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Globalization of Physics Education: The African Perspective.

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Abstract
The paper tends to highlight the relevance of physics education in issues of globalization in some African countries. Issues concerning global warming, greenhouse effect, e-waste just to mention a few, are discussed as it affects African countries, suggestions such as world leaders should make a concerted effort to salvage the affected African countries from total destroy, support the African leaders financially to boost Physics education, help them to the judicial use of alternative power source of electricity supply.
Keywords globalization, physics education and Africa.

Introduction

Globalization is viewed differently by different scholars, it takes the meaning from economical point of view as the world-wide movement towards economic financial and trade. Shenkar and Lou (2004) see globalization as the growing interdependence of countries worldwide through the increase in volume; variety of cross border transactions in goods, services and of international flows, as well as through the rapid and wide spread diffusion of technology and information. On the social point of view, globalization is seen by Williams (2004) as the social process where the nation-state as the unit of economic, political, cultural analysis becomes less important or even irrelevant and its place are borderless worldwide social relation. The definitions of globalization has been controversial for a long period, it can be given different perspectives, depending on the situation, but one can look at it as universal changes in economics, culture, way of life of people from tradition to modern ways. The internet, wireless telephones, video conferences, satellite networks, computers inter border data flow are all symbols of globalization which touches almost all nations and tribe irrespective of color, race or sex

Globalization and education

Globalization of education is a very wide area which was complimented by many researchers in but not limited to the global curriculum, the knowledge, economy and technology, lifelong learning, global migration and brain circulation, multiculturalism, methods of instruction, testing, gender equality, and English as a global language Joel (2008). This indicates educational knowledge in the global view

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has been a special area of research, the writer focuses on roles of physics education in tackling the global issues in Africa.

Physics education deals with the methods, strategies of teaching physics, it is a course that is built with mystery only few people are aware of this, it encompasses every aspect of life, health, technology industry and everything in relation to energy and matter. It is the concern of this paper to pin point some elements of physics that is of great threat to the African continents, those elements require an urgent attention from the global community. Africa being the second largest continent in the world, it is the second most populous with 54 member countries (Wikipedia), the continent is surrounded with the problem of ozone layer depletion, global warming, greenhouse effect, environmental pollution, deforestation, inadequate power supply of electricity, these fundamental elements of physics are briefly discussed:

Ozone layer is the earth's atmosphere that contain ozone, that is a naturally occurring molecule containing three oxygen atoms. These ozone molecules form a gaseous layer in the Earth's upper atmosphere called stratosphere. Kerr, (1998); Santee, (2004); Jungck, & Kajornsin, (2003). They further assert that the lower region of stratosphere containing relatively higher concentration of ozone is the essential property of ozone molecule, is its ability to block solar radiations of wavelengths less than 290 nanometers from reaching Earth's surface. In this process, it also absorbs ultraviolet radiations that are dangerous for most living beings. UV radiation could injure or kill life on Earth. Though the absorption of UV radiations warms the stratosphere but it is important for life to flourish on planet Earth Haylay, (2015). If this vital portion is disturbed the consequences that flows are numerous, it entails over exposure of strong UV light, thereby disrupting susceptible terrestrial and aquatic ecosystems, unprecedented rainfalls, skin cancer, cataracts, sunburns, weakening of immune system and quick aging as reported by Haylay, (2015). Kane, (1999) mentioned some crops species that are vulnerable to strong UV light and overexposure may well lead to minimal growth, photosynthesis and flowering. Some of the crop species he observed to be vulnerable to UV light include barley, wheat, corn, oats, rice, broccoli, tomatoes, and cauliflower just to name a few, all are foods grown in African and serve as the major consumed crops. Forests equally bear the brunt of ozone depletion. Kumar (1999) observed that

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certain marine life, especially planktons, is greatly impacted by exposure to strong ultraviolet rays. In the aquatic food chain, planktons appear high up. If planktons decrease in number due to ozone layer destruction, the marine food chain would be disrupted in many ways. Also, overexposure of sun rays could reduce the fortunes of fishers. On top of that, certain species of marine life as observed by Santee, (2004) have been greatly affected by overexposure to ultraviolet radiation at their early stage. In domesticated animals, too much Ultraviolet radiation could also lead to skin and eye cancer. Materials like plastics, wood, fabrics, rubber are massively degraded by too much ultraviolet radiation Nigeria being an agricultural based country will definitely loose its agricultural potentialities hence economically down thrown, its citizens will be starved of hunger and starvation; invariably less effective. As the giant of Africa its collapse will definitely be disastrous to all other African countries. It has been on air when the Republic of Niger fall drought in 2013 due to climate change which lead to loss of lives, hunger and starvation.

Greenhouse effect

The greenhouse effect is a natural process that warms the Earth's surface. When the Sun's energy reaches the Earth's atmosphere, some of it is reflected back to space and the rest is absorbed and re-radiated by greenhouse gases Lau (2010), the Gases includes water vapor, carbon dioxide, methane, nitrous oxide, ozone and some artificial chemicals such as chlorofluorocarbons (CFCs. The absorbed energy warms the atmosphere and the surface of the Earth. Disasters in some African countries are usually caused by these phenomenon, collapse of buildings in Lagos, Nigeria, is a clear case. The process maintains the Earth's temperature at around 33 degrees Celsius warmer than it would otherwise be, allowing life on Earth to exist kerr (1998) highlighted the dangers of the phenomenon as what we now face is that human activities – particularly burning fossil fuels (coal, oil and natural gas), agriculture and land clearing – are increasing the concentrations of greenhouse gases. This is the enhanced greenhouse effect, which is contributing to warming of the Earth. It is observed that if the trend continues climate change will cause increases to the frequency and intensity of extreme weather events. Countries like Chad, Nigeria, Egypt, Congo and all the coastal communities will be

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affected due to rising sea levels that pose a significant risk, while the world's oceans could become too acidic to support coral reefs and other calcifying marine organisms Kane, (1999).

Global Warming

According to Haylay (2015) global warming is the energy that lights and warm the earth which comes from the sun. Most of the energy that comes into our planet is a short wave radiation in which visible light also fall there. When this energy strikes the earth surface, the energy in turn releases some amount of heat as long wave radiation i.e. infrared radiation. Much of this long wave radiation i.e. infrared radiation reflects its way back to space but a portion of this is trapped in the earth atmosphere Nelkon (2005). Certain gases in the atmosphere including the water vapor, carbon dioxide and methane provide the trap; absorbing and reflecting waves radiated by the earth. These gases are known as water vapor, carbon dioxide, methane and the nitrous oxide help to conserve the heat as in greenhouse. As the concentration of these greenhouse gases in the atmosphere increases more heat energy remains trapped below.

The implications of the global warming as reported by Kahe and Karl (2014) are very serious threat to the existing ecosystem. It is expected to melt the polar ice caps; glaciers, as well as warm the oceans which will expand its volume and raise sea level by an estimated 9 to 10 cm, flooding some region and even entire island. Some regions in the warmer climates will receive more rainfall than before it used to happen. Niger republic, Ghana, Mali and Benin are most affected, for they record an early rainfall and flood. But the soil will dry out faster between storms which result to drought. This soil dryness may damage food crops, disrupting food supplies in some part of the world hence the global warming has an adverse effect on whether, agriculture, plants and animals. Some scientist believe that global warming has food effect on glacier and the dry land because of cooling of the temperature. Another boring global issue is environmental pollution which is equally explain thus:

Environmental pollution

Environmental pollution is the contamination of the physical and biological components of the earth/atmosphere system to such an extent that normal environmental processes are adversely affected Kane and Kumar (1999): Gillespie (2003).

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Environmental pollution takes place when the environment cannot process and neutralize harmful by-products of human activities (for example, poisonous gas emissions) in due course without any structural or functional damage to its system Bernard, (1990): Sobiya& Yashau, (2008): Rinkish, (2009). Environmental pollution matters because it has negative impacts on crucial environmental services such as provision of clean air and clean water without which life on Earth as we know would not exist. In modern industrialized societies, fossil fuels (oil, gas, coal) transcended virtually all imaginable barriers and firmly established themselves in our everyday lives, Niger Delta in Nigeria is a clear example. Not only do we use fossil fuels for our obvious everyday needs (such as filling a car), as well as in the power-generating industry, the oils are also present in such products as all sorts of plastics, solvents, detergents, asphalt, lubricating oils, a wide range of chemicals for industrial use, etc. Wikipedia

Combustion of fossil fuels produces extremely high levels of air pollution and is widely recognized as one of the most important aimed areas for reduction and control of environmental pollution.

Fossil fuels also contribute to soil contamination and water pollution as rightly observed by Santeee, (2004). For example, when oil is transported from the point of its production to further destinations by pipelines, an oil leak from the pipeline may occur and pollute the soil and subsequently into groundwater. When oil is transported by tankers by ocean, an oil spill may occur and pollute the water in the ocean. Egypt, Nigeria, Ivory coast and Cameroun are some of the affected areas, the Chad lake is currently shrinking, aquatic lives are seriously in danger; fishing is one of their major source of revenue but today the story has changed.

Of course, according to Santeee, (2004) there are other natural resources whose exploitation causes a serious environmental pollution; for example, the use of uranium for nuclear power generation, produces extremely dangerous waste that would take thousands of years to neutralize. South Africa, Niger and Nigeria are under such threat even though, their nuclear reactors are for peaceful uses only. But there is no

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doubt that fossil fuels are among the most serious sources of environmental pollution. Power-generating plants and transport are probably the biggest sources of fossil fuel pollution. Fossil fuel combustion is also a major source of carbon dioxide (CO2) emissions and perhaps the most important cause of global warming.

Among other pollution sources are; agriculture, livestock farming as in Somalia, Niger, Sudan, Cameroun is worth mentioning as the largest generator of ammonia emissions resulting in air pollution. Chemicals such as pesticides and fertilizers which are widely use in Nigeria, Ghana, Chad and Niger in agriculture, may lead to water pollution and soil contamination as well Kelbessa, (2007). Recent findings indicates that trading activities may be another source of environmental pollution. For example, it's been noted that packaging of products sold in supermarkets and other retail outlets are far too excessive and generates large quantities of solid waste that ends up either in landfills or municipal incinerators leading to soil contamination and air pollution.

Electronics Waste (e-waste)

E-waste is one of the major challenges of globalization in Africa. Electronic waste is defined as all secondary electronics gadgets such as computers, television mother boards, Television set, entertainment devices, mobile phones, refrigerators, whether sold, donated or discarded by the original owners. The definition includes, used electronics which are destined to be recycle, reuse, dispose, resale, and salvage. Omatek (2011) and Achim (2007) the UN secretary opines that globalization is triggering a massive rise in electronic waste in Africa. The toxicity of the materials causes havoc to the health condition of the Africans. There deposition in Africa is a threat to the environment to lose its fertility, there by becoming difficult for farmers to harvest any crop, impliedly hunger and starvation will be echoed everywhere, some of those deposited materials cannot decompose especially plastics which produce bromine on contact with heat, the motherboard produces beryllium element which is a carcinogenic and many other dangerous elements are exhibited by different e-waste rubbish.

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According to Achim and Steiner (2007) the UN, Under-Secretary-General and Executive Director of the UN Environment Program, announced that, globalization is triggering a massive rise in electronic wastes, some of which are being dumped in Asia and Africa. It was revealed that at least 100,000 computers arrive at the port of Lagos alone each month. Up to three quarters of the imports; which also includes old televisions and mobile phones; will end up in an African rubbish tip or open air incinerator. In other words, Omatek, (2011) pointed out that computer manufacturers competing intensely in terms of innovation, the raw processing power of computers is rapidly increasing, resulting in a large number of machines becoming obsolete within a short time and also due to ongoing technological advancement, many electronic products become old-fashioned within short period, creating a large surplus of unwanted electronic products.

Deforestation

The biggest driver of deforestation is agriculture Lal, (1997). Farmers cut forests to provide more room for planting crops or grazing livestock. Often, small farmers will clear a few acres by cutting down trees and burning them in a process known as slash and burn agriculture. Logging operations, which provide the world's wood and paper products, also cut countless trees each year. Loggers, according to Steiner, (2007) some of them acting illegally, also build roads to access more and more remote forests—which leads to further deforestation. Forests are also cut as a result of growing urban sprawl as land is developed for dwellings. Not all deforestation is intentional. Some is caused by a combination of human and natural factors like wildfires and subsequent overgrazing, which may prevent the growth of young trees.

Effects of deforestation

Deforestation can have a negative impact on the environment. The most dramatic impact is a loss of habitat for millions of species. Eighty percent of Earth's land animals and plants live in forests, and many cannot survive the deforestation that destroys their homes Hasmot, Varadachari, and Kunal, (1998). Deforestation also drives climate change. Forest soils are moist, but without protection from sun-blocking tree cover, they quickly dry out.as rightly observed by.Kwibisa, (2003). Trees also help perpetuate the water cycle by

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returning water vapor to the atmosphere. Without trees to fill these roles, many former forest lands can quickly become barren deserts.

Removing trees deprives the forest of portions of its canopy, which blocks the sun's rays during the day, and holds in heat at night. This disruption leads to more extreme temperature swings that can be harmful to plants and animals. Kwibisa, (2003) Trees also play a critical role in absorbing the greenhouse gases that fuel global warming. Fewer forests means larger amounts of greenhouse gases_entering the atmosphere—and increased speed and severity of global warming. Lal (1997) opines that, the most feasible solution to deforestation is to carefully manage forest resources by eliminating clear-cutting to make sure forest environments remain intact. The cutting that does occur should be balanced by planting young trees to replace older trees felled. The number of new tree plantations is growing each year, but their total still equals a tiny fraction of the Earth's forested land.

Electricity in Africa

Inadequate electricity supply, this accounts for the driven power of the developed countries, expect for few countries in Africa, one would have concluded that there is no electricity in the African continent, electricity is life, electricity is development, electricity is an economic builder and this is what Africans are lacking Hasmaini, Hazlie, Ab Halim and Hew (2011). Physics provided a number of ways electricity can be generated, if wisely use, the problem can be reduce if not eliminated, the most common source of electricity is the hydro-electric, solar, wind and nuclear other forms of electricity generation includes tidal, thermal, and biomass.

Lee, (1989) is of the view that using hydropower is to involve the kinetic motion in water as it flows downstream, part of the normal water cycle of the Earth, to generate other forms of energy, most notably electricity. Dams according to Lee (1989) use this property as a means of generating electricity. This form of hydropower is called hydroelectricity. Waterwheels were an ancient technology which also made use of this concept to generate kinetic energy to run equipment, such as a grain mill, though it was not until the creation of

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modern water turbines that the principle of electromagnetic induction was used to generate electricity Nelkon and Parker (2005). This source of power supply was introduced in Nigeria in the fifties and it is responsible for the supply of electricity to many of the neighboring countries like Niger, Cameroun, and chad. This could be the reason for unstable power supply to many of these countries in Africa. The issue of electricity supply in the African countries is sympathetic, a popular adage is often said that, whenever you heard aloud scream in most African countries is a sign of the return of electricity which has been off for sometimes. No industrial activities, little technological developments-since much of it depends on heavy usage of electricity, increase in global warming-since fossil fuel generators are used as the source of electrification by individuals for domestic purposes. Since the hydropower source is not enough other sources could be employ such as the wind, nuclear, thermal, biomass and solar energy. Brief explanation of each is given below

Wind energy as a source of electricity

Modern wind mills can transfer the kinetic energy of the air flowing through them to other forms of energy, windmills are mounted on a tower to capture the most energy. At 100 feet (30 meters) or more aboveground, they can take advantage of the faster and less turbulent wind. Turbines catch the wind's energy with their propeller-like blades. Usually, two or three blades are mounted on a shaft to form a rotor Paul (2004)

Paul (2004) further explained that a blade acts much like an airplane wing. When the wind blows, a pocket of low-pressure air forms on the downwind side of the blade. The low-pressure air pocket then pulls the blade toward it, causing the rotor to turn. The force of the lift is actually much stronger than the wind's force against the front side of the blade, the combination of lift and drag causes the rotor to spin like a propeller, and the turning shaft spins a generator to make electricity.

Nuclear energy in Africa

Interest in nuclear power remains strong in some regions, particularly in the developing world. Commitments agreed to at the 21st session of the Conference of the Parties to the United Nations Framework Convention on Climate Change may also have an impact on

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nuclear energy development in the future IAEA (2016). Scholle & Ulmer (1997), explained the principle of operandi of electricity production via nuclear reactor that, certain elements undergo radioactive decay harnessing this nuclear energy and transforming it into electricity. Nuclear power is controversial because the material use can be dangerous and resultant waste product are toxic. Nuclear power, a capital intensive and centralized technology, is foreseen as a long-term and high-performance option, and might contribute to climate policies as well as to energy security, considering the risk of high volatility prices of oil and gas on international markets Fiore, (2006). However, the development of nuclear power has also some significant limitations, such as the risk of accidents and the production and management of radioactive wastes, contributing to a generally low social acceptation. The main advantage, is its capacity to produce large amount of energy, on an uninterrupted basis, from a small amount of primary resources. Moreover, this option relies on abundant resources, and consequently represents a stable energy source on the long term, without large price fluctuations as for fossil fuels.

Finally, considering the future economic growth and energy needs of developing countries, the development of nuclear energy is more and more considered as a valid option in a global strategy of sustainable development Duffey, and Omoto, (2005). About 30 power reactors are currently being constructed in 11 countries, notably China, South Korea, Japan, and Russia. The International Atomic Energy Agency has also significantly increased its projection of world nuclear generating capacity (at least 60 new plants in the next 15 years), based on specific country programs together with the changed outlook due to the Kyoto Protocol. The fastest growth would be in Asia. Advisably for the developing countries the Light water reactor (LWR): which is a second-generation reactors represents 90% of the reactors currently in use worldwide NEA (2005) could be started with. LWRs include pressurized water reactors (PWR) and boiling water reactors (BWR). They were first developed in the USA, as well as in the FSU OECD, (2001). This technology has been available from the first period of the model (2000). Presently, nuclear power is produced in all regions, except in the Middle East and

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Australia with non in the African countries. After their useful lifetime, LWRs are replaced by more advanced types of reactors, then let the Africans also start with this type.

Biomass in Africa

The use of biomass can reduce dependence on foreign oil, because biofuels are the only renewable liquid transportation fuels available as rightly observed by Antonio (2005). Biomass is not really a separate type of energy so much as a specific type of fuel, it is generated from organic waste product cornhusks swage and grass chippings. According to Antonio, Mario, Pacifico and Federica (2005) this material contain residual energy which can be release by burning it into biomass power plant since this waste product always exist it is considered renewable. However, recent studies as observed by Antonio, et al (2005) have found that clearing forests to grow biomass results in a carbon penalty that takes decades to recoup, so it is best if biomass is grown on previously cleared land, such as under-utilized farm land. Biomass energy supports U.S. agricultural and forest-product industries. The main biomass feed stocks for power are paper mill residue, lumber mill scrap, and municipal waste. For biomass fuels, the most common feed stocks used today are corn grain (for ethanol) and soybeans (for biodiesel) which readily available in most of African countries, since they are largely farmers especially Ghana Cameroun Chad Burkina Zimbabwe and others. Agricultural residues such as corn Stover (the stalks, leaves, and husks of the plant) and wheat straw can also be used. Long-term plans include growing and using dedicated energy crops, such as fast-growing trees and grasses, and algae. These feed stocks can grow sustainably on land that will not support intensive food crops.

Solar in Africa

Currently, the world is facing energy and environmental challenges that could possibly be met using renewable energy primarily from solar flux. All the countries in Africa can judicially use the abundant gift. This paper outlines the potential of solar energy for alleviating current and future energy demands in the African countries. Sun is the single most significant source of energy in the planet earth Chapin, Fuller, and Pearson (2009). If solar radiation is connected to solar voltaic power cells electricity is generated. What we require is a new

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materials to efficiently absorb sunlight, new techniques to harness the full spectrum of wavelengths in solar radiation, and new approaches based on nanostructured architectures that can revolutionize the technological techniques to produce solar electricity. Consideration should also be made on the inherent day-night and sunny-cloudy cycles of solar radiation demand for an effective method to store the converted solar energy for later dispatch and distribution. The most attractive and economical method of storage is conversion to chemical fuels. The challenge in solar fuel technology is to produce chemical fuels directly from sunlight in a robust, cost-efficient fashion, our primary source of clean, abundant energy is the sun. The sun deposits 120,000 TW of radiation on the surface of the Earth, Chapin, et al (2009) far exceeding human needs even in the most aggressive energy demand scenarios.

Recommendation

The paper recommends the intervention of the world leaders on the educational curriculum content and practice especially in physics education; since the roles of physics in globalizing the world is worth, increase the pay of physics teacher in other to reduce the brain drain in the field, increase the number of physics teachers at all levels in African schools, provide learning materials (books, laboratory equipment and computers). Other recommendation includes:-

To carry a long the less privilege Africans countries by way of supporting the countries financially, to control erosion; buy food for the starved; increase research potentials;

To impose laws on the quality of electronics products in order to reduce e-waste or change the dumping grounds

To increase interaction level by sponsoring Africans to study physics abroad and vice versa this will help to check mate the way and manner physics is taught globally; and increase social interaction.

Summary and conclusion

The paper briefly touches the areas of strength and weakness of African countries in terms of global issues; it stress the need for urgent attention to alleviate the poor condition of Africans

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by providing means for electric power production, especially the cheapest source which is the solar; electricity will surely boost physics researchers to intensify their researches, help to protect some of the African countries facing the dangers of ozone layer depletion, global warming deforestation and e-waste disposal.

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