

Demographics and Sustainability: Investigating the Co-Relation of Overpopulation with Environmental Degradation

Varyam Gupta

The Doon School, Dehradun

Abstract

Although environmental concerns are nothing new, it has been only recently that environmental issues have been considered as having national security implications. Along with increased environmental awareness, security planners now include nonmilitary concerns, including the environment, into what has traditionally been a military-oriented policy. Though beginning to take place, this transition or "broadening" of national security policy to include these issues is proving slow and controversial. The nature of environmental issues is such that their inclusion into a national security framework is not an easy one, especially due to the challenge posed by overpopulation. Overpopulation has become a key demographic factor affecting policies and decision-making processes, and thus plays a key role in the demarcation of policies to counter environmental degradation. Hence, due to the current and potential national security threats embodied in environmental degradation, a coherent environmental security policy needs to be formulated keeping in mind the overpopulated demographics of the world. However, because of the scope, complexity, and unknown nature of the co-relation between overpopulation and environmental issues this has not yet been fully accomplished.

Keywords

Sustainability, Degradation, Overpopulation, Policymaking

Date of Submission: 30-09-2021

Date of Acceptance: 13-10-2021

I. Introduction

Between 1960 and 1999, Earth's population doubled from three billion to six billion people. In many ways, this reflected good news for humanity: child mortality rates plummeted, life expectancy increased, and people were on average healthier and better nourished than at any time in history. However, during the same period, changes in the global environment began to accelerate: pollution heightened, resource depletion continued, and the threat of rising sea levels increased.

Recent years have been among the warmest on record. Research suggests that temperatures have been influenced by growing concentrations of greenhouse gases, which absorb solar radiation and warm the atmosphere. Research also suggests that many changes in atmospheric gas are human-induced. According to one estimate, population growth will account for 35 percent of the global increase in CO₂ emissions between 1985 and 2100 and 48 percent of the increase in developing nations during that period. As such, both attention to demographic issues and the development of sustainable production and consumption processes are central responses to the processes involved in global warming.

Objectives :

The objectives of the study are as following –

1. To analyze the relationship between population and environment.
2. To analyze the causes of overpopulation in India.
3. To analyze the environmental effects of overpopulation.
4. To analyze the outlook of overpopulation and sustainability.

Methodology :

In the study of population and environment, the data used is secondary in nature. The sources used for the study are census report, research paper, journals and online sites etc.

II. Review of literature

"Relationship between population and environment" The present paper examines the relevance of Malthusian principles in understanding the role of poor and population growth in Environmental degradation. It outlines the Alternative principles based on linkages between population growth environment and nature of political economy. The paper suggests that Basic needs Approach to development could save our environment .

The Deccan Geographer " The Role of education in India. A Regional perspective " In the recent decades the importance of education and elementary education has not only been accepted as a means to reach and end but as an end in itself. Education is being considered non-negotiable and necessary the relevance of education at least up to elementary stage is no more in question.

Singh Nidhi June – 2009 39 The Deccan Geographer " Post colonial Urbanization and Urban growth ." Urbanization is a process indicating growth of urban centers in number as well as population inhabiting in these centers. In India the rate of Urbanization is not even throughout the national periphery. Among many other states West Bengal shares a significant portion in the scenario of urbanization in India both in the proportion of urban population to the total population. Tah Sandip June 2009.

Population and the environment

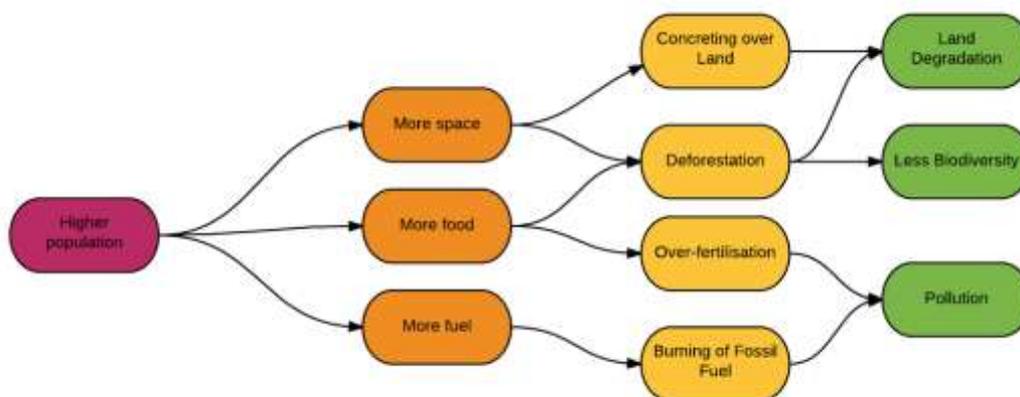
The combination of increasing levels of population and consumption is changing the planet's ecosystems at an unprecedented rate and scale, with rates of biodiversity loss posing a major threat to human well-being. Population dynamics, including population growth, density, urbanisation and migration, are important underlying causes of biodiversity loss, with human demands for food, energy, land and other natural resources placing ecosystems under increasing stress.

Population growth and density are often particularly high in areas where there is the greatest biodiversity, and therefore the greatest threat of biodiversity loss. While conservationists acknowledge the role of human population dynamics as an underlying driver of declining levels of biodiversity, few conservation strategies directly address the issues which lead to patterns of population growth, such as barriers to family planning information, rights and services

Overpopulation is associated with negative environmental and economic outcomes ranging from the impacts of over-farming, deforestation, and water pollution to eutrophication and global warming. While a lot of positive steps are being taken to better ensure the sustainability of humans on our planet, the problem of having too many people has made lasting solutions more challenging to find.

Causes of Overpopulation

Overpopulation is largely attributed to trends such as people living longer and enjoying higher live birth rates. Overpopulation of specific locations can also result from migration. Oddly enough, the overpopulation of an area can occur without a net gain of population. It can result from a reduction in the carrying capacity of a region, such as reduced agricultural yield due to over farming or drought. Such conditions may lead to an out-migration.



Environmental Effects of Overpopulation

The relationship between overpopulation and environmental impacts are often interrelated and complex. Below are some of the key sustainability challenges associated with overpopulation. For the sake of simplicity, they are listed separately, but understand the connections between them are complicated, which makes them more challenging to manage.

Farming impacts

A growing agricultural base to feed an expanding world population comes with its own complications. As the global population increases, more food is needed. Such measures may be met through more intensive farming, or through deforestation to create new farm lands, which in turn can have negative outcomes. Agriculture is responsible for about 80 percent of deforestation, worldwide.

Deforestation

Deforestation in turn leads to a reduced ability to capture CO₂, thus exasperating the greenhouse gas problem. Tropical rainforests in South America are responsible for producing 20 percent of the Earth's oxygen. Deforestation is also strongly associated with loss of habitat and extinctions. Agriculture, as mentioned above, is responsible for about 80% of global deforestation. Another 14 percent is attributed to logging, 5 percent to firewood collection, and the balance resulting from other causes.

Human population increase is related to all of these deforestation pressures. More people mean we need more food, more wood products, and more firewood.

Loss of Fresh Water

While there is plenty of water on the planet, it is very much a scarce resource. Only 2.5 percent of water resources are fresh water, and just a small fraction of that is available as unpolluted drinking water.

One of the byproducts of population growth has been stress on freshwater supplies. "Water stressed" is defined as a case of demand exceeding the supply of suitable water available. According to one report, around 15 percent of the world's population lived in "water stressed" regions in 2016, the amount has been projected to reach 50 percent by 2030. Another commentator expects 2/3 of the world's population to be living with water shortages by 2025, which he attributes to population growth. Also consider that population growth is most rapid in part of the world where water is in high demand already, such as Africa, Southeast, Southwest, and Central Asia, and Oceania.

Global Warming

Human population growth and climate change have grown hand in hand as the use of fossil fuels has exploded to support industrialized societies. "More people means more demand for oil, gas, coal and other fuels mined or drilled from below the Earth's surface that, when burned, spew enough carbon dioxide (CO₂) into the atmosphere to trap warm air inside like a greenhouse," notes Scientific American. Most fossil fuel consumption comes from developed countries. It is a sobering thought that most developing nations aspire to similar industrial economies as they experience economic growth, which further escalates CO₂ emissions into the atmosphere.

Deforestation is another important component of greenhouse gas emissions. Globally, forests store more than twice the amount of carbon dioxide than is found in the atmosphere. As forests are cleared and burned, that CO₂ is released into the atmosphere, accounting for an estimated 25 percent of total greenhouse gas production.

Outlook for Overpopulation and Sustainability

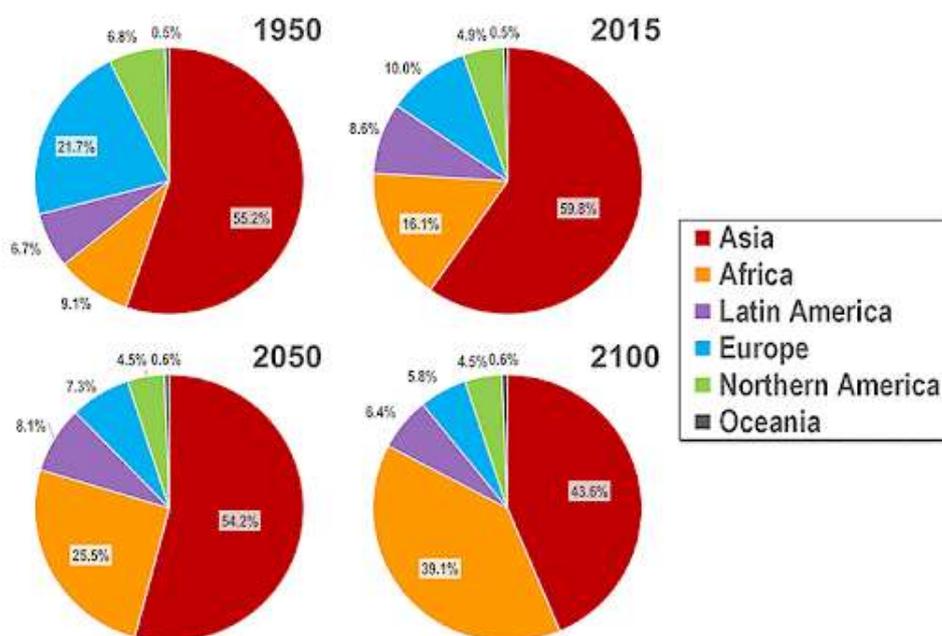
There are issues aplenty to overcome. Clearly, initiatives to switch to clean energy sources such as solar, improve agricultural practices, better manage water resources and fully embrace the principles of the circular economy will help us mitigate the impact of population growth. At the other end of the spectrum, policies that encourage family planning, education, gender equity and other measures to help slow population growth will help reduce pressure on the planet. Take time to understand the issues, and support policies that will make a difference.

Population Size

No simple relationship exists between population size and environmental change. However, as global population continues to grow, limits on such global resources as arable land, potable water, forests, and fisheries have come into sharper focus. In the second half of the twentieth century, decreasing farmland contributed to growing concern of the limits to global food production. Assuming constant rates of production, per capita land requirements for food production will near the limits of arable land over the course of the twenty-first century. Likewise, continued population growth occurs in the context of an accelerating demand for water: Global water consumption rose sixfold between 1900 and 1995, more than double the rate of population growth.

Population Distribution

The ways in which populations are distributed across the globe also affect the environment. Continued high fertility in many developing regions, coupled with low fertility in more-developed regions, means that 80 percent of the global population now lives in less-developed nations. Furthermore, human migration is at an all-time high: the net flow of international migrants is approximately 2 million to 4 million per year and, in 1996, 125 million people lived outside their country of birth. Much of this migration follows a rural-to-urban pattern, and, as a result, the Earth's population is also increasingly urbanized. As recently as 1960, only one-third of the world's population lived in cities. By 1999, the percentage had increased to nearly half (47 percent). This trend is expected to continue well into the twenty-first century.



The distribution of people around the globe has three main implications for the environment. First, as less-developed regions cope with a growing share of population, pressures intensify on already dwindling resources within these areas. Second, migration shifts relative pressures exerted on local environments, easing the strain in some areas and increasing it in others. Finally, urbanization, particularly in less-developed regions, frequently outpaces the development of infrastructure and environmental regulations, often resulting in high levels of pollution.

Population Composition

Composition can also have an effect on the environment because different population subgroups behave differently. For example, the global population has both the largest cohort of young people (age 24 and under) and the largest proportion of elderly in history. Migration propensities vary by age. Young people are more likely than their older counterparts to migrate, primarily as they leave the parental home in search of new opportunities. As a result, given the relatively large younger generation, we might anticipate increasing levels of migration and urbanization, and therefore, intensified urban environmental concerns.

Other aspects of population composition are also important: Income is especially relevant to environmental conditions. Across countries, the relationship between economic development and environmental pressure resembles an inverted U-shaped curve; nations with economies in the middle-development range are most likely to exert powerful pressures on the natural environment, mostly in the form of intensified resource consumption and the production of wastes. By contrast, the least-developed nations, because of low levels of industrial activity, are likely to exert relatively lower levels of environmental pressure. At highly advanced development stages, environmental pressures may subside because of improved technologies and energy efficiency.

Within countries and across households, however, the relationship between income and environmental pressure is different. Environmental pressures can be greatest at the lowest and highest income levels. Poverty can contribute to unsustainable levels of resource use as a means of meeting short-term subsistence needs. Furthermore, higher levels of income tend to correlate with disproportionate consumption of energy and production of waste.

Two Specific Areas of Population-Environment Interaction: Global Climate Change and Land-Use Patterns

Two specific areas illustrate the challenges of understanding the complex influence of population dynamics on the environment: land-use patterns and global climate change.

Land Use

Fulfilling the resource requirements of a growing population ultimately requires some form of land-use change--to provide for the expansion of food production through forest clearing, to intensify production on already cultivated land, or to develop the infrastructure necessary to support increasing human numbers. During the past three centuries, the amount of Earth's cultivated land has grown by more than 450 percent, increasing from 2.65 million square kilometers to 15 million square kilometers. A related process, deforestation, is also critically apparent: A net decline in forest cover of 180 million acres took place during the 15-year interval 1980–1995, although changes in forest cover vary greatly across regions. Whereas developing countries experienced a net loss of 200 million acres, developed countries actually experienced a net increase, of 20 million acres.

These types of land-use changes have several ecological impacts. Converting land to agricultural use can lead to soil erosion, and the chemicals often used in fertilizers can also degrade soil. Deforestation is also associated with soil erosion and can lessen the ability of soil to hold water, thereby increasing the frequency and severity of floods. Human-induced changes in land use often result in habitat fragmentation and loss, the primary cause of species decline. In fact, if current rates of forest clearing continue, one-quarter of all species on Earth could be lost within the next 50 years.

Population consumption

While poverty and environmental degradation are closely interrelated, it is the unsustainable patterns of consumption and production, primarily in developed nations, that are of even greater concern.

It's not often that those in developed countries stop and consider our own levels of consumption. For many, particularly in industrialized countries, the consumption of goods and resources is just a part of our lives and culture, promoted not only by advertisers but also by governments wanting to continually grow their economy. Culturally, it is considered a normal part of life to shop, buy and consume, to continually strive to own a bigger home or a faster car, all frequently promoted as signs of success. It may be fine to participate in consumer culture and to value material possessions, but in excess it is harming both the planet and our emotional wellbeing.

Country	Production		Domestic consumption		Population number	Domestic consumption		Weight of milk, cheese and eggs consumer expenditure in:	
	Milk (metric tons)	Cheese (metric tons)	Milk (metric tons)	Cheese (metric tons)		Milk* (liter per capita)	Cheese (kg per capita)	Food and non-alcoholic beverages category (%)	Disposable income (%)
China	30,700,000	n/a	12,600,000	n/a	1,344,130,000	9.09	n/a	9.29	1.38
India	53,500,000	n/a	51,660,000	n/a	1,221,156,319	41.03	n/a	21.01	3.90
European Union 27	138,220,000	8,981,000	33,870,000	8,374,000	506,031,022	64.92	16.55	14.81	1.86
United States	88,978,000	4,806,000	28,436,000	4,716,000	311,582,564	88.52	15.14	8.85	0.57
Indonesia	n/a	n/a	n/a	n/a	243,801,639	n/a	n/a	10.79	3.27
Brazil	30,715,000	679,000	11,429,000	715,000	196,935,134	56.29	3.63	17.19	2.56
Pakistan	n/a	n/a	n/a	n/a	176,166,353	n/a	n/a	25.89	10.28

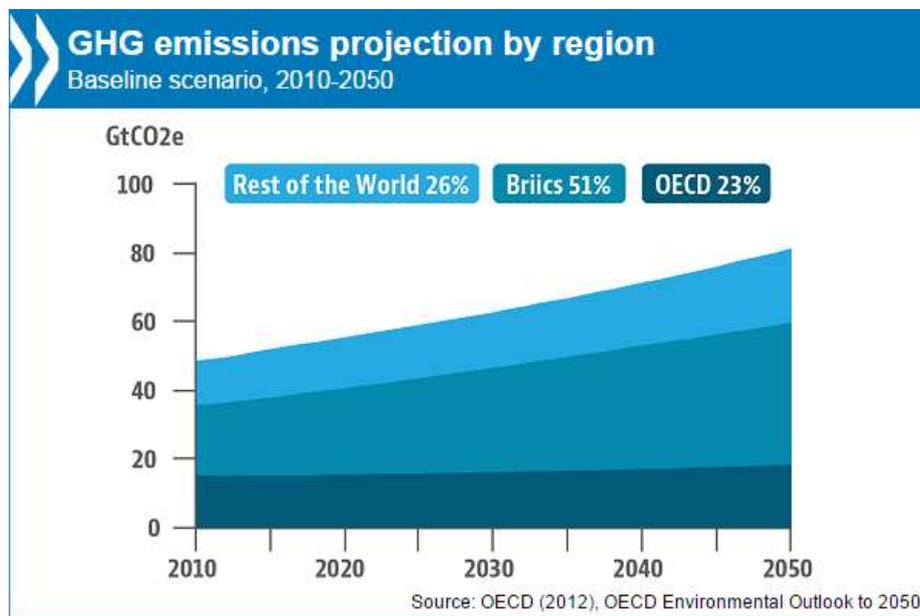
The environmental impact of all this consumption is huge. The mass production of goods, many of them unnecessary for a comfortable life, is using large amounts of energy, creating excess pollution, and generating huge amounts of waste.

To complicate matters, environmental impacts of high levels of consumption are not confined to the local area or even country. For example, the use of fossil fuels for energy (to drive our bigger cars, heat and cool our bigger houses) has an impact on global CO₂ levels and resulting environmental effects. Similarly, richer countries are also able to rely on resource and/or waste-intensive imports being produced in poorer countries. This enables them to enjoy the products without having to deal with the immediate impacts of the factories or pollution that went in to creating them.

Global Climate Change

Recent years have been among the warmest on record. Research suggests that temperatures have been influenced by growing concentrations of greenhouse gases, which absorb solar radiation and warm the

atmosphere. Research also suggests that many changes in atmospheric gas are human-induced. The demographic influence appears primarily in three areas. First, contributions related to industrial production and energy consumption lead to carbon dioxide emissions from fossil fuel use; second, land-use changes, such as deforestation, affect the exchange of carbon dioxide between the Earth and the atmosphere; and third, some agricultural processes, such as paddy-rice cultivation and livestock production, are responsible for greenhouse gas releases into the atmosphere, especially methane.



According to one estimate, population growth will account for 35 percent of the global increase in CO₂ emissions between 1985 and 2100 and 48 percent of the increase in developing nations during that period. As such, both attention to demographic issues and the development of sustainable production and consumption processes are central responses to the processes involved in global warming.

Relationship between environment and population growth

Humans are an integral part of the eco-system of nature and there is close interconnection between human beings and environment. Ever since life existed humans have been depending on their environment for food, shelter, and other necessities. There is an inverse relationship existing between population growth and environment as overpopulation will lead to adverse effect on the environment. As human population increase, there is also increase in the demand for food and other energy sources. It is essential that the population is maintained at a level so that the natural resources are sufficient to meet the requirement for survival of all living beings.

Deforestation for agriculture

If the human population growth is left unchecked, a day might come when the earth's resources will not be able to sustain the requirements of human beings. As overpopulation will demand increasing food, energy, and other resources, humans will engage in activities that will directly affect our environment and ecosystem. For instance, about 160,000 square kilometers per of tropical rainforests are cleared for agricultural use thus resulting in loss of habitat for the biodiversity (Laurance, 1999). Such loss of forests will contribute to global warming and other negative effects on environment.

Urbanization/industrialization

In order to meet the growing demand of increasing population, humans have been using technologies such as industrialization for enhanced production of food and other needs. Increased industrialization and urbanization results in air pollution, noise pollution, and water pollution which are all detrimental to our environment. Increased urbanization will also mean clearance of forests for construction of roads, buildings etc. which further adds to pollution.

Depletion of non-renewable natural resources and emission of green house gases

Uncontrolled growth of population will lead to rapid depletion of non-renewable natural resources such as fossil fuels which are used as source of energy. The burning of fossil fuel i.e. carbon based fuels, mainly

wood, coal, oil and natural gas produces significant amount of CO₂ which is one of the main green house gases that contributes to global warming (International Energy Outlook, 2000). The green house effect maintains the earth at comfortable temperature range but if there is excessive release of CO₂ and other harmful gases from the industries and factories, the green house gases gets easily out of control and will lead to so many problems like continental drift, climate change, natural disasters and variations of suns out put.

Loss of biodiversity and habitat

Due to growing population, especially in the rural areas of developing countries, people practicing shifting cultivation undertake slash-and-burn techniques which results in the extinction of native flora and fauna. It has been reported that nearly 140,000 species are lost every year due to deforestation activities (Pimm, Russell, Gittleman and Brooks, 1995). Therefore, if population growth is not controlled, increasing human activities will further result in destruction of the habitat and loss of biodiversity. In Bhutan, human-wildlife especially human-elephant conflict is increasing and this is mainly due to the loss of habitat for the elephants due to increasing human population and activities.

What Should Policymakers Do?

The policy implications of demographic influences on the environment are complicated and can sometimes be controversial. While some view large, rapidly growing populations in developing regions as the primary culprit in environmental decline, others focus on the costly environmental effects of overconsumption among the slowly increasing populations of the developed nations. These differing emphases naturally point to radically different solutions: slow population increase in less-developed nations or change destructive consumption and production patterns in the more-developed nations. This debate, however, presumes a one-step solution to the complex problems created by population pressures on the environment. Both population size and consumption influence environmental change and are among the many factors that need to be incorporated into realistic policy debate and prescriptions. Examples of policies that could address the environmental implications of demographic factors include policies to promote effective family planning, more effective rural development to slow migration to crowded urban centers, and incentives to encourage sustainable levels of consumption and the use of efficient, cleaner technologies. population dynamics have important environmental implications but that the sheer size of population represents only one important variable in this complex relationship. Other demographic dynamics, including changes in population flows and densities, can also pose challenging environmental problems.

III. Conclusion

In conclusion overpopulation can lead to problems in the form of depleting natural resources, environmental pollution and degradation, and loss of habitat. Therefore, urgent steps need to be taken to manage human population growth to a level that can be managed well. The theories founded by Reverend Malthus can be still followed because the natural resources available now may not be sufficient in the future if we do not control human population growth.

There is a need to find solutions to decrease the problems associated with overpopulation and environmental degradation. The governments around the world should have policies to decrease the population growth rate by increasing use of birth control measures. The governments should also frame good policies to protect forests and environment and prevent loss of natural habitat. Innovative ideas and research should be done to increase food production without disturbing the environment. The governments should increase funding for education and awareness of especially the poor people for them to protect and take care of their environment.

Unless urgent steps are taken to control population, serious problems can arise like environment damage and limited availability of food resources. Continuous population growth can be problem and therefore it is important to understand how we can manage population growth for the benefit of all. Human beings have tried to make food resources available for all the population in many ways. Starting from the industrial revolution, advances in modern medicine, and green agriculture revolution have all made us self sufficient so far. However, such technology development cannot go forever and therefore unless we manage population a day may come when all resources will be finished.

References

- [1]. Cristina Luiggi. (2010). "Still Ticking". *The Scientist* 24 (12): 26.
- [2]. Hubbert, M.K. *Techniques of Prediction as Applied to Production of Oil and Gas*, US Department of Commerce, NBS Special Publication 631, May 1982.
- [3]. *International Energy Outlook 2000*, Energy Information Administration, Office of Integrated Analysis and Forecasting, U.S. Department of Energy, Washington, D.C. (2000)
- [4]. Joel Cohen, *How Many People Can the Earth Support?* (New York: Norton, 1995)
- [5]. J. Van Den Bergh and P. Rietveld, *Reconsidering the Limits to World Population: Meta-analysis and Meta-predictions*, *Bioscience* 54, no 3 (2004): 195.

- [6]. Laurance, W. F. 1999. Reflections on the tropical deforestation crisis. *Biological Conservation* 91: 109-117.
- [7]. Paul R. Ehrlich; Anne H. Ehrlich (2009). "The Population Bomb Revisited". *Electronic Journal of Sustainable Development* 1(3): 6371. Retrieved 2010-02-01.
- [8]. S.L. Pimm, G.J. Russell, J.L. Gittleman and T.M. Brooks, The Future of Biodiversity, *Science* 269: 347350 (1995).

Varyam Gupta. "Demographics and Sustainability: Investigating the Co-Relation of Overpopulation with Environmental Degradation." *IOSR Journal of Environmental Science, Toxicology and Food Technology (IOSR-JESTFT)*, 15(09), (2021): pp 34-41.