CHAPTER FOUR

POPULATION GROWTH & ENVIRONMENTAL CHANGE

Madawalabu University

Rural Development and Agricultural Extension

Environment and Sustainable Development

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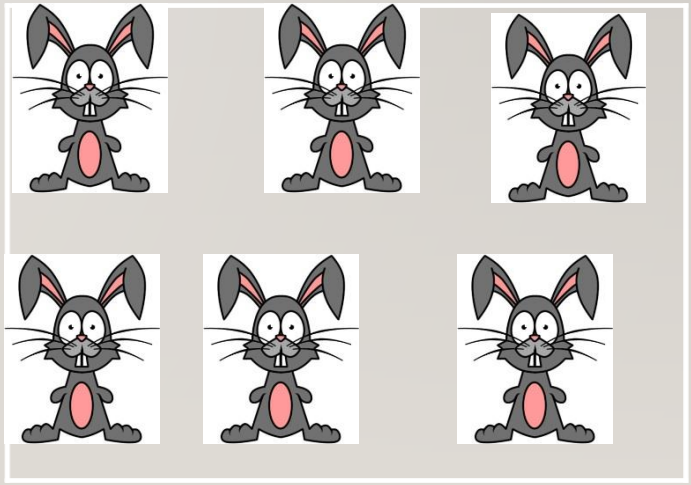
CONCEPTS

- **Population:** **all the individuals of a species that live together in an area**
- **Demography:** **the statistical study of populations, make predictions about how a population will change**
- **Three Key Characteristics of Populations**
  - **Size**;- number of individuals (N)
  - **Density**; measurement of population per unit area or unit volume
    - **Pop. Density** = # of individuals ÷ area
    - **Area =** Length X Width
    - **If the Length = 2m & With= 1m.**
    - **So the Area = 2 meters2**



INTRODUCTION

- All populations change in size with time
  - If births exceed deaths, the population grows
  - If deaths exceed births, the population shrinks
  - Only when births equal deaths does the population stay the same
  - A positive growth rate means a population is increasing.
  - A negative growth rate means it is decreasing.

POPULATION GROWTH RATE

- **Population growth rate** (**r**) is how fast a population changes in size over time.
- *Globally, population growth is shaped entirely by trends in fertility and mortality;*
- **The two main factors affecting global population growth are**
  - *Birth rate (b) and*
  - *Death rate (d).*

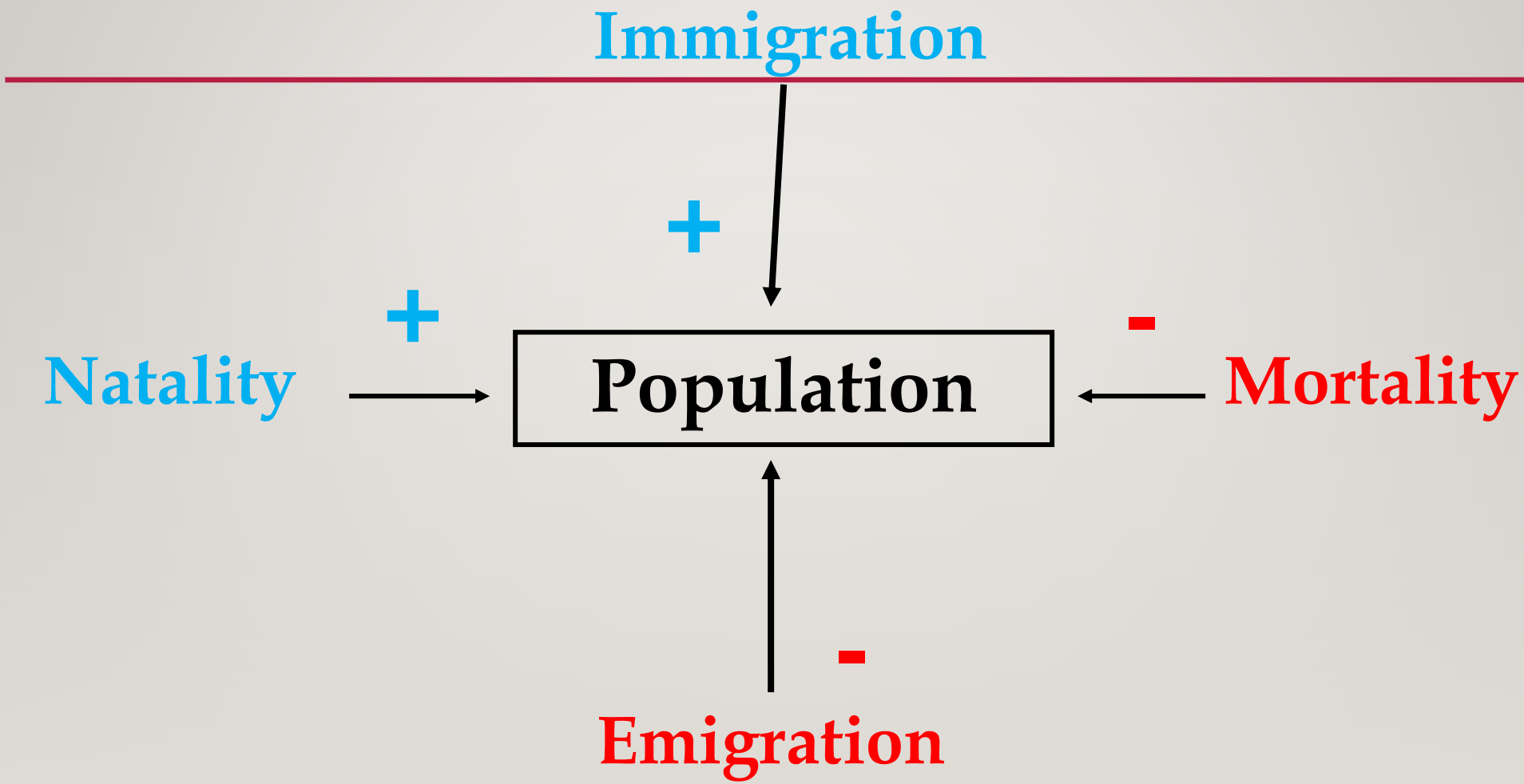
Global population growth rate (r)= b-d

- *Suppose we had a population of 100,000 individuals. Suppose in one year there were 1000 births, and 500 deaths.*
  - *What percentage of the population were births?*
    - *1000/100,000 = 0.01, or in percentage terms, this is 1% of the population.*
  - *What percentage of the population were deaths?*
    - *500/100,000 = 0.005, or in percentage terms, this is 0.5% of the population.*

POPULATION GROWTH RATE

- However, at the national or regional level, international migration can also play an important part.
- So Population growth at national level may also be affected ***(immigration, i) & (emigration, e)***
  - **Immigration** (i);- people coming into the population from somewhere else
  - **Emigration** (e). or leaving the population for another area
- (The formula for population growth takes all these factors into account.
- **r = (b + i) - (d + e)**
  - r = population growth rate
  - b = birth rate
  - i = immigration rate
  - d = death rate
  - e = emigration rate

Factors That Affect Population Growth



CRUDE BIRTH RATE & CRUDE DEATH RATE

- The CBR and CDR are determined by **taking the total number of births or deaths in a population and dividing both values by a number to obtain the rate per 1,000.**

- 1. **Crude Birth Rate**; *Annual number of live births per 1000 population*
  - **CBR= (Number of live births / Estimated midyear Population) * 1,000.**
    - *Considered 'high' – 30 > per 1000*
    - *Considered 'low' – 18 < per 1000*
    - *Transitional birth rates – 18 to 30 per 1000*
- **2. Crude Death Rate**; Annual number of events per 1000 population
  - CDR= (Number of deaths / Estimated midyear population) * 1,000
    - *'High' = > 20 per 1000*
    - *'Low' = <10 per 1000*

POPULATION GROWTH TREND

- **Earth's Human Population Growth Trends**
  - Before 1960= world population is below 3 billion
  - In 1960 = 3 billion;
  - 1975 = 4 billion;
  - 1987 = 5 billion
  - 2002 = 6.3 billion (1.3 Billion People added in 15 years)
  - 2017=7.6 billion (1.3 Billion People added in 15 years)
  - Currently, the world population is 8 billion and UN projection for 9.7 billion in 2050 and 10.9 billion in 2100
  - Over 90 million people are added to world's population every year.

SPATIAL PATTERNS OF POPULATION GROWTH

- Most of the world's low-income countries are experiencing rapid population growth.
- **Asia**
  - It is home to 60 per cent of the world's population of 7.8 billion in 2020
  - It account about 4.3 billion of which 1.4 billion lived in China and 1.4 billion were in India.
- **Sub-Saharan Africa**
  - Comprising about 1.1 billion people in 2020 or 14 per cent of the global population.
  - Currently growing at an annual rate of 2.6 per cent, more than twice the global average of 1.1 per cent per year.
- **Europe and Northern America**
  - The number of persons residing in Europe and Northern America is now stabilizing.
  - Their combined population is projected to grow more slowly than the world average or1.1 per cent per year.

CAUSES OF RAPID POPULATION GROWTH

- The unprecedented growth of the global population that has occurred since 1960 is **the result of two trends:**
  - Gradual increase in average human longevity
  - On the other hand, the persistence of high levels of fertility in many countries.
- Various social and economic changes have led to higher standards of living and a healthier life in general.
- So, widespread improvements in public health, nutrition, personal hygiene and medicine resulted in life expectance increment

WHY POPULATION GROWTH MATTERS?

- **Humans are the dominant agent of environmental change**
- **In the past, population growth was a gradual phenomenon and the Earth's ability to replenish resources was capable of adjusting to this increase.**
- **In the recent past, the escalation in growth of human numbers has become a major cause of our environmental problems.**
- **So bigger population has put bigger pressure on environment and increased the demand for the earth's resources.**
- **Increasing population**
    - **More food must be produced**
    - **More water for drinking and agricultural purposes**
    - **More materials to provide shelter and so on.**

WHY POPULATION GROWTH MATTERS?

- **THE EARTH IS FINITE**
  - Population growth and natural resources are intricately linked
  - In the last decade food production from both land and sea has declined relative to population growth.
  - The area of agricultural land has shrunk, both through soil erosion and reduced possibilities of irrigation.
  - The availability of water is already a constraint in some countries.
  - These are warnings that the earth is finite, and that natural systems are being pushed ever closer to their limits.

WHY POPULATION GROWTH MATTERS?

- The growth and decline of population affects the availability of natural resources
- Humans and all living organisms rely on the basic resources found in the earth's environment for their very survival.
- Paramount among these resources are fertile land, fresh water, energy, and biodiversity.
- Resource use, waste production and environmental degradation are accelerated by population growth.

POPULATION THEORY

- **Malthus Theory**
- **Boserup's theory**

THOMAS MALTHUS

- 1766-1834.
- He is an English economist and demographer
- **Wrote 'An essay in the First Principle of population' first published in 1798**
- Two hundred years ago his ideas *were very revolutionary and controversial*
- World population in 1798 =9 million, now surpassed 6 billion

MALTHUS THEORY:

The Core Principles of Malthus

1) **Food is necessary for human existence**
2) **Human population grows faster than our ability to produce food**
3) **Humans usually don't limit their population size voluntarily - "preventive checks" in Malthus' terminology.**

- *Malthus recognized that population if unchecked, grows at a geometric rate:*

  1 2 4 8 16 32

- *However, food only increases at an arithmetic rate, as land is finite.*

  1 2 3 4 5 6

MALTHUS THEORY:

The Core Principles of Malthus

- Poverty was the natural consequence of population growth
  - ***As population increases, food prices rise (excess demand), wages fall (low employment opportunities), poverty -increases***
- Anything that raises the income of the poor (e.g., poor law payments) would raise the birth rate
  - *Hence, it's impossible to raise the income of the poor; don't try*

MALTHUS THEORY:

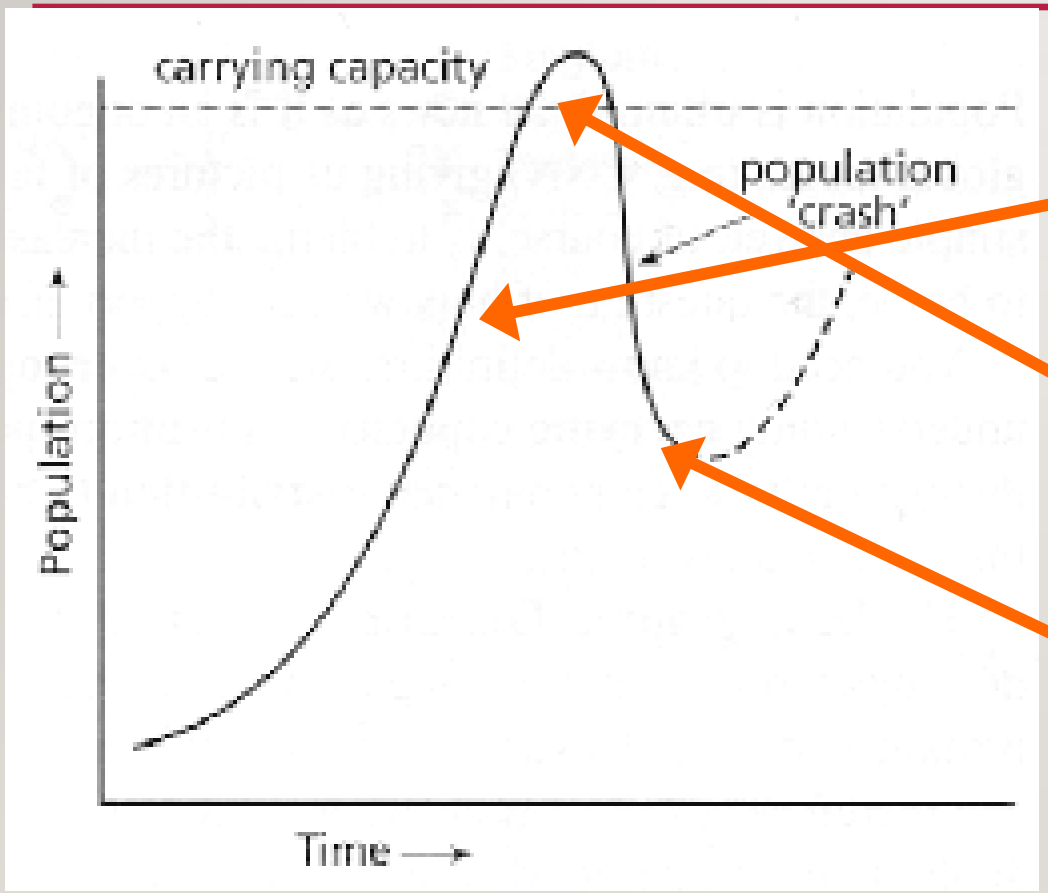
Population Growth Checks

- Checks are natural method of population control

- **Negative Checks (Decreased Birth Rate)**
  - It includes abstinence/ postponement of marriage which lowered the fertility rate.
  - Malthus favoured moral restraint (including late marriage and sexual abstinence) as a check on population growth.
- **Positive Checks (Increased Death Rate)**
  - It is the way to reduce population size by events such as famine, disease, war - increasing the mortality rate and reducing life expectancy

MALTHUS THEORY

Population Checks of Malthus theory



Population grows geometrically….

Population exceeds carrying capacity…

Population is kept in "check"– preventative and/or positive checks

MALTHUS THEORY:

Critics of Malthus

- There has been a population explosion in Africa – repeated famines, wars, food crisis, environmental degradation and disastrous floods occur
- Malthus did not realize that economic development can bring down the birth rate.
- In some countries food production had increased more than the population due to agricultural technology innovations
- He is pessimistic about science and innovation solving problems from increasing population
- Positive measures suggested by Malthus are morally unacceptable.

BOSERUP'S THEORY

- **Ester Boserup 1965**
- **Born in Copenhagen on May 18, 1910,**
- **She was a Danish Economist.**
- **She studied economic and agricultural development**
- **She also wrote a book in 1965 titled "*The Conditions of Agricultural Growth: The Economics of Agrarian Change Under Population Pressure*"**
- **She is known for her theory of agricultural intensification, also known as Boserup's theory,**

BOSERUP'S THEORY

- Boserup admits that overpopulation can lead to unsuitable farming practices which may degrade the land
  - e.g. population pressure as one of the reasons for desertification in the Sahal region (so fragile environments at risk)
- But, she believed that people have the resources of knowledge and technology to increase food supplies.
- In simple terms, Boserup suggested that the more people there are, the more hands there are to work;
- More intensive systems and used when the population grew.
- Demographic pressure promotes innovation (irrigation, weeding, crop intensification, better seeds, tools, and techniques)
- The changes in technology allow for improved crop strains and increased yields.

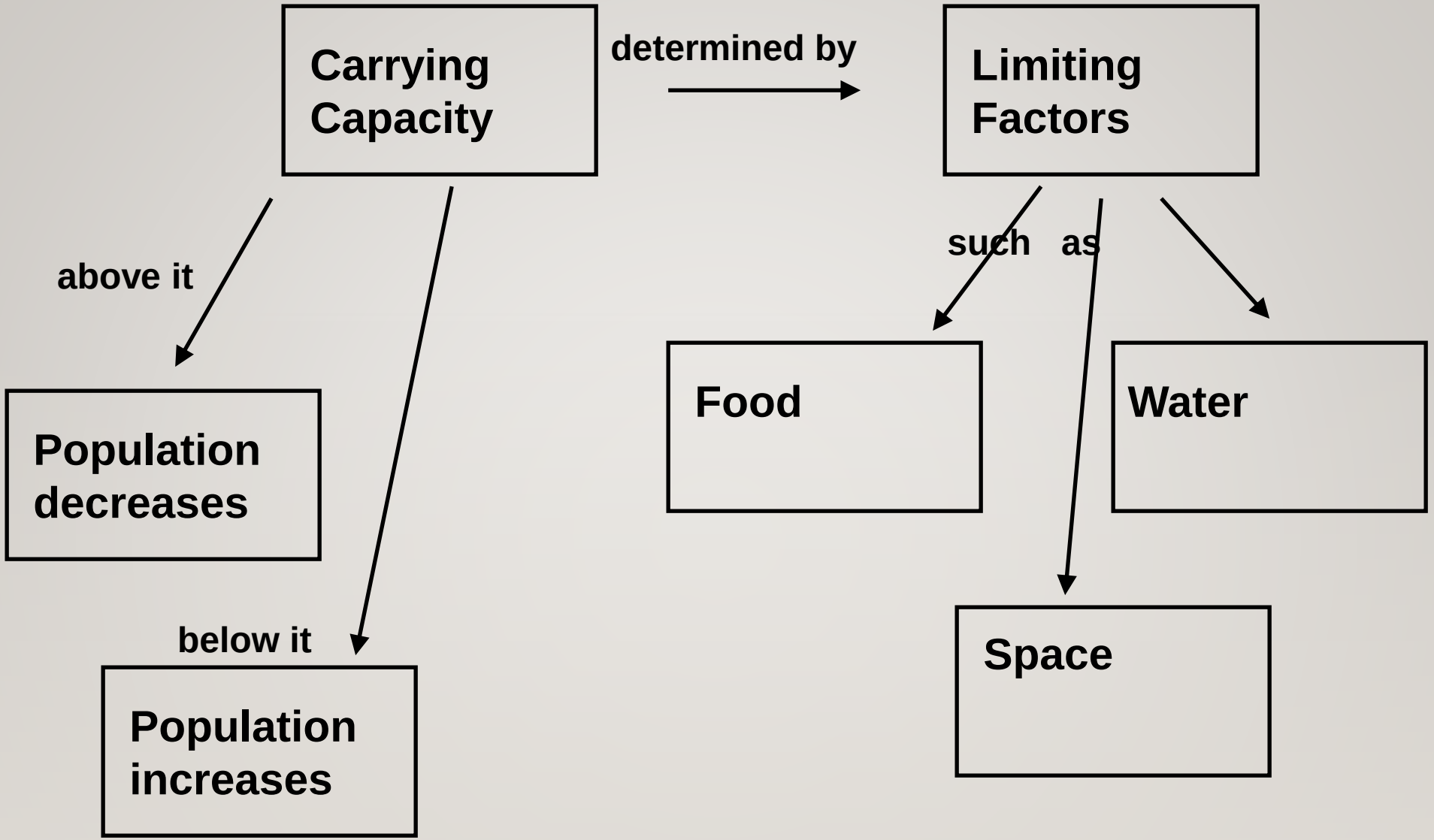
BOSERUP'S THEORY

- *Advantages of larger population*

  - Encourages division of labor, leading to more efficient production of goods
  - Allows economies of scale, development of infrastructure (e.g., irrigation systems, transportation networks)
  - Supports the growth of cities, more complex societies
  - More people =s more potential inventors of new technology (Simon)

CARRYING CAPACITY

- **Carrying capacity can be defined as a species' average population size in a particular habitat.**
- **It also refers to the maximum number of individuals (of that species) that the environment can carry and sustain,**
- **The species population size is limited by environmental factors like adequate food, shelter, water, and mates.**
- **If these needs are not met, the population will decrease until the resource rebounds.**


Carrying Capacity
determined by
Limiting Factors
above it
such as
Population decreases
Food
Water
Space
below it
Population increases