THE POLITICS OF GLOBAL ENVIRONMENTAL POLICIES

By

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PREFACE

Environmental issues such as global warming and climate change are at the epicenter of debate among scholars, environmentalists, world leaders, concerned individuals, governmental and non-governmental organizations on how to balance relations between humans and the various natural systems on which they depend, in such a way that all the components are accorded proper degrees of sustainability.

This Book of Readings by like-minded academics and experts in the field lend credence to this on-going debate especially on the need to protect and conserve our environment by engaging in environmentally friendly activities or packaging. The idea behind this masterpiece is not only to provide adequate and proper information on the burning issues but also to build and encourage dialogue and strengthen synergies among the diverse stakeholders in the preservation of our environment.

The editors are glad to be able to bring together the views and perspectives contained in each of the chapters. It is our utmost belief that the contributions in this Book of Readings which is elective in nature will provide students of various disciplines, researchers, environmentalists, governments, non-governmental organizations and the reading public with the insights that would be useful for understanding the issues, politics, nature, dimensions and dynamics of environmentalism.

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We wish to state here that the views contained in this book are exclusively those of the authors.

Enefiok Ibok
Ekong Daniel
Ofonmbuk Atakpa

FOREWORD

I came across the manuscripts of 'The Politics of Global Environmental Policies' towards the end of 2018. That was shortly after Mr. Donald Trump, had unilaterally withdrawn the United State of America from the agreements by World Leaders on the deteriorating state of the World's environment. That Trumplike action by the American President himself, and the widespread condemnation of the decision by the international community was my first real experience of the politics of Global Environmental Policies in action.

This book of readings on the Politics of Global Environmental Policies, authored by young academics in the Social and Management sciences at Akwa Ibom State University deals with an important aspect of the debate on the state of the deterioration of the world's environment and steps being taken to normalize the situation. There are twelve chapters.

The first chapter "The Politics of Global Environmental Issues" starts off with the various environmental problems that give rise to environmental issues. Environment in this context refers to the tangible physical or in-organic environment land (lithosphere), water (hydrosphere) and air (atmosphere) and the organic environment (biosphere) which is made up of small parts of the three components of in-organic environment. It notes that concern about the state of the environment is not new, but dates back to pre-history; that in the past, the issues of concern were largely restricted to the adequacy of the earth's resources to support the small but increasing human population. That today, however, the major issues relate to the state of the natural environment (abiotic and biotic), which is increasingly being suffocated by human activities, using highly sophisticated advanced technology of production and destruction of the land, air and sea.
The author classifies global environmental problems into two categories based on (1) the physical or spatial extent of occurrence of the problem (damage) and (2) social perception of the problem as global or not, by individuals, the media, in public debates or in scientific research. More importantly he sub-divided the category (1) problems into two sub-groups namely (a) systematic global environmental problems and (b) cumulative global environmental problems.

A systematic global environmental problem such as the release of ozone- depleting substances in a particular place brings about an effect or damage to the whole global system; but such damage can be controlled or repaired not necessarily at the point or country where the problem or damage started, but at any point (place) in the global system. The cumulative sub-group problems are those that occur simultaneously in various parts of the world but are not linked to a global system as in the case of bio-diversity damage.

Currently, governance appears to be the central theme of global environmental politics. This point is clearly demonstrated in the dislocations and embarrassments caused by the unilateral withdrawal of the United States government of President Donald Trump from International Agreements on Global Environmental Issues, including climate change. The stand of developing countries on key proposals by developed countries to reduce the damage that humans have inflicted on the physical environment is presented under the brief discussion of the North/South Divide in Global Environmental Politics.

There are two chapters on the distribution (location) of the physical components of the earth, land, air and sea – the distribution of these elements and their structural composition. It is their functioning that produces the disasters that environmentalists seek to prevent. It is also these components that contain the resources that humans exploit for a living and in the process do great damage to the environment. That is one aspect of the geographic factor. The other is the two-way human environmental relations which relate to the ways humans impact on the environment and the ways the environment impacts on humans. There is no smoke without fire, so goes the saying. It is these aspects of our environment that constitute the fires that produce the environmental disaster smoke.

A comprehensive account of the ongoing concern about the state of the world environment starting with the Human Environment at Stockholm, Sweden is presented in the chapter on the History of Global Environmental Meetings. The series of subsequent meetings and conferences led to the agreements signed by Heads of Government to

ensure that the decisions to contain the damaging effects of the ozone layer level were carried out by the countries concerned.

Actors in and "Actors on Global Environmental Politics" constitute the core contribution to this treatise on Global Environmental Politics. The state, a political association that has authority over a country or territory is or should be the main actor in environmental politics. In practice, there are also many other non-state actors in some countries. These other actors include local and inter-national Non-Governmental Organizations (NGOS), civil society groups, private businesses, including transnational corporations like the Rockefeller and Ford Foundations and United Nations Agencies such as the World Bank and Food and Agricultural Organization (FAO) etc.

Non-state Actors have over the years become the major source of funds and personnel for the increasing number of conferences and meetings to discuss global environmental issues and to find solutions to global environmental problems. In respect of state participation, it has become increasingly clear that governance is what is most important in contemporary politics of global environmental policies. Governance is what has brought about the unilateral abrogation in 2018 of treaties signed by world leaders to protect the earth's environment by the President of the United States of America, Mr. Donald Trump.

Global environmental issues and problems (disasters) have become so widespread, more regular and more damaging to humans and the environment during the past four decades, that a new field of study - global environmentalism has emerged. Global environmentalism is defined as the study of the concern about the state of the global environment and the actions to help solve environmental problems. Global environmentalism is at the root of Green Party Politics of the developed countries of the world. The principles, norms, rules and the decision-making procedures that Actors have to apply in dealing with a given environmental problem or issue is referred to as environmental regime.

Regimes that deal with endangered species, hazardous waste, protection of the ozone layer and climate change have admirable goals, but are

difficult to enforce. These are issues that are best handled at the international level. The problem with international environmental regimes is that they lack the ability and authority to implement their own legal standards. Why? Politics! When formally organized, an international regime can transform into an intergovernmental organization. They are, however not actors or non-governmental organization (NGO'S).

The overriding purpose of environmental policies and programmes is to ensure the sustainability of the Earth's environment that is in addition to repairing the damage caused by natural disaster and rehabilitating the victims of these disasters. Chapter nine presents a situation global report on the issues and challenges of sustainable development. It draws attention to the lack of implementation of the recommendation from the numerous global environmental meetings by many governments. The unilateral withdrawal in 2018 of the American President, Mr. Donald Trump from the Paris Agreement (December, 2015) of the world climatic commission is a case in point.

Chapter 10 presents the special case of oil multinational companies that have caused massive destruction of the physical environment and disruption of social and family life of local populations, and this, in spite of existing international human rights. The chapter zeros in on the special case of the Niger Delta, where the inhabitants of the region that produces the crude oil and gas that fuel the Nigerian economy, live in absolute poverty in a most polluted and ravaged wetlands without potable water, electricity and basic health facilities.

The chapter on climate change – a most topical environmental issue, considers climate change to be a militating factor against sustainable development in Africa. Climate change is not new in Africa. The Sahara was once a sea bed and later had extensive forests and fauna, the remains of which formed the crude oil and natural gas in Libya etc. The difference between past climate change in Africa and the current ongoing climate change is the presence today of the human population which is growing rapidly and on the move. The drying up of lake chad and severe droughts in the West African Sahel have already disrupted social life and the native economy of these regions. There is a strong

case for more people oriented politics, for more positive action to protect the environment of the regions of Africa by national governments and international agencies such as the World Climatic Commission, Forest Commission and relevant United Nations Agencies.

The study ends with an interesting, but unusual presentation on Environmental Accounting Information System, unusual in the sense that most papers on environmental studies do not consider the cost implications of the recommendations made. The editors have done a good job in putting together these papers for use by students in the related disciplines in the Faculty of Social and Management Sciences and Law.

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CHAPTER 1

THE POLITICS OF GLOBAL ENVIRONMENTAL ISSUES

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INTRODUCTION

The most important feature of environmental degradation is that it affects all mankind. Since the whole world is a stakeholder, it raises issues on who should do what to combat environmental degradation. The environment itself encompasses the whole of life on earth and the complex interrelationship that links the biotic and the abiotic world. In a general sense, it covers everything contained within the air, land and sea (Ahmad-Khan, 2013).

Since the advent of humankind, man has established an inalienable close tie with the environment. As early as 5,000 years ago, especially after the start of human civilization, the area coverage by human colonization has been continually widened with the increase of population and progress of production technology, followed with environmental problems. Therefore, it is pertinent to say that throughout the process of human development, the entire history is actually a process during which humankind kept fighting against and got adapted to the environment. For example, the Industrial Revolution of the United Kingdom which occurred in the middle of the eighteenth century witnessed the emergence of an industrial society era. When industrialization was providing the benefits of industrialized civilization and economic growth for humans, a series of important environmental problems worsened in company with industrial globalization.

From the Industrial Revolution in the eighteenth century to 1950, the developed countries accounted for 95% of CO_2 emission. Between 1950 – 2000, emission by developed countries went up to77% of world total. Of concern is that after the 1940s when the imbalance between ecology and economy in fields like resources, energy and the environment became increasingly outstanding, the issue of environmental protection became one of the biggest concerns of the public. Certain organizations of developed countries even launched “strong initiatives” for global environmental protection. These include International Union for

Conservation of Nature (IUCN) founded in Switzerland in 1948, World Wildlife Fund (WWF) founded in 1961, Club of Rome founded in 1968, Greenpeace International (GI) established in 1971 in Canada, World Commission on Environment and Development (WCED), established by the UN in 1983. Others are Friends of the Earth founded in 1983, Global Environmental Facility (GEF) launched in 1997 and International Environmental Protection Organization Association (IEPOA). All these organizations turned out to be influential advocators and implementers of environmental protection throughout the world and having made progress, contributed to the undertaking of global environmental protection. It is worth noting that the above-mentioned organizations are mostly established by developed countries and the initial participants are also developed countries. It is only at a later stage that developing countries and underdeveloped countries were absorbed in, (Magdoff, 2011, Xu, 2007).

The concerns over the health of our global environment continued to rise in the late 1960s and early 1970s. This concern motivated experts who met in 1968 at the United Nations Biosphere Conference held in Sweden to discuss global environmental problems. The first Earth Day was held in the United States (US) in April, 1970, with twenty million people rallied. This was indeed one of the largest organized demonstrations in the history of the United States. The impact was that the same year, the United States government founded the Environmental Protection Agency (EPA). In the following year 1971, the Canadian Government created a Department of the Environment. The result of these growing societal and political concerns was the United Nations Conference on the Human Environment, held in Stockholm, Sweden, in June 1972 (Dryzek, 1992).

GLOBAL ENVIRONMENTAL PROBLEMS

The growing population has been a great pressure for resource environment. Excessive growth of population in spite of ecological environment load-bearing limitation is another important cause of global environmental problems. Since the nineteenth century, and particularly after the twentieth century, the rapid growth of population has triggered a series of environmental problems, such as air pollution, security of resources, piles of household garbage etc (Jiangiang, et al, 2013).

The traditional economic development pattern focusing solely on economic growth is the immediate cause of environmental issues. History shows that after the Industrial Revolution, countries like United Kingdom (UK), United States of America (USA) and Germany have created miracles of rapid economic development but accompanied with the global environmental issues that threaten human development. This is because the traditional economic development pattern focused more on the achievements made in the economic sphere with the primary target being growth in total output value and economic profit and increase in material wealth. Under this approach (traditional pattern), people tended to emphasize economic growth at the expense of the environment and where due regard is not given to resource utilization and efficiency, the ecosystem is exposed to destruction (Magdoff, 2011, Chen, 2009).

Also, capitalist system in developed countries and the inequitable international order are the root causes of global environmental problems. Under capitalism, the environment does not exist as a natural domain where humankind must coexist with other species, but as a domain to be developed in the ever-expanding process of economy. Ecological sociologists argue that capitalism is the root cause of Western or even global ecological crisis and environmental problems. The expansion of capitalism goes without limitation; the trends of infinite accumulation of capital and the dominating logics of maximization of added value imply impulsive consumption of earth's resources and destruction of natural environment and has inherently decided the unsustainability of economic development and the inevitability of ecological colonialism (Chen, 2009; Yu Jin, 2009).

It is a well-known fact that our environment is constantly changing. However, as our environment changes, so does the need to become increasingly aware of the process that surrounds it. With a mass influx of natural disasters, warming and cooling periods, different types of weather patterns, people need to be aware of what types of environmental problems our planet is facing (www.conserv-energy-future.com, 2018).

Global warming has become an undisputed fact about our current livelihoods. Our planet is warming up and we are definitely part of the problems. But this is not the only environmental problem that we should be concerned about. Across the globe, people are facing a wealth of new and challenging environmental problems every day. Some of these problems are small and only affect fewer ecosystems, but others are drastically changing the landscape of what is already known to us. This, therefore, means that our planet is at the brink of a severe environmental crisis. It is glaring that current environmental problems make us vulnerable to disaster and tragedies, now and in the future. The whole world is in a state of planetary emergency, with environmental problems piling up high around us. Unless these problems are variously and prudently addressed, we are surely doomed for disaster. This entails that the current environmental problems require urgent attention (Ahmad-Khan 2013, Benedick, (1991).

Some of the major current environmental problems confronting us are: pollution, global warming, over-population, natural resources depletion, waste disposal, climate change, loss of biodiversity, deforestation, ocean acidification, ozone layer depletion, acid rain, water pollution, urban sprawl, public health issues, genetic engineering, nuclear issue, deforestation, desertification etc. All these affect humans, animals, and nations on this planet (Ahmad-Khan, 2013, Forsyth, 2011).

It is of interest to say that the attention given to the above-mentioned problems has changed over time, with different perspectives, and the varying involvement of different countries and actors. It is envisaged that these views are likely to continue to change. Besides, it is now obvious that 'global environmental problems present great complexity on how they are caused, how they impact on different people and places and how they are evaluated. What steps can we take to clarify global environmental problems, or classify them into different types? Explaining further on these problems, based on location, Turner (1990) classified global environmental problems into two categories, namely: the physical extent of "global" environmental problems and the social perception of 'global' problems.

Turner sub-divided physical extent problems into two types, namely systemic and cumulative. Systemic environmental problems according to him are global because they are caused by a change in a global system. This approach emphasizes that a change in one location in the global system will impact upon the rest of the system. This therefore entails that a solution to the global system need not be located in the same place as the cause of the disturbance to the system. For example, the release of ozone depleting substances in one country will impact on the entire ozone layer. In the same vein, reducing ozone-depleting substances in a different country will help reduce the impact of the damaged ozone layer in other countries. On the other hand, cumulative environmental problems are global because they occur globally, but are not necessarily linked to a global system. For example, biodiversity loss might be called a cumulative problem because it is accruing in many places simultaneously. There is no physical link between biodiversity loss in one country and in another. Therefore, protecting biodiversity in one location will be restricted to that location (Forsyth, 2011).

The social perception of environmental problems relates to the way that people think about the state of the environment and is influenced by scientific research, media, and public debates. It is a better understanding of how environmental issues are interpreted into social dynamics. And there is need to improve our knowledge of social perception about environmental problems. According to Siqueira (2008), environmental issues are perceived and integrated by people in different manners, since the way people face these issues is affected by the peculiarities from individual perceptions. Such particularities have influence over the perception about certain aspects of the environment to the detriment of other issues, which are actually under threat but that remain imperceptible to the sensory organs. So environmental perceptions are crucial to the understanding of men/environment interrelations, their expectations, satisfactions, hopes, judgments and conduct within the space they are inserted in (Siquara, 2008 and Almeida, et al, 2017).

Taylor and Buttel (1992) harp on the need to understand the role of discourse in making us believe in the reality of certain environmental problems or in how environmental changes might impact on soceity as a

whole. Environmental discourses are the textual and spoken interaction about the environment. A discursive formation determines what should be said and how. Consequently, environmental discourses are the way we construct, interpret, discuss, and analyze environmental problem (Dryzek, 1997). The core of environmental discourses is on environmental issues – what is discussed. It can be the issue of air pollution, nuclear waste, or global climate change. So when people think, speak, and write about the environment, they interpret it through the lens of their belief system or ideology that results in a certain environmental discourse. Explaining further, Taylor and Buttel (1992) say that the word 'discourse' refers to how the language we use can help create controversial vision of reality in hidden ways. This can be used to discuss various aspects of global environmental problems and politics because it refers to how problems are framed and discussed in ways that can sometimes shape how they are defined or addressed.

Discourses are the hidden assumptions about the world that we carry in everyday speech. A discourse creates a vision of reality when people use this language in ways that do not question these assumptions. For instance, newspapers, politicians and environmentalists might talk of environmental change as a global risk. This is indeed a cognitive statement, which is aimed at making people more worried about environmental problems. But if these statements also assume that environmental risks occur because the world has fixed limits, or that fast-growing countries pose the greatest environmental threats, then these explicit meanings might be a form of hidden discourse. So the analysis of discourse within political debate aims to make these assumptions more transparent, and consequently make political debate more informed and less based on assumption. So there exists the need to ascertain the role of global discourse as an important force in convincing people about global environmental problems (Dryzek, 1997).

GLOBAL ENVIRONMENTAL POLITICS

Global environmental politics examines the relationship between global political forces and environmental change, with particular attention given to the implication of local-global interactions for management as well as the implication of environmental change for world politics (O'Neill and Stacy, 2017).

Global environmental politics is a much more recent phenomenon and is rooted in modern environmentalism with emphasis on the 'global environment' as an object of concern. This idea arose in public consciousness, particularly in the United States (US), as a result of several factors, including fear about 'global' (i.e. Third World) population growth, concern about the effects of industrialization and images of Earth from space (McCormick, 1989).

The central theme in global environmental politics today is governance. Aside from the general calls for global responses to address global environmental problems such as climate change, there is also the emergence of new actors such as non-governmental organizations in environmental politics, debate about the relationship between trade and environment and new environmental regimes that encompass both specific international laws and inter-governmental organizations. Transnational institutions, such as the United Nations and The World Trade Organization, have equally become increasingly involved broadly in environmental debates and more narrowly in environmental management (Dalby, 2002, Klare, 2001).

The term 'global' is not only about linkages that connect the world into a single place but is also simultaneously about differentiation and disconnection among people and places. Therefore, the 'global' of global environmental politics does not indicate a particular arena for political struggle that dominates regional, national, or local arenas, but rather it is about how all these are produced and come together (or not) in environmental conflicts (Mansfield, 2003). These can further be examined within a 'formal' environmental politics that occurs within the confines of multilateral negotiations and an 'informal' environmental politics of activism and social movements (Robins, 2004, Peer and Watts, 2004).

Formal environmental politics as the name implies is the environmental politics of UN conferences and reports which, in recent years, has explicitly extended into the environmental politics of free trade. Important issues are about who is actually responsible for environmental degradation, what are the most appropriate measures for achieving

environmental goals, and who should pay for them (with cash or lost development opportunities). Within this politics, the North is often presented as protector of the environment and the South as the protector of the poor, and economic growth is offered as the primary solution to both economic and environmental problems. This is anchored on the politics of neo-liberalism (Mansfield, 2003).

On the other hand, informal environmental politics generally occurs outside of official settings and is carried out by grassroots groups. Within this activist politics, the critical issue has been about the negative impacts of both conservation and development on both people and the environment. The activist discourse exposes the North for degrading the environment and the South for promoting policies that worsen problems for the world's poor. According to this view, too much economic activity is bad for the environment and leads to greater inequalities between the rich and the poor. This is 'politics against neoliberalism' (Mansfield, 2003).

A closer look at 'formal' and 'informal' global environmental politics does not only concern environmental protection but also is about equity, global power relations, and the relationship between the environment and development. So the two frameworks are important in that the "formal" is dominant and issues raised from within this debate are not exhaustive. However, the informal activists provide important perspectives about the larger or formal framework and address issues that are not generally up for discussion within formal politics. Thus, we can deduce that both formal and informal politics show that the global world is uneven and contested, while explicitly addressing informal politics highlights that the global world is produced through both linkage and differentiation (Mansfield, 2003).

GLOBAL ENVIRONMENTAL POLITICS – NORTH VERSUS SOUTH DIVIDE

The disagreemenst about global environmental problems is often described in terms of richer versus poorer countries, or North versus the global South. It is also argued that environmental issues addressed by governance at the global level tend to be those on the priority agenda of Northern countries. These are usually issues of a 'global character',

often including climate change, ozone depletion, and biodiversity. While the effects of climate change are likely to be most adverse and severe primarily for developing countries, these countries are the ones faced with more pressing immediate concerns. It is equally claimed by the South that, the global environmental agenda is a Northern agenda, of little relevance to them, rather, the issues on which attention is focused are often far from the experience of environmental degradation of poor people in villages, towns and mega-cities in large parts of the world, where 'the environment' consists of problems associated with health, shelter, and food availability. These environmental issues prioritized by the South are less visible on the global agenda (Redclift and Sage, 1998, Gutman, 1994, Agarwal et al, 1999, Karlsson, 2017).

Environmentally, the North-South divide refers to the difference in opinion between the developed world and the developing world on carbon emission cuts, compensation, subsidies and technology transfers for moving towards a greener economy and a host of other contentious issues which have arisen in the context of global warming and climate change. The deepening contention is that since the developed world (North) is responsible for the major chunk of the historic carbon emission therefore, it has a moral obligation to accept binding emission cut in consonance with its role in degradation of the environment. On the other hand, the developing world (South) argues that it has limited responsibility in the impending climate crisis and therefore it should not have to adhere to limited emission cuts, and that too of a non-binding nature in any climate deal in the future (www.quorh.com, 2018).

Elaborating deeply into the classic differences between North and South, the environmentalists in richer countries of the North hold the opinion that the rapid growth of developing countries such as Brazil, India and China etc. presents severe risk to the planet. According to them, these countries have immense populations, and will demand more and more food, electricity, fuel and other commodities. Many of them also have some of the most important tropical forests, biodiversity or areas of wilderness but comparatively low levels of environmental awareness about global problems such as climate change. They (North) expressed concern that the political capacity of states or other actors of the South to implement environmental policies is low, hence, an urgent need to

transfer environmentally sound technologies to rapidly developing countries, and also the need to create environmental regulations that work in these challenging conditions (Forsyth, 2011).

However, for many developing countries of the South, the current environmental problems from richer countries of the North raise some important additional concerns such as; why should developing countries which are poorer and have immense developmental problems, take responsibility for addressing environmental problems? Why should they not develop first and thereafter worry about environmental problems? In some cases, such as deforestation or industrialization, richer countries have been contributing to problems longer than many developing countries, so it seems unfair that poorer countries should take responsibility (Dryzek, 1997, Sachs, 1993, Forsyth, 2011).

Besides, it is also contended by the South that many developing countries have not received levels of aid that were promised some years back, so any additional help relating to the environment should not replace existing commitments to assistance. That is anchored on the fact that, some aspects of climate change might impact most on developing countries and hence it is only right that they should get assistance. It is equally important to note that richer countries have not yet transferred technologies to developing countries and many resist the access of poor countries to international trade. The most important issue is that, environmental worries should not be used as a reason to prevent poorer countries from gaining access to the wealth that has been enjoyed by richer countries for years, meaning that what is good for the goose is also good for the gander. So in a nutshell, it is glaring that many political controversies about global environmental problems occur between North and South.

ENVIRONMENTAL POLICIES: ADAPTATION AND MITIGATION

There exists dispute or disagreement about how to address global environment problems in effective ways. An important division is in how much emphasis is given to the mitigation of environmental problem compared with adaptation to such problems. The terms ‘mitigation’ and

'adaptation' are two important terms that are fundamental in the environmental change debate.

Mitigation refers to policies or actions that reduce the size of an environmental change, for example, any action that reduces greenhouse gas concentration might be called mitigation because it is reducing the physical process that creates anthropogenic climate change. Mitigation is considered to be the most effective means of addressing environmental problems because it reduces their cause. It should also be clear that mitigation tends to work best when environmental problems are considered to be systemic. If climate change is considered to be systemic, then mitigating climate change can be achieved through acts that reduce greenhouse gas concentration at any point in the world (Forsyth, 2011, www.global-greenhouse-warming.com, 2017; IPCC 4th Report).

Adaptation on the other hand, is any response that reduces the impact of an environmental change. It is an undertaking of how individuals, group and natural system can prepare for and response to change in climate or their environment. Adaptation has two forms. The first refers to physical actions or technologies that can reduce the impact of physical environmental changes. The second form of adaptation is to diversify social, economic and cultural behaviour that might make the impacts of change less damaging to people's way of life. Holistically, mitigation tackles the causes of environmental or climate change while adaptation tackles the effect of the phenomenon (Forsyth, 2011, Elliot, 2004).

Most policy makers have agreed that adaptation can be hard to achieve in many developing countries where technological capacity is low or where poverty makes it hard to diversify options. It is of interest to note that most environmental policy makers agree that both mitigation and adaptation should be adopted at the same time. Be that as it may, there are still many barriers to both. For example, some deep-green activists see any form of adaptation as a way of avoiding dealing with the underlying cause of change, which is dangerous interference with the earth's natural limits (Forsyth, 2011).

The tension between mitigation and adaptation raises various important questions for global environmental policy. In philosophical terms, if a society is infinitely adaptable to environmental change, it radically reduces the extent to which an environmental problem is actually 'problematic'. Of course, it is very few environmentalists or policy makers that suggest that societies should try to become immune to environmental change. There are many ethical, economic or cultural reasons to conserve environments or avoid risks. But the fact remains that many environmental problems are considered problematic because of assumptions we make about their impact. If we can reduce their impact, or re-evaluate how we see them, then the nature of environmental problems changes too.

As already observed, most analysts propose that mitigation and adaptation should be undertaken at the same time. But it is worth noting that there are some deep green disagreements about how to integrate mitigation and adaptation. For example, at an international conference on climate change in Tokyo in 1997, a representative of China said that climate change policy should include more direct assistance to help industrializing countries such as China adapt faster to climate change and that developed countries should provide greater technological assistance to poorer countries. In response to this statement, a representative of the USA stood up and urged delegates to remember that the climate change convention was about 'climate change' and not 'development'. He therefore, urged all discussions to see the main objectives of climate-change policy as reducing atmospheric greenhouse gas concentrations. In a simple word, the USA at that time was urging mitigation through any means possible, rather than adaptation (Forsyth, 2011).

Also, some critics have argued that some forms of mitigation might prevent adaptation if it damages people's overall access to development. For example, some radical environmentalists have suggested reducing economic growth, which would impact on less developed countries right to development. Even some forms of reforestation for climate change mitigation have also been criticised for taking up agricultural land, which might provide food and employment for people (Forsyth, 2011; www.global-greenhouse-warming.com; Anand, 2013).

CONCLUSION

Global environmental issues or problems are now on every one's mind. Environmental destruction caused by humans is a global problem and this is ongoing everyday. This has generated worries about the impacts on human and the nature. Since the whole world is facing planetary emergency, environmental problems must be prudently addressed. This lies on governance. But the formal politics which implies the environmental politics of the UN conferences and reports raise issues about who is actually responsible for environmental degradation and who should bear the burden in terms of paying the price. Within this debate, the North is often seen as protector of the environment while the South as the protector of the poor.

Outside the official arena of environmental politics, we have informal environmental politics which is carried out by grassroots groups. These groups focus attention on the negative impacts of development on both the people and the environment. They believed that much economic activities are bad for the environment and this leads to greater inequalities between rich and poor countries which is as a result of linkages and differentiation (Mansfield, 2003).

Attempts to address environmental change debates brought about the emergence of two important terms that are fundamental to environmental change namely: mitigation and adaptation. As the name implies, mitigation tackles the causes of environmental or climate change while adaptation tackles the effect of the phenomenon. To solve environmental problems and save our globe, most analysts have proposed that mitigation and adaptation should be used at the same time. This is a mere proposal and not a consensus as there still exists disagreement between the North and the South on how to effectively integrate the duo that is adaptation and mitigation in solving environmental problems facing us especially the South which is the developing countries.

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CHAPTER 2

GEOGRAPHICAL PERSPECTIVE OF THE PHYSICAL ENVIRONMENT

Ekong E. Daniel

INTRODUCTION

The term "Environment" refers to all living things and non-living things occurring naturally on Earth. The sum total of all surroundings of a living organism, including natural forces and other living things which provide conditions for development and growth as well as of danger and damage. The living and once living things referred to as biotic elements thrive in the biosphere and are capable of reproducing. Examples are animals, birds, plants, fungi and other similar organisms. The non-living things include physical and chemical elements, usually referred to as abotic elements that are obtained from the lithosphere, atmosphere and hydrosphere. Examples are water, air, soil, sunlight, and minerals. These make up the physical earth.

THE PHYSICAL STRUCTURE OF THE EARTH

Geophysics, which studies the physics of the earth, has led to many significant discoveries about the earth and its make-up. For example, it has revealed that the earth has several distinct layers (See Fig. 1). Each of these layers has its own properties. The outermost layer of the earth is the crust. This comprises the continents and ocean basins. The crust has a variable thickness of 35-70 km in the continent and 5-10km in the ocean basins. The crust is composed mainly of aluminosilicates.

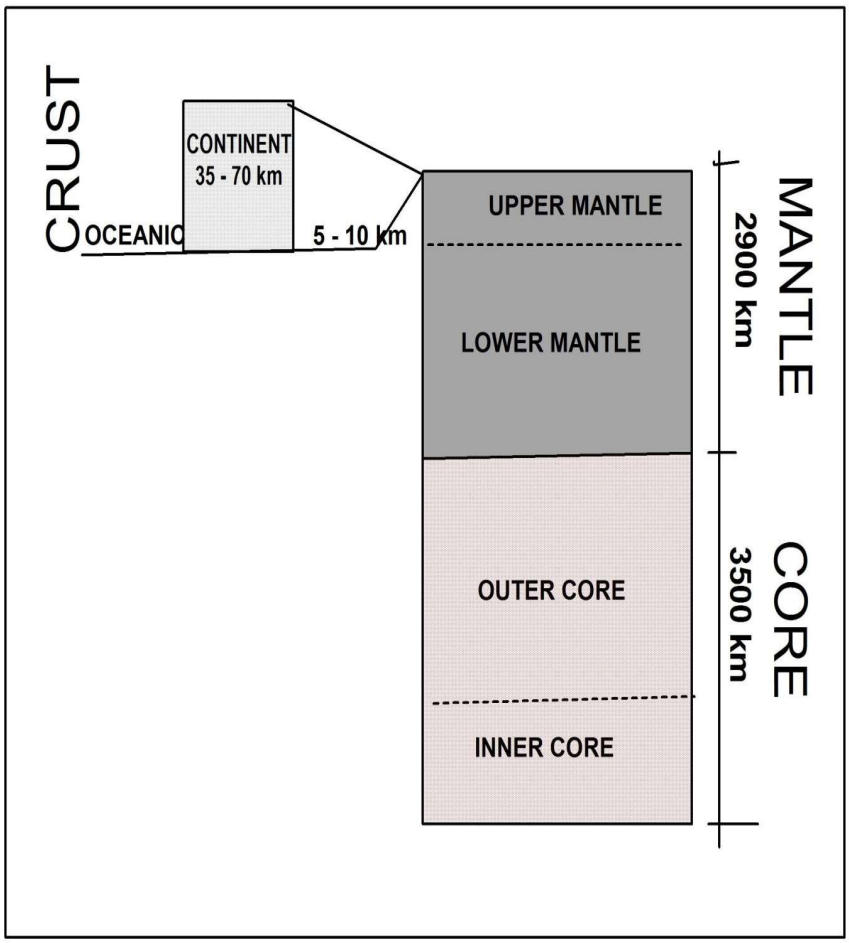

Fig.1: Cross Section of the Earth (not to scale)
Source: Centre for General Studies, Akwa Ibom State University, Nigeria (2018)

The next layer is the mantle, which is composed mainly of ferromagnesium silicates. It is about 2900km thick, and is separated into

the upper and lower mantle. This is where most of the internal heat of the earth is located. Large convective cells in the mantle circulate heat and may drive plate tectonic processes. The last layer is the core, which is separated into the liquid outer core and the solid inner core. The outer core is 2300km thick and the inner core is 1200km thick. The outer core is composed mainly of nickel-iron alloy, while the inner core is almost entirely composed of iron. The earth's magnetic field is believed to be controlled by the liquid outer core.

THE LITHOSPHERE

The earth is separated into layers based on mechanical properties in addiction to composition. The topmost – layer is the lithosphere, which comprises the crust and the solid portion of the upper mantle. The lithosphere is divided into many plates that move in relation to each other due to tectonic forces. The lithosphere essentially floats atop a semi-liquid layer known as the asthenosphere. This layer allows the solid lithosphere to move around since the asthenosphere is much weaker than the lithosphere.

The land surface of the earth occupies about thirty percent (30%) of the total area, and the land-masses are separated by ocean basins. The land surfaces are synonymous with the seven continents. These continents are named as Asia, Europe, Africa, North America, South America, Australia and Antarctica. Various reasons have been advanced to attempt to explain the distribution of these land masses. There are certain areas, like most of Africa, which are made up of ancient crystalline rocks. These areas are known as shields and the main ones are shown in Figure 2.

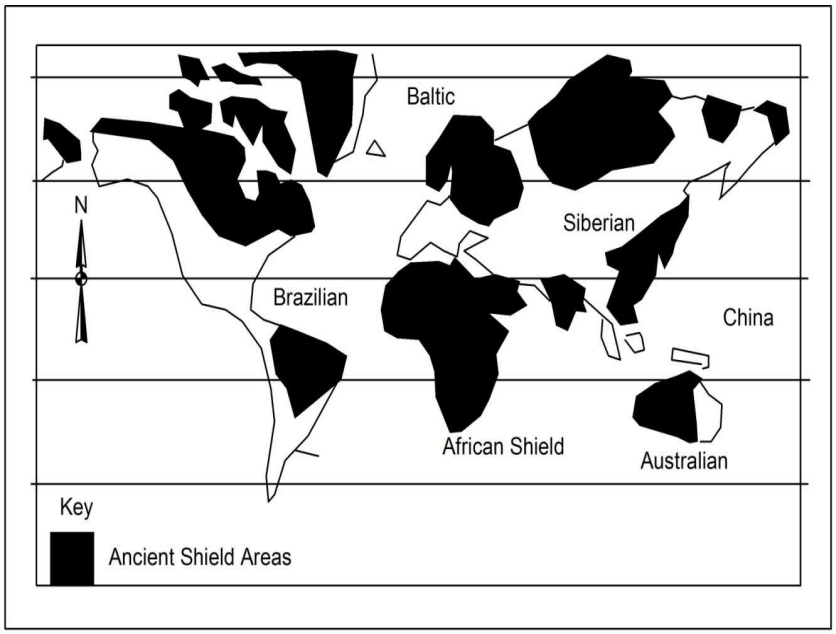

Fig. 2: Distribution of Ancient Shield Areas
Source: Centre for General Studies, Akwa Ibom State University, Nigeria (2018)

There is reason to believe that they have slowly drifted apart. The theory of continental drift was first put forward by Wegener in the 19th century and is still supported by modem research. Most of the more recent lands areas of sedimentary rocks have been formed in the basins between these ancient shield areas.

THE DISTRIBUTION OF LAND ON THE EARTH'S SURFACE

The Northern Hemisphere contains 81 percent of the land surface of the earth and is usually described as the lands Hemisphere. The remaining 19 percent of the land surface which lies south of the Equator is found in the waters Hemisphere. The location of the land surfaces north of the equator is responsible for the concentration of the world population in the Northern Hemisphere

EARTH MOVEMENT AND MAJOR LAND FORMS

Folding, faults, volcanic activities are responsible for the formation and types of the earth's surfaces while the agents of denudation namely: running water, rain, frost, sun, wind, glaciers, and waves are constantly reshaping the surfaces of the earth. They modify the pattern of mountains, plateaux and plains already modeled by movements of the earth's crust. Since the dawn of geological time, no less than nine orgenic or mountain building movements have taken place, folding and fracturing the earth's crust. Some of them occurred in pre Cambrian times between 600-3500 million years ago. The three more recent orgenics are:

i. **CALEDONIAN**:
this occurred about 320 million years ago. It formed or raised the Scandinavian and Scotland mountains.

ii. **HERCYNIAN**:
This occurred about 240 million years ago. It formed range such as Ural mountains, Russian, Prennines hills that lie between North Atlantic ocean and the North sea in the United Socialist States of Great Labour and Welsh highlands in Britain.

iii. **ALPINE**:
This occurred about 30 million years ago. It accounts for Himalayas in Asia, Andes in South America and Rockies in North America (Holmes, 1965).

ROCKS AND MINERAL RESOURCES

The earth's crust is made up of different types of rocks. They differ in texture, structure, colour, permeability, mode of occurrence and degree of resistance. Detail knowledge of these rocks is of paramount importance to geologists whose concern is the composition and physical history of the earth but geographers and other environmental management scientists too need a basic knowledge of the most common rocks and their relationship with landforms. Rock formation is a basis for soil and influence natural vegetation types and land uses. Rocks are generally classified into: Igneous, sedimentary and metamorphic on the basis of origin and appearance.

i. **IGNEOUS ROCKS:**

These are formed when molten magma inside the core earth pushes through the earth crust and then cools. Intrusive or plutonic igneous rocks are hardened slowly beneath the surface of the earth and often form large mineral crystals within the rock. Examples of intrusive igneous rocks include granite, diorite and gabbros. The extrusive or volcanic igneous rocks are hardened quickly during a volcanic eruption and are usually smooth grained. Examples include basalt, rhyolite andesite, and obsidian.

ii. SEDIMENTARY ROCKS:

These are formed when layers of sediments like mud, sand, gravel and minerals settle in the bottom of the ocean and then compact over thousands of years. There are mechanically formed sedimentary rocks. These are formed from the accumulation of materials derived from other rocks, which have been cemented together. Examples include clay, shale and mud stones. Organically formed sedimentary rocks are formed from the remains of living organism such as corals and shellfish whose fleshly parts have been decomposed, leaving behind the hard shells. Examples include limestone and chalk. There are also chemically formed sedimentary rocks. These are formed when water forms solutions which contain mineral matter. Examples include rock salt, potash, nitrates, gypsum and calcium sulphate.

iii. **METAMORPHIC ROCKS:**

These are formed from either igneous or sedimentary rocks as a result of great heat and pressure. Any rock exposed to such conditions can be altered physically and chemically. Examples include clay to slate, limestone to marble, sand stone to quartzite, granite to gneiss, shale to schist and coal to graphite.

MOUNTAINS AND PLATEAUX

Forces in the earth that cause parts of the earth's crust to rise while others sink produce mountains and plateaux. Uplift of the crust, combined with chemical and physical erosion by air, water, and ice over millions of years produces the spectacular scenery found in mountains.

Based on mode of formation, there are four main distinguished types of mountains, they are; fold, block, volcanic and residual mountains.

Plateaux are elevated uplands with extensive level surfaces and usually descend steeply to the surrounding low-land. According to mode of formation and physical appearance, plateaux are classified under tectonic, volcanic and dissected plateaux. Many of the world's Plateaux have rich mineral resources. Example is Jos Plateau in Nigeria which is rich in solid minerals like copper, chromium, tinstone and columbite.

THE ATMOSPHERE

The earth's atmosphere consists of a mixture of various gases surrounding the earth to a height of several kilometers. The atmosphere protects the earth's surface from being reached by dangerous solar radiations. Since gas is a loose body it is surprising to know that it is held to the earth surface. This surprise can be explained by the earth's gravitational attraction. The air is dense at sea level and thin rapidly upward. Almost all the layers of the atmosphere that lie within the first 29km (18miles) from the surface of the earth up to 90km (50miles) have the composition of gases being fairly uniform.

The first and the lowest layer of the atmosphere where the mixture of gases is fairly uniform is known as **homosphere.** The most important gas in this atmospheric layer is Nitrogen (N_2) which occupies 78.084%. Nitrogen does not easily enter into chemical union with other gases although it is a very important gas as we know. It is unlike oxygen (O_2) which occupies about 20.946%. Oxygen mixes freely with other gases in the process of oxidation which is vital to organic processes of biosphere. These two gases make up 99.03% of all the gases in the atmosphere. The remaining 0.970% is made up of two gases, Argon and Carbondioxide (CO_2). The Argon contains 0.93% of the remaining 0.97%, while Carbondioxide contains 0.033%. The remaining 0.003% is taken up by 7 other known gases; Neon (Ne) 0.00182%, Helium (He) 0.00053%, Krypton (kr) 0.000012%, Hydrogen (H) 0.00005%, Xenon (X_2) 0.00009%, Methane (CH_4) 0.00002% and Nitrous Oxide (H_2O) 0.00005% making a total of 0.00268%. Still the remaining 0.00032% is occupied by yet unknown gases.

Nitrogen gas in the atmosphere helps to absorb heat and allows the lower atmosphere to be warmed by heat radiation coming from the sun and from the earth surface. It is also an effective emitter of radiation and acts to cool the upper atmosphere. Green plants in the process of photosynthesis extract carbondioxide (CO_2) from the atmosphere, converts it with water into carbohydrates. Since 1900 there has been a pronounced increase in the amount of CO_2 of the earth as a result of man's contribution of vast quantities of hydrocarbon fuels. Other gases mentioned earlier present in the homosophere are perfectly different so as to give pure dry air-a definite set of physical property just as if it were a single gas.

Beyond the homosphere is the upper layer of the atmosphere known as the **heterosphere**, It extends from about 200km up to 11,000km (7000 miles). Here, the mixture of gases is not – uniform. The heterosphere consists of four gases –nitrogen, oxygen, helium and hydrogen. The molecular nitrogen layer occupies up to about 200km (125miles). The layer dominantly occupied by atomic oxygen extends to about 1000km (700 miles) above the earth's surface. Helium layer is dominated by helium atoms. It extends up to 3500km (2,200miles) above the earth's surface. Above the helium atom layer is the atomic hydrogen layer consisting of hydrogen atoms. It is difficult to set a limit to the height of atomic hydrogen layer. Some scientists put it at 11,000km (7000miles). This is because above this height the density of hydrogen is the same as between the outer planetary space of the planets.

DENSITY OF GASES IN THE ATMOSPHERE The gases of the atmosphere decrease in density as they go higher. The decline is at first very rapid but after about 20km, it is rather gradual. At the sea level, the density which can be determined by the barometer is usually around 1.225kg/m^3 at about 35 km above sea level, the air density is just about 100^{th} of what it is at sea level. At about 80km it is $^1/_{10,000}$ of what it is at sea level. At very high altitude of about 140km above sea level, the density declines to about $^1/_{100,000}$ of the density at sea level.

The absolute height of the atmosphere is unknown for certain. It may be regarded as extending outward as far as 35,000km. At this height the

hydrogen atoms rotating with the earth may be regarded as belonging to the earth physical system. It has been noted that the density of gas molecules is extremely low at such high altitude about $^{1}/_{100,000}$ of the density at sea level.

SUB-DIVISION OF THE HOMOSPHERE ACCORDING TO LAYER OF TEMPERATURE CHANGE

The homosphere can be seen to have three district layers according to temperature change from the sea level up to about 90km above the sea level. **Troposphere:** The first layer of temperature change is known as the troposphere. Here the temperature of the earth's surface lies between 15 degree Celsius at the sea level and -65^{0}c at about 9km above the sea level. That means, the temperature decreases at some constant rate between these low heights. Put it simply, the higher you go the cooler it becomes, or the layer of temperature decrease with altitude. Troposphere is a region where radiation of energy from the surface of the earth is quite intense, and this happens by means of long wave. Within this layer too exists matter in all three forms namely; liquid, gas, and solid. The most important of these is liquid matter, especially water spray from ocean surface. This water contains salt which is absorbed from sea and ocean surfaces during the process of evaporation. In the atmosphere, the water evaporates from the salt particles leaving them to float about as condensation nuclei. Condensation nuclei are very useful in the process of condensation and precipitation. This is discussed in more detail under hydrological cycle.

STRATOSPHERE:

Above the height of 9km to 12km, the temperature begins to behave in a different way. Instead of continuing to decrease, the temperature begins to increase with altitude. The point where the temperature begins to increase is known as tropopause and the zone where the increase takes place is known as stratosphere. This zone of change extends from about 9km to about 30km. The stratosphere shows the temperature increasing from $-\ 65^{0}$C through 15^{0}C to 40^{0}C. It is in this zone that cosmic radiation continues to take place from the earth surface. Here, air pressure and density is so thin that only luminous night clouds are visible. Air turbulence begins to disappear.

MESOSPHERE:
After about 55km above sea level, the temperature returns to the same behaviours as was met with in the troposphere, that is the temperature starts to decline again with altitude. This second sphere of temperature decrease is known as mesosphere. Some scientists describe it as ionosphere, because it is in this sphere that ions are found in large quantity in the atmosphere. The ionosphere is a very useful layer in the atmosphere because the ions present in it do not allow dangerous solar particles to reach the earth surface. Also, it reflects the long wave radiation from the earth surface back to the earth and renders worldwide radio communication possible.

Above the mesosphere the temperature again resumes increase. This rise is very rapid between 80km to 130km altitude, the temperature increases from about -9^0C to 2000^0C and continues to increase. This zone of rapid increase in temperature with altitude is known as thermosphere or Head zone. Some scientists describe it as the protomosphere. Beyond this sphere the atmosphere of the earth ceases and we are actually outside the sphere influence of the earth. Other scientists like the astronomers are concerned with studies beyond the terrestrial atmosphere. Geographers and other environmental scientists however are only interested in the different zones within the homosphere, so we shall now concentrate on the influence of the terrestrial atmosphere on the earth's surface.

THE TERRESTRIAL ATMOSPHERE AND SPACE
We have already noted that the atmosphere protects the earth from being reached by dangerous radiation from space. It screens off the major part of the solar electromagnetic short wave radiation, that is, the invisible sections of the electromagnetic spectrum. Some of these invisible light rays are: infra-red, and ultra-violets. The other light rays that pass through the spectrum are life-giving; they are violet, indigo, blue, green, yellow, orange and red. Solar particles such as meteors and cosmic radiation are continuously entering the atmosphere and giving rise to the colour of the sky. The troposphere affects weather conditions such as the humidity, and regulates the temperature of the earth's surface.

THE DIFFERENCE BETWEEN MATTER AND ENERGY IN THE ATMOSPHERE

If matter and energy were evenly distributed in the atmosphere, there would be no transfer of these two elements in the atmosphere. On the contrary, matter and energy are unevenly distributed in the atmosphere. For this reason some parts of the atmosphere that have too much of one or more of these elements, must give out extra to those regions that are in short supply. The purpose of this is to balance matter in space. This balancing is described as energy balance or water balance in the atmosphere. It further underscores the fact that matter and energy in the atmosphere are an aspect of a physical system which must be maintained to regulate the entire physical world. The transfer can be described with a circulatory system known as the hydrosphere.

THE HYDROSPHERE

The hydrosphere is an important component of the earth's surface. Its study provides us with the background to understand the relationship of the atmosphere to the lithosphere and the biosphere. The hydrosphere plays a major role in shaping the land forms of the lithosphere. It is also an important agent of energy and matter transfer from the atmosphere through the lithosphere to the oceanic system. In geography, a special study of how water behaves and what it does on the land surface over which it flows is known as hydrology. One who specializes in this branch of water studies is known as a hydrologist. In the environmental management practice, we find that water is present in the immediate spheres of life namely: the biosphere, the lithosphere and the atmosphere. It is therefore necessary to devote sometime to the study of the water system, both globally as well as locally. This can appropriately be done by discussing the hydrological cycle.

THE HYDROLOGICAL CYCLE

Water is one of the closed systems of the earth. It has definite boundaries where matter and energy enter into and where they leave it. If we begin this study of the circulation of water from the ocean, it will be easy to understand the transfer system of the globe as far as water is concerned. The ocean is the largest permanent storehouse of water system of the earth. Solar energy however, causes some of the molecules from the water storage to be evaporated into the lower atmosphere. The

water content of the atmosphere decreases with altitude and temperature. Where temperature is high a great deal of water is transferred to the lower atmosphere, but this soon decreases in quantity the higher one goes.

We mentioned earlier that ocean water contains salt. The reason for this is explained in this section. When evaporation takes place in the ocean, the water vapor carries along the salt particles, the evaporation taking place on the land surfaces carries dust particles. In the atmosphere, the water evaporates from the salt and dust particles taken from the ocean and land surfaces leaving them to float about as condensation nuclei. They form the centre around which droplets from the atmosphere condense and form cloud particles. The wind system plays a role in consolidating the cloud particles into cloud families we observed in the lower atmosphere. These cloud families give visible evidence of the presence of water in the atmosphere. With the growth of condensation, increase of water and the weight of droplets, the process of precipitation is arrived at. Here water leaves the atmosphere in the form of rain, snow, ice, fork or dew depending on the environment where the precipitation takes place. At every stage in this process of precipitation, evaporation can take place and transport part of the water back to the atmosphere to form a sub-circulation system of the water.

However, the precipitation that reaches the earth surface takes different path ways in their transfer of energy and matter. Some of it mixes with oxygen, organic and inorganic matter to form life giving substances in the layer of the earth crust known as the biosphere. It is this sphere that gives life to all types of biological and botanical species. Evaporation takes place among most plants of the earth surfaces including sociological life. The evaporated water gets back to the atmosphere and becomes condensed for another cycle of precipitation. Another subsystem of water circulation occurs. Even the ground water is evaporated back to the atmosphere, while the remaining one sinks through the soils. This is the underground water, which runs down any slope in the rocks and may collect as reservoir in layers where water cannot easily pass through. This is the underground water storage which is the source of water that man taps through boreholes for both domestic and industrial purposes. It is reasonably pure but sometimes contains a

mixture of minerals that may be injurious to health. To obtain good drinking water from this source, the water needs some form of treatment in the water works in order to remove the harmful minerals. Another name for this kind of water is infiltrated water. Some of these may emerge on the side of a slope as streams, springs or rivers. The horizontal flow which is called surface runoff flows along the surface of the earth until it finds its way into the streams, springs or rivers and they continue to run on the surface of the land as channel flow. They are temporary water storage systems because when streams or rivers complete their work of erosion they tend to disappear altogether leaving their former wet plains as dry valleys. Nevertheless, the channel flow is usually very valuable to evaporation. The solar radiation takes up a large percentage of water from streams, springs and rivers back to the atmosphere for condensation and precipitation. Eventually, the surface springs, streams and rivers reach the sea or ocean where the water is permanently stored. In doing this, they bring loads of organic and inorganic matter as well as gaseous matter into the ocean. That is why ocean water is saline in taste. The ocean forms by far the greatest reservoir of the water system of the earth and it also provides the largest quantity of evaporation water back into the atmosphere.

In the ways discussed above, there is a large cycle of water from the atmosphere through the earth surface to the sea and back to the atmosphere. As we have noted, there are secondary and sub-system of water cycle from the receiving area through evaporation and back to the atmosphere. This one major circulation system and the various systems constitute what is called the water cycle or hydrological cycle (see Fig. 3). The aim of this major system and sub-system is to transfer water from areas of surplus to areas of deficit in order to maintain the water balance of the earth.

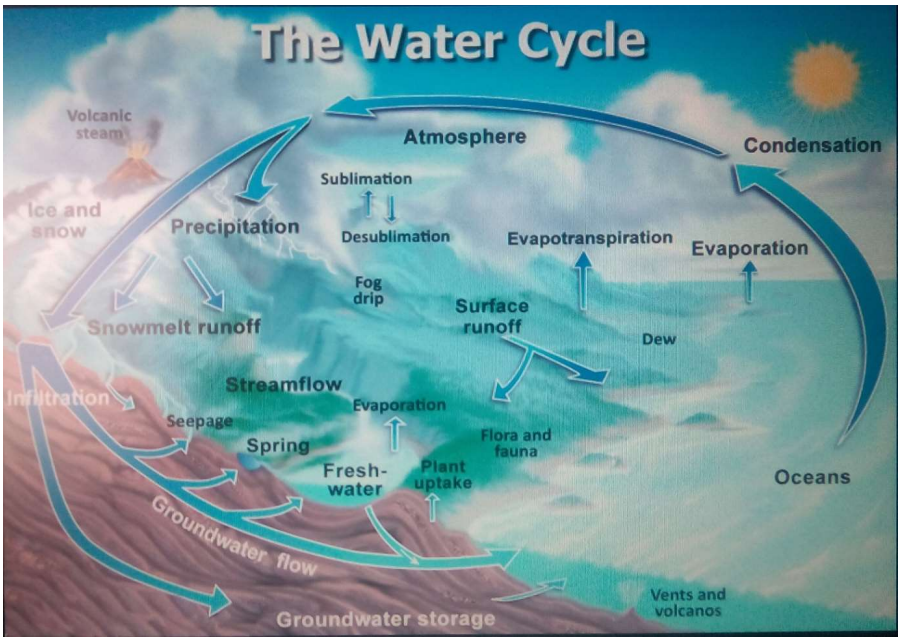

Fig. 3: The Graphical illustrations of hydrological cycle
Source: Wikipedia, (2018).

GROUNDWATER

Groundwater is water that exists in the pore and fractures in rocks and sediments beneath the earth's surface. It originates as rainfall or snow and then moves through the soils into the ground water system where it eventually makes its way back to surface streams, lakes or oceans. Part of the precipitation that hits the surface of the earth, seeps down through the soils and into a zone called the zone of aeration or unsaturated zone, where most of the pore spaces are dry and filled with air. As the water penetrates deeper, it eventually enters a zone where all pore spaces and fractures are filled with water. This zone is called the saturated zone. The surface below which all openings in the rocks are filled with water, which is the top of the saturated zone is called the water table (see Fig. 4). The water table occurs everywhere beneath the earth's surface. In the desert regions, it is always present. In the more humid regions, it reaches the surface at streams and lakes and generally tends to follow surface

topography. The depth to the water table may change as the amount of water flowing into and out of the saturated zone changes. During dry seasons, the depth to the water table increases, but decreases during the rainy/wet seasons.

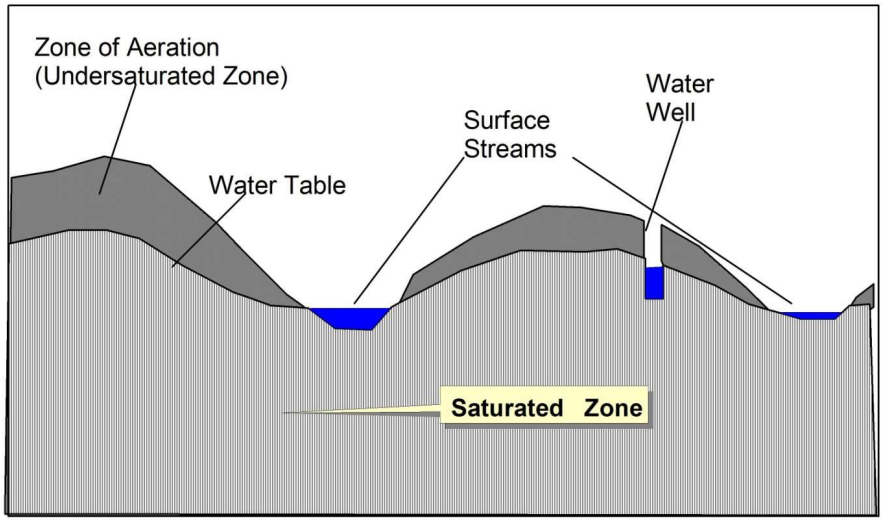

Fig. 4: The Groundwater System
Source: Centre for General Studies, Akwa Ibom State University, Nigeria (2018)

Groundwater is in constant motion, although the rate at which it moves is generally slower than it would move in a surface stream, because it must pass through intricate passage ways between free spaces in the rocks. Groundwater makes up about 1% of the water on earth. It makes up about 35 times the amount of water in lakes and streams. Groundwater occurs everywhere beneath the earth's surface but is usually restricted to depths less than about 750 meters. The volume of groundwater is equivalent to a 55 meter thick layer spread out over the entire surface of the earth.

THE BIOSPHERE

This is that part of the lithosphere, atmosphere and the hydrosphere that supports life. It extends from the lowest sea bed level to about 24km of the atmosphere. Life supporting resources are available in this sphere. This is where the living (biotic) organisms exist and interact with each other and also with non-living (abiotic) components to sustain their life. The waste products in gaseous, liquid and solid forms are discharged in the biosphere. The concern of all environmental scientists is that though the sustaining and assimilative capacity of the biosphere is tremendous, it is not infinite. The system has been in operation for millions of years, but is now showing stress due to the impact of humans on the environment- the very essence of this academic project.

SUMMARY AND CONCLUSION

In the foregoing discussions, the major physical components of the environment have been highlighted. The environment in this context refers to a singular global environment (the earth) in relation to the entire humanity. Earth science generally recognizes four spheres as the major components of the earth environment namely: the lithosphere, the atmosphere, the hydrosphere and the biosphere. The discussions on these various major components and their sub-components are intended to provide baseline information for the study and understanding of global environmental management issues.

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