THE DICHOTOMY OF THE NATURAL AND ARTIFICIAL ENVIRONMENTS: IMPLICATION FOR HUMAN SURVIVAL

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Abstract

The paper examines the dichotomy of the natural and artificial environments, taking an environmentalist pragmatist position that the dichotomy is both an 'angel' and a 'devil'. It notes that while one side of the dichotomy has brought good life for urban and rural dwellers, the opposite side appears as a bedeviled agent of deforestation, acid rain, ozone layer depletion, and the attendant catastrophic global warming causing fear across the globe. Nonetheless, out of this fear comes a feasible solution: finding balance. Accordingly while we naturally bubble with the desire to enjoy the rosy side of science and technology, it behooves on us to urgently take steps to amend environmental wrongs and this demands: environmental friendliness, ozone-protection programmes and legally compelling industrialized nations of the world to limit their carbon emission.

The subject of environmental degradation and the attendant effect on the biosphere has taken centre-stage of the global arena for well over two decades, promising to engage international attention for generations yet unborn, steadily showing that 'environment' is the most fundamental ecological/biological concept to man. In ecology, environment refers to the physical, chemical and biological conditions of the region in which an organism lives (Isaacs, Daintith & Martin, 1999). In biology, environment means all the factors in the organism's surrounding which affect it in anyway and which it may interact with. The factors include both biotic factors (other living organisms) and abiotic factors (such as soil, water, air, climate and attitude) (Stone, Cozens & Ndu, 1999).

Much to the perplexity of man, the environment has undergone tremendous technological changes, leaving (virtually) mere traces of its original form. By contrast, natural environment encompasses wildlife, rocks, mountains, hills, valleys, forests, and in general those things (such as plains, lakes, oceans, rivers, the atmosphere, temperature, wind, humidity and other atmospheric conditions) that have not been

substantially altered by human intervention, or which persist despite human interference. On the other hand, artificial environment refers to built environment. It covers those things that have been brought into being by human consciousness, or technology. Accordingly, elements or components of artificial environment are: bridges, flyovers, skyscrapers, electronic gadgets, automated teller machine (ATM), industries and the global system of mobile communications (GSM) companies. Others include: deforestation, mechanized agriculture/agro-based industries, automobile companies, oil and mining industries, land and sea transport companies, the flying of air crafts across the horizon, the generation of countless kilowatts of electricity, including the deployment of nuclear reactors – whether or not for peaceful purposes.

Although human beings constitute an infinistemally small proportion of the earth's total biomass, human impact on nature (the natural environment) has been profound over the past few decades resulting in the emergence of the artificial environment. Expectedly, human beings inhabit a technologically built environment rather than the natural. Modern technology, therefore, represents an ever-increasing and awesome system of artificial environment that is dramatically swallowing-up the natural, ushering in an unprecedented dichotomy between the former and the latter environments. But what does dichotomy within the context of human survival portend?

Walter (2005) defined dichotomy as "the difference between two completely opposite ideas or things". Implicit in this definition is:

1. The need to view dichotomy in two-fold fashion of a blessing and a curse.
2. The necessity to examine the tension at the interface of the dichotomy.

Accordingly, in looking at the dichotomy between the natural and artificial, we are obliqued to examine the unprecedented ways in which science and technology (the artificial) has brought good life to urban and rural dwellers while not being oblivious of the colossal damage done on the natural environment by the artificial and the attendant implication for the biosphere.

Advantages of Science and Technology

It is probably impossible to exhaust the impressive catalogue of the useful applications of science and technology. Perhaps, a representative sample should be spotlighted from the vantage point of application of science and technology in agriculture, medicine, engineering, resource exploitation and development.

Agriculture

Science and technology have been applied to animal husbandry. Food supplements and veterinary medicine are given to animals to boost production. Broiler chickens can mature in seven weeks if given good feed supplements.

Science and technology have jacked up the yield of crops by increasing the fertility of the soil through soil analysis. The health of crops are protected by the application of pesticides and fertilizers. Modern tractors have been developed and deployed to cultivate, sow, weed and harvest crops. Specialized machines can plow, plant seeds, apply herbicides, pesticides and fertilizer concurrently. Improved strains of oil palm tree capable of simultaneous production of multiple bunches have been raised; special tools for the care of the palms have been fabricated and the processing of the palm fruits has been simplified with the availability of oil processing machines.

Medicine

Science and technology have injected tremendous improvement into medical services. Overall, we have proper diagnosis of diseases, improved drugs for treatment; and advanced medical equipment for surgery resulting in improved health-care delivery.

Certain diseased organs are sometimes replaced with artificial organs made with synthetic materials such as plastics and specially treated metals. Greater understanding of the physiology of the human body has made possible the transplantation of some healthy organs from living donors to sick people (NTI, 2000a). Other artificial parts available in medicine include, artificial hands and feet, artificial heart, artificial joints, artificial blood vessels, tendons and artificial skin made from silicon and collagen for burn victims. Also available, is the dialysis machine which helps to filter the blood of persons with kidney disorders (New standard Encyclopedia, 1989).

Engineering

In engineering, the by-products of science and technology are easily recognizable in:

(i) **The transport industry:** In tangible forms such as cars, trains, ships and aeroplanes which triggered the construction of roads, bridges, railways, including the sea and air routes which are today taking advantage of the huge benefits accruable from the

(ii) **Computer industry:** Which produces computers which are fast becoming indispensable gadgets in sea navigation and aerospace, supermarkets, banks, schools, the military and government offices. With a (laptop) computer, one can hook up to the

(iii) **Internet:** Which provides up-to-date information and communication services around the globe, having accelerated the

(iv) **Revolution in the telecommunication Industry:** Which is epitomized in the global system for mobile communication (GSM) technology which offers enormous advantage of making people accessible anytime and any where, with

the phenomenal features of enabling users to access the internet, send and receive e-mail/text messages, watch premier league matches, listen to music and so on.

(v) **Resource Exploitation and development:** These have resulted in employment generation, wealth creation and mass production of goods and services. In recognition of these, NTI (2000b) observed that water resources have been utilized and transformed into hydroelectric power; forest products have been used to produce pulp, paper, timber and plywood; while crude oil yields petroleum products; iron ore is being used for steel, limestone for production of cement and marble for tiles.

Nonetheless, just as science and technology have brought good life for urban and rural dwellers, it has ironically, inflicted them with woes.

Disadvantages of Science and Technology

Science and technology have brought to mankind an indispensable level of civilization. Paradoxically, there exists a highly complex feedback loop between the use of advanced technology and (adverse) changes to the environment that are only slowly becoming understood (science Daily, 2006). Man-made threats to the earth's natural environment include pollution, deforestation, oil spills and extinction of many plants and animals. Over and above these, human (science and technology) activities have led to acid rain, ozone layer depletion, green house effect and the attendant tension in mankind.

Acid Rain

Oxides of sulphur and nitrogen dissolve in rain water to produce acid rain. Isaacs, Daintith and Martin (1999) described the formation process vividly thus:

> *Acid rain results from the emission into the atmosphere of various pollutant gases, in particles, sulphur dioxide and various oxides of nitrogen, which originate from the burning of fossil fuels and from car exhaust fume respectively. These gases dissolve in atmospheric water to form sulphuric acid and nitric acid.*

This results in the fall of acid rain which affects plant growth, by damaging the leaves and impairing photosynthesis (Isaacs, Daintith & Martin, 1999) and by increasing the acidity of the soil (Stone, cozen and Ndu, 1999). The acid pollution of the soil leads to acidification of water draining from the soil into lakes and rivers, which will then become unable to support fish life (Isaacs, Daintith & Martin, 1999).

Acid rain dissolves the aluminium salts in soils, causing them to build up to toxic levels in underground water supplies. This affects our source of drinking water,

and when it falls on buildings and metallic structures, it dissolves them (Ramalingam, 1993) and in Europe and North America has been shown to defoliate and kill large areas of forest (Stone, Cozen & Ndu, 1999).

Ozone Layer Depletion

Ozone (O_3) is the three-atom molecule of oxygen. Its largest concentration is located in a layer in the lower stratosphere at a height between 20 and 50km. ozone layer is a translucent screen acting like a nourishing umbrella which protects the earth from the harsh effect of the solar ultra-violet (UV) radiation.

Unfortunately, ozone layer is now being damaged and depleted by pollutants introduced through human activities. The dissociation of ozone is catalyzed by carbon monoxide, sulphur oxides (SO_3, SO_2) generated from sources such as: exhaust fumes from automobiles, trucks, power plants, steam boilers for generating electricity and from various industrial plants operating at high temperatures. Other sources include petroleum refineries, petrochemical industries, incomplete combustion of coal, natural gas and other hydrocarbons. Also palpable are noxious pollutants which include nitrogen oxides such as NO and NO_2 which are formed

1. during fossil (coal, petroleum and natural gas) combustion and;
2. by supersonic transport jets (SSTS) like the American Boeing 2707s, the Anglo-French concord and the Russian Tupolov-144, traveling at high speeds and at high altitudes (> 20km) in the stratosphere and;
3. by atmospheric tests of nuclear weapons and nuclear explosions.

On major source of pollution that not only traps heat but also destroys ozone layer is the chlorofluorocarbons (CFCs) which contain chlorine, fluorine and carbon. Having the trade name "Freon", the CFCs are used as aerosol propellants, refrigerants and solvents and in the manufacture of rigid packing foam (Isaacs, Daintith & Martin, 1999). Freon consumption has implication for ozone. Indeed the use of CFCs is potentially catastrophic. Chlorofluorocarbons, because of their chemical inertness, gradually rise (diffuse) into the stratosphere where they eventually release their chlorine atoms (due to photochemical reaction) to do their damage. "One chlorine atom can destroy thousands of ozone molecules, similar to the actions of NO and NO_2 (NTI 2000c).

National Aeronautic and Space Administration (NASA) estimates that about 75 tons of chlorine are deposited in the ozone layer each time a shuttle is launched. According to Gusau (2007),

> *It has been found that one chlorine molecule can destroy 100,000 molecules of ozone and a molecule of nitrogen (iv) oxide can destroy 10 ozone molecules. A flight of space craft (US) can emit 187 tons of chlorine, 7 tons of nitrogen*

compounds and 177 tons of aluminium oxide aerosols before it reaches 50km into space.

Ozone layer damage or depletion poses serious threat to life. For instance

1. If ozone layer gets depleted, the dose of harmful UV radiation striking the earth will increase. Any life exposed to the harmful radiation would undergo faster mutation; and genetic defect would become prevalent. In humans, destruction of ozone in the upper atmosphere will lead to higher incidence of skin cancer.

2. Increased exposure of plants to UV radiation damages the leaves and so impairs photosynthesis. Thus, an increase in UV radiation reduces the yield of many crops, posing threat to global food supply.

3. Aquatic organism, including fish larvae, plankton (single cell, drifting organisms) and marine algae which are very sensitive to UV radiation will be depleted or destroyed. Drop in ozone layer would allow UV radiation to penetrate deeper into the ocean. This would cause sizeable reduction in the productivity of plankton that form the base of oceanic food chain. Hence if ozone layer were completely depleted anywhere, the impact would be catastrophic.

Greenhouse Effect and Global Warming

The uncontrolled burning of fossil fuels and carbon, including the destruction of forests is disturbing the equilibrium of carbon (iv) oxide in the atmosphere, the end result being the greenhouse effect (Gusau, 2007), which is an effect in which the earth's atmosphere behaves like the greenhouse such that the earth's surface will absorb most of the solar UV radiation, re-emitting it as infrared radiation. This is absorbed by carbon (iv) oxide (carbon dioxide) water and ozone in the atmosphere, as well as by clouds, and re-radiate back to earth. "At night, this absorption prevents the temperature falling rapidly after a hot day, especially in regions with a high atmospheric water content" (Isaacs, 2000). This has the singular effect of raising the mean temperature of the planet earth which results in global warming (Gusau, 2007) which has generated unprecedented tension in mankind.

The Tension

In the last couple of years, the weather has been quite hotter than normal (NTI, 2000a). As a result of accumulation of greenhouse gases (carbon(iv)oxide 50%, methane 18%, CFCs 14%, ozone 12% and nitrogen (iv) oxide 6%) in the atmosphere, scientists have forecasted that by the next decade, the mean temperature of the earth would increase by $1^{o}C$. This would have the net effect of melting the polar ice caps and subsequent rise in sea level with its concomitant flooding of the low lying coastal areas. "The greenhouse effect/global warming will alter climatic patterns and have adverse consequences for farming throughout the whole world" (Stone, Cozens & Ndu, 1999).

Although millions have already died as a result of flood and famine, health-related illness and death toll will soar. According to WHO (World Health Organization), global warming could extend the range of insect-bearing, tropical diseases such as malaria. Mosquito-borne disorders are expected to become increasingly prevalent since mosquitoes proliferate faster and bite more as the air becomes warmer. And because everywhere will be heated up, mosquitoes will expand into formerly hidden territories, bringing illness with them.

Arising from changes in regional rainfall and snow, there will be reduced fresh water supplies and this could cause an increase in some water borne and food borne diseases and parasites. Also, global warming will expand the incidence and distribution of many serious medical disorders. The number of death related to heat waves is projected to double by 2020.

Implication for Human Survival

The message conveyed in this global fears is very clear: it behooves on us all to truly care for the biosphere:

> *Indeed the whole earth operates like a system in which the world of living things, called the biosphere or ecosphere interacts with the atmosphere (the world of gases), the lithosphere (the world of rocks) and the hydrosphere (the world of water…. A change in any one component of a system sets up a chain reaction which results in corresponding changes in the other components (Areola, Ahmed, Irueghe, Adeleke & Leong, 1991).*

Hence, every adverse change on planet earth will, by chain reaction, threaten the very existence of man. This has fundamental implications for human survival. It urges mankind to see itself as an intricate part of the larger biosphere, obliged to focus on aspects of environmental responsibility. The benefit of having this mindset suggests that we have to be mindful of how the artificial environment impacts the natural. It demands a threshold acknowledgement of environmental damage and urges us to take responsibility. For human survival, therefore, steps must be taken to amend environmental wrongs, particularly, in the areas of agricultural waste disposal, acid rain, ozone layer depletion and greenhouse effect. To do so, here is the “blue print”.

S/N	Sources of Pollutants	Pollutants	Control measures
1.	Agricultural wastes	Pesticides e.g insecticides (DDT), herbicides, fertilizers washed from land	Limit the use of some pesticides and fertilizers. Educate farmers on correct usage of fertilizers to limit run-off.
2.	Acid rain: Industrial fumes Exhaust fumes of motor cars	Sulphur dioxide, oxides of nitrogen, carbon-monoxide, carbon dioxide Carbon monoxide; oxides of nitrogen	Use of filters to absorb dangerous gases and release harmless ones. Use of efficient engines to ensure complete combustion of fuel
3.	Ozone layer depletion: Exhaust fumes from automobiles, power plants, steam boilers. Petroleum refineries Petrochemical industries Incomplete combustion of coal, natural gas and other hydrocarbons Freon consumption	 Sulphur oxides (SO_3, SO_2); nitrogen oxides (NO, NO_2). CFCs Clo, Cl, NO	 Use of efficient engines to ensure complete combustion of fuel Use of filters to absorb dangerous gases and release harmless ones. Discourage flaring of natural gas. Regulating the burning of fossil fuels (coal petroleum and natural gas). Regulating/discouraging the use of CFCs or Freon in aerosol and industries Finding reasonable alternatives (that have low ozone depleting potential) to CFCs. Mobilizing the community behind ozone protection programmes Use of filters to absorb dangerous gases and release harmless ones.

	Supersonic transport jet planes		
4.	Greenhouse effect Industrial fumes	Excess carbon dioxide in air (major pollutant)	Use mass media to educate a large number of people Industrialized nations should be compelled to limit carbon emissions. Ensure extra photosynthesis through forests and green fields.

Conclusion and Summary

Over centuries of laborious human activities, the globe, taken as a universal ecosystem, has suffered profound impact of science and technology, leading to the dichotomy of the natural and artificial environments. Environmental pragmatism sees the dichotomy in a two-fold fashion of a blessing and a curse. On one side of the dichotomy, science and technology is seen as having brought good life for urban and rural dwellers. On the other side of the dichotomy, science and technology is defined as a devilish agent of deforestation, acid rain, ozone layer depletion, greenhouse effect with its attendant global warming which is a precursor to global calamity. The survival of the ecosphere (of which mankind is part) commands urgent and genuine care for the environment; and this passionately demands taking proactive control measures such as reforestation, mobilizing the community behind ozone-protection programmes, in addition to limiting ozone-depleting activities of industrialized nations.

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