

Module III

Population and Environment - I



Lecture 3 (10 July 2024)
Dr. Asib Ahmed



**Department of Social Relations
EAST WEST UNIVERSITY**

Topic covers:

1. Basics of population
2. Population dynamics
3. Population growth theory

Human population

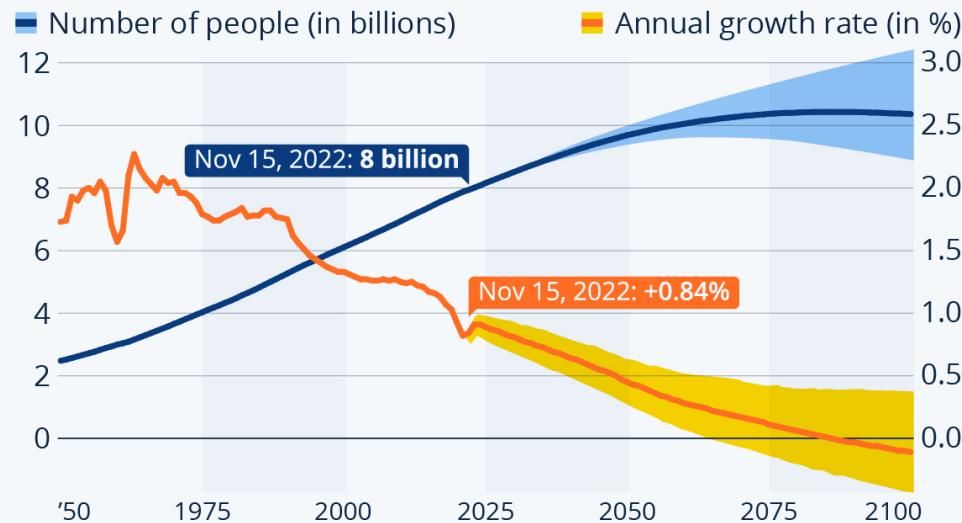
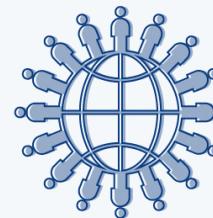
The meaning of POPULATION is the whole number of people or inhabitants in a country or region.

“Demography is the scientific study of human populations, primarily with respect to their size, their structure, and development” (UN, 1958)

The study of population dynamics focuses on these changes -- how, when, and why they occur.

World Population Reaches 8 Billion

(Forecast) number of people on Earth and annual growth rate of the world population

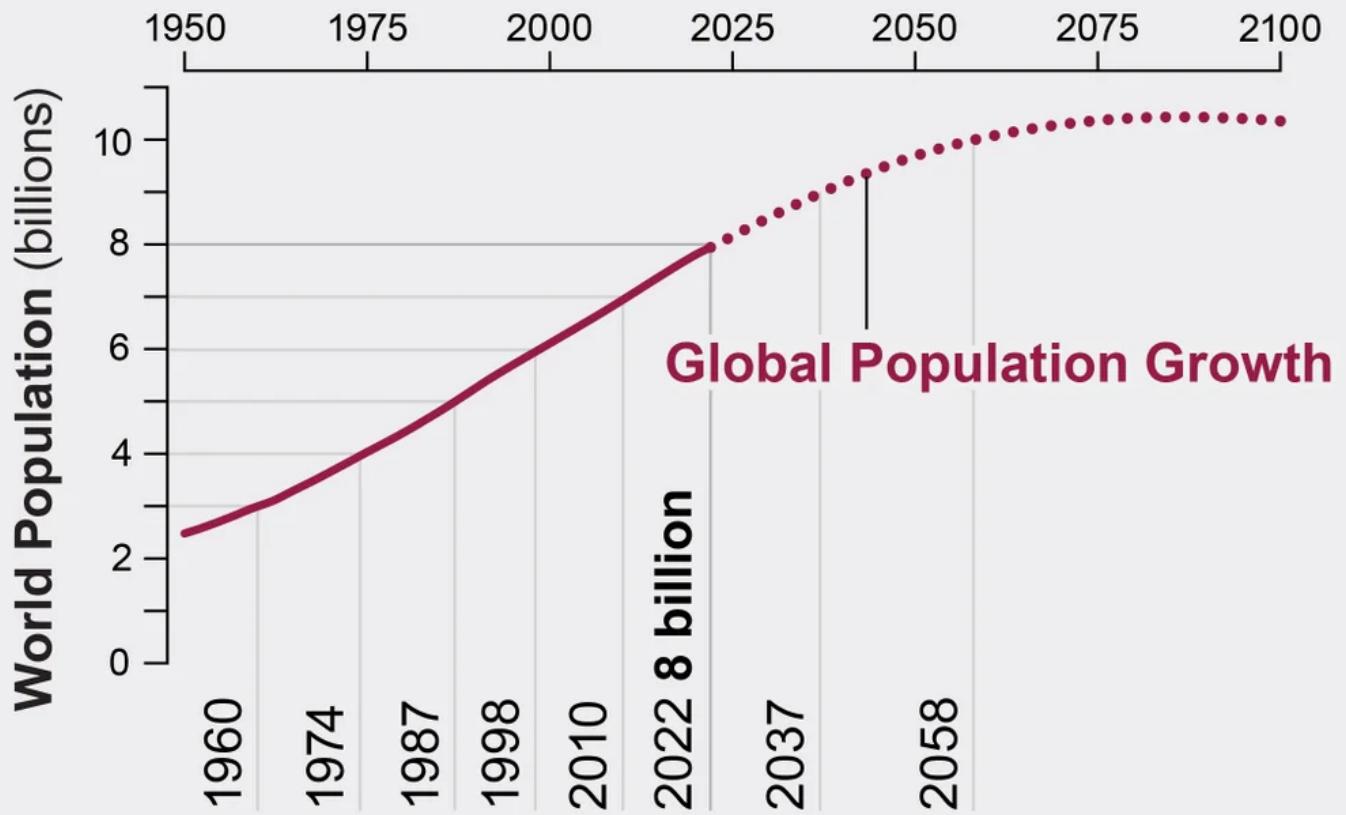


Forecast from 2022 according to the medium scenario with moderate fertility
Source: UN Population Division

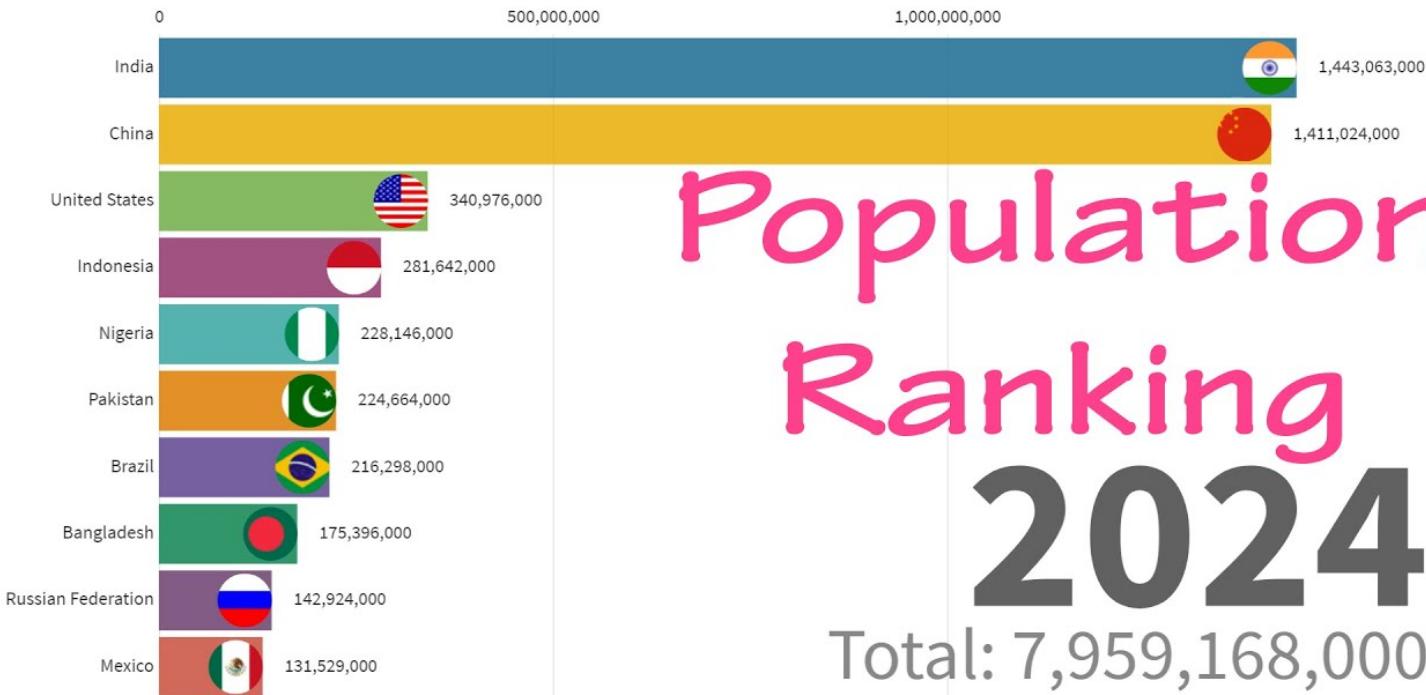
According to UN calculations, the number of people in the world exceeded the 8 billion mark by 2022 - more than three times as many as in 1950.

Looking ahead, the UN Population Division's forecast predicts that the world's population will exceed ten billion by 2059.

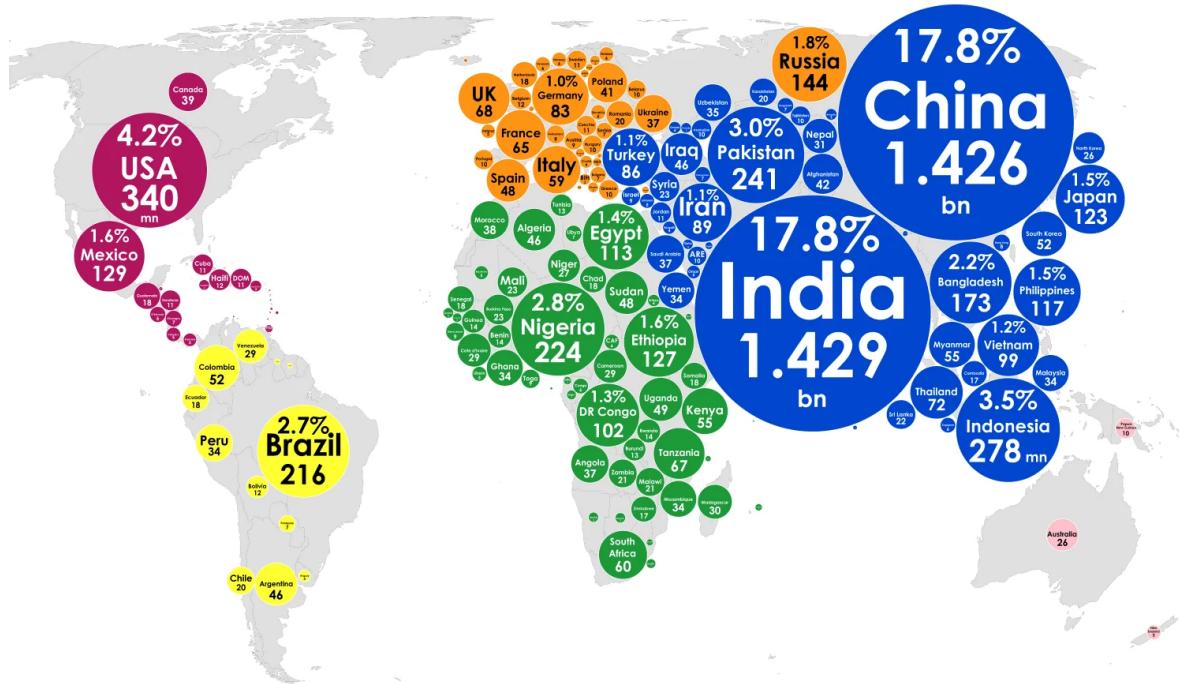
By the end of the century, the number will then decline slightly. The growth of the worldwide populace has already been slowing down for decades, as illustrated by the yellow line in info-graphic.



World Population 1980-2024



Where do 8 billion people live?

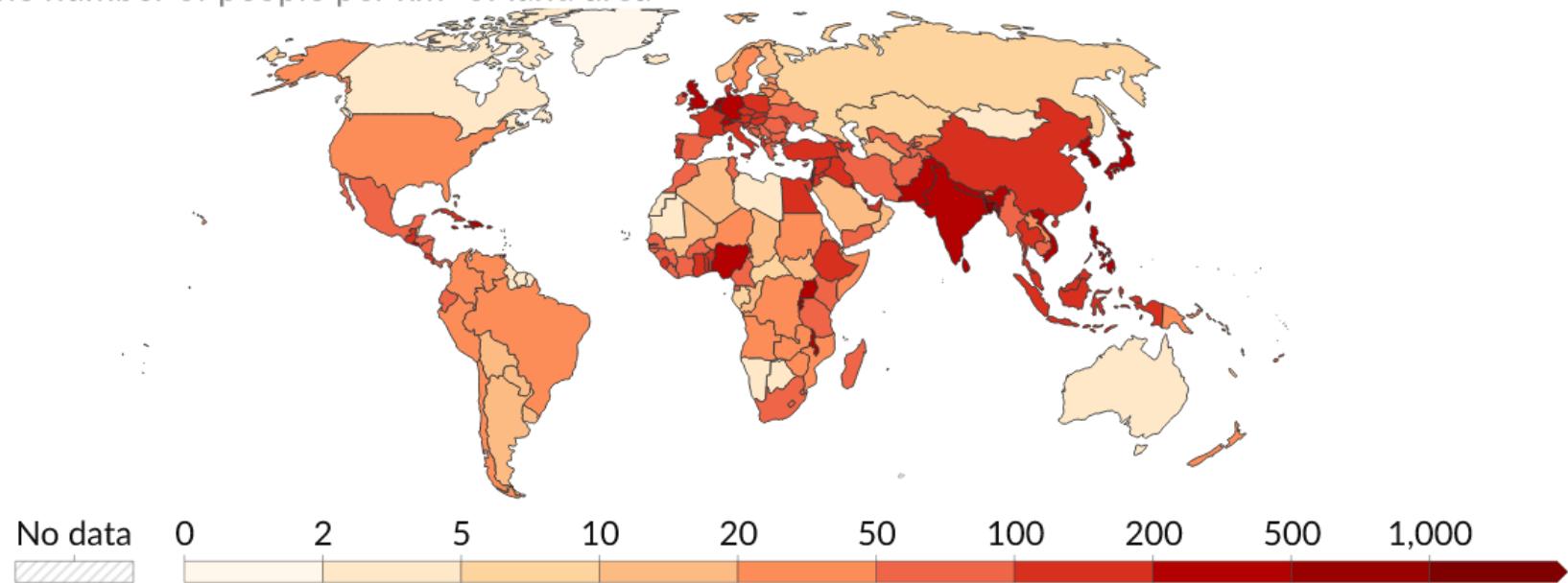


Source: UNFPA, United Nations Population Fund
2023 mid-year estimates. Numbers rounded to nearest millions.
China & India in billion

statsofindia.in
by @PratapVardhan

Population density, 2024

The number of people per km² of land area



Data source: HYDE (2017); Gapminder (2022); UN WPP (2022); UN FAO (2022)
OurWorldInData.org/population-growth | CC BY

Select a year



Normal



1800



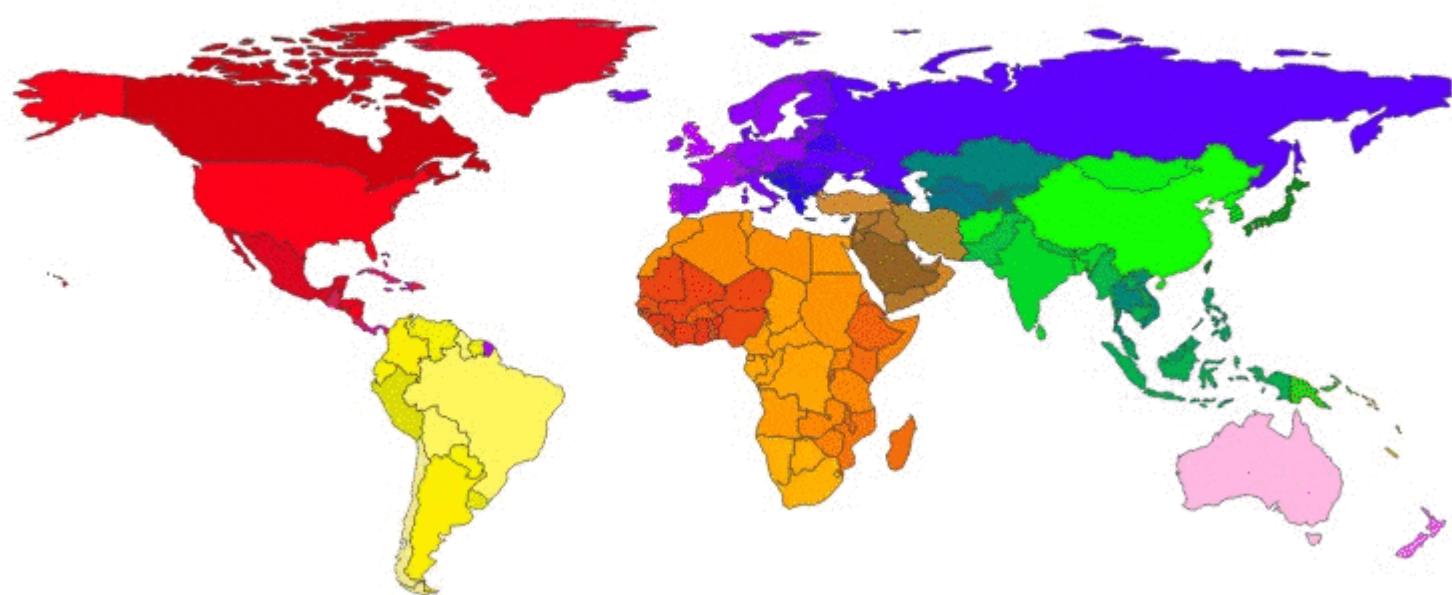
1900



2000

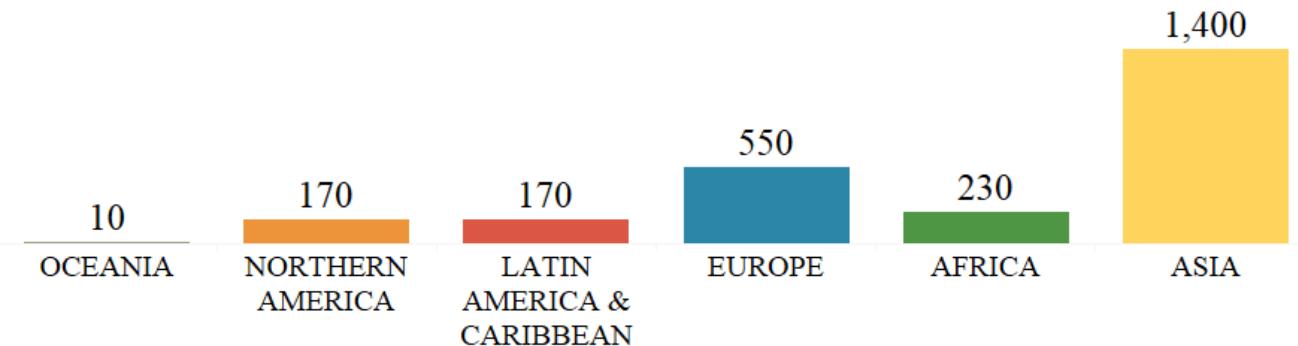
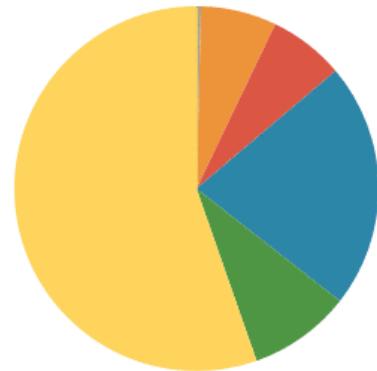


2100



Population in millions by region **1950**

Share of world population **2.5B**



Created by Twitter user [@simongerman600](#) for The Demographics Group
based on data from UN Population Prospects 2017

Why Population Changes?

Components of Demography/ Population Dynamics

- **Fertility:** Adding New People
- **Mortality:** Subtracting People
- **Migration:** Adding and Subtracting People

Population structure and population pyramids

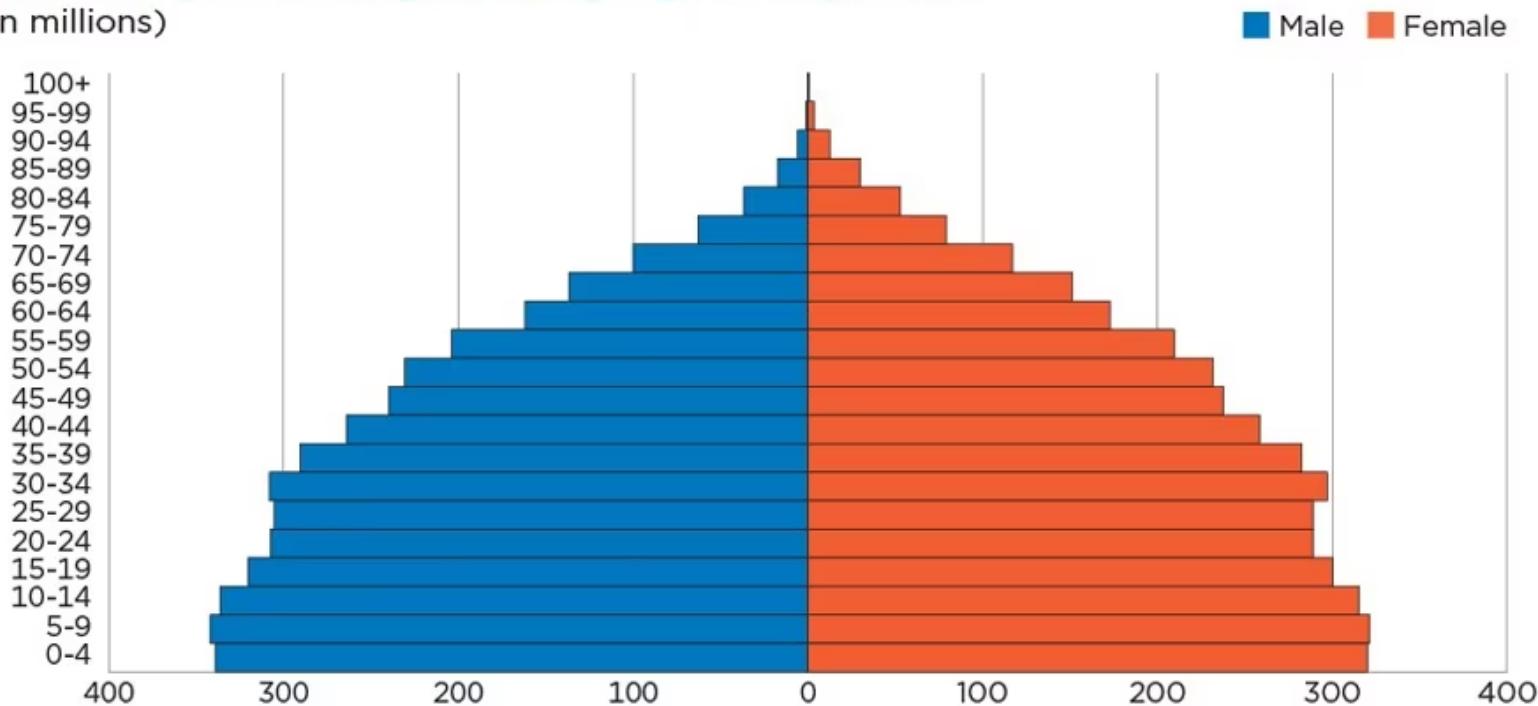
Population structure means the 'make up' or composition of a population. Looking at the population structure of a place shows how the population is divided up between males and females of different age groups.

Population structure is usually shown using a population pyramid. A population pyramid can be drawn up for any area, from a whole continent or country to an individual town, city or village.

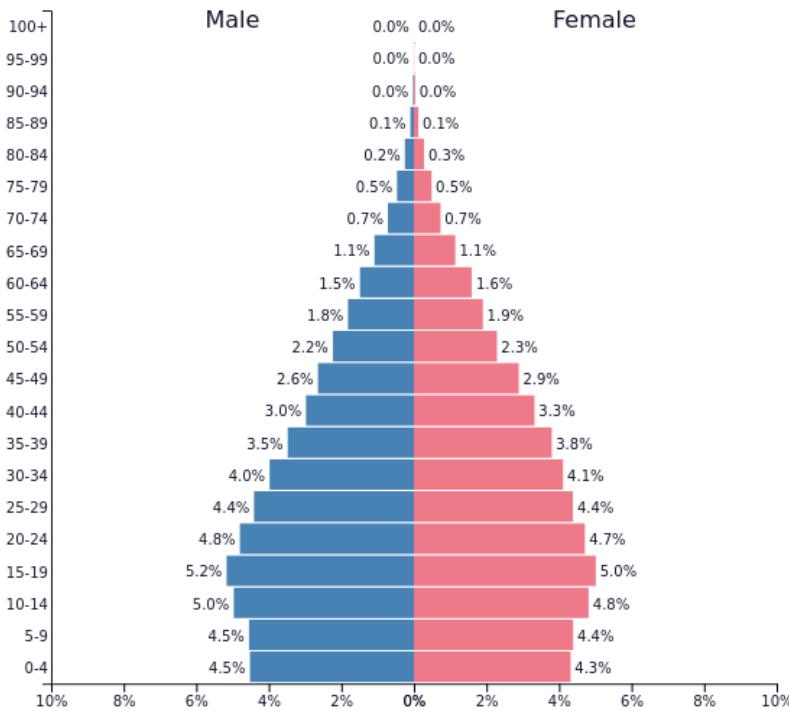
Figure 3a.

Global Population Pyramid by Age Group: 2023

(In millions)



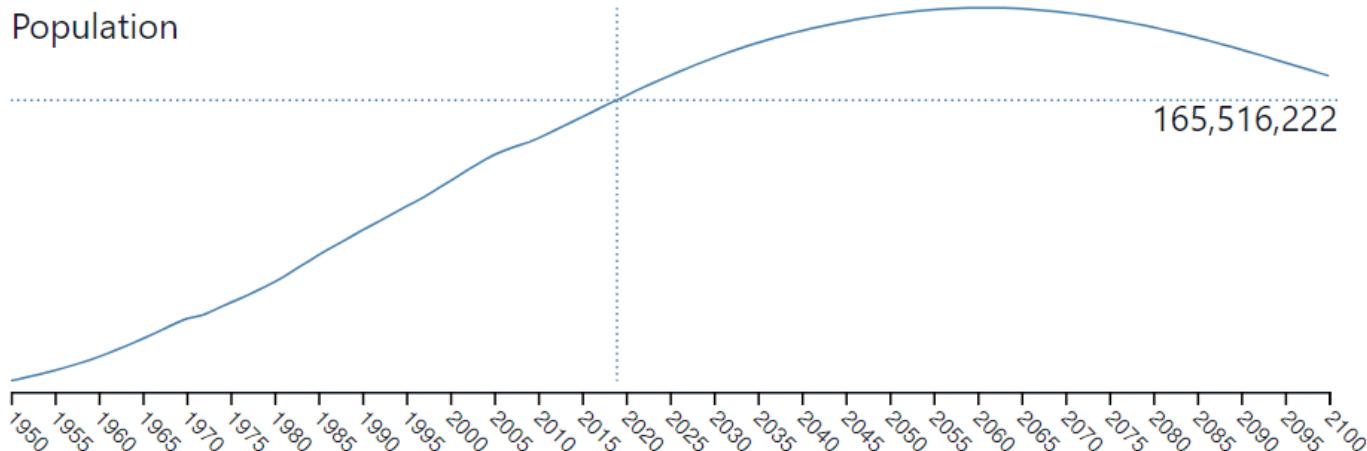
Source: U.S. Census Bureau, International Database.

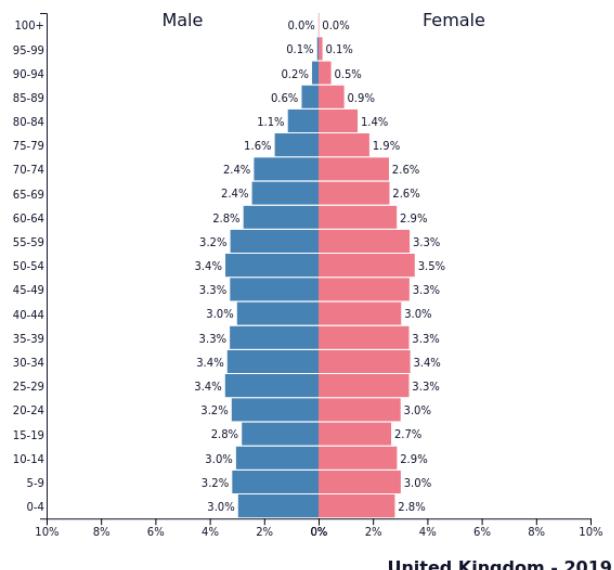


PopulationPyramid.net

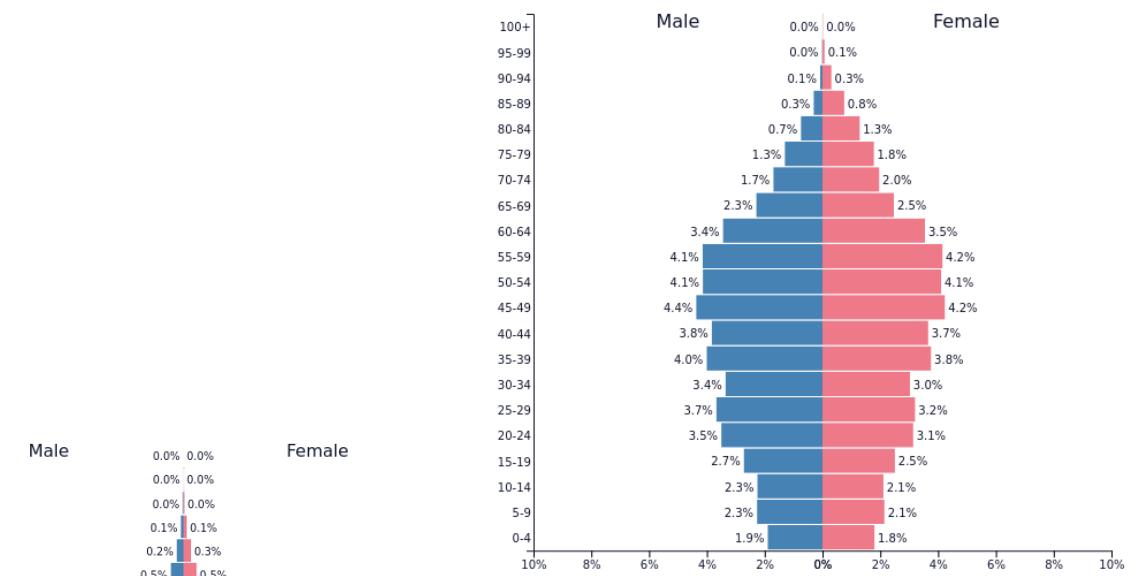
Bangladesh - 2019
Population: **165,516,222**

Population

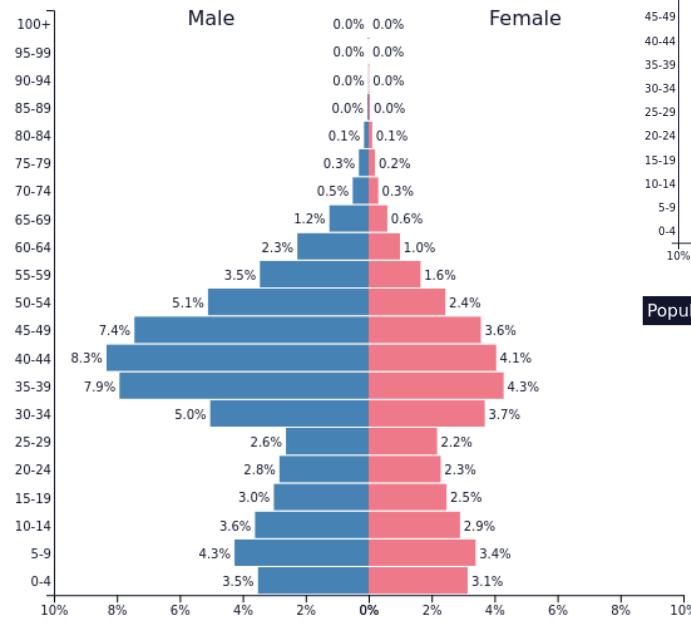




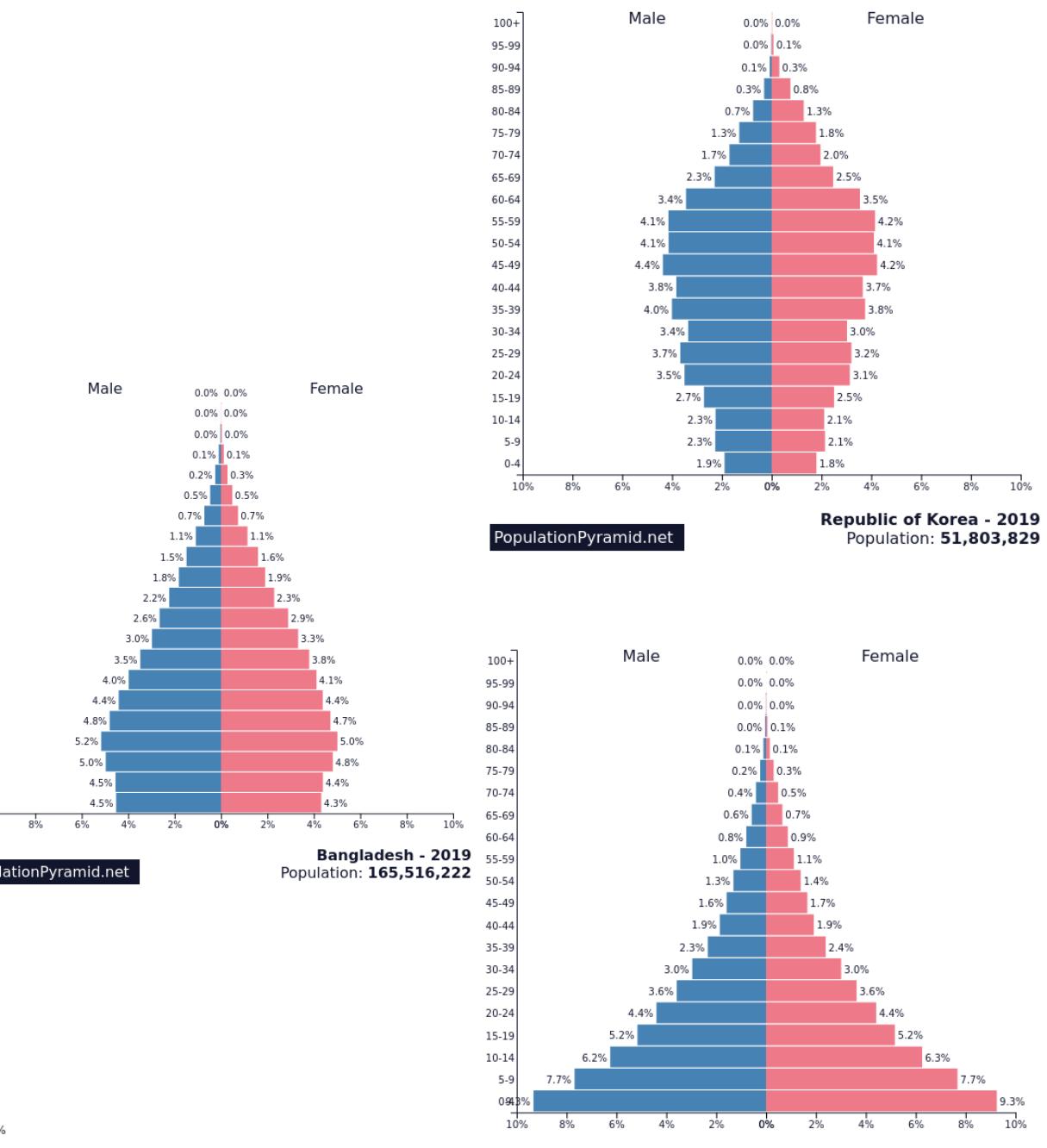
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PopulationPyramid.net



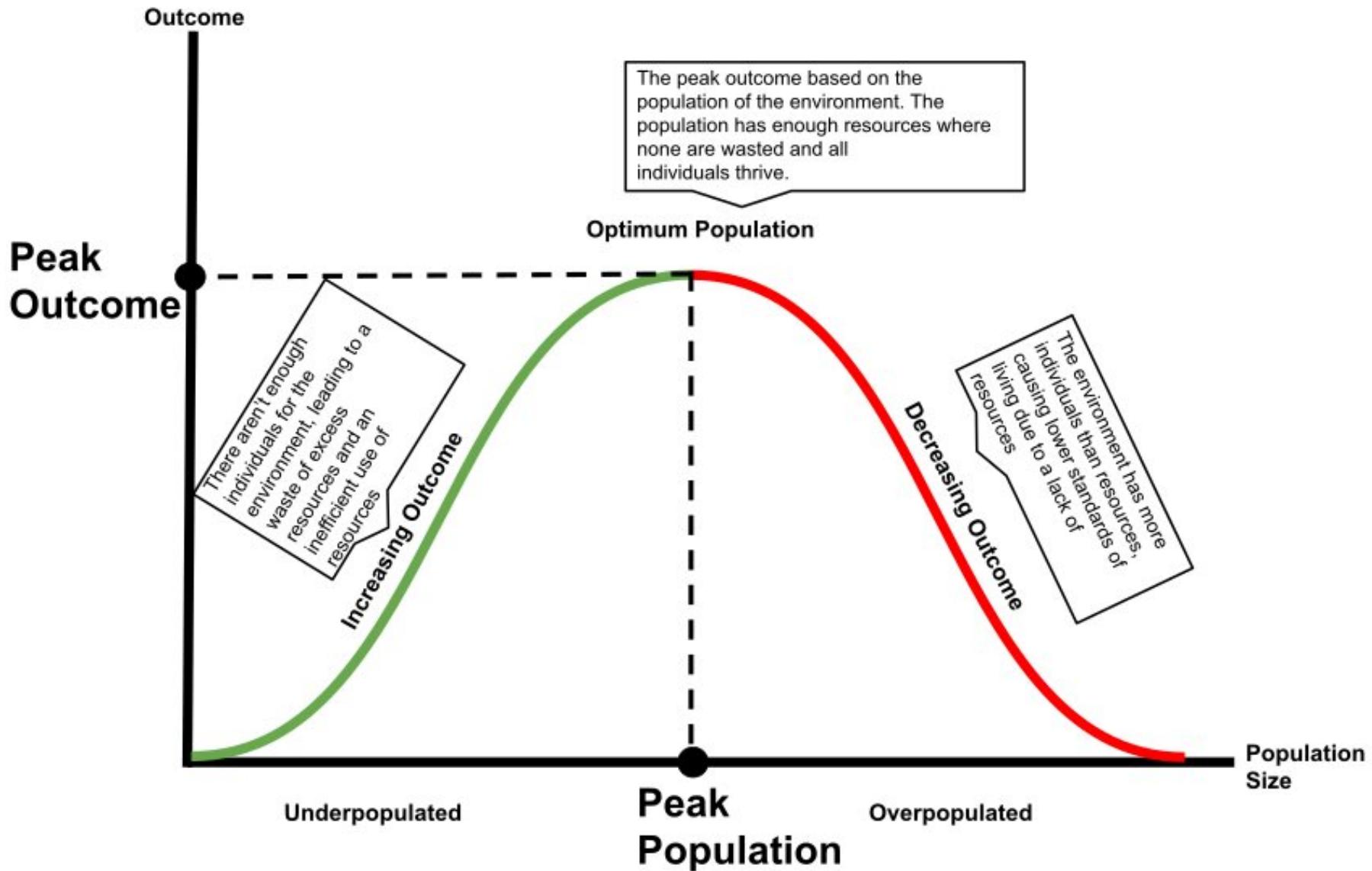
PopulationPyramid.net



PopulationPyramid.net

What is optimum population and What are the impacts of underpopulation and overpopulation?

A relationship between population and (economic) outcome



Malthusian Theory of Population Growth

The Malthusian theory of population growth is a sociological theory originally proposed by Thomas Robert Malthus to explain what he saw as the dangers of overpopulation.

Malthus first published his influential essay on population growth in 1798. Since that time, Malthusianism has been both praised and criticized for its approach to population theory.

The Malthusian Theory of Population is the theory of exponential population and arithmetic food supply growth.

He believed that a balance between population growth and food supply can be established through preventive and positive checks.

Major Elements of the Malthusian Theory

1. Population and Food Supply

The Malthusian theory explained that the population grows in a geometrical fashion. The population would double in 25 years at this rate.

However, the food supply grows in an arithmetic progression. Food supply increases at a slower rate than the population. That is, the food supply will be limited in a few years.

The shortage of food supply indicates an increasing population.

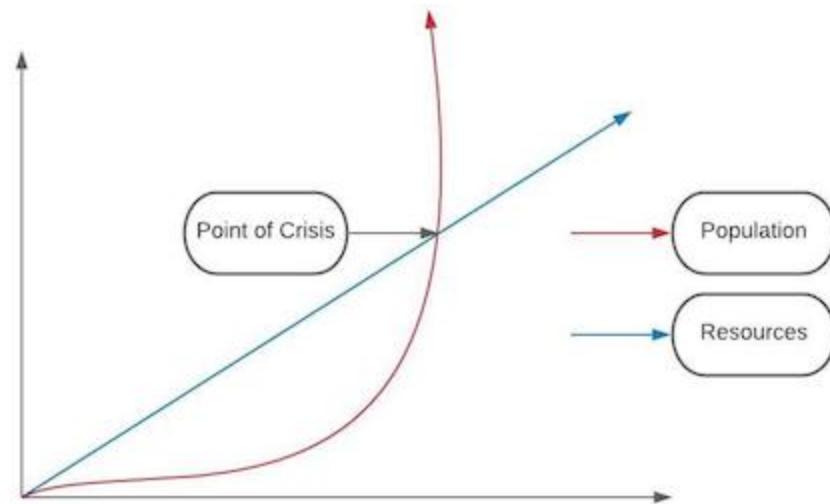
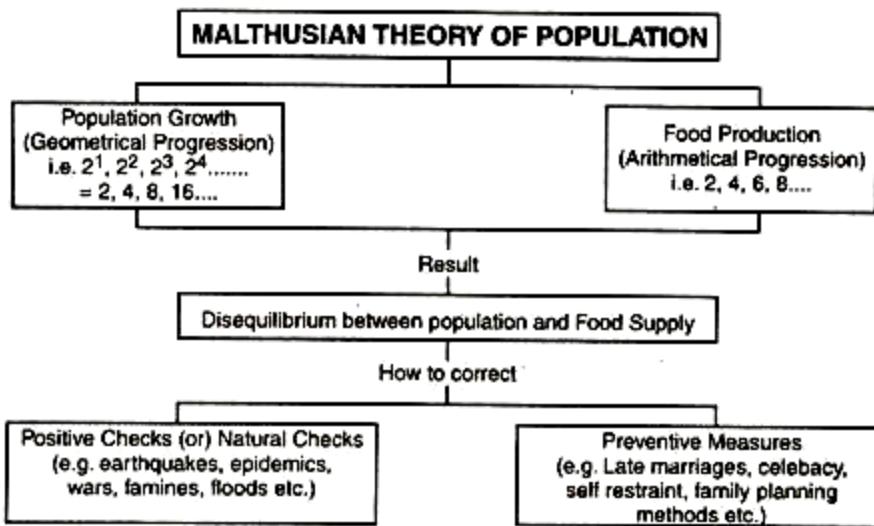
2. Checks on Population

When the increasing population rate is greater than the food supply, disequilibrium exists.

As a result, people will not get enough food even for survival. People will die due to a lack of food supply.

Adversities such as epidemics, wars, starvation, famines and other natural calamities will crop up which are named as positive checks by Malthus.

On the contrary, there are man-made checks known as preventive checks.



Criticism of Malthusian Theory of Population

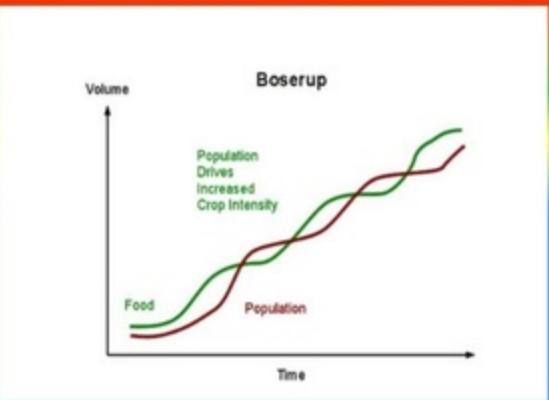
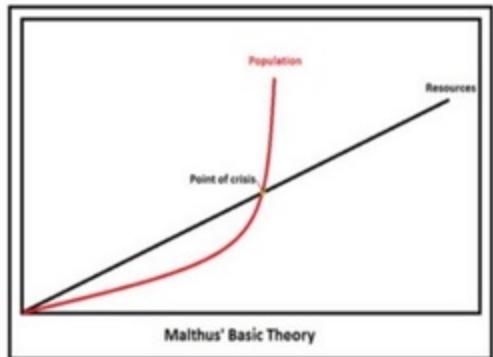
The Malthusian theory was criticised based on the following observations:

1. In Western Europe, the population was rising at a rapid rate. At the same time, the food supply had also increased due to technological developments.
2. Many times, food production had increased more than the population. For example, 2% of the total population is working in the agricultural sector in the US. Still, the total GDP is more than 14 trillion dollars.
3. Malthus's theory stated that one of the reasons for limited food supply is the non-availability of land. However, the amount of food supply in various countries has increased due to increased globalization.

Difference Between

Malthus Theory

Boserup Theory



The Malthus theory states that population growth will always outpace agriculture, and the excess people must die off.

The Boserup theory states that population growth is the catalyst for agricultural innovation.



OPTIMIST:

Ester Boserup (1910 - 1999)

Core ideas:

- When population grows and puts pressure on food supply, solutions will be found to increase food supply.
- Technology improvements and increased area of farmland will enable this increase.
- Population can continue to grow without any Malthusian positive checks.



Module III

Population and Environment - II



Lecture 3 (10 July 2024)
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**Department of Social Relations
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Topic covers:

1. Nexus between population and environment

Population and environment

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.

Does the simultaneous occurrence of population growth and environmental decline over the past century indicate that more people translate into greater environmental degradation?

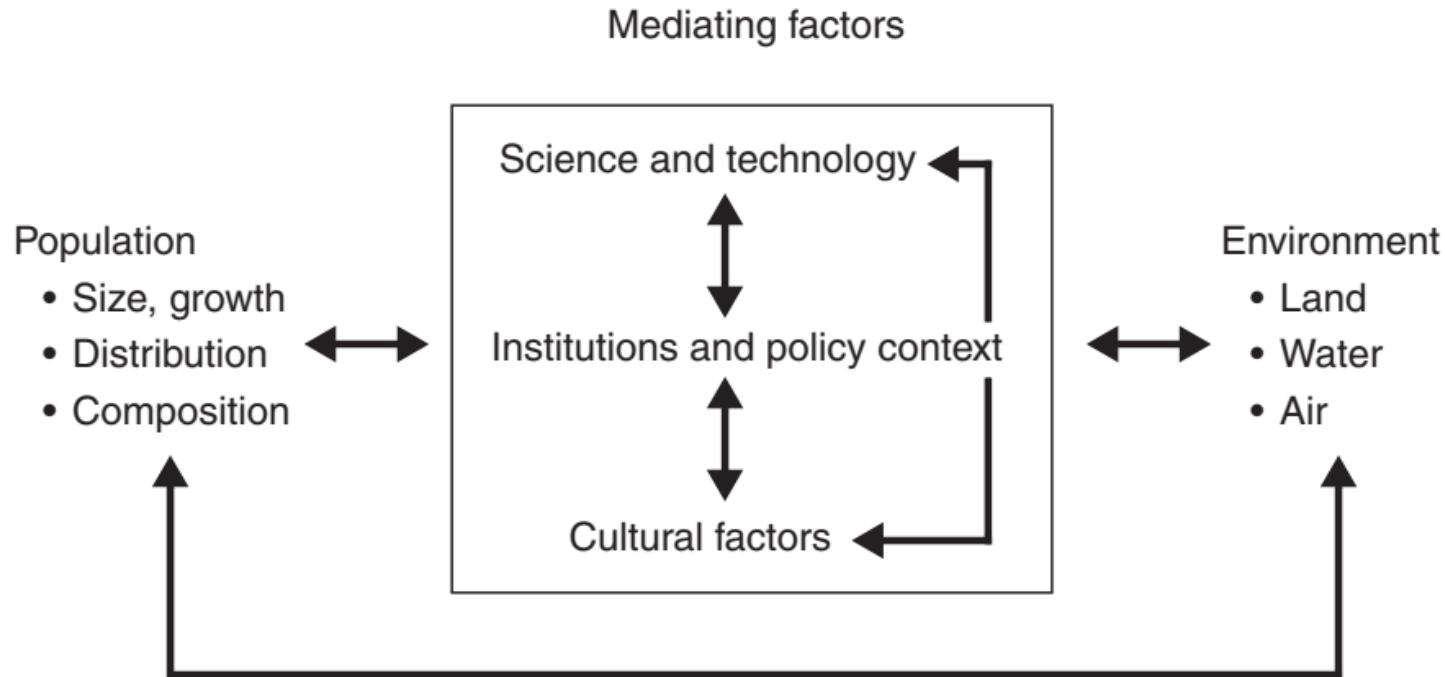
In *The Environmental Implications of Population Dynamics*, Lori Hunter synthesizes current knowledge about the influence of population dynamics on the environment. Specifically, her report examines the following:

- 1. The relationship between demographic factors:** population size, distribution, and composition — and environmental change.
- 2. The mediating factors that influence this relationship:** technological, institutional, policy, and cultural forces.
- 3. Two specific aspects of environmental change affected by population dynamics:** climate change and land-use change.
- 4. Implications for policy and further research.**

Hunter concludes that 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.

How are human population size, distribution, composition, and consumption related with environmental impacts?

RANDMR1191-1



SOURCE: Adapted from MacKellar et al., 1998.

Figure 1.1—Framework for Considering the Relationship Between Population and the Environment

Environmental Implications of Specific Population Factors

1. 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 six-fold between 1900 and 1995, more than double the rate of population growth.

2. 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.

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.

3. 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.

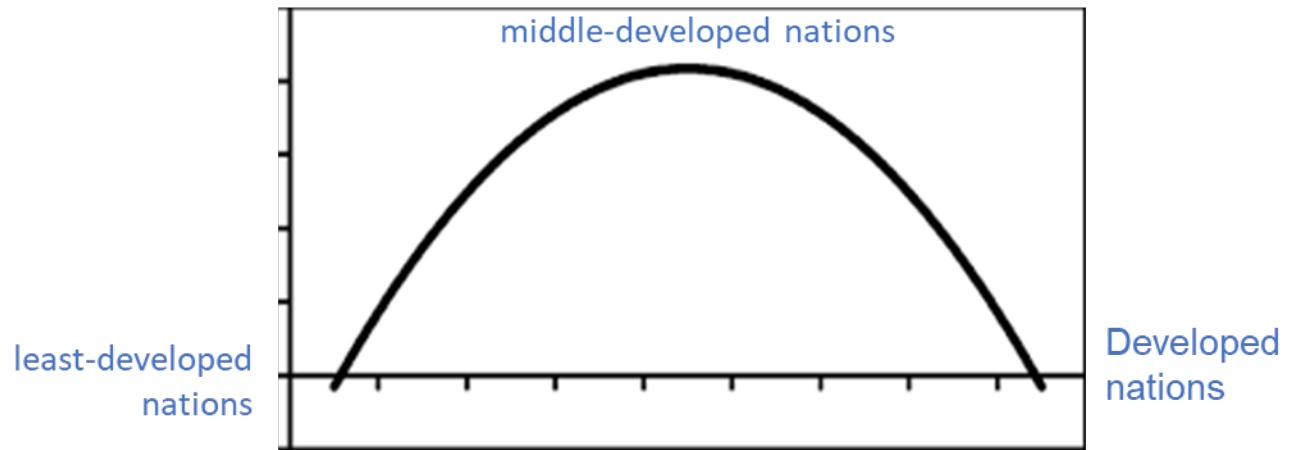


Figure: Relationship between economic development and environmental pressure

Source: Hunter, Lori M. (2000) *The environmental implications of population dynamics*

Mediating Factors:

- Technology,
- Policy Contexts
- Cultural Factors

Current technology, policies, and culture influence the relationship between human population dynamics and the natural environment.

The technological changes that have most affected environmental conditions relate to energy use. The consumption of oil, natural gas, and coal increased dramatically during the twentieth century. Until about 1960, developed nations were responsible for most of this consumption. Since then, industrialization in the newly developing nations has resulted in greater reliance on resource-intensive and highly polluting production processes.

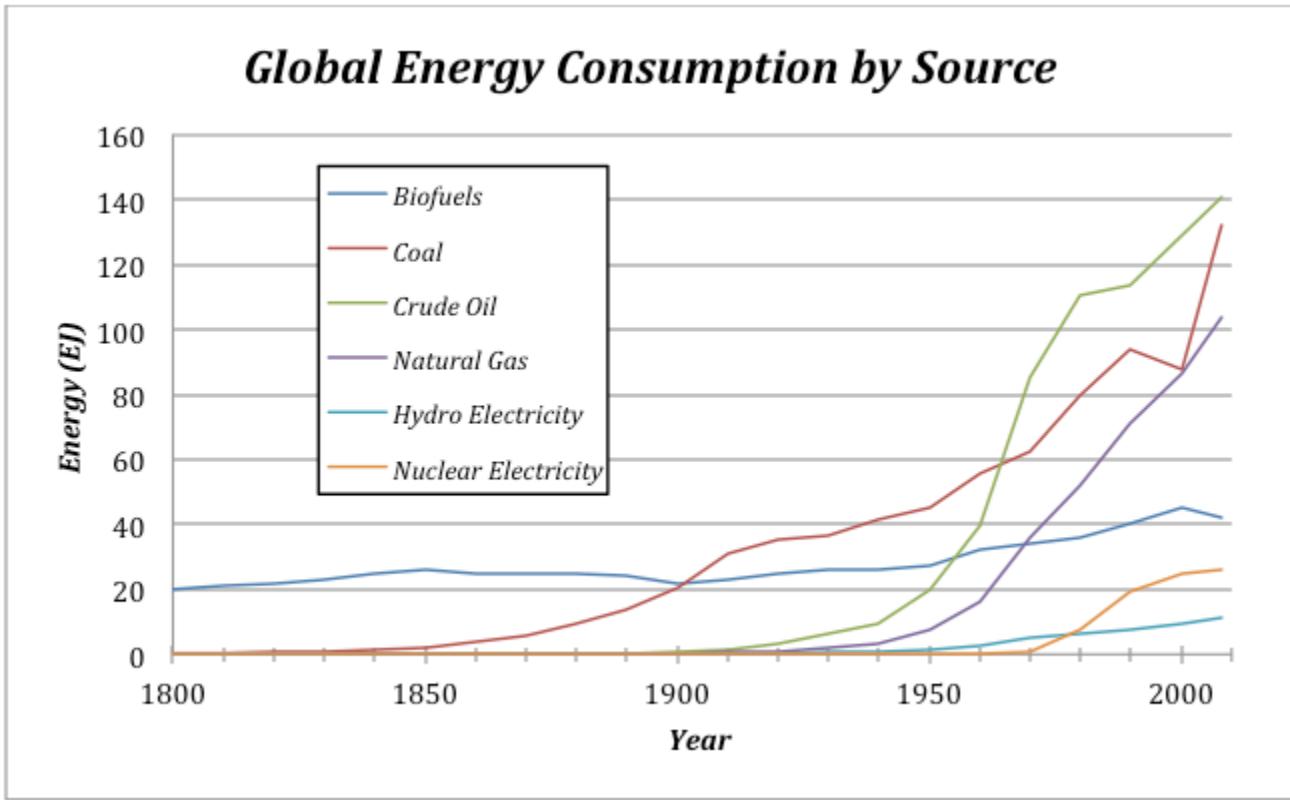


Figure: World Energy Consumption, 1800-2000.

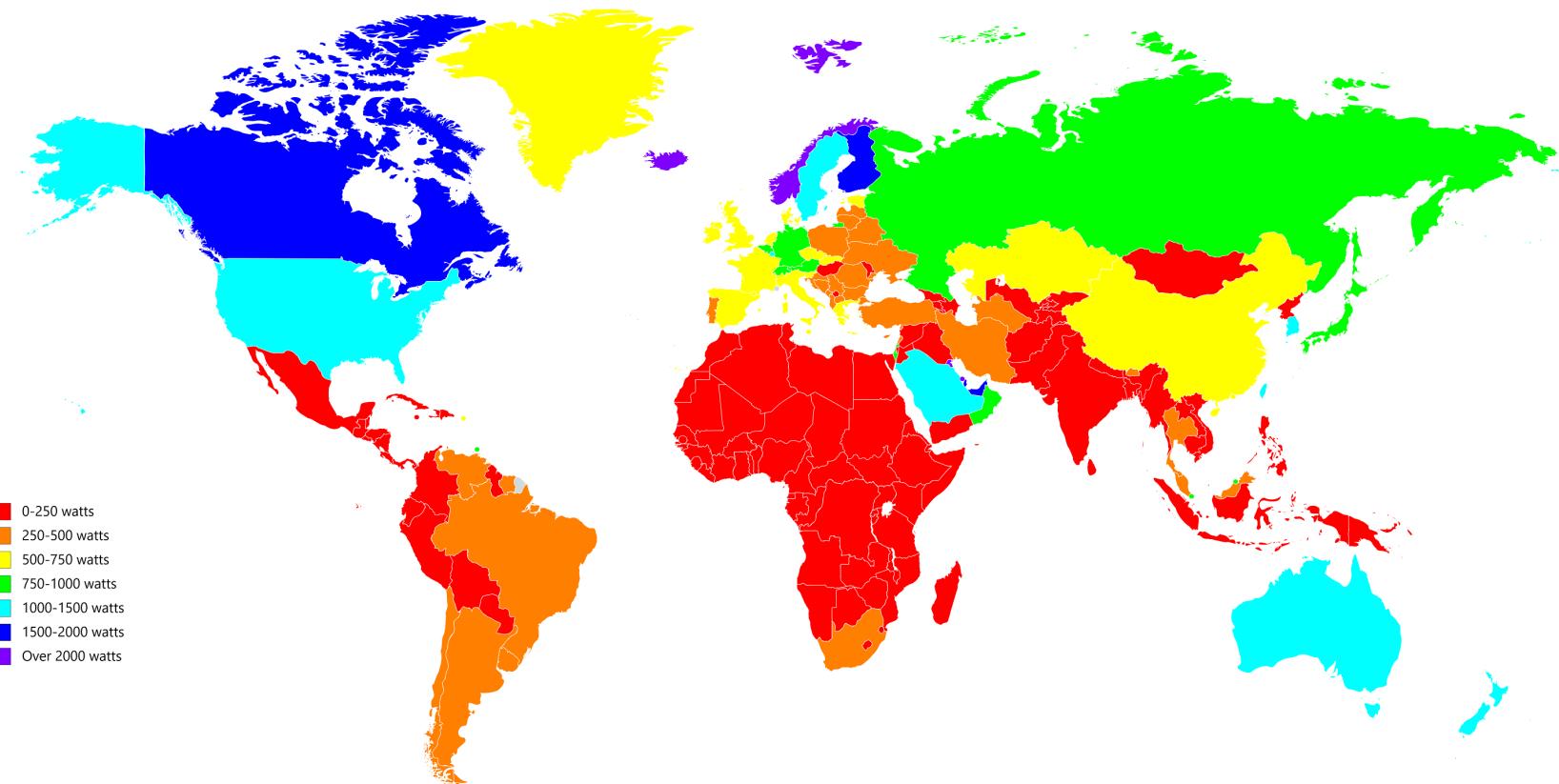


Figure: World Energy Consumption.

Decade % Incr. in Energy vs Population Change

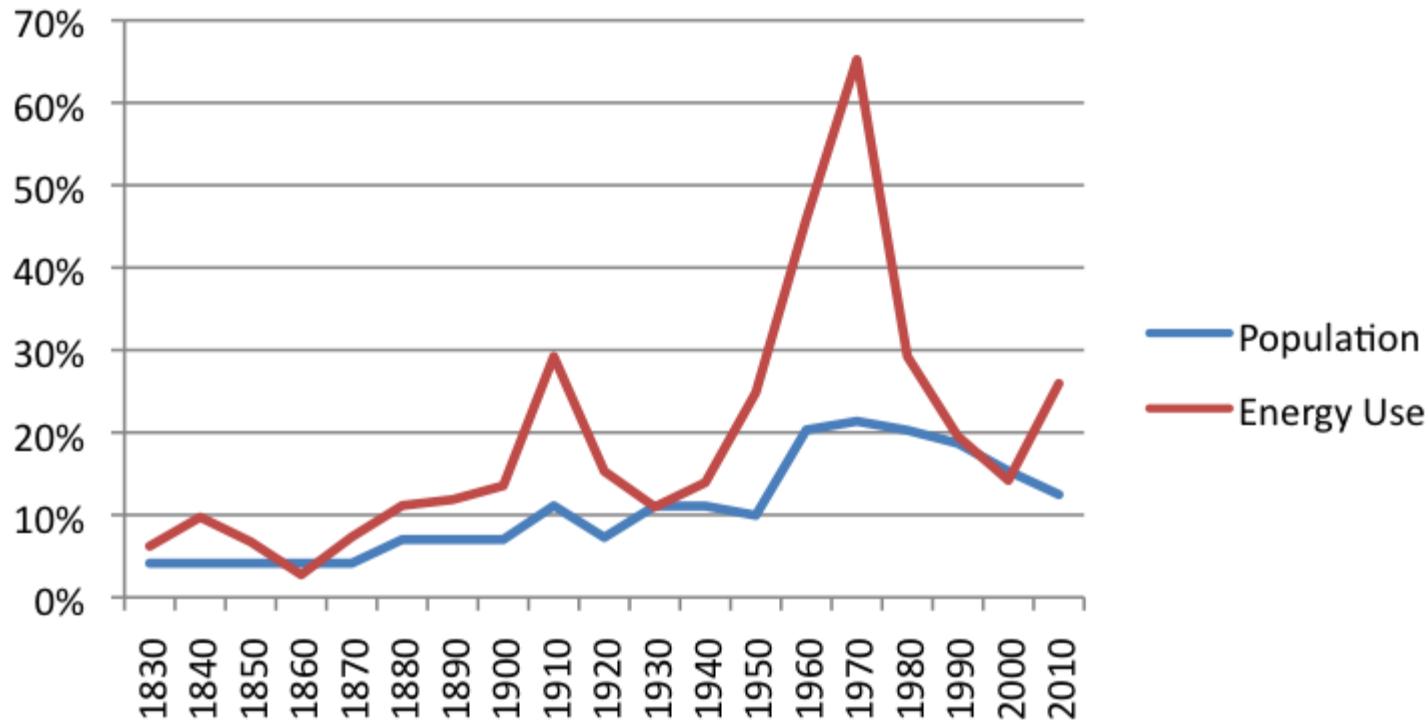


Figure: World Energy Consumption Since 1820.

Policy actions can ameliorate environmental decline — as in the case of emissions standards — or exacerbate degradation as in the case in Central Asia's Aral Sea basin, which has shrunk 40 percent since 1960 and has become increasingly contaminated, in large part because of the irrigation policies of the former Soviet Union.

Cultural factors also influence how populations affect the environment. For example, cultural variations in attitudes toward wildlife and conservation influence environmental conservation strategies, because public support for various policy interventions will reflect societal values.

Two Specific Areas of Population-Environment Interaction:

- 1. Land-Use Patterns**
- 2. 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.

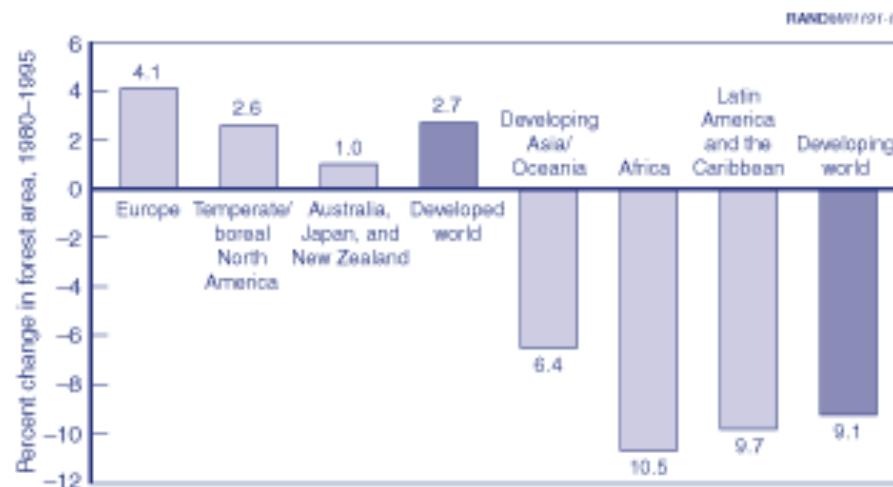


Figure: Forest Area in 1995 Compared with 1980

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:

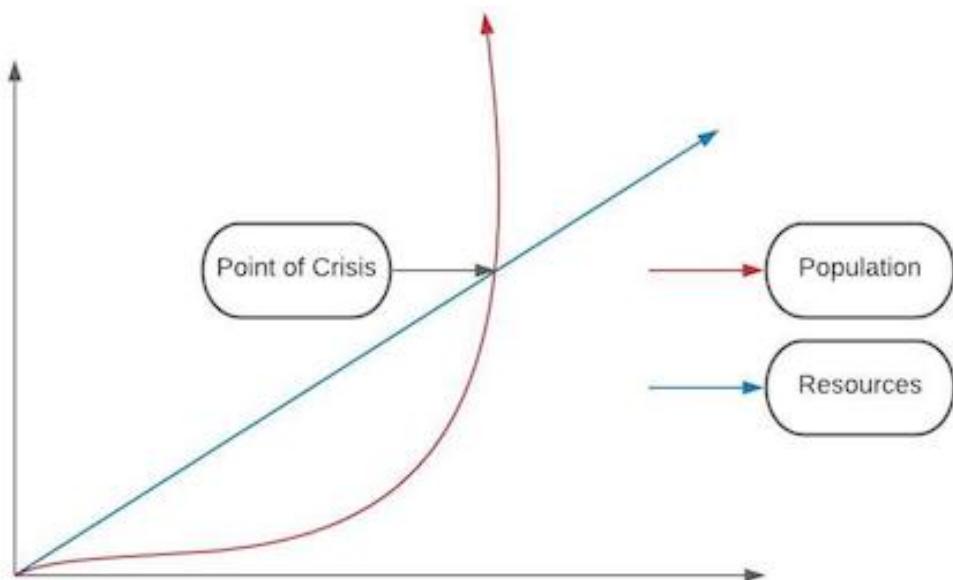
First, contributions related to industrial production and energy consumption lead to carbon dioxide emissions from fossil fuel use;

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.

The Idea that the growing population size is a threat to environment – where did this come from?



Malthusianism is the idea that population growth is potentially exponential while the growth of the food supply or other resources is linear



In 1798, **Thomas Malthus** proposed this theory

The Idea that the growing population size is a threat to environment – where did this come from?

One widely-cited formula is the "**I = PAT**" equation, proposed by Paul R. Ehrlich and John P. Holdren in 1974.

Environmental Impact = Population x Affluence (or consumption) x Technology

Environmental impact (I) can be considered in terms of resource depletion and waste accumulation;

Population (P) refers to the size of the human population;

Affluence (A) refers to the levels of consumption by that population; and

Technology (T) refers to the processes used to obtain resources and transform them into useful goods and wastes.

How do we solve the delicate problem of population change and environmental limitations?

1. A bigger pie: technical innovation
2. Fewer forks: education and policy change
3. Better manners: less is more

