

Population Pressure on Resources and Population Resource Regions

Dr. Anupama M. Hasija

Shaheed Bhagat Singh College (Eve.), University of Delhi

Humans are perhaps the most successful species in the history of life on Earth. From a few thousand individuals some 200,000 years ago and crossed one billion around 1800 and were 6 billion in 1999. The level of consumption and the development of technologies have grown in parallel with and in some ways outpaced, human numbers. Human success is showing signs of over reaching itself, of threatening the key resources on which humans depend. Man's impact on the planet has reached a truly massive scale. Approximately half the land on earth has been transformed for human needs; around 11 percent each for farming and forestry and 26 percent for pastures with at least 2 to 3 percent for housing, industry, services and transport. The area used for growing crops has increased by almost six times since 1700, mainly at the expense of forest and woodland.

According to estimates published by the United States Census Bureau, the world population hit 6.5 billion (6,500,000,000) on February 25, 2006. It is estimated that by 2012, the Earth will be home to 7 billion. The United Nations Population Fund designated October 12, 1999 as the approximate day on which world population reached six billion. This was about 12 years after world population reached five billion, in 1987. However, the population of some countries, such as Nigeria, is not even known to the nearest million, so there is a considerable margin of error in such estimates.

In 2007 the United Nations Population Division projected that the world's population will likely surpass 9 billion in 2050. The last 50 years have seen a rapid increase in population due to medical advances and substantial increase in agricultural productivity, particularly in the period 1960 to 1995 due to Green Revolution.

Today, India stands only next to China in population count with a whopping 1,087,000,000 people (roughly 1.1 billion). Yes, we are highly populated but the fact remains that we live in a large area of land. So, what counts is population density and not just the numbers. **Population density is defined as number of people living in a square kilometer of land area.** The following table is comparing population densities (2001 and

beyond) and percentage of arable land of Korea, Japan, Netherlands and India. Except India, other countries in the list are well developed and fast progressing.

Countries	Population Density People/sq.km	Arable Land (%)
South Korea	493	17.18
Netherlands	397	26.71
Japan	337	12.19
India	328	54.40
Israel	302	16.39

Source Table Compiled From Fact Sheets of the above Mentioned Countries.

(Arable land is defined as the land that can be used for growing crops)

It is therefore, clear that there are some countries doing much better than India despite their high density population. They are not starving despite having a lower percentage of arable land (table above). They are finding success by making good use of advanced technologies.

More than half of India's land can be used for growing crops which has no match in world. India, is the only country having such a high percentage of arable land. Yet, we starve. Worse, we blame it on our own population and not on our incapability and incompetence.

South Korea is noted for its population density, which at 493 per square kilometer is more than 10 times the global average. **Japan's** population is estimated at around 127.3 million. Japan has one of the highest life expectancy rates in the world, at 81.25 years of age as of 2006. Japan is highly populated and very small; less than 20% of the land in Japan is habitable, so you can get an idea of how space is at a premium. One-story dwellings are practically non-existent. Most of the population is near coastline and mountains. It seems like almost every bit of flat land is taken up by something, and rice paddies seem to fill the countryside.

Netherlands is the 61st most populated country in the world and as of February 23, 2009 it has a population of 16,499,084. Between 1900 and 1950 the population had doubled

from 5.1 to 10.0 million people. From 1950 to 2000 the population increased from 10.0 to 15.9 million people, making the relative increase smaller.

Israel was mostly a desert until desalination plants were built on the coast. People of Israel turned infertile non-arable land into fertile arable land. The plants turn salt water into fresh water for farming, drinking, and washing. Israel has created its own large fresh water source. At present, they are progressing against all the odds. Another good example is **Aran Island** which is off the west coast of Ireland. The non-arable land of the island was covered with a shallow layer of seaweed and sand from the ocean. Today, people grow a number of crops there. This is how technology can transform a country. If India is better managed by adopting advanced technological skills, it can feed more than the present population. Large population is a valuable resource especially when many of the developed countries are fast aging today. Whereas China's population density is 362 people square mile (compared to 4 per square mile in Mongolia, 72 in the United States, and 1,188 in South Korea). The population density of China is three times the world average of 91 people per square mile.

Resources are the foundation of wealth and power because people are material using social animals. Everything we use, from food we eat to keep us alive to the objects we manufacture, comes from substances in the form of resources that we found on this planet. Our concern over resources however is nothing new. The hunger for land, water, and mineral supplies is as old as the ages. According to Erich W. Zimmermann, Resources are living phenomena, expanding and contracting in response to human effect and behavior..... To a large extent, they are man's own creation. Man's own wisdom is his premier resource - the key resource that unlocks the universe..... The word "Resource" does not refer to a thing or a substance but to a function which a thing or a substance may perform. Resources are an expression or reflection of human appraisal, and without people, there would be no resources. Resources are not static, but expand and contract in response to human needs and human actions.

Resource Based Theories of Population Thomas Robert Malthus for the first time provided a systematic analysis of population and resources, later followed by Ricardo and Marx.



Thomas Robert Malthus

Thomas Robert Malthus, FRS (13 February 1766 – 29 December 1834), an English demographer and political economist, has become best-known for his influential views on population growth. Malthus, the second son of eight children (six of whom were girls) born to Daniel and Henrietta Malthus, came into a prosperous family, with his father a personal friend of the philosopher David Hume and an acquaintance of Jean-Jacques Rousseau. The young Malthus was educated at home in Bramcote, Nottinghamshire and at the Dissenting Academy, Warrington until his admission to Jesus College, Cambridge in 1784. There he studied many subjects and took prizes in English declamation, Latin and Greek, but his principal subject was mathematics. He earned a masters degree in 1791 and was elected a fellow of Jesus College two years later. In 1797, he was ordained and became an Anglican country parson. In 1805 he became Britain's first professor in political economy at the East India Company College at Hertford Heath, near Hertford in Hertfordshire, now known as Haileybury. His students affectionately referred to him as "Pop", or "Population" Malthus. One of his student, Graham Fischer, wrote a responsive essay concerning population growth and criticizing many of the ideas proposed by Thomas Malthus. Dr. Tom Klein, a future professor of his, later publicized it.

Principle of Population

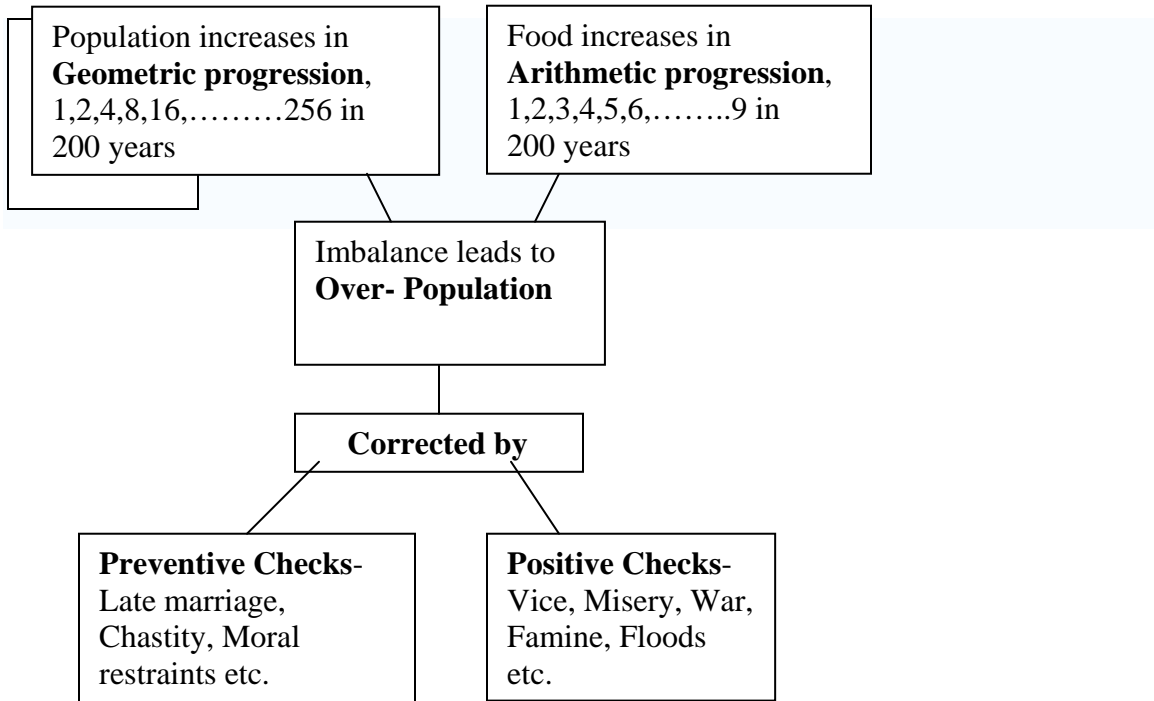
Malthus largely developed his views in reaction to the optimistic opinions of his father and his associates, notably Rousseau. Malthus's essay was also in response to the views of the Marquis de Condorcet. In *An Essay on the "Principle of Population"*, first

published in 1798, Malthus made the famous prediction that population would outrun food supply, leading to a decrease in food per person.

“ The power of population is so superior to the power of the earth to produce subsistence for man that premature death must in some shape or other visit the human race. The vices of mankind are active and able ministers of depopulation. They are the precursors in the great army of destruction, and often finish the dreadful work themselves. But should they fail in this war of extermination, sickly seasons, epidemics, pestilence, and plague advance in terrific array, and sweep off their thousands and tens of thousands. Should success be still incomplete, gigantic inevitable famine stalks in the rear and with one mighty blow levels the population with the food of the world”.

This "Principle of Population" depended on the idea that population if unchecked increases at a geometric rate (i.e. 2, 4, 8, 16, etc.), whereas the food supply grows at an arithmetic rate (i.e. 1, 2, 3, 4, etc.).

Malthusian Theory of Population



Above Flow Chart is Prepared by the Author

Malthus suggested that only natural causes (such as accidents and old age), misery (war, pestilence, plague, and above all famine), moral restraint and vice (which for Malthus included infanticide, murder, contraception and homosexuality) could check excessive population-growth. He favoured moral restraint (including late marriage and sexual abstinence) as a check on the growth of population. However, Malthus proposed this only for the working and poor classes. Thus the lower social classes took a great deal of responsibility for societal ills, according to his theory. In his work *An Essay on the Principle of Population*, he proposed the gradual abolition of poor laws. Essentially what this resulted in was the promotion of legislation, which degenerated the conditions of the poor in England, lowering their population but effectively decreasing poverty.

Malthus's Population Predictions

Malthus, at least in his first edition, predicted continuing famines in Europe; a prediction which has proven false. Elwell states that Malthus made no specific prediction regarding

the future; and that, some predictions were merely interpretations which constituted Malthus's illustration of the power of geometric (or exponential) population growth compared to the arithmetic growth of food production. Rather than predicting the future, the Essay offers an evolutionary social theory.

Eight major points regarding evolution appear in the 1798 Essay:

1. Subsistence severely limits population-level.
2. When the means of subsistence increases, population increases.
3. Population-pressures stimulate increases in productivity.
4. Increases in productivity stimulate further population-growth.
5. Since this productivity cannot keep up with the potential of population growth for long, population requires strong checks to keep it in line with carrying capacity.
6. Individual cost/benefit decisions regarding sex, work, and children determine the expansion or contraction of population and production.
7. Checks will come into operation as population exceeds subsistence-level.
8. The nature of these checks will have significant effect on the rest of the socio-cultural system — Malthus points specifically to misery, vice, and poverty.

Impact

Malthus's theory of population has proven very influential. In 1978 Michael H. Hart published a book called *The 100: A Ranking of the Most Influential Persons in History*, which placed Malthus at number 80 in this worldwide ranking. At Haileybury, Malthus developed a theory of demand-supply mismatch which he called gluts. Considered ridiculous at the time, his theory foreshadowed later theories about the Great Depression, and the works of admirer and economist John Maynard Keynes.

Before Malthus, commentators had regarded high fertility as an economic advantage, since it increased the number of workers available to the economy. Malthus, however, looked at fertility from a new perspective and convinced most economists that even though high fertility might increase the gross output, it tended to reduce output per capita. Malthus has been widely admired by, and has influenced, a number of other notable economists such as David Ricardo and Alfred Marshall.

A distinguished early convert to Malthusianism, British Prime Minister William Pitt The Younger (in office: 1783 - 1801 and 1804 - 1806), after reading the work of Malthus

promptly withdrew a bill he had introduced that called for the extension of Poor Relief. Pitt also launched the first modern census in the UK (conducted in 1801). In the 1830s Malthus's writings strongly influenced Whig reforms, which overturned Tory paternalism and brought in the Poor Law Amendment Act of 1834.

Concerns about Malthus's theory helped promote the idea of a national population census in the UK. Government official John Rickman became instrumental in the first modern British census being conducted in 1801. Malthus took pride in the fact that some of the earliest converts to his population theory included the leading creationist and natural theologian, Archdeacon William Paley whose *Natural Theology* first appeared in 1802. Both men regarded Malthus's *Principle of Population* as additional proof of the existence of a deity.

Ironically, given Malthus's own opposition to contraception, his work exercised a strong influence on Francis Place (1771–1854), whose Neo-Malthusian movement became the first to advocate contraception. Place published his *Proofs on the Principle of Population* in 1822. Malthus's idea of man's "struggle for existence" had decisive influence on Charles Darwin and the theory of evolution. Other scientists related this idea to plants and animals, which helped to define a piece of the evolutionary puzzle. This struggle for existence of all creatures is the catalyst by which natural selection produces the "survival of the fittest", a phrase coined by Herbert Spencer. Darwin, in his book 'The Origin of Species', called his theory an application of the doctrines of Malthus in an area without the complicating factor of human intelligence.

Darwin recognized the significance of competition between populations of the same species, as well as competition between species. Malthusian thinking on population also explained how an incipient species could become a full-blown species in a very short time frame. The first Director-General of UNESCO, evolutionist and humanist Julian Huxley, wrote of "The Crowded World" in his *Evolutionary Humanism* (1964), calling for a "World Population Policy". Huxley was openly critical of Communist and Roman Catholic attitudes to birth control, population control and overpopulation. Today world organizations such as the United Nations Population Fund acknowledge that the debate over how many people the Earth can support effectively started with Malthus. Julian's brother, author Aldous Huxley, in his book "Brave New World", refers to Malthusian

theories on population. In *Brave New World*, the popular form of birth control is known as the **Malthusian Belt**. Malthus continues to have considerable influence to this day. Paul R. Ehrlich, author of "The Population Bomb" (1968), furnishes a famous recent example of this. Ehrlich predicted, in the late 1960s, that hundreds of millions would die from a coming overpopulation crisis in the 1970s, and that by 1980 life expectancy in the United States would be only 42 years. Other famous examples are the 1972 book "The Limits to Growth" from the self-styled Club of Rome, and the Global 2000 report to the then President of the United States of America Jimmy Carter. Science fiction author Isaac Asimov issued many appeals for population control reflecting the perspective articulated by people from Thomas Malthus through Paul R. Ehrlich.

More recently, a school of "neo-Malthusian" scholars has begun to link population and economics to a third variable, political change and political violence, and are trying to show how the variables interact. In the early 1980s, James Goldstone linked population variables to the English Revolution and David Lempert devised a model of demographics, economics, and political change in the multi-ethnic country of Mauritius. Goldstone has since modeled other revolutions by looking at demographics and economics and Lempert has explained Stalin's purges and the Russian Revolution of 1917 in terms of demographic factors that drive political economy. Ted Robert Gurr has also modeled political violence, such as in the Palestinian territories and in Rwanda/Congo (two of the world's regions of most rapidly growing population) using similar variables in several comparative cases. These approaches compete with explanations of events as a result of political ideology and suggest that political ideology is really a creation that follows demographic forces.

Malthus is widely regarded as the founder of modern demography. Malthus had proposed his Principle of Population as a universal natural law for all species, not just humans. But, today, his theory is widely regarded as only an approximate natural law of population dynamics for all species. This is because it can be proven that nothing can sustain exponential growth at a constant rate indefinitely.

Nonetheless, Malthus continues to openly inspire and influence futuristic visions, such as those of K Eric Drexler relating to space advocacy and molecular nanotechnology. As Drexler put it in *Engines of Creation*: "In a sense, opening space will burst our limits to

growth, since we know of no end to the universe". Nevertheless, Malthus was essentially right." Malthus has also inspired retired physics professor, Albert Bartlett, to lecture over 1,500 times on "Arithmetic, Population, and Energy", promoting sustainable living and explaining the mathematics of overpopulation.

The Malthusian growth model now bears Malthus's name. The logistic function of Pierre Francois Verhulst results in the well-known S-curve. Yet, Verhulst created the logistic growth model favored by so many critics of the Malthusian growth model in 1838 only after reading Malthus's essay. Some disputes Malthus's arithmetic model of food-supply, as it is arguable that food supply has kept pace with population for the past two centuries. Malthus's position as professor at the British East India Company training college, which he held until his death, gave his theories considerable influence over Britain's administration of India through most of the 19th century, continuing even under the Raj after the company's dissolution in 1858. The most significant result of this influence was that the official response to India's periodic famines, which had been occurring every decade or two for centuries, became one of not entirely benign neglect: the famines were regarded as necessary to keep the "excess" population in check. In some cases even private efforts to transport food into famine-stricken areas were forbidden. However, this "Malthusian" policy did not take account of the enormous economic damage done by such famines through loss of human capital, collapse of credit structures and financial institutions, and the destruction of physical capital (especially in the form of livestock), social infrastructure and commercial relationships. The presumably unintended consequence was that production often did not recover to pre-famine levels in the affected areas for a decade or more after each disaster, well after the lost population had been regained. Malthusian theory also influenced British policies in Ireland during the 1840s, in which relief measures during the Irish Potato Famine (1845-1849) were neglected and mass starvation was seen as a natural and inevitable consequence of the island's supposed over-population.

Although many people assume that Malthus's pessimistic views gave economics the nickname "the Dismal Science", the phrase was actually coined by the historian Thomas Carlyle in reference to laissez-faire economic theories in general.

Criticism

Theoretical and political critiques of Malthus and Malthusian thinking emerged soon after the publication of the first Essay on Population, most notably in the work of the reformist industrialist Robert Owen, the essayist William Hazlitt (*Malthus And The Liberties Of The Poor*, 1807) and economists John Stuart Mill and Nassau William Senior (*Two Lectures on Population*, 1829), and moralist William Cobbett, *True Law of Population* (1845) by politician Thomas Doubleday, an believer of Cobbett's views.

The highpoint of opposition to Malthus's ideas came in the middle of the nineteenth century with the writings of Karl Marx (*Capital*, 1867) and Friedrich Engels (*Outlines of a Critique of Political Economy*, 1844), who argued that what Malthus saw as the problem of the pressure of population on the means of production actually represented the pressure of the means of production on population. They thus, viewed it in terms of their concept of the labor reserve army. In other words, the seeming excess of population that Malthus attributed to the seemingly innate disposition of the poor to reproduce beyond their means was actually a product of the very dynamic of capitalist economy.

Engels called Malthus's hypothesis "...the crudest, most barbarous theory that ever existed, a system of despair which struck down all those beautiful phrases about love thy neighbour and world citizenship." Evolutionist Ronald Fisher expressed criticism of the use of Malthus's theory as a basis for the theory of natural selection. John Maynard Smith was critical of Malthus's hypothesis, doubting that famine was the great leveler that Malthus insisted it was.

Some 19th-century economists believed that improvements in the division and specialization of labor, increased capital investment, and other factors had rendered some of Malthus's warnings implausible. In the absence of any improvement in technology or increase of capital equipment, an increased supply of labor may have a synergistic effect on productivity that overcomes the law of diminishing returns. Many 20th century economists, such as Julian Lincoln Simon, have also criticised Malthus's conclusions. They note that despite the predictions of Malthus and the Neo-Malthusians, massive geometric population growth in the 20th century has not resulted in a Malthusian catastrophe, largely due to the influence of technological advances and the expansion of the market economy, division of labor, and stock of capital goods. Such arguments are

echoed by skeptical environmentalist, Bjørn Lomborg. Malthus is thus, regarded by some such as British physicist John Maddox as a failed prophet of doom.

The views of Marx and Engels on population are, largely in the light of their response to the ideas of Malthus. The general tenor of their argument was that capitalism could make it look as if there were too many people, but that, this was due to factors peculiar to capitalism rather than to any general relation between population and means of subsistence. Firstly, they regarded Malthus as a plagiarist, who derived most of his views from the work of others, but without specifically acknowledging this. Secondly, they described him as a 'bought advocate', who spurned a scientific approach to economics and instead supported the class interests of the capitalists and landowners (especially the latter, as he defended their existence as a class of unproductive consumers). Thirdly, they rejected the view (due originally to Darwin himself) that Charles Darwin's theory of evolution, and in particular the idea of a struggle for existence, was an application of Malthus' ideas on population to the plant and animal kingdoms.

In *Outlines of a Critique of Political Economy* (1844), Engel argued that Malthus' theory of population had been invented to reconcile the undeniable facts about apparent surplus population with bourgeois economic theory. Rather than admitting that capitalist competition, with its booms and slumps, made some productive power appear superfluous, economists conceived the idea that population tended to multiply beyond the means of subsistence. Engels' response was that Malthus had confused means of subsistence with means of employment, and that population in fact pressed against the means of employment. Moreover, Malthus had left out of consideration scientific progress, which advanced at least as rapidly as population, and would help to ensure increased agricultural production. Engels returned to this issue in "The Condition of the Working Class in England" (1845), which was based largely on his experiences in Manchester. He accepts the views of Adam Smith and Malthus that there are always 'too many people' in the world, but emphasizes that this is merely the appearance created by capitalism. Competition among workers forces them to work as long as they can, thereby reducing the numbers in

employment and giving the impression that there are more people than can be profitably employed. But Malthus was crucially wrong to conclude that there are more people than can be maintained from the available means of subsistence. Engels returned to this theme towards the end of the book. Since, on Malthus' account, the earth is always overpopulated, poverty and misery is the eternal lot of humanity. The 'surplus' population, then, should not be made useful but allowed to starve to death in the least objectionable way. This was the aim of the new Poor Law passed, under Malthus' influence, in 1834, which made workhouses even more degrading. The strong language, which Engels sometimes uses here, echoes his earlier description of Malthus' theory as 'this vile and infamous doctrine, this repulsive blasphemy against man and nature'.

Marx here studies 'the general law of capitalist accumulation', and the relation between accumulation of capital and the demand for labour, since it is lack of demand for labour which can create the appearance of a 'surplus population'. The increase of capital may lead to an increased demand for workers, and so to an increase in wages. These higher wages in turn mean smaller profits and less accumulation, so wages fall back. The rate of wages is thus dependent on the rate of accumulation of capital, rather than vice versa. The apparent 'law of population', which gives the appearance of workers being now too few and now too many, is not a relation between two independent things, the amount of capital and the number of workers, but simply reflects the varying shares of labor and capital in what is produced. The number of workers can only be relatively superfluous, i.e. surplus to the demands of capital at some time. Marx continues this is a law of population peculiar to the capitalist mode of production; and in fact every special historic mode of production has its own special laws of population, historically valid within its limits alone. An abstract law of population exists for plants and animals only, and only in so far as man has not interfered with them. It should be noted that this conclusion is quite at odds with Malthus' view that 'since the world began, the causes of population and depopulation have probably been as constant as any of the laws of nature with which we are acquainted'.

Optimum Population

Optimum population is where the amount of resources available in a country is equal to the country's population needs, so there are enough resources to maintain its population. If it is below its optimum population then it has more resources than needed for the population, if it is above then it has too little resources to maintain its population. To achieve optimum population, a country must change some of the following dimensions to lower or increase their fertility rate, before they can achieve optimum population. Immigration, age distribution and changes in lifespan must also be taken into account.

Achieving Optimum Population

Social and Cultural: Changing people's views and attitudes on religion to adjust it into a modern fashion, changing social attitudes, such as giving women more rights and thought in starting a large family than following tradition.

Economic: Increasing career opportunities will have peoples' minds set on education and career prospects, and maintaining their job, such that the immediate impulse to start a family might be delayed.

Medical and Scientific: Increasing the amount of contraception in LEDC (Less Economically Developed Country) educating adults and children about sexual education, on how to use contraception and the risks involved.

Political: Improving education to direct people into a career, this will have people concentrate on getting a stable job rather than plan ahead on starting a family.

Population as a function of food availability

Thinkers such as David Pimentel, a professor from Cornell University, Virginia Abernethy, Alan Thornhill, Russell Hoffenberg and author Daniel Quinn propose that like any animals, human populations predictably grow and shrink according to their

available food supply – populations grow in an abundance of food, and shrink in times of scarcity.

Proponents of this theory argue that every time food production is increased, the population grows. Some human populations throughout history support this theory. Populations of hunter-gatherers fluctuate in accordance with the amount of available food. This was followed by subsequent population growth after subsequent agricultural revolutions. Critics of this idea point out that birth rates are lowest in the developed nations, which also has the highest access to food. In fact, some developed countries have both a diminishing population and an abundant food supply. The United Nations projects that the population of 51 countries or areas, including Germany, Italy, Japan and most of the successor states of the former Soviet Union, is expected to be lower in 2050 than in 2005. This shows that human populations do not always grow to match the available food supply; also, many of these countries are major exporters of food.

However as Daniel Quinn points out in his book "The Story Of B": "When our population system is assessed as a whole, on a global scale, rather than country by country, there is no doubt whatever that, as a whole, our population is increasing catastrophically, so that studies conducted by international groups like the United Nations predict without reservation that there will be twelve billion of us here in forty years or so." However, a more recent report from the U.N. predicts that world population will reach 9.2 billion in the year 2050.

Over Population

Overpopulation is a condition when an organism's numbers exceed the carrying capacity of its ecological niche. In common parlance, the term usually refers to the relationship between the human population and its environment, the Earth.

Overpopulation is not simply a function of the size or density of the population. Overpopulation can be determined using the ratio of population to available resources. If a given environment has a population of ten, but there is food or drinking water enough for only nine, then that environment is overpopulated; if the population is 100 individuals

but there is food, shelter or water enough for 200, then it is not. Overpopulation can result from an increase in births, a decline in mortality rates due to medical advances, from an increase in immigration, a decrease in emigration, or from an unsustainable use and depletion of resources. It is possible for very sparsely-populated areas to be "overpopulated", as the area in question may have a very meager or non-existent capability to sustain human life (e.g. the middle of the Sahara desert or Antarctica).

The resources to be considered when evaluating whether an ecological niche is overpopulated include clean water, clean air, food, shelter, warmth, and other resources necessary to sustain life. If the quality of human life is addressed as well, there are then additional resources to be considered, such as medical care, employment, money, education, fuel, electricity, proper sewage treatment, waste management, and transportation. Negative impacts should also be considered including crowding stress and increased pollution. If addressing the environment as a whole, the survival and well-being of species other than humans must also be considered.

In the context of human societies, overpopulation occurs when the population density is so great as to actually *cause* an impaired quality of life, serious environmental degradation, or long-term shortages of essential goods and services. This is the definition used by popular dictionaries such Merriam-Webster. Overpopulation is not merely an imbalance between the number of individuals compared to the resources needed for survival, or a ratio of *population over resources*, or a function of the number or density of individuals, compared to the resources (i.e. food production) they need to survive.

Some countries have managed to increase their carrying capacity by using technologies such as, used in agriculture, used for desalination, and the use of nuclear power. Some people have argued that poverty and famine are caused by bad government and bad economic policies, and that higher population density leads to more specialization and technological innovation, and that this leads to a higher standard of living.

Some of the overpopulated regions of the world are India, Petén region of Guatemala, Bangladesh, Madagascar, Australia, Nigeria, Ethiopia, Sudan, Niger, Haiti, United States, Arizona, California, Uganda, and Zimbabwe.

Effects of Overpopulation

Some problems associated with or exacerbated by human overpopulation:

- Inadequate fresh water for drinking water use as well as sewage treatment and effluent discharge. Some countries, like Saudi Arabia, use energy-expensive desalination to solve the problem of water shortages.
- Depletion of natural resources, especially fossil fuels.
- Increased levels of air pollution, water pollution, soil contamination and noise pollution. Once a country has industrialized and become wealthy, a combination of government regulation and technological innovation causes pollution to decline substantially, even as the population continues to grow.
- Many Third World countries simply lack the economic or infrastructural base to provide a rising standard of living for most of their people, especially in Africa, the Arab world, and parts of Latin America.
- Deforestation and loss of ecosystems that sustain global atmospheric oxygen and carbon dioxide balance; about eight million hectares of forest are lost each year.
- Changes in atmospheric composition and consequent global warming
- Irreversible loss of arable land and increases in desertification Deforestation and desertification can be reversed by adopting property rights, and this policy is successful even while the human population continues to grow.
- Illegal (and legal) immigration to the developed world on an unprecedented scale, creating an unprecedented demographic and political problem in Europe and the United States. Even the controlled and legal migration of talented and well-educated people from the Third World to the developed world denudes it of its limited skills base.
- Mass species extinctions from reduced habitat in tropical forests due to slash-and-burn techniques that sometimes are practiced by shifting cultivators,

especially in countries with rapidly expanding rural populations; present extinction rates may be as high as 140,000 species lost per year. The IUCN Red List lists a total of 698 animal species having gone extinct during recorded human history.

- High infant and child mortality. High rates of infant mortality are caused by poverty. Rich countries with high population densities have low rates of infant mortality.
- Increased incidence of hemorrhagic fevers and other infectious diseases from crowding, lack of adequate sanitation and clean potable water, and scarcity of available medical resources.
- Starvation, malnutrition or poor diet with ill health and diet-deficiency diseases (e.g. rickets). Famine is aggravated by poverty. Rich countries with high population densities do not have famine.
- Poverty coupled with inflation in some regions and a resulting low level of capital formation. Poverty and inflation are aggravated by bad government and bad economic policies. Many countries with high population densities have eliminated absolute poverty and keep their inflation rates very low.
- Low birth weight due to the inability of mothers to get enough resources to sustain a fetus from fertilization to birth
- Low life expectancy in countries with fastest growing populations
- Unhygienic living conditions for many based upon water resource depletion, discharge of raw sewage and solid waste disposal
- Elevated crime rate due to drug cartels and increased theft by people stealing resources to survive
- Conflict over scarce resources and crowding, leading to increased levels of warfare
- Over-utilization of infrastructure, such as mass transit, highways, and public health systems
- Higher land prices.

Population decline



The population of Ireland since 1500, (showing a 100-year population decline caused by emigration, and the Great Irish Famine of 1845).

Population decline is a decrease in a region's population. It can be caused by sub-replacement fertility, heavy emigration, or more dramatically disease, famine, or war. In the past, population decline was mostly caused by disease. The Black Death in Europe and the arrival of Old World diseases to the Americas all caused massive population declines. In biology, population decline of a species is usually described as a result of gradually worsening environmental factors, such as prolonged drought or loss of inhabitable areas for the studied species. These, or other factors, may lead to a small population, in which case genetic factors may become dominant in the survival, or extinction of a population.

Under-Population is recognized when there are more resources in an area (for example, food, energy and minerals) than can be used by the people living there. Hence, the maximum human potential of that area is not realized as the resources are not fully exploited. Countries like Canada and Australia can export the surplus of food, energy, and mineral resources, have high incomes, good living conditions and level of technology and immigration.

Some rural areas close to major cities in advanced countries such as the UK are under-populated due to outward migration. In the UK, the Southwest Wales and the highlands of Scotland are less densely populated compared to the rest of the country. This has also

happened in older declining industrial areas and the outward movement or migration has been due to lower wages and unemployment. This phenomenon results in a decline in a population. With fewer people, there is a decrease in demands for services. The lower level of services therefore sometimes encourages further outward migration.

However, when making comparisons on a global scale, there does not seem to be any direct correlation between population density and over-or under-population. For example, Brazil is 'over-populated' with two people per square kilometer, whereas portions of California may have further carrying capacity with over 500 people per square kilometer. Therefore, this is related to the amount of available resources. Similarly, population density is not necessarily related to the GDP per capita. The Netherlands and Germany, for example, both have a high GDP per capita and a high population density whereas Canada and Australia have a high GDP per capita and a low population density, while Bangladesh has low GDP per capita and a high population density, etc.

The balance of population and resources within a country may be uneven. For example, a country may have a population, which is too great for one resource such as energy, yet too small to use fully a second such as food supply.

Various attempts to address population decline that have been made are as follows:

- i. Improving communication networks and transport facilities makes remote places more accessible. This strategy was used in developing countries like Nigeria and Tanzania where modern railway networks were established, but these attempts were not very successful.
- ii. Establishment of new capital cities, new towns, or development growth points. For example, Brazil has a population imbalance between the coastal parts from east and south and the rest of the country. Brasilia, the new capital was created in the 1960s in the country's geographical center to attract people into the North and Center-West regions, but this had limited effect, as most of these unpopulated areas are occupied by large forests and swamps.

- iii. Regional development programs. In Brazil, the interior improvement of transport networks and development of secondary growth points and rural development has all been enhanced to attract more people and discourage out-migration. The standard of living in such regions is expected to gradually improve due to improved resource utilization.
- iv. Ponytails policies providing tax incentives paid maternity leaves, daycare, or other benefits to families to bear more children. Such policies have been tried, with mixed success, in Western Europe in recent years.

Population Control is the practice of curtailing population increase, usually by reducing the birth rate. Surviving records from Ancient Greece document the first known examples of population control. These include the colonization movement, which saw Greek outposts being built across the Mediterranean and Black Sea basins to accommodate the excess population of individual states. An important example of mandated population control is China's one-child policy, in which having more than one child is made extremely unattractive. This has led to allegations that practices like infanticide, forced abortions, and forced sterilization are used as a result of the policy.

It is helpful to distinguish between fertility control as individual decision-making and population control as a governmental or state-level policy of regulating population growth. Fertility control may occur when individuals or couples or families take steps to decrease or to regulate the timing of their own child-bearing. In Coal's oft-cited formulation, three preconditions for a sustained decline in fertility are: (1) acceptance of calculated choice (as opposed to fate or chance or divine will) as a valid element in fertility, (2) perceived advantages from reduced fertility, and (3) knowledge and mastery of effective techniques of control. In contrast to a society with natural fertility, a society that desires to limit fertility and has the means to do so may use those means to delay childbearing, space childbearing, or stop childbearing. Delaying sexual intercourse (or marriage), or the adoption of natural or artificial means of contraception are most often an individual or family decision, not a matter of a state policy or societal-wide sanctions. On the other hand, individuals who assume some sense of control over their own fertility can also accelerate the frequency or success of child-bearing through planning.

At the societal level, declining fertility is almost an inevitable result of growing secular education of women. However, the exercise of moderate to high levels of fertility control does not necessarily imply low fertility rates. Even among societies that exercise substantial fertility control, societies with an equal *ability* to exercise fertility control (to determine how many children to have and when to bear them) may display widely different *levels* of fertility (numbers of children borne) associated with individual and cultural preferences for the number of children or size of families.

In contrast to *fertility control*, which is mainly an individual-level decision, governments may attempt to exercise *population control* by increasing access to means of contraception or by other population policies and programs. The idea of "population control" as a governmental or societal-level regulation of population growth does not require "fertility control" in the sense that it has been defined above, since a state can affect the growth of a society's population even if that society practices little fertility control. It's also important to embrace policies favoring population *increase* as an aspect of population control, and not to assume that states want to control population only by limiting its growth. To stimulate population growth, governments may support not only immigration but also ponytails policies such as tax benefits, financial awards, paid work leaves, and childcare to encourage the bearing of additional children. Such policies have been pursued in recent years in France and Sweden, for example. With the same goal of increasing population growth, on occasion governments have sought to limit the use of abortion or modern means of birth control. An example was Romania's 1966 ban on access to contraception and abortion on demand.

In ecology, population control is on occasions considered to be done solely by predators, diseases, parasites, and environmental factors. At many times human effects on animal and plant populations are also considered. Migrations of animals may be seen as a natural way of population control, for the food on land is more abundant on some seasons. The area of the migrations' start is left to reproduce the food supply for large mass of animals next time around.

Carrying Capacity

A common fallacy is to equate existing and seemingly open or "unused" spaces with the kind of resources and ecologically productive land needed to support human life under modern conditions. In fact, the criterion for determining whether a region is overpopulated is not land area, but carrying capacity.

Carrying capacity refers to the number of individuals who can be supported in a given area within natural resource limits, and without degrading the natural social, cultural and economic environment for present and future generations. The carrying capacity for any given area is not fixed. It can be altered by improved technology, but mostly it is changed for the worse by pressures, which accompany a population increase. As the environment is degraded, carrying capacity actually shrinks, leaving the environment no longer able to support even the number of people who could formerly have lived in the area on a sustainable basis. No population can live beyond the environment's carrying capacity for very long. We must think in terms of "carrying capacity" not land area. The effects of unfettered population growth drastically reduce the carrying capacity in the United States.

Present State of Population

According to estimates published by the United States Census Bureau, the world population hit 6.5 billion (6,500,000,000) on February 25, 2006. It is estimated that by 2012, the Earth will be home to 7 billion. The United Nations Population Fund designated October 12, 1999 as the approximate day on which world population reached six billion. This was about 12 years after world population reached five billion, in 1987. However, the population of some countries, such as Nigeria, is not even known to the nearest million, so there is a considerable margin of error in such estimates.

In 2007 the United Nations Population Division projected that the world's population will likely surpass 9 billion in 2050. The last 50 years have seen a rapid increase in population due to medical advances and substantial increase in agricultural productivity, particularly in the period 1960 to 1995 made by the Green Revolution.

The United Nations states that: Almost all growth will take place in the less developed regions, where today's 5.3 billion population of underdeveloped countries is expected to increase to 7.8 billion in 2050. By contrast, the population of the more developed regions will remain mostly unchanged, at 1.2 billion. The world's population is expected to rise by 40% to 9.1 billion.

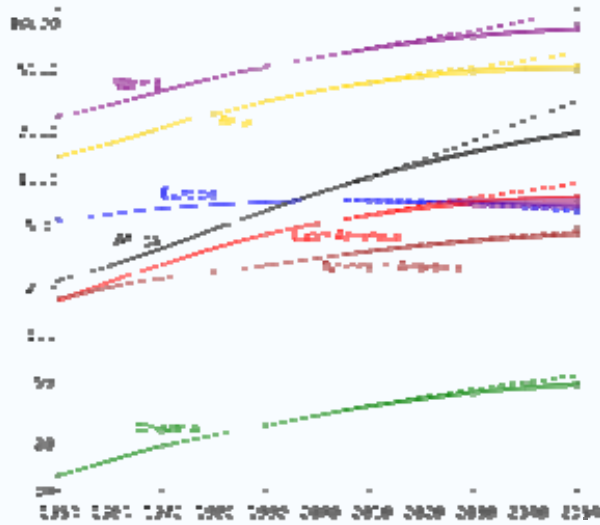
Total Population of the World by Decade, 1950–2050

(Historical and projected)

Year	Total world population (mid-year figures)	Ten-year growth rate (%)
1950	2,556,000,053	18.9%
1960	3,039,451,023	22.0
1970	3,706,618,163	20.2
1980	4,453,831,714	18.5
1990	5,278,639,789	15.2
2000	6,082,966,429	12.6
2010	6,848,932,929	10.7
2020	7,584,821,144	8.7
2030	8,246,619,341	7.3
2040	8,850,045,889	5.6
2050p	9,346,399,468	—

P: Projected.

Population projections from the 1900's to 2050



source : CIA's 2005–2006 [World Factbooks](#), United Nations.

World population is currently growing by approximately 75 million people per year. Net growth by mid-century is predicted by the United Nations to be 34 million per year in contrast to the roughly 76 million per year that was seen from 2000 to 2005.

In 2000-2005, fertility at the world level stood at 2.65 children per woman, about half the level it had in 1950-1955 (5 children per woman). In the medium variant, global fertility is projected to decline further to 2.05 children per woman. During 2005-2050, nine countries are expected to account for half of the world's projected population increase: India, Pakistan, Nigeria, Democratic Republic of the Congo, Bangladesh, Uganda, United States of America, Ethiopia, and China, listed according to the size of their contribution to population growth. Global life expectancy at birth, which is estimated to have risen from 46 years in 1950-1955 to 65 years in 2000-2005, is expected to keep rising to reach 75 years in 2045-2050. In the more developed regions, the projected increase is from 75 years today to 82 years by mid-century. Among the least developed countries, where life expectancy today is just under 50 years, it is expected to be 66 years in 2045-2050. The population of 51 countries or areas, including Germany, Italy, Japan and most of the successor States of the former Soviet Union, is expected to be lower in 2050 than in 2005.

During 2005-2050, the net number of international migrants to more developed regions is projected to be 98 million. Because deaths are projected to exceed births in the more developed regions by 73 million during 2005-2050, population growth in those regions will largely be due to international migration. In 2000-2005, net migration in 28 countries either prevented population decline or doubled at least the contribution of natural increase (births minus deaths) to population growth. These countries include Austria, Canada, Croatia, Denmark, Germany, Italy, Portugal, Qatar, Singapore, Spain, Sweden, United Arab Emirates and United Kingdom.

The updated United Nations figures project that the world population will reach 9.2 billion around 2050. This is the medium variant figure which assumes a decrease in average fertility from the present level of 2.5 down to 2. Birth rates are now falling in many developing countries, while the actual populations in many developed countries would fall without immigration. By 2050 (Medium variant), India will have almost 1.7 billion people, China 1.4 billion, United States 400 million, Indonesia 297 million, Pakistan 292 million, Nigeria 289 million, Bangladesh 254 million, Brazil 254 million, Democratic Republic of the Congo 187 million, Ethiopia 183 million, Philippines 141 million, Mexico 132 million, Egypt 121 million, Vietnam 120 million, Russia 108 million, Japan 103 million, Iran 100 million, Turkey 99 million, Uganda 93 million, Tanzania 85 million, and Kenya 85 million.

CONTINENT	1900	2050
Africa	133 million	1.9 billion
Asia	946 million	5.2 billion
Europe	408 million	664 million
Latin America & Caribbean	74 million	769 million
Northern America	82 million	445 million

Source: World Population Estimates.

Population and Resources

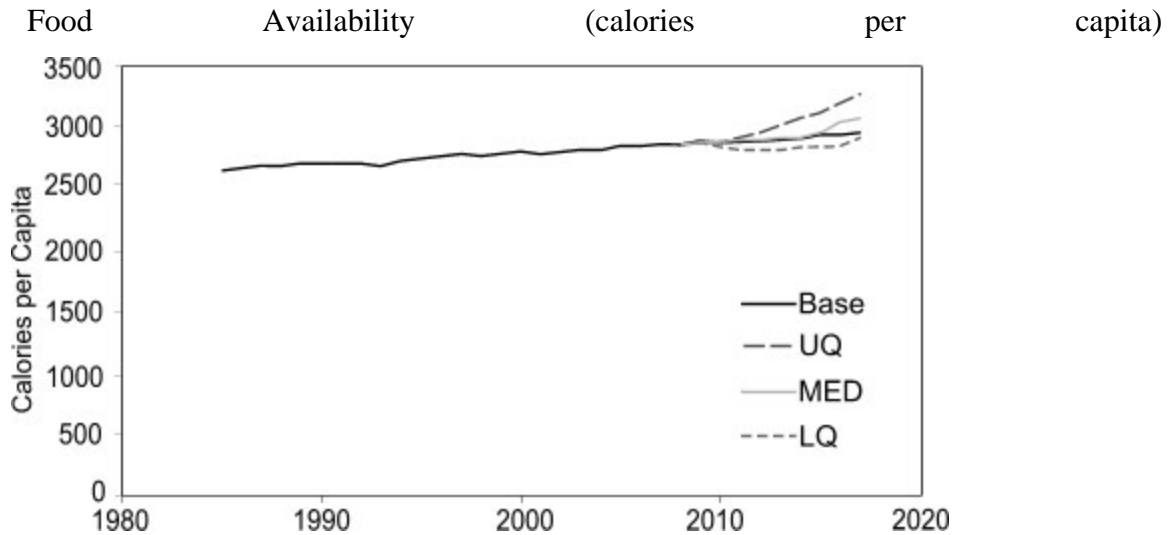
Global population is changing from high mortality and high fertility to low mortality and low fertility. Half the 6.6 billion people today are urban; by 2050 two-thirds could be. About a third of urban population live in “slums,” and the number of slum dwellers could double by 2030. Some 25 percent of children worldwide have protein-energy malnutrition, which reduces cerebral development. A quarter of the world (excluding Africa) will be over 60 years old in 2050. There will be more people over 60 than fewer than 15 by 2045 according to the UN medium forecast. Today about 65 percent of the older persons live in developing countries; by 2050 nearly 80 percent will. The first world got rich before it grew old, but developing countries will have a more difficult time managing, even though they are not aging as fast. Retirement and health care systems and culture will have to change. Population may increase by another 2.8 billion by 2050 before it begins to fall, according to the UN’s lower forecast, after which it could be 5.5 billion by 2100. However, technological breakthroughs are likely to change these forecasts over the next 50 years, giving people longer and more productive lives than most would believe today.

Food and Agriculture Organization of the United Nations (FAO), estimates that the Millennium Development Goals’ (MDG) target on hunger, can be met. But this is largely due to increasing population and not the reduction of hungry people per se. The absolute number of undernourished people has declined by only 3 million since the early 1990s, while it decreased 37 million during the 1970s and 100 million in the 1980s. The number actually increased by 23 million from 2001 to 2003, offsetting gains during the 1990s. There are still 854 million undernourished people worldwide. Climate change and monocultures undermine biodiversity, which is critical for agricultural viability. The factors reducing population growth still need to be reinforced. These include increased income, improved literacy, diminished infant mortality, empowerment and education of women, urbanization, and family planning.

A quarter of all fish stocks are over harvested. FAO estimates that water for agriculture needs to increase 60 percent to feed an additional 2 billion people by 2030, even as urban

water requirements are increasing. About 40 percent of agricultural land is moderately degraded and 9 percent is highly degraded, reducing global crop yield by as much as 13 percent. Without sufficient nutrition, shelter, water, and sanitation produced by more intelligent human-nature symbioses, increased migrations, conflicts, and disease seem inevitable. UN-HABITAT says about one-third of the urban poor are “environmental refugees” due to climate change.

Once thought to be a problem, urbanization is a key to improving the human condition due to its many amenities and economies of scale. Creative financing models are being developed to meet urban housing, water supply, sanitation, and other urban infrastructure needs that could double in a generation. To reduce the economic burden on younger generations and to keep up living standards, people will work longer and create many forms of tele-work, part-time work, and job rotation. Nanotech reduces material consumption per unit of output, while increasing utility and durability. ICT is more optimally matching needs and resources worldwide in real time. Better rain-fed agriculture and irrigation management, plus genetic engineering for higher-yielding, drought-tolerant crop varieties, will be needed. Currently, agriculture uses 80 percent of arable land in developing countries, of which 20 percent is irrigated. Massive efforts are required to maintain fertile cropland. Demand for animal protein may increase 50 percent by 2020, triggering massive investments into genetically modified food, aquaculture, and stem cells for meat production without growing the animal. Seawater agriculture on desert coastlines could produce biofuels, pulp for the paper industry, and food for humans and animal biofuels, while absorbing carbon and reducing the drain on fresh water.



Source: World Resources Institute, with Millennium Project estimates

Population Resource Regions

Many thinkers like the Malthusians and neo Malthusians, view with pessimism the prospects of an explosion of population which production will not satisfy. The fears are that death control is more widespread than birth control; that social organization in backward countries encourages population increase; that the world will be inundated by Asians; that the hundreds of millions who are hungry will augment; that standards of living will decline; that the gap between rich and poor nations will grow; that world food supplies will not match population growth. The vast negative areas (mountains, deserts, jungles, permafrost zones) are considered incapable of making an important contribution; the low-income countries of South- East Asia are considered too demographically fertile and too densely peopled to achieve high living standards in the immediate future.

Since the Second World War contrasting views have emerged concerning man's ability to meet the challenge of food supply, ranging from sublime optimism to imminent doom. Towards the end of the 1960s there was a noticeable movement towards guarded optimism, even among some formerly pessimistic Western experts, as a consequence of the early successes of the "green revolution". But there remain vast differences in opinion concerning the possibilities of extending the earth's cultivated area.

Other writers blame social institutions for the inconsistencies between the population and resources some attack colonialism, some attack the class structure. Socialist and Marxist demographers stress the importance of social and economic revolutions as a means to reduce fertility and to raise living standards. They emphasize the technical feasibility of increased agricultural yields and industrial and energy production.

Edward A. Ackerman has used three basic criteria for devising the world's regional scheme of population /resource ratio, which are:

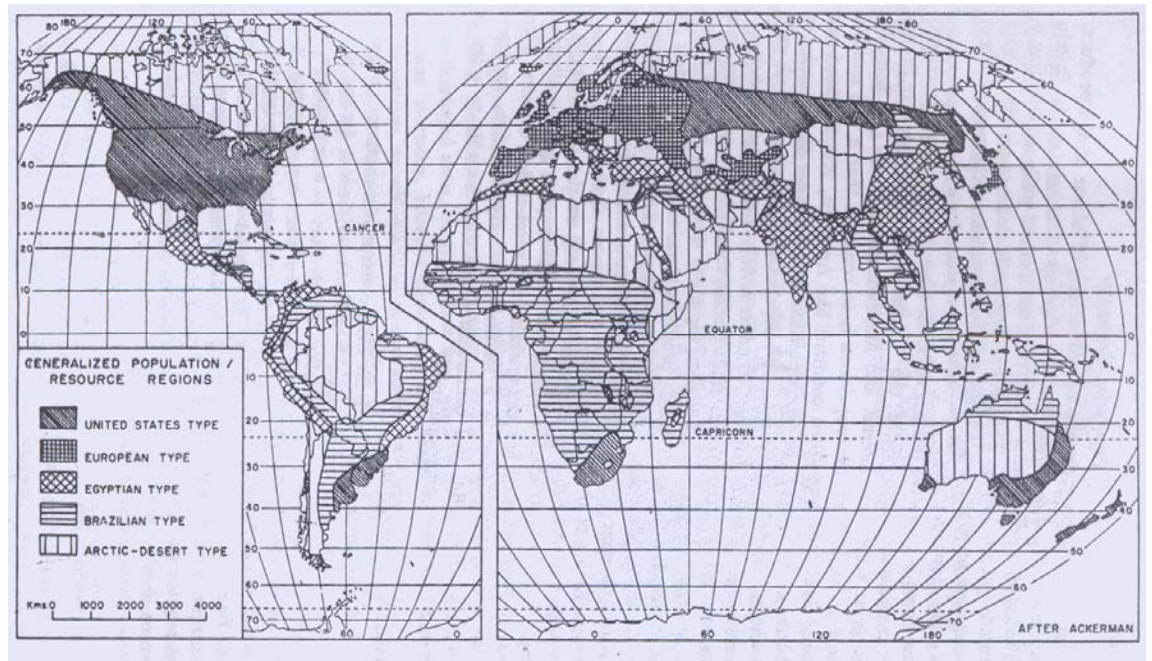
- Population factor,
- Resource factor and
- Technology factor.

Among these three variables used in this scheme, the most critical is the magnitude and quality of available technology. Ackerman while using the three factors of population, resource and technology, emphasized more on technology. He suggested a five-fold classification of the world into population/resource regions on the basis of population resource ratios and the availability of technology:

1. **United States Type:** About one sixth of the world's people live in technology-source areas with low population/resource ratios, as in much of North America, Australia and New Zealand and the erstwhile Soviet Union.
2. **European Type:** One sixth live in technology-source areas with high population/resource ratios, where industrialization and technology have permitted an expansion of resources through international trade. Most of Europe and Japan fall in this category.
3. **Egyptian Type:** Roughly one half live in areas which are technology-deficient with high population/resource ratios, as in India, Pakistan and China. This type epitomizes some of the most severe population problems.
4. **Brazilian Type:** One sixth live in technology- deficient areas with low population/resource ratios, as in much of Latin America, Africa and

South-East Asia, where resources sometimes remain unused because of the problems of developing difficult environments.

5. **Arctic- Desert Type:** The largely uninhabited ice caps, tundra's and deserts are mostly technology- deficient and offer little food-producing potential at the moment.



Generalised Population/ Resource Regions after E.A. Ackerman

This classification is a useful general guide but offers little help for more specific cases of pressure of population on resources, which is extremely difficult to define in quantitative terms due to the dynamism of the variables involved: population, resource, technology and the economic expectations and attainments of the people.

Conclusion

India, also has enormous problems of overpopulation. The current population is over a billion, but India does not have as much land mass as China. India is experiencing major problems with declining water tables due to over-extraction beyond sustainable yield.

India is building desalination plants to solve this problem. Because India has the same population density as Japan, some have claimed that India's poverty is caused by underdevelopment, not overpopulation. However, if China and India were to consume as much resources per capita as United States together they would require two planet Earths just to sustain their two economies. The Worldwatch Institute said the booming economies of China and India are planetary powers that are shaping the global biosphere. The State of the World 2006 report said the two countries' high economic growth hid a reality of severe pollution.

The report states: **The world's ecological capacity is simply insufficient to satisfy the ambitions of China, India, Japan, Europe and the United States as well as the aspirations of the rest of the world in a sustainable way.**

References

1. Chandana, R.C. (2002) Geography of Population, New Delhi: Kalyani.
2. Clarke, J.I. (1976) Population Geography, 2nd Edition, Oxford: Pergamon Press.
3. Ghosh, B.N. (1985) Fundamentals of Population Geography, New Delhi: Sterling Publishers.
4. Harrison, P. and Pearce, F. (2000) AAAS Atlas of Population and Environment, Berkeley: University of California Press.
5. Rose, J. (2000) "Population Problems: Topical Issues, Environmental Topics", Gordon and Breach Science Publishers, Australia, Vol.8.

Web References

1. "Worldwatch Briefing: Sixteen Dimensions of the Population Problem" at <http://www.worldwatch.org/alerts/pr98924.html>
2. "Life on Earth is Killing Us" press release at <http://www.enn.com/news/enn-stories/1998/10/100298/killings.asp>.
3. Population Division of the Department of Economic and Social Affairs of the United Nation. World Population Prospects: The 2006 Revision.
4. [Population Resource Centre](#), [Wikipedia](#) and [CIA World Fact Book](#)
5. U.S. Census Bureau, International Database.
6. China's Population Data base www.cpirce.org.cn.
7. Demographics of South Korea, Netherlands, Israel and Japan.