and attitudes towards urban solid waste management in the Berekum Municipality, Ghana. *Oguaa Journal of Social Sciences*, *7*(2), 25–37.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Swanson, R. A., & Chermack, T. J. (2013). *Theory building in applied disciplines*. Berrett-Koehler Publishers.

Trochim, W. M., Cabrera, D. A., Milstein, B., Gallagher, R. S., & Leischow, S. J. (2006). Practical challenges of systems thinking and modeling in public health. *American Journal of Public Health*, *96*(3), 538–546.

Turner, J., Bindschadler, R., Convey, P., Di Prisco, G., Fahrbach, E., Gutt, J., Hodgson, D., Mayewski, P., & Summerhayes, C. (2009). *Antarctic climate change and the environment*.

Van den Ban, A. W. (1996). Article review. *European Journal of Agricultural Education and Extension*, *3*(1), 59–60.

Wahid, A. (2006). Influence of atmospheric pollutants on agriculture in developing countries: a case study with three new wheat varieties in Pakistan. *Science of the Total Environment*, *371*(1–3), 304–313.

Walker, W. (2005). The strengths and weaknesses of research designs involving quantitative measures. *Journal of Research in Nursing*, *10*(5), 571–582.

Warner, H. W., & Åberg, L. (2006). Drivers' decision to speed: A study inspired by the theory of planned behavior. *Transportation Research Part F: Traffic Psychology and Behaviour*, *9*(6), 427–433.

Winton, B. G., & Sabol, M. A. (2022). A multi-group analysis of convenience samples: free, cheap, friendly, and fancy sources. *International Journal of Social Research Methodology*, *25*(6), 861–876.

Xue, T., Zhu, T., Zheng, Y., & Zhang, Q. (2019). Declines in mental health associated with air pollution and temperature variability in China. *Nature Communications*, *10*(1), 2165.

Digitized by Sam Jonah Library

University of Cape Coast https://ir.ucc.edu.gh/xmlui

Yamane, T. (1973). *Statistics: An introductory analysis*.

Yap, J., Ng, Y., Yeo, K. K., Sahlén, A., Lam, C. S. P., Lee, V., & Ma, S. (2019). Particulate air pollution on cardiovascular mortality in the tropics: impact on the elderly. *Environmental Health*, *18*, 1–9.

Zelezny, L. C., & Schultz, P. W. (2000). Psychology of promoting environmentalism: Promoting environmentalism. *Journal of Social Issues*, *56*(3), 365–371.

Zhang, L., Ou, C., Magana-Arachchi, D., Vithanage, M., Vanka, K. S., Palanisami, T., Masakorala, K., Wijesekara, H., Yan, Y., & Bolan, N. (2021). Indoor particulate matter in urban households: sources, pathways, characteristics, health effects, and exposure mitigation. *International Journal of Environmental Research and Public Health*, *18*(21), 11055.

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APPENDICES

APPENDIX A

UNIVERSITY OF CAPE COAST

FACULTY OF SOCIAL SCIENCES

DEPARTMENT OF GEOGRAPHY AND REGIONAL PLANNING

QUESTIONNAIRE FOR RESIDENTS

TITLE: ASSESSING RESIDENTS' PERCEPTIONS OF AIR POLLUTION IN ACCRA METROPOLIS.

Dear Sir/Madam,

I am Magdalene Adei Nikoi, a postgraduate student at the Department of Geography and Regional Planning, University of Cape Coast. This questionnaire aims to find out **Residents' Perceptions of Urban Air Pollution** in the Accra Metropolis. This research is purely for academic purposes and it intends to aid in policy implementation and ensure a healthy environment. Therefore, your participation in this study is optional and you are assured of confidentiality and anonymity. Thank you.

SOCIO-DEMOGRAPHIC CHARACTERISTICS

1. Gender:

- Male
- Female

2 Age:

- 18-29 years [ ] • 30-39 years [ ] • 40-49 years [ ] • 50 years and above [ ]

3 Place of residence: ……

4 Education level:

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- Basic [ ] • Secondary/ Vocational [ ] • Tertiary [ ] • None [ ]

5 Marital status:

• Single [ ] • Married [ ]

• Divorced [ ] • Widow/widower [ ]

6 Employment status:

• Student [ ] • Civil/public servant [ ] • Private worker [ ]

• Trader [ ] • Others ……

LEVEL OF KNOWLEDGE ON URBAN AIR POLLUTION

7 How many years have you stayed here?

- Less than 3 years [ ] • 4-6 years [ ] • 7-9 years [ ] • 10 years and above [ ]

8 In your opinion, what is the status of air pollution in your town of residence?

- Serious [ ] • Moderately Serious [ ] • Not Serious [ ] • Other (specify) [ ]

9 How do you access information about air pollution in your area? (can pick one or more)

- TV and Internet [ ] • Friends/Relatives [ ] • Technical Report [ ]
- Other (specify) [ ] ……..

10 In your opinion, in the last 5 years, air quality in your city of residence:

- Has been improving [ ] • Improved initially then deteriorated [ ]
- Has been deteriorating [ ] • Deteriorated initially then improved [ ]

11 Are you aware that every citizen is responsible for improving the environment?

- Strongly aware [ ] • Aware [ ] • Not aware [ ] • Somewhat aware [ ]

12 In your opinion, are increased air pollution levels are linked to the severity of an illness or disease?

- Not at all [ ] • Moderately [ ] • A lot [ ] • Extremely [ ]

13 Kindly tick (√) as appropriate the main sources of urban air pollution practiced in your area:

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- Exhaust from vehicles [ ] • Industries/factories [ ] • Fume chambers [ ]
- Smoke from dumpsites [ ] • Dust [ ] • other (specify) [ ] …….

ATTITUDES TOWARD URBAN AIR POLLUTION

14 Have you paid attention to the air pollution in your area?

a. Yes • No

15 Based on your perception, how would you rate the overall air quality in your community last year?

- Good [ ] •Fair [ ] • Poor [ ] • other (specify)……

16 Which of the following substances do you think are air pollutants in your area? Kindly tick (√) as appropriate.

- Dust Particles [ ] • Smell of Sewage/gutters [ ] • Water Vapour [ ]
- Other (specify) [ ]…….

17 Do you agree that recycling is an important action to protect the environment?

• Strongly agree [ ] • Agree [ ] • Disagree [ ] • Strongly disagree [ ]

18 I feel concerned when I see reports about high levels of air pollution in my area.

• Strongly agree [ ] • Agree [ ] • Disagree [ ] • Strongly disagree [ ]

19 Do you agree that economic activities that harm the environment should be regulated more strictly.

• Strongly agree [ ] • Agree [ ] • Disagree [ ] • Strongly disagree [ ]

20 I am confidence that poor air quality negatively impacts my daily activities.

• Strongly agree [ ] • Agree [ ] • Disagree [ ] • Strongly disagree [ ]

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ENVIRONMENTALLY FRIENDLY PRACTICES OF URBAN AIR POLLUTION

21 Do you believe that natural and human-induced activities contribute to urban air pollution and also affect our health?

- Yes • No

22 What do you do to protect yourself when there is pollution in the air?

• I wear a face mask [ ] • I do nothing [ ] • I use handkerchief [ ] • other (specify)……

Please indicate the extent to which you think that each of the following environmentally friendly practices is associated with increased exposure to urban air pollution. Where 1= Strongly Disagree (SD), 2= Disagree (D), 3= Uncertain (U), 4= Agree (A), 5 = Strongly Agree (SA), tick (√) the appropriate answer of your choice.

Indicators	**SD**	**D**	**U**	**A**	**SA**
Living Condition					
23 Living near a busy traffic intersection					
24 Living near an open garbage dump					
25 Living near gas stations					
26 Living near a construction site					
Household Conditions/ Activities					
27 Smoke Outlet/Chimney					
28 Open windows at home					
29 Indoor Cooking					
30 Pesticides and Insecticides					
31 Waste burning					

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32 Kindly tick (√) as appropriate the health outcomes associated with urban air pollution:

Health Problems/outcomes	**SD**	**D**	**U**	**A**	**SA**
Increased respiratory symptoms such as difficulty in breathing.					
Chest pain					
Skin infection/Rashes					
Aggravated asthma					
Allergies					
Dry scratchy throat					
Headache and drowsiness					
Heart diseases					

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