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## ABSTRACT

Approaches to challenges being faced as a result of the global increase in human population must of a necessity be universal in nature. The carrying capacity of the earth which is being overstretched today may lead to damage of the ecosystem and great implications for the inhabitants of the earth. This review therefore focused on the population increase and the carrying capacity of the earth. The paper also discusses on the issue of minimum and maximum carrying capacity and the resultant effects of both. The causes of population growth and the resultant effect and the current challenges being faced in combating population explosion globally was all reviewed. This is due to the fact that a challenge in one region has direct or indirect impact in others. Therefore, Better training for farmers; improving awareness on family planning; improved educational opportunities; Promote sustainable development and resource management, were all proposed as a way forward.

**Keyword:** Human, Population, Carrying Capacity

## Introduction

Population growth has moved from being an emerging term a century ago to a global concern. The geometric increase in population has been found to have untold effect on resources upon which mankind depends. This leads us to the questions 'to what extent can the earth's resources support human population?'-the earth's carrying capacity and 'the maximum sustainable burden on resources'. Population dynamics over time as well as the global actions marshaled towards checking population growth were examined.

## Global Population

The global population reached 7 billion on the 31<sup>st</sup> of October, 2011 from an estimated six billion in 1999. Studies have shown that in the next 40 years, population will hit 9.3 billion. An increase of nearly as many people as inhabited the planet as recently as 1950. The estimates, released by the population division of the Department of Economic and Social Affairs of the United Nations, also projected that the population will reach 10.1 billion by 2100.

David Bloom and Clarence James (Gamble Professor of Economics and Demography at the Harvard School of Public Health), in a reviewed article published in July 29, 2011 in Science, wrote that the huge increases in population figures are unprecedented globally. Over the next 40 years, nearly all (97%) of the 2.3 billion projected increase will be in the less developed regions, with nearly half (49%) in Africa. By contrast, the populations of more developed countries will remain flat, but will age, with fewer working-age adults to support retirees living on social pensions.

The world's population grew in an arithmetical progression for most of human history. It was not until 1800 that the population was said to hit 1 billion. It took only 123 years for the figure to double. By 1927, there were 2 billion people in the world while the population hit 4 billion in 1974 (only 37 years), and it is believed that at this rate, it will hit eight billion in 2028(see table 1 below). In 2011, it is believed that out of the approximately 135m people that would be born, 57 million would die of various causes leaving a net increase of 78 million people.

Many developing countries are likely to face tremendous difficulties in supplying food, water, housing, and energy to their growing populations, with repercussions for health, security, and economic growth.

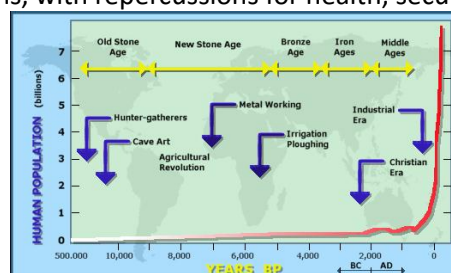


Figure 1: Human Population Growth over Time Source: UNDP, 2011

Although the issues immediately confronting developing countries are different from those facing the rich countries, in a globalized world, demographic challenges anywhere are demographic challenges everywhere.

There is the bigger problem of the number of people in an area exceeding the resources and the carrying capacity of the environment necessary to sustain human activities. Even though much focus is placed on the rapid population growth in third world countries, some studies suggest that a comparison of the lifestyles of rich countries to that of the poor countries show that the former are a much greater problem.

For example, Americans constitute less than five percent of the world's total population, yet they consume 26 per cent of the world's energy. Just as much as the population size, there is the need to consider the resources consumed by each person, the damage done by technologies used to supply them to the environment and to mankind in general. Overpopulation is a problem when the number of people exceeds the number of resources and they cannot be permanently maintained without depleting resources and without degrading the environment and the people's standard of living. In the light of this, virtually all nations are overpopulated already, using up their resources and declining the earth's carrying capacity in the process.

#### **Carrying Capacity**

Carrying capacity is a term used by ecologists to describe the maximum number of individuals of a given species that a habitat can support conveniently, without inducing any downward trend on the environment or permanently degrading it. The carrying capacity is the size of a population that can live comfortably using the resources available where that population lives. An analogy was given of an island onto which is dropped a colony of rabbits. As long as there is an adequate supply of food and water, the rabbits will not only survive but they will reproduce and the colony will get larger. The rabbit population can continue to grow as long as food and water are adequate. However, if at some point, there are more rabbits than there is food to feed them, then the rabbit population will start to decline.

This limit is called the carrying capacity. Carrying capacity is not a fixed number; it depends upon factors such as the availability of resources and per capita consumption such as how much one eats, how fast the food grows, and how well the natural systems of the island can handle the waste produced by individuals. Obviously, in a drought year less food would grow and the island would support fewer individuals. In the good years, the island would support more rabbits.

#### **The Law of Minimum**

In the 17th century, Anton Van Leeuwenhook (1673-1723), estimated that the earth could support a maximum of 13.4 billion people. In the same century, Gregory King predicted that the earth could support 6-12 billion people. A German Chemist, Justus Von Liebig (1803-1873), formulated his law of minimum based on the realization that the addition of a single fertilizer will increase crop yield only if a particular soil can deliver all the other necessary nutrients. Any of the essential minerals could become the controlling factor in plant growth. This law has been applied to the study of animal populations. Hence, using Liebig's approach, modern estimates for human carrying capacity have ranged from 1-2 billion people living in prosperity, to 33 billion people fed on minimum rations and using all suitable land for high intensity food production. Many scientists now believe that the human carrying capacity of the earth may be approximately 12 billion.

#### **Causes of Population Growth**

The human population has skyrocketed in recent times, from about 300 million people 2000 years ago to 1 billion 200 years ago, and over 7 billion in this age; increasing at a geometrically sporadic manner. At this rate, it is estimated that 1 billion will be added to the earth population every 13 to 14 years.

Reasons for the sporadic growth in population have been adduced to the following factors:

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- A sharp decline in death rates compared to birth rates due to improvement in medicine; the availability of antibiotics, immunizations, clean water, improved sanitation, reduction in child and infant mortality rates etc.
- Rise in average life expectancy as a result of education, medical breakthroughs and improved standards of living.
- Fertility plays a vital role in population growth over time. To maintain a stable population size, a total fertility rate (TFR) of 2.1 is needed. However, currently the global average TFR is placed at 2.9, though there are regional variations of low and high rates. The awareness generated and the application of family planning methods, the HIV/AIDS pandemic, civil unrests and drought are some of the factors responsible for the regional decline in TFR.

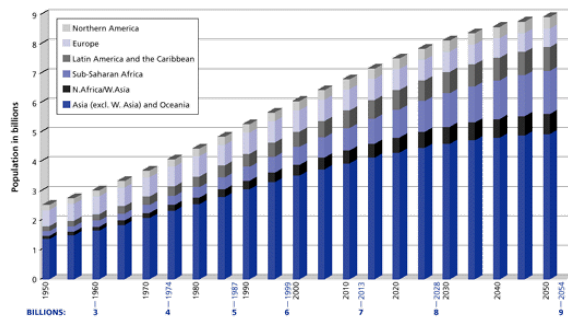


Figure 2: Projected World Population Growth Source: UNDP, 2011

### Human Impact on Environment and the Emerging Challenges

Increase in human population has been found to lead to greater impact on the environment. Humans have been extremely successful as a species. With a population of 7 billion, our impact on planet earth is colossal. This has resulted in activities that negatively affect the environment. The environment is a very weak system and humans have the biggest effect on it.

These activities come in varying forms such as mining, explorations, large scale fishing, construction activities, recreation and the craze for beach front property, oil spillages, urbanization and agricultural practices among others. These activities have resulted in the growing rates of environmental impacts. These impacts include desertification, deforestation, erosion, oil spillages, global warming, animal migration, global extinction of biodiversity, the alteration of the gaseous composition of the atmosphere, the impact of agro-chemicals on organisms, food-chain and human beings, the deepening incidence and dynamics of poverty in developing countries.

The import of these is that each element captured above among others, have great impact on the earth carrying capacity. For example, humans use more than half of the easily accessible freshwater on earth. They have altered the flow of about two-third of all rivers, creating artificial lakes and altering natural environments. About two-third marine fisheries have been fished to their limits or beyond. In the 20th century, half of all coastal mangrove forests were destroyed by human-caused pollution, as were 10% of coral reefs. The increase burning of fossil fuel is closely associated with the increasing global temperature (global warming). It has been observed that since the year 1600, about 484 animal species and 654 plant species have become extinct.

Humans have caused other species to disappear from the earth, less directly, but just as permanently, by depriving them of necessary habitat. It is noteworthy that projected increase in population alone could double this level of exploitation, causing the demise of many ecosystems on whose service human beings depend.

Babatunde Osotimehin, Executive Director of the United Nations Population Fund (UNFPA), said the challenges are formidable, with new pressure on land, energy, food and infrastructure and on Governments that must provide education, health and other services.

### Global Action in Combating Population Growth

A United Nations Environmental Programme (UNEP) report(2011), An Ecosystem Services Approach to Water and Food Security, said that population growth and stress are driving Earth to a food and environmental crunch that only better farming techniques and smarter use of ecosystem will avert. Today's farming techniques which focus on always higher yields and ever wider use of land would result in disaster, degrading or destroying the terrestrial freshwater and coastal ecosystems that are vital to life itself.

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Going by the myriad challenges being faced globally, the Millennium Development Goals of the UNDP were formulated to check the impact of population increase as well as chart a course towards a more livable planet earth.

**Recommendations**

Approaches to challenges being faced as a result the global increase in human population must of a necessity be catholic in nature. This is due to the fact that a challenge in one region has direct or indirect impact in others. To this end, the following recommendations are made:

- \* Better training for farmers;
  - Including incentives for environmentally-sound practices, selecting crops that are more suited to scarce or erratic rainfall.
  - Better irrigation techniques that would improve the efficiency of water use, catchment ponds in hot countries that would help small farmers to survive in times of absence of rain.
  - Planting trees and shrubs on the perimeter of fields to discourage water runoff and retain soil moisture.
- \* Improving awareness on family planning;
  - Most rural dwellers in developing countries as still not aware of family planning and the benefits associated with it. Improve coordinated awareness campaign in rural area especially in developing world.
  - Improve access to family planning in the developing world. Osotimehin in welcoming the 7 billionth inhabitant, noted that about 215 million women in developing countries lacked access to family planning and the need to make motherhood safe, by caring for women, preventing deaths in childbirth and providing nutrition to mothers and babies.
- \* Improved educational opportunities;
  - Equality in educational for girls as boys, with access to sex education to protect themselves from HIV and to make informed decision s about having children.
  - Investment in health, education and economic empowerment of youth would guarantee the full benefit of future economic development making provisions for the basic ingredients for a decent life.
  - Governments and the United Nations should raise awareness about the serious challenges on the rising inequality, extreme poverty, food security and high death and birth rates in the poorest countries. This should be addressed comprehensively through sustainable development as a matter of priority.
- \* Promote sustainable development and resource management.
  - The United Nations and the international community should collectively join forces towards an integrated approach to fulfill the Millennium targets, entrench sustainability and intensify efforts in providing solutions to problems concerning water, food security and crisis in many parts of the world due to climate change.
  - Regional Governments should be encouraged to formulate and guide policies on sustainable resource management. The entrenchment of science and technology in environmentally friendly and sustainable developments should be embraced at all times.

There is virtually no question that world population growth rates will continue to decline. The rate is only as high as it is because of population momentum, with many women of childbearing ages in developing countries because of rapid population growth in earlier decades.

**Conclusion**

The impact of human activities on planet earth depends upon our sheer numbers, the quantity of resources we consume, and the effect of our waste products. In many ways, human impact on earth exceeds that of all other living species combined. The earth's carrying capacity determines not just the sustenance of resources, but the survival of the human race.

According to Osotimehin (2011), "with planning and the right investment in people now, to empower them to make choices that are not only good for them, but also for our global commons, our world of 7 billion can have thriving sustainable cities, productive labour forces that fuel economies, and youth populations that contribute to the well-being of their societies." This buttresses the fact that the future of our planet is in our uncultured or inexperienced hands.

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