POPULATION GROWTH

Concept

- In human geography, population growth is the increase in the number of individuals in a population.
- Population growth (positive or negative) is caused exclusively by the operation of fertility, mortality, and migration.
- Human population growth depends on the rate of natural increase, or the fertility rate minus the mortality rate, and net migration. The basics of demography can be reduced to this formula:

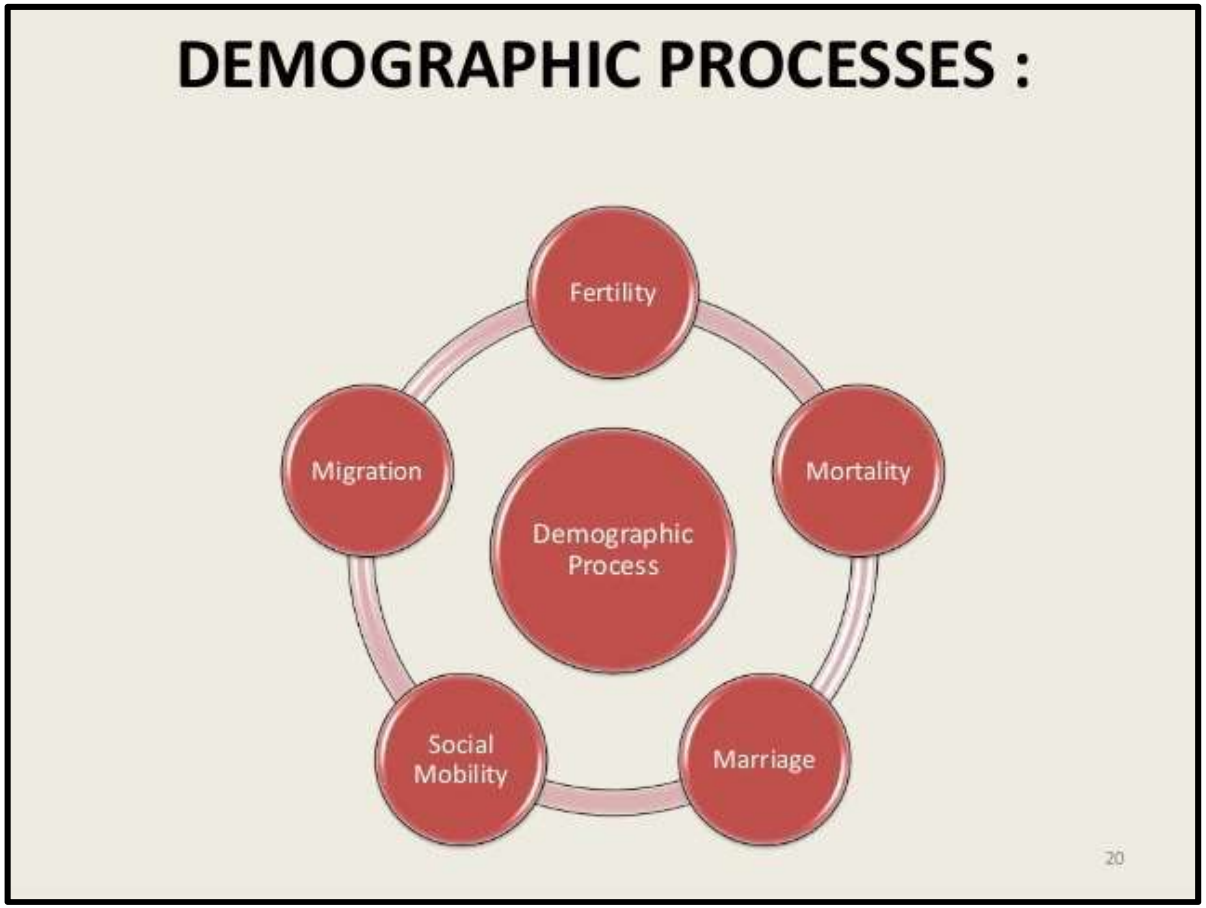
(Births – Deaths) +/- ((In-Migration) – (Out Migration)) = Population Change.

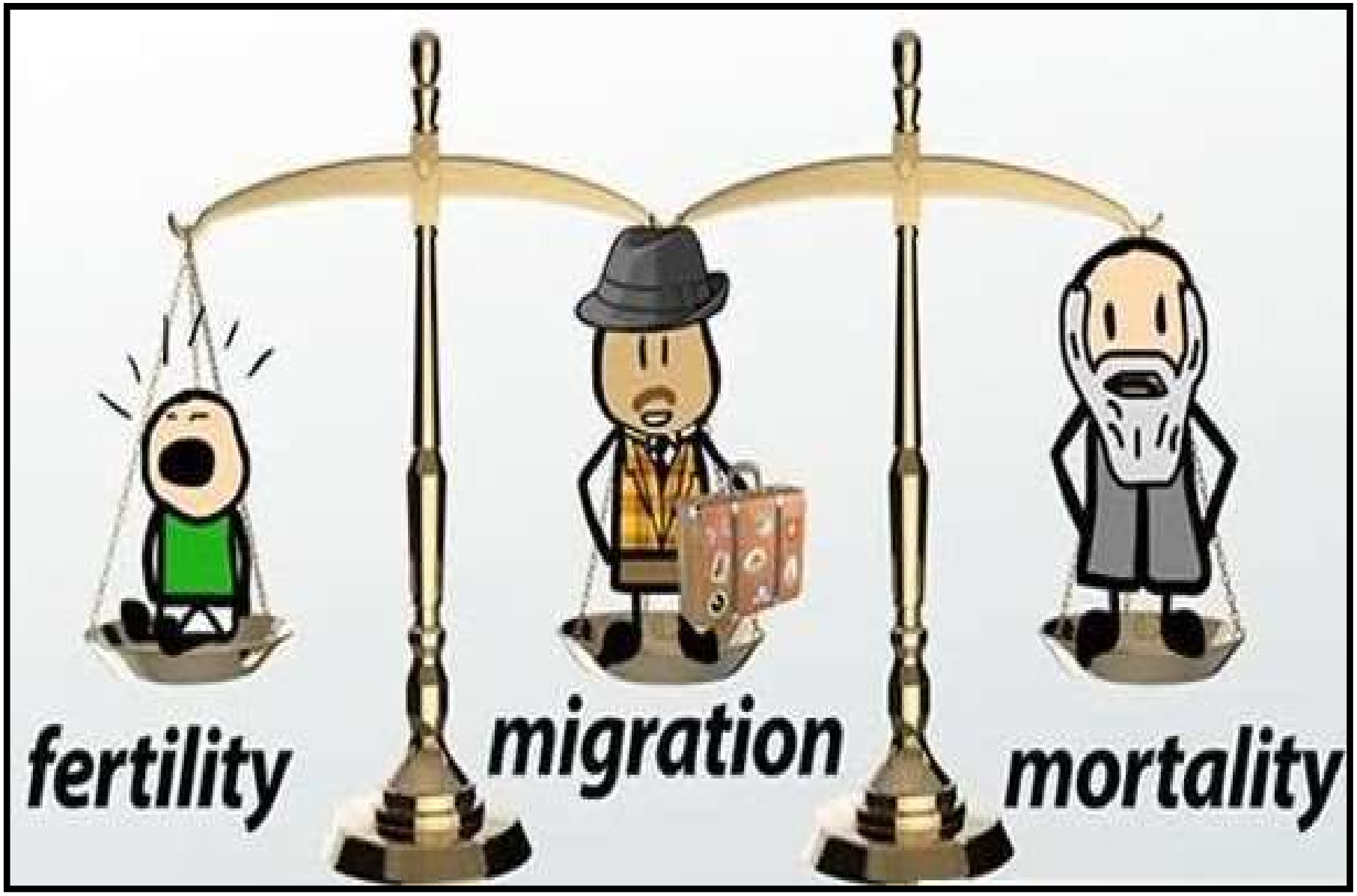
Determinants of Population Growth

Fertility

Mortality

Migration




fertility
migration
mortality

Fertility

- Fertility — occurrence of birth per year — is one of the most important indicators of population growth.

- Fertility is a general term with many varieties. But two most important measures of fertility are **Crude Birth Rate (C.B.R.)** per year and **General Fertility Rate (G.F.R.)** per year.

- **Crude birth rate** is the number of birth per year per thousand, expressed by the formula: **CBR = B/P × 1,000**

  where B is number of birth/year and P is the total population. This measure gives us the idea of net increase of population per year in a region.

- **The General Fertility Rate or G.F.R**. is, however, considered only for reproductive females. It is expressed by the formula: **GFR = B/P × 1,000**

  where B is the no. of birth per year while P refers to the number of productive women.

Mortality

- Mortality is the passing away of living being, expressed by **crude death rate (C.D.R.)** per thousand per year, i.e.,CDR = D/P × 1,000

  where D is the number of deaths per year and P is the number of population.

- Mortality is a vital determinant of population growth and indicates general health, living standard, economic condition, nutrition and degree of development of the respective society.

- Low mortality rate reflects improved health facility, low child mortality, and effective preventive measures against epidemics.

Migration

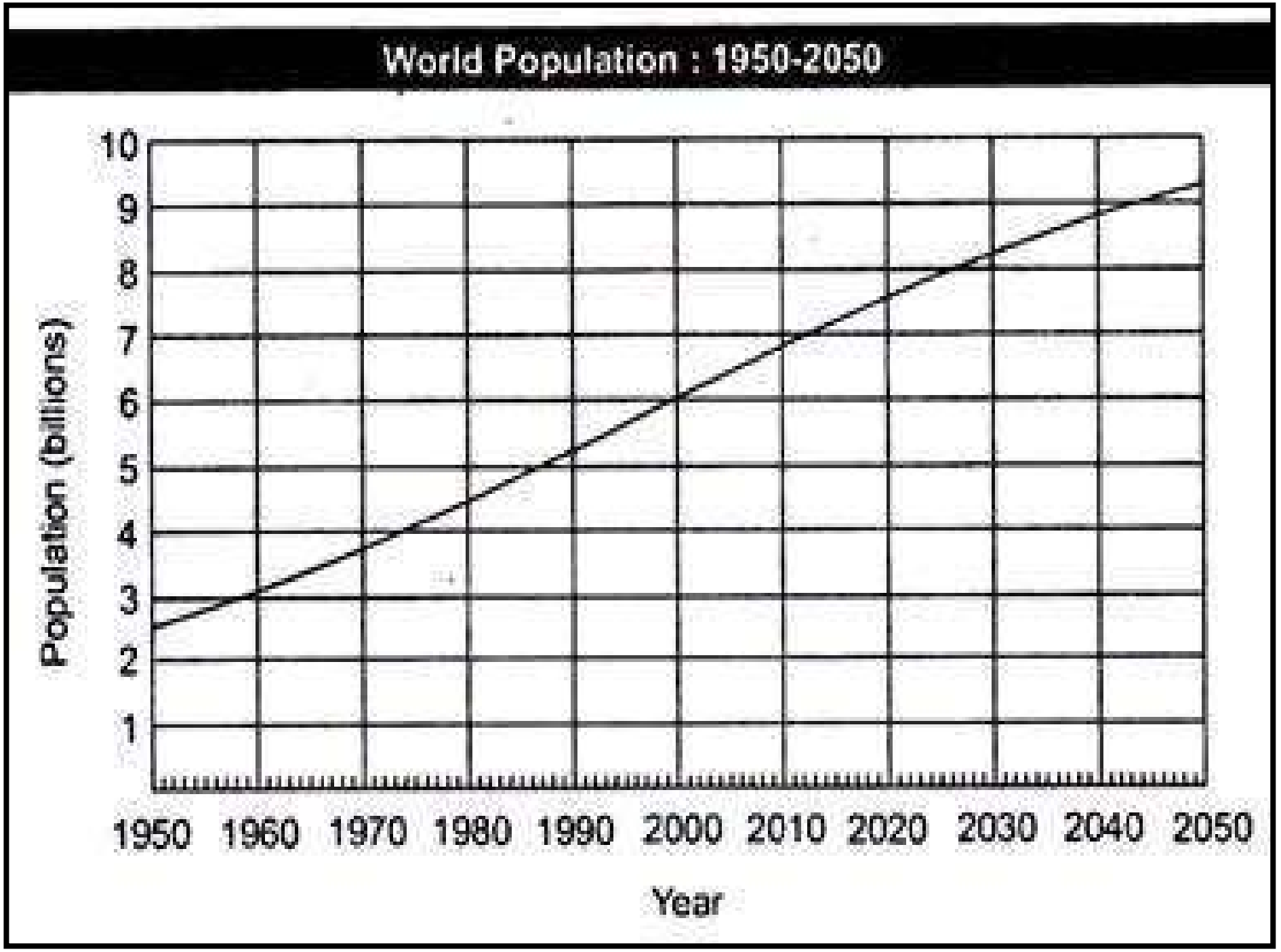
- Migration is shifting of people from one place to another for residential and occupational reasons.
- Migration may be of two types — in migration or **immigration** and out-migration or **emigration**. Migration, therefore, is reallocation of human resources that eventually disrupts normal population growth.
- Push factors are liable for out-migration which includes war, famines, political unrest, economic disorder, ethnic conflict etc. Pull factors invite in-migration when more financial opportunities and political stability exist at a region.

History and Evolution of Global Population Growth

The origin of Homo sapiens and Paleolithic man dates back to 1 million years. Since then, growth of world population had gone through several transformations. The entire history of human population growth can be sub-divided into 4 major phases.

These are:

1. Pre-historic phase — up to 6,000 B.C.
2. Neolithic phase – 6,000 B.C. to 0 B.C.
3. Historical phase — 1 A.D. to 1650
4. Modern phase — 1650 onwards.


World Population : 1950-2050
Population (billions)
10
9
8
7
6
5
4
3
2
1
1950
1960
1970
1980
1990
2000
2010
2020
2030
2040
2050
Year

Pre-historic Phase — up to 6,000 B.C.

- The growth of population was restricted by constant fierce battle with hostile environment, epidemics, hunger etc.
- After the end of glacial age, at 10,000 B.C., human population possibly reached 100,000 to 1 million mark.
- Since then, human race started to migrate to different corners of the globe.

Neolithic Phase — 6,000 B.C. to 1 A.D.

- This period witnessed comparatively larger population growth and population increased to 5 million in 6,000 B.C., and to 256 million in 1 A.D.

- In this period, the development of agriculture and livestock ranching encouraged spread of population from Mediterranean and South-West Asia to Central Asia, China, India and even in Far East Asia.

- To combat famines and epidemics, population growth rate was very high, along with high mortality rate from 6,000 B.C. to 0 A.D.

Historical Phase— 1 A.D. to 1650 A.D.

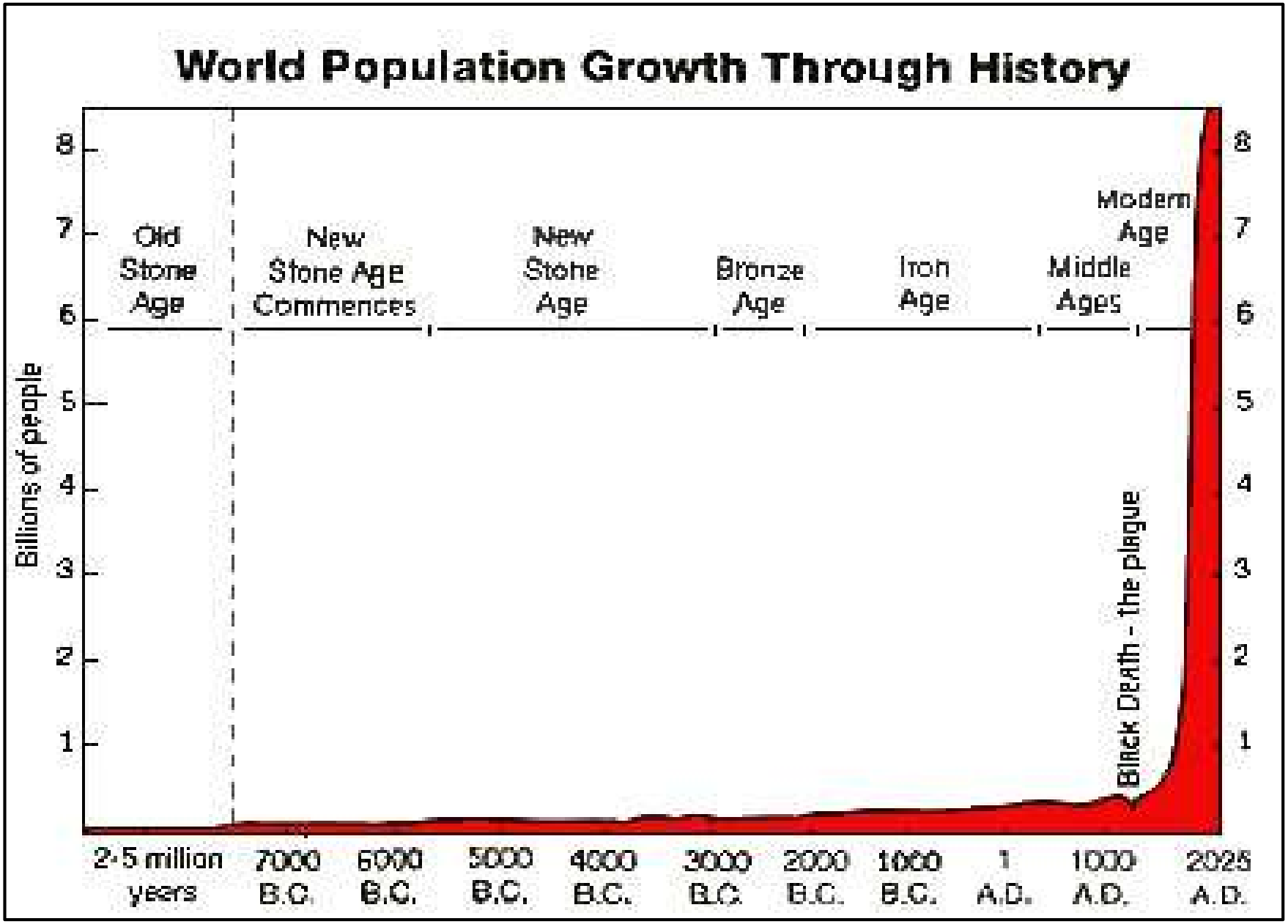
- At the beginning of Christian era, agricultural practices were well-entrenched in large parts of the world.
- The estimated population of 256 million in 1 A.D. increased to 400 million in 1300 A.D. It finally rose to 500 million in 1650 — at the start of Industrial Revolution.
- The entire period (1 A.D. to 1650 A.D.) had experienced population growth rate of 0.1% per annum.

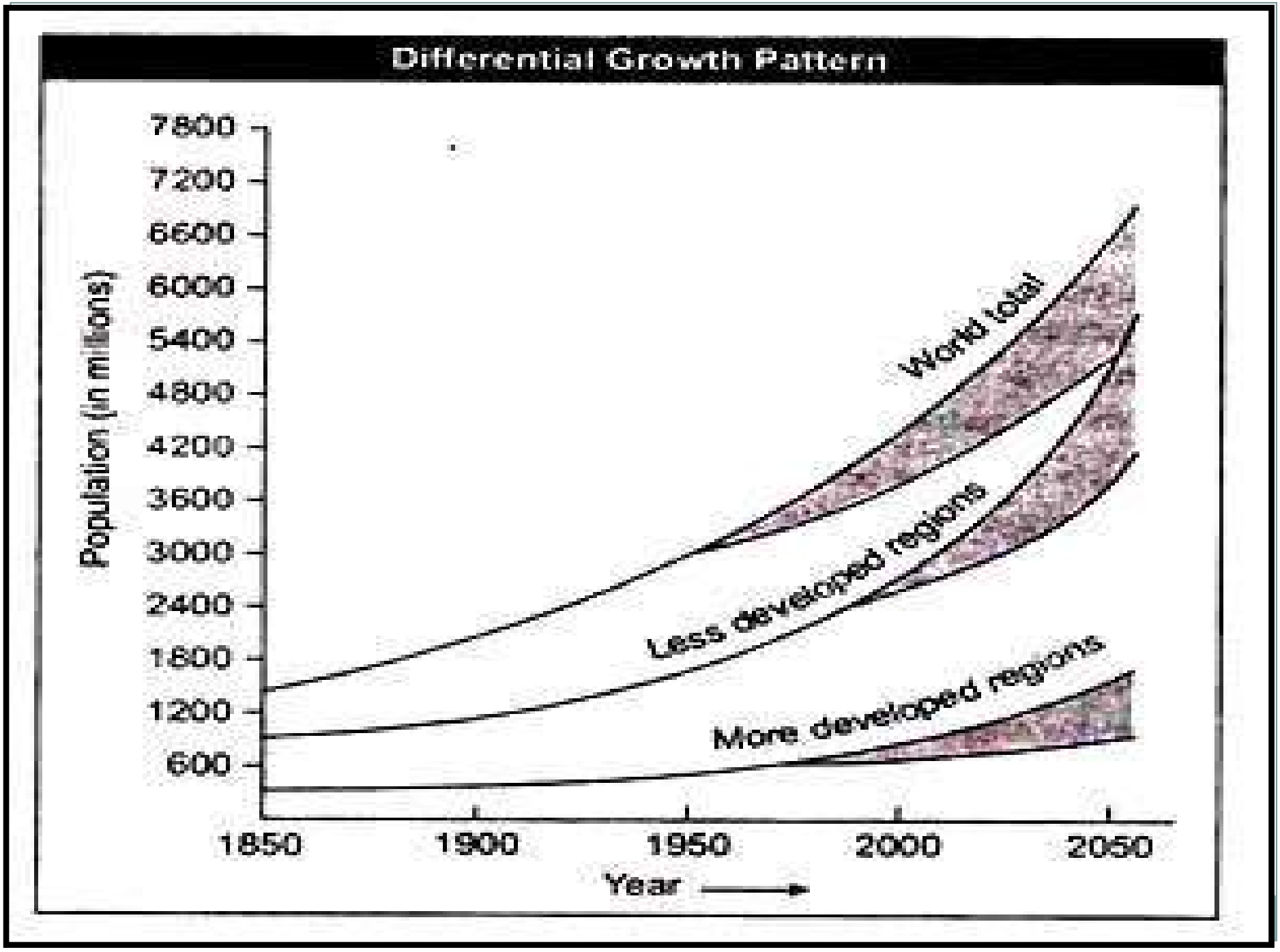
Modern Phase—1650 Onwards

- Since the beginning of Industrial Revolution, global population growth rate experienced a sudden dramatic and spectacular growth.
- In between 1700 A.D. and 1800 A.D. population was doubled, registering a growth rate of 0.5% per annum, five times more than the previous century.
- In between 1800 and 1900 A.D. net addition of population was another 400 million and world population increased to 1.6 billion from 1.2 billion. The average annual increment was 0.6% per annum.
- 1900 to 1930 —only 30 years — experienced another addition of 400 million people, with average annual growth of 1.07% per year.
- Between 1930 to 1950, net addition was 500 million and population reached 2.5 billion.
- Between 1950 to 1970, growth rate was a staggering 2.06% per year. Global population touched 3.7 billion mark.
- In 2000, population touched a whopping 6 billion mark with a yearly growth rate of 1.4% per annum.

Present Trend

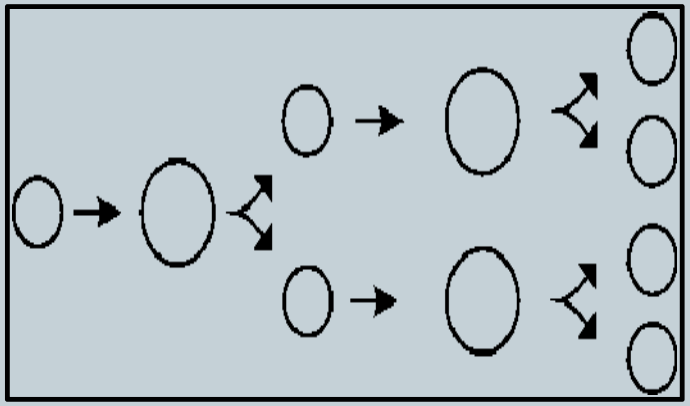
- The global population is still increasing at an alarming rate with an annual addition of over 8 cores (81 million) people per year.
- The gradual lowering of fertility rate and increase of life expectancy has enabled developed countries to stabilize population growth.


World Population Growth Through History
Billions of people
8
7
6
5
4
3
2
1
Old Stone Age
New Stone Age Commences
New Stone Age
Bronze Age
Iron Age
Middle Ages
Modern Age
Black Death - the plague
2·5 million years
7000 B.C.
6000 B.C.
5000 B.C.
4000 B.C.
3000 B.C.
2000 B.C.
1000 B.C.
1 A.D.
1000 A.D.
2025 A.D.


Differential Growth Pattern
Population (in millions)
7800
7200
6600
6000
5400
4800
4200
3600
3000
2400
1800
1200
600
World total
Less developed regions
More developed regions
1850
1900
1950
2000
2050
Year

Types of population growth

- **Exponential growth:** When a quantity increases by a constant amount per unit time e.g. 1, 3, 5,7 etc. it is called linear growth. But, when it increases by a fixed percentage it is known as exponential growth e.g. 2, 4, 8, 16, 32 etc.



- **Doubling time:** The time needed for a population to double its size at a constant annual rate is known as doubling time. It is calculated as follows:

Td = 70/r

where Td = Doubling time in years

r = annual growth rate

Rule of 70

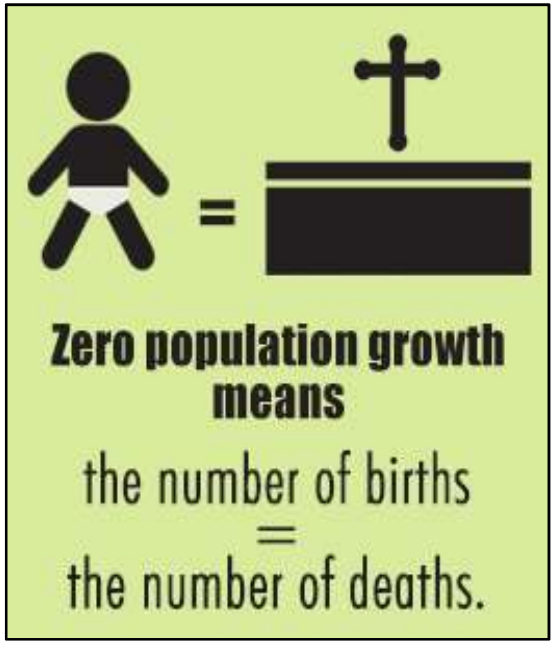
A trick to estimate population doubling

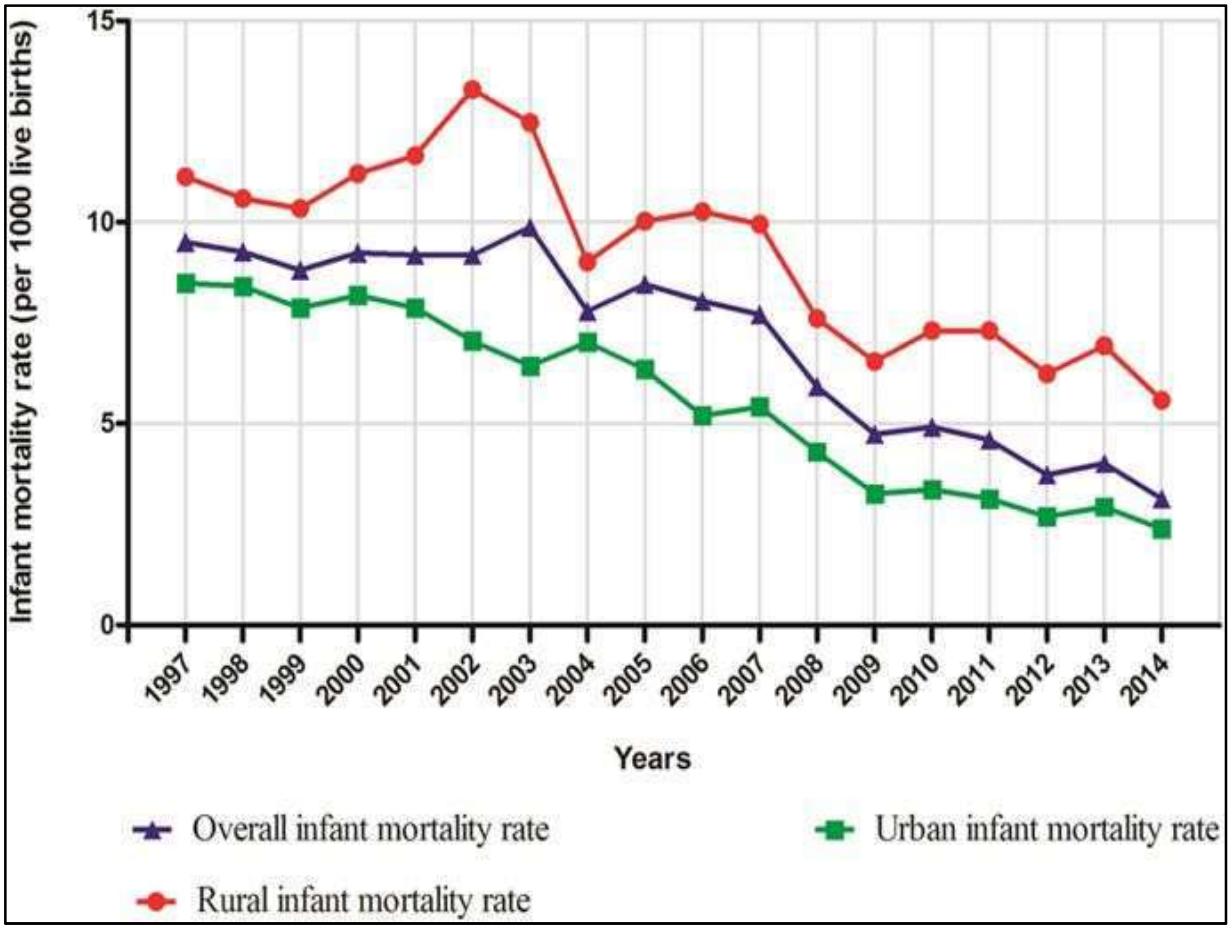
$$\text{Doubling Time (years)} = \frac{70}{\%\ \text{Growth Rate}}$$

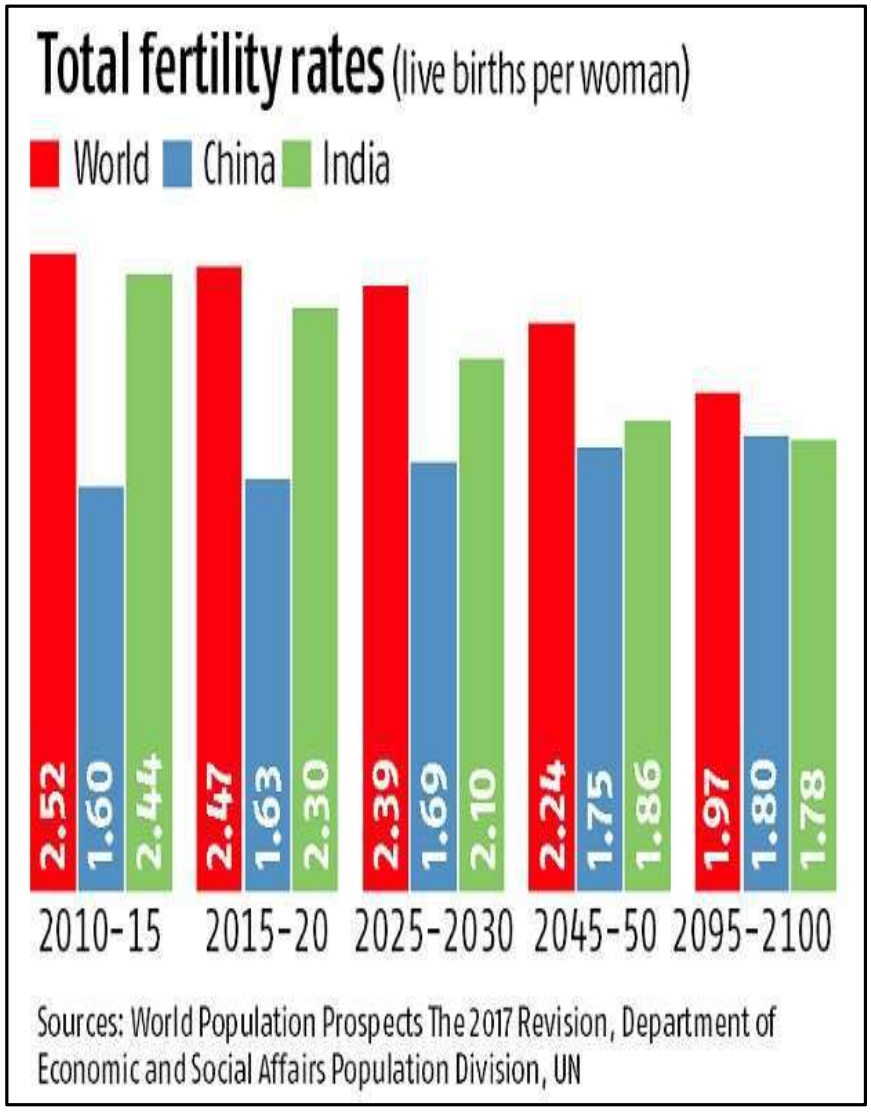
$$\left(\frac{70\%}{\text{r (in percent form)}}\right) \textit{ or } \left(\frac{.7}{\text{r (in decimal form)}}\right) = \text{doubling time (years)}$$

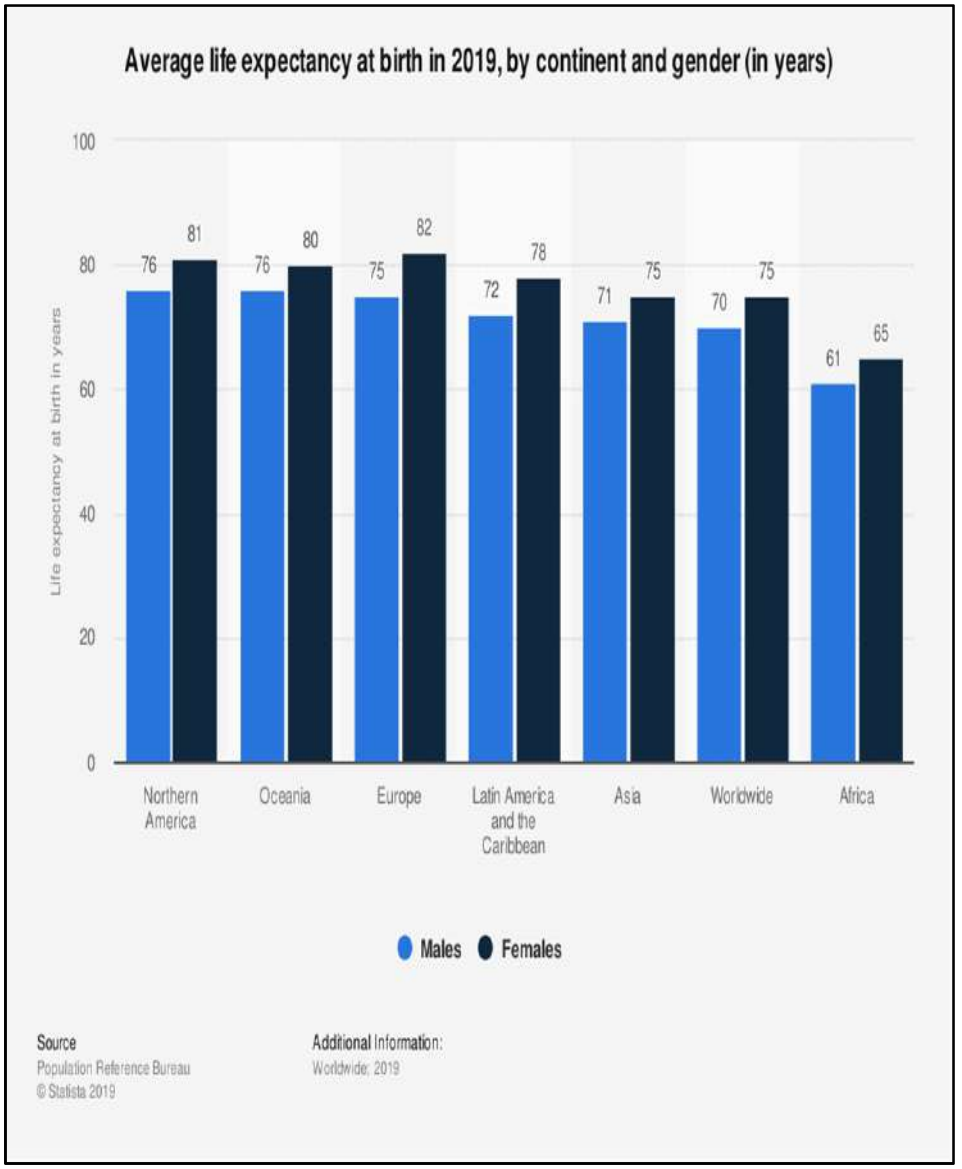
for example: $\left(\frac{.7}{.07}\right) = 10$ years

- **Total Fertility Rates (TFR):** It is one of the key measures of a nation's population growth. **TFR** is defined as the average number of children that would be born to a woman in her lifetime if the age specific birth rates remain constant.
- **Infant mortality rate:** It is an important parameter affecting future growth of a population. It is the percentage of infants died out of those born in a year.
- **Zero population growth (ZPG):** When birth plus immigration in a population are just equal to deaths plus emigration, it is said to be zero population growth.
- **Male-female ratio:** The ratio of boys and girls should be fairly balanced in a society to flourish.
- **Life expectancy:** It is the average age that a new-born infant is expected to attain in a given country. The average life expectancy, over the globe, has risen from 40 to 65.5 years over the past century.


Zero population growth means
the number of births
=
the number of deaths.


Infant mortality rate (per 1000 live births)
15
10
5
0
1997
1998
1999
2000
2001
2002
2003
2004
2005
2006
2007
2008
2009
2010
2011
2012
2013
2014
Years
Overall infant mortality rate
Urban infant mortality rate
Rural infant mortality rate


Total fertility rates (live births per woman)
World
China
India
2.52
1.60
2.44
2.47
1.63
2.30
2.39
1.69
2.10
2.24
1.75
1.86
1.97
1.80
1.78
2010-15
2015-20
2025-2030
2045-50
2095-2100
Sources: World Population Prospects The 2017 Revision, Department of Economic and Social Affairs Population Division, UN


Average life expectancy at birth in 2019, by continent and gender (in years)
Life expectancy at birth in years
100
80
60
40
20
0
76
81
76
80
75
82
72
78
71
75
70
75
61
65
Northern America
Oceania
Europe
Latin America and the Caribbean
Asia
Worldwide
Africa
Males
Females
Source
Population Reference Bureau
© Statista 2019
Additional Information:
Worldwide; 2019

- **Demographic transition:** Population growth is usually related to economic development. There occurs a typical fall in death rates and birth rates due to improved living conditions leading to low population growth, a phenomenon called demographic transition. It is associated with urbanization and growth and occurs in four phases:

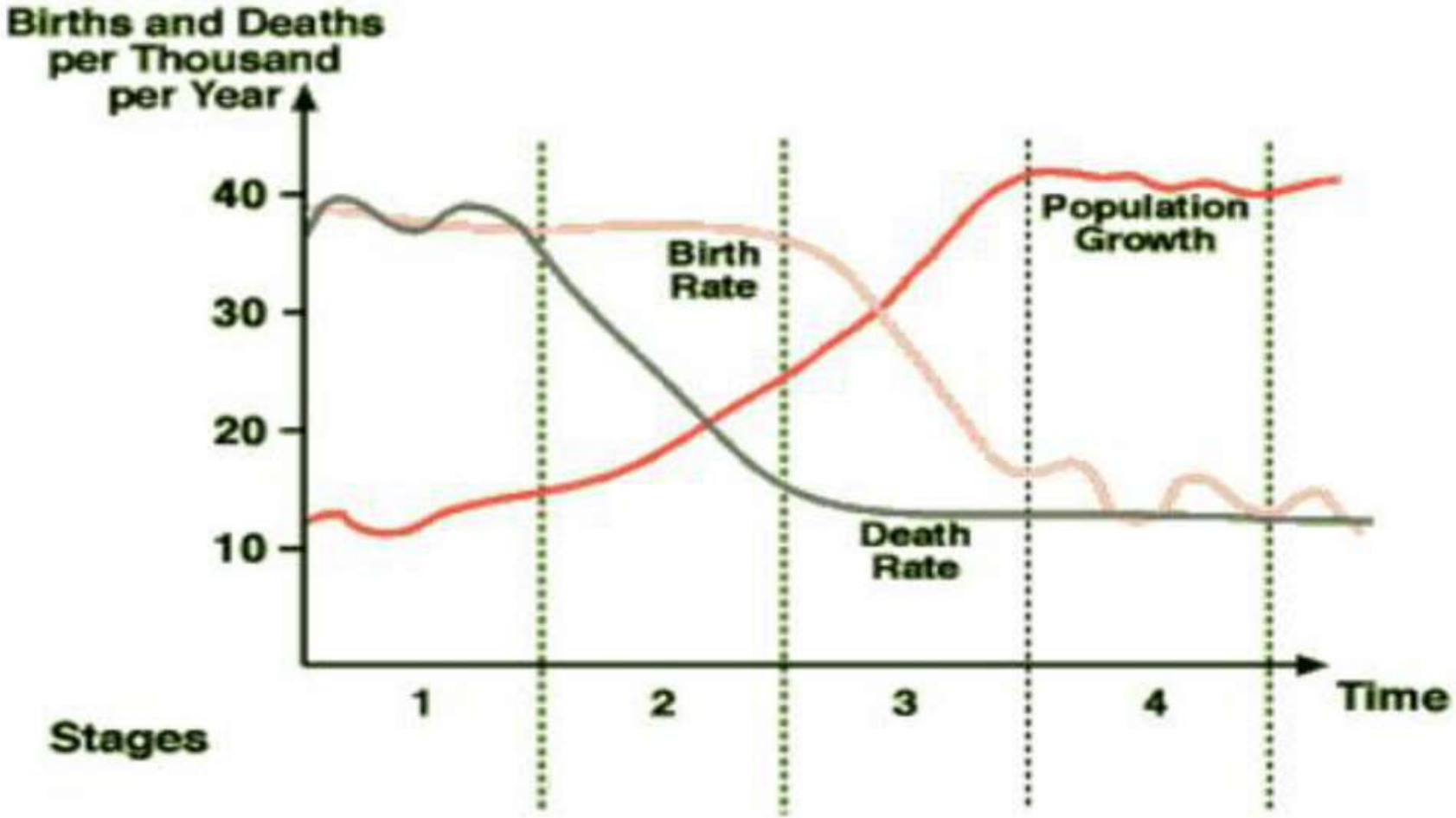
(a) Pre-industrial phase characterized by high growth and death rates and net population growth is low.

(b) Transitional phase that occurs with the advent of industrialization providing better hygiene and medical facilities and adequate food, thereby reducing deaths. Birth rates, however, remain high and the population shows 2.5-3% growth rate.

(c) Industrial phase while there is a fall in birth rates thereby lowering growth rate.

(d) Post industrial phase during which zero population growth is achieved.

Demographic Transition Model



Three types of population situation

Under population:

- Under population exists when a population is too small, therefore unable to fully utilize the available resource endowments.
- Under population is also characterized by a situation where the available resources are capable of supporting a much larger population with no reduction in living standards.
- The situation is found in regions of low technical development such as equatorial Congo, Amazon River basin or the rich Prairie region of North America.

Optimum Population:

- The **optimum population** is a concept where the human population is able to balance maintaining a maximum population size with optimal standards of living for all people.

- Optimum population has been defined as that size of population enabling per capita output of the maximum orders accompanied by the highest possible standards of living under a given set of economic and technological conditions.

- Thus optimum population yields highest quality of life, which means each person has access to adequate food, water, energy and air of highest quality, adequate medical care, recreational facilities and cultural outlets.

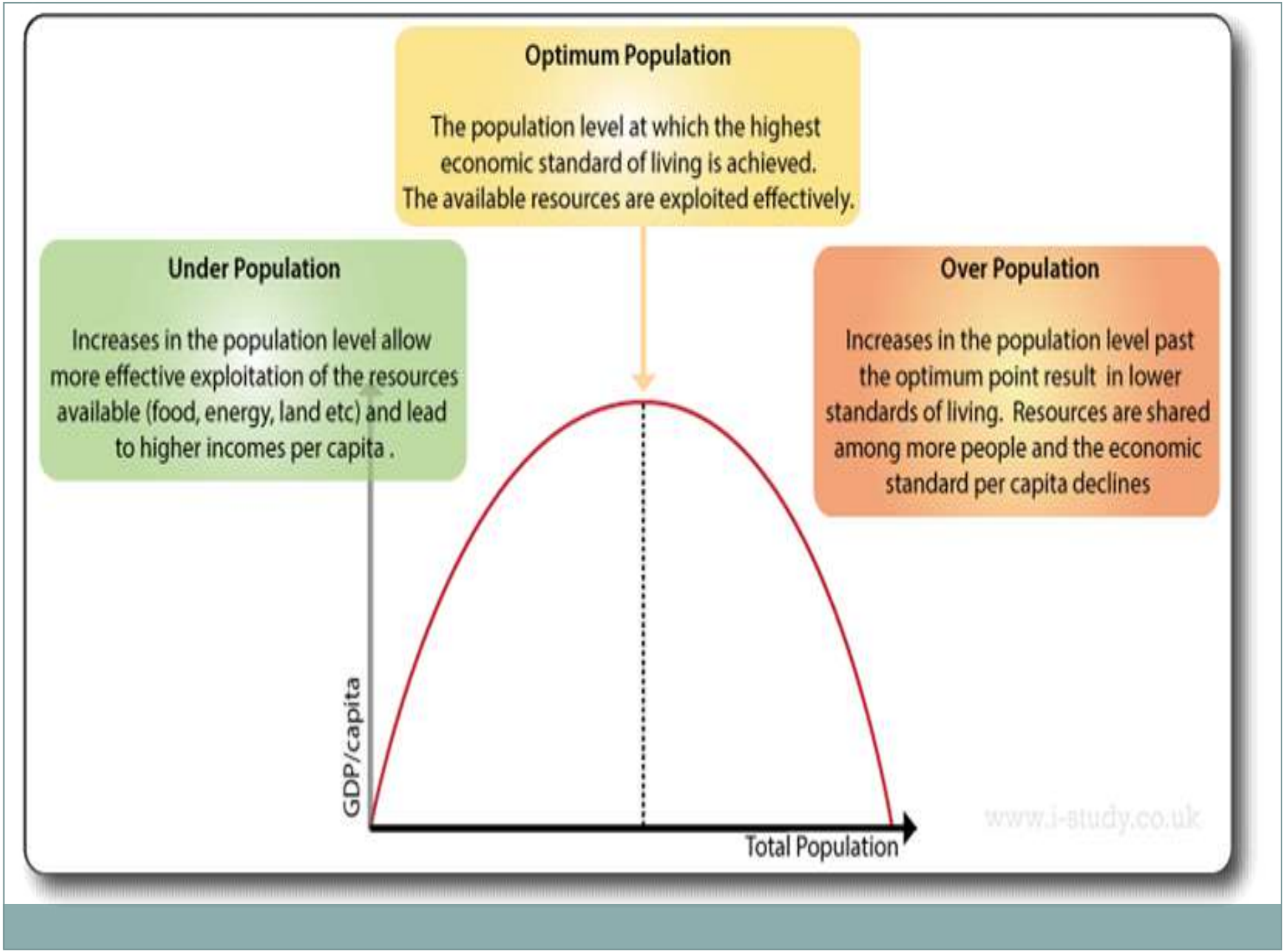
OVER POPULATION:

- The term ‘overpopulation’ means too great a population for a given region to support. There may be two causes:

(i) population growth exceeds the existing resource base;

(ii) existing resources have been depleted.

- The situation of overpopulation displays the following socio-economic characteristics: high unemployment, low incomes, low standards of living, high population density, malnutrition and famine.

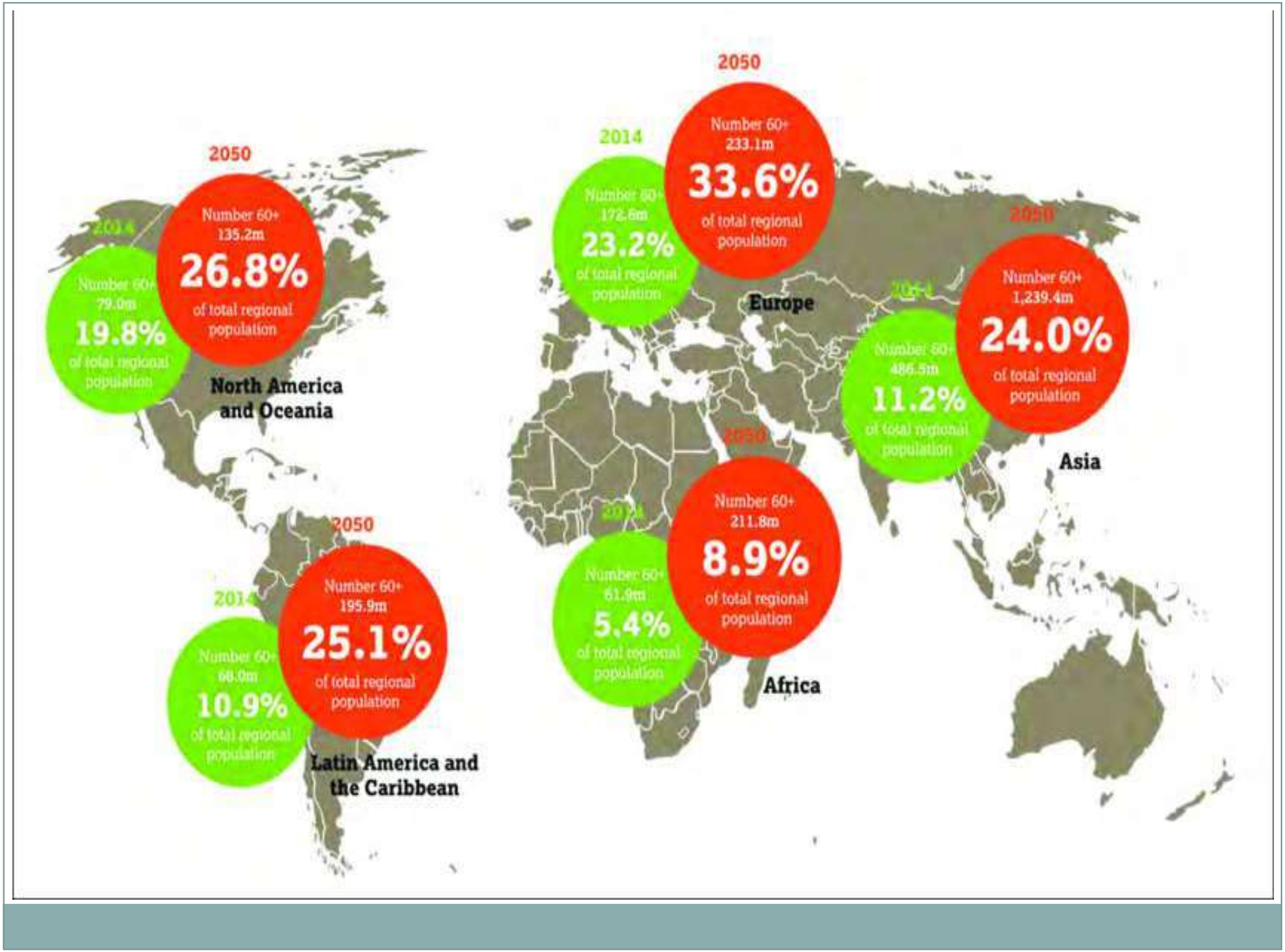

Optimum Population
The population level at which the highest economic standard of living is achieved. The available resources are exploited effectively.
Under Population
Increases in the population level allow more effective exploitation of the resources available (food, energy, land etc) and lead to higher incomes per capita .
Over Population
Increases in the population level past the optimum point result in lower standards of living. Resources are shared among more people and the economic standard per capita declines
GDP/capita
Total Population
www.i-study.co.uk

Population Explosion:

- There has been a dramatic reduction in the doubling time (the time needed for a population to double its size at a constant annual rate) of the global human population. In the 20th century, human population has grown much faster than ever before.

- Population explosion is causing severe resource depletion and environmental degradation. Our resource like land, water, fossil fuels, minerals etc. are limited and due to overexploitation these resources are getting exhausted.

- Even many of these renewable resources like forest, grassland etc. are under tremendous pressure. Industrial and economic growth are raising our quality of life but adding toxic pollutants into the air, water and soil. As a result, the ecological life support systems are getting jeopardized.


2050
Number 60+
135.2m
26.8%
of total regional population
2014
Number 60+
79.0m
19.8%
of total regional population
North America and Oceania
2050
Number 60+
233.1m
33.6%
of total regional population
2014
Number 60+
172.6m
23.2%
of total regional population
Europe
2050
Number 60+
1,239.4m
24.0%
of total regional population
2014
Number 60+
486.5m
11.2%
of total regional population
Asia
2050
Number 60+
211.8m
8.9%
of total regional population
2014
Number 60+
61.9m
5.4%
of total regional population
Africa
2050
Number 60+
195.9m
25.1%
of total regional population
2014
Number 60+
68.0m
10.9%
of total regional population
Latin America and the Caribbean

Causes of Overpopulation or Population Explosion

- **Decline in the Death Rate:**

The fall in death rates that is decline in mortality rate is one fundamental causes of overpopulation. Owing to the advancements in medicine, man has found cures to the previously fatal diseases. The new inventions in medicine have brought in treatments for most of the dreadful diseases. This has resulted in an increase in the life expectancy of individuals. Mortality rate has declined leading to an increase in population.

- **Rise in the Birth Rate:**

Thanks to the new discoveries in nutritional science, we have been able to bring in increase in the fertility rates of human beings. Medicines of today can boost the reproductive rate in human beings.

- **Migration:**

Immigration is a problem in some parts of the world. If the inhabitants of various countries migrate to a particular part of the world and settle over there, the area is bound to suffer from the ill effects of overpopulation. If the rates of emigration from a certain nation do not match the rates of immigration to that country, overpopulation makes its way.

- **Lack of Education:**

Illiteracy is another important cause of overpopulation. Those lacking education fail to understand the need to prevent excessive growth of population. They are unable to understand the harmful effects that overpopulation has.

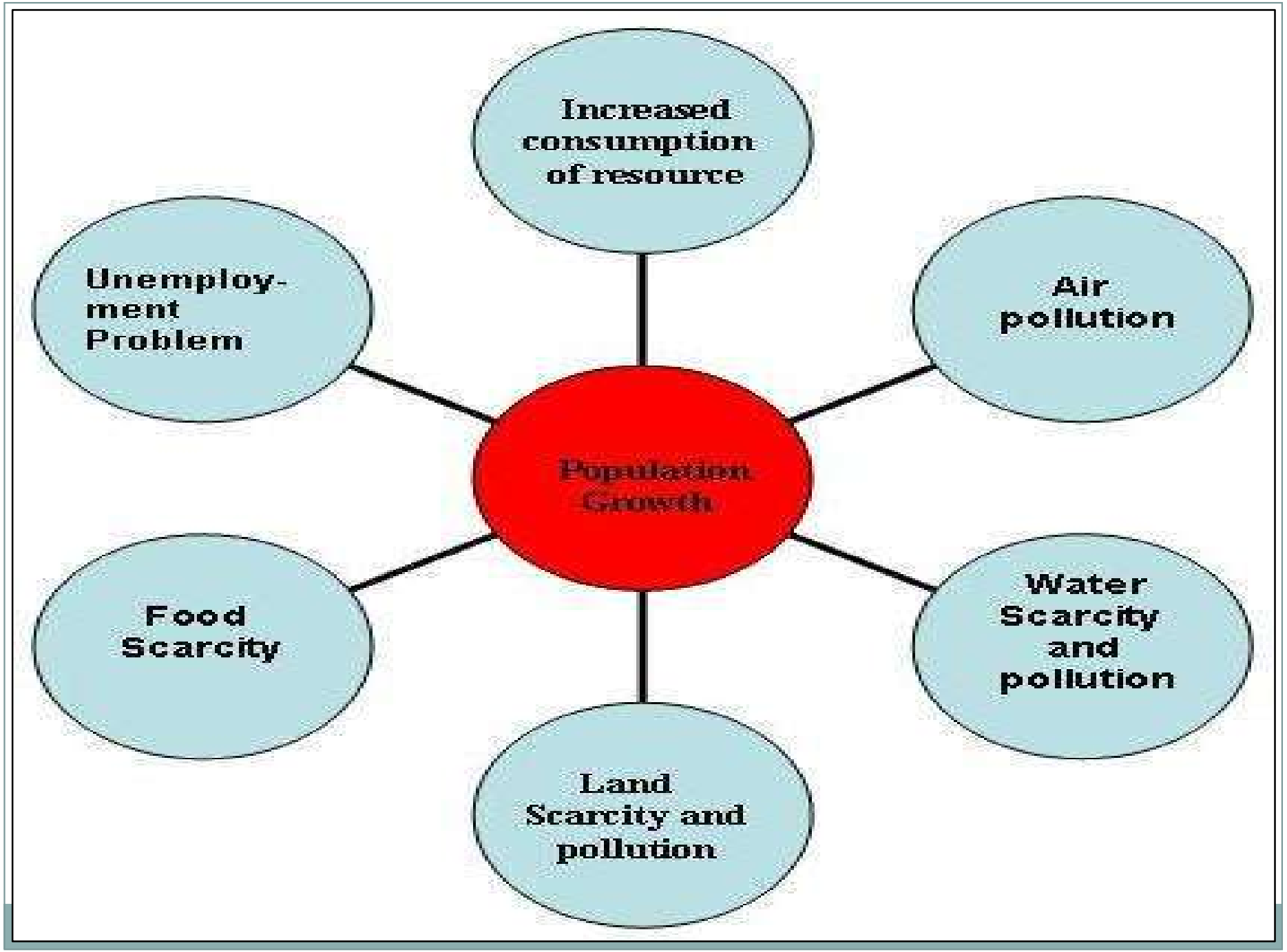
- **Poverty**

Due to poverty, population is increased in developing countries. People lives in slum, uses their children as a tool, to earn money, hence they always try to increase the number of children in their families.

- **Other Causes**

Apart from the above, following are other causes of overpopulation

1- Social compulsion of Marriage
2- Ambition of big family
3- Betterment in economic position
4- Joint family system,
5- Arrival of Refugees etc.


Increased consumption of resource
Unemploy-ment Problem
Air pollution
Population Growth
Food Scarcity
Water Scarcity and pollution
Land Scarcity and pollution

Effects of Overpopulation or population explosion

- **Problem of Investment Requirement:**

Indian population is growing at a rate of 1.8 percent per annum. In order to achieve a given rate of increase in per capita income, larger investment is needed. This adversely affects the growth rate of the economy.

- **Problem of Capital Formation:**

Composition of population in India hampers the increase in capital formation. High birth rate and low expectancy of life means large number of dependents in the total population.

- **Effect on per Capita Income:**

Large size of population in India and its rapid rate of growth results into low per capita availability of capital.

- **Effect on Food Problem:**

Rapid rate of growth of population has been the root cause of food problem. People do not get sufficient quantity of food due low availability of food which affects their health and productivity.

- **Problem of Unemployment:**

Large size of population results in large army of labour force. But due to shortage of capital resources it becomes difficult to provide gainful employment to the entire working population.

- **Low Standard of Living:**

Rapid growth of population accounts for low standard of living. Even the bare necessities of life are not available adequately.

- **Poverty:**

Rising population increases poverty in developing countries. People have to spend a large portion of their resources for bringing up of their wards. It results into less saving and low rate of capital formation.

- **Population and Social Problems:**

Population explosion gives rise to a number of social problems. It leads to migration of people from rural areas to the urban areas causing the growth of slum areas. People live in most unhygienic and insanitary conditions.

- **More Pressure on Land:**

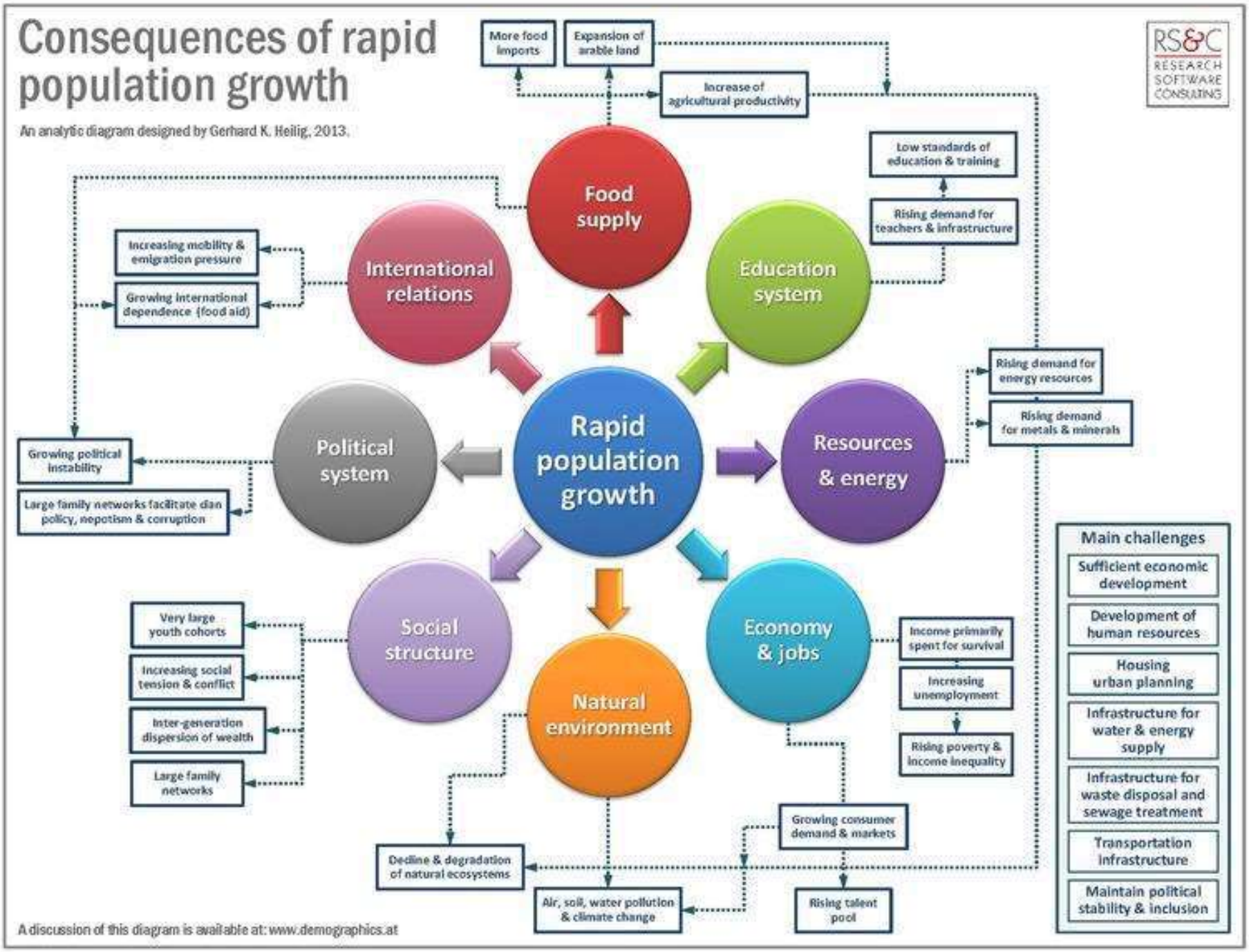
Rising rate of population growth exerts pressure on land. On the one hand, per capita availability of land goes on diminishing and on the other, the problem of sub-division and fragmentation of holdings goes on increasing. It adversely affects the economic development of the country.

- **Pressure on Environment:**

Population explosion leads to environmental degradation. Higher birth rate brings more pollution, more toxic wastes and damage to biosphere. Briefly speaking, population explosion hinders the economic development. It should be controlled effectively.

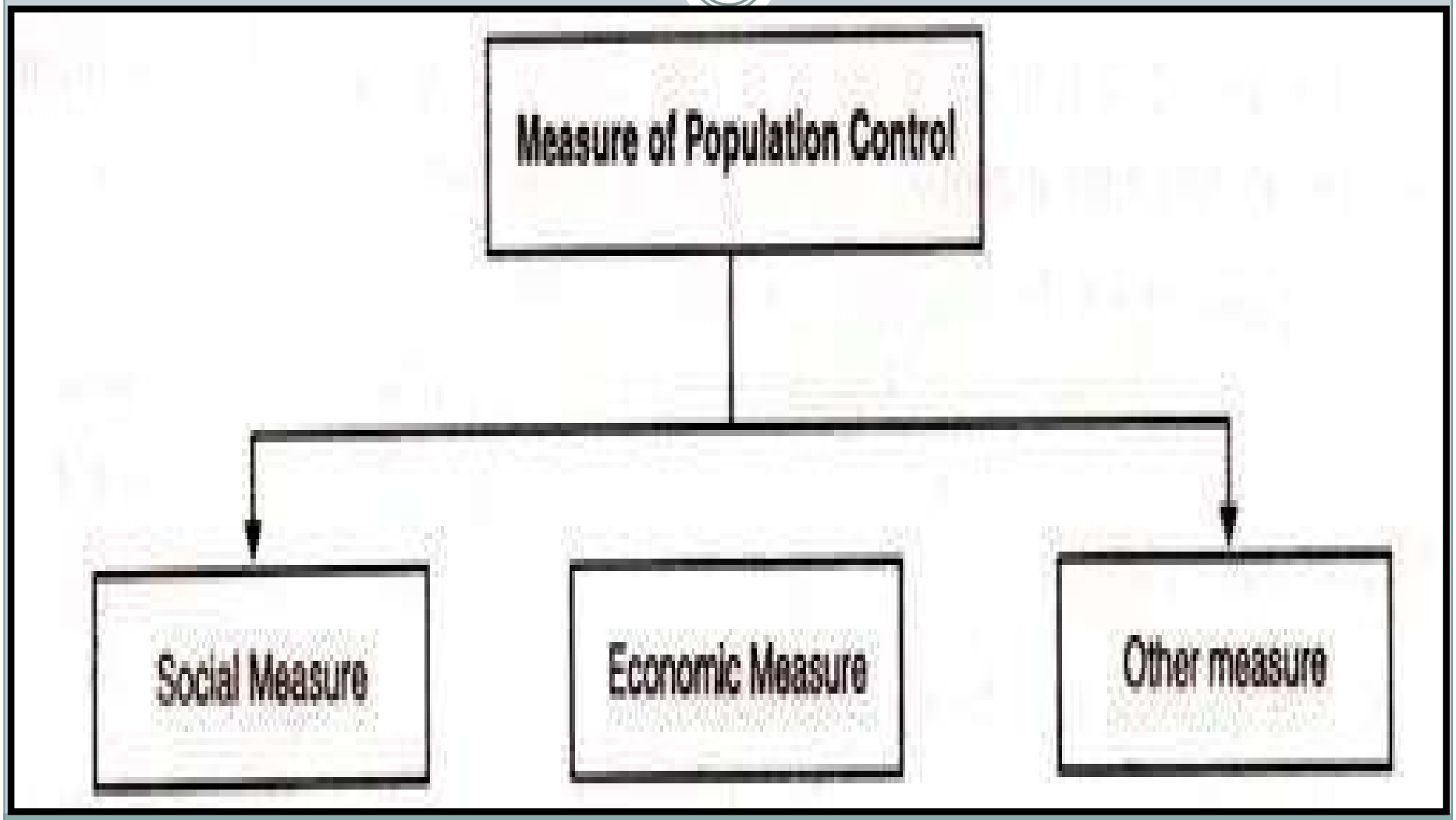
Consequences of rapid population growth

An analytic diagram designed by Gerhard K. Heilig, 2013.



A discussion of this diagram is available at: www.demographics.at

Measures to Control Population



Social Measures:

Population explosion is a social problem and it is deeply rooted in the society. So efforts must be done to remove the social evils in the country.

- **Minimum age of Marriage:**

As fertility depends on the age of marriage. So the minimum age of marriage should be raised. In India minimum age for marriage is 21 years for men and 18 years for women has be fixed by law.

- **Raising the Status of Women:**

There is still discrimination to the women. Women should be given opportunities to develop socially and economically. Free education should be given to them.

- **Spread of Education:**

The spread of education changes the outlook of people. The educated men prefer to delay marriage and adopt small family norms.

- **Change in Social Outlook:**

Social outlook of the people should undergo a change. Marriage should no longer be considered a social binding. Issueless women should not be looked down upon.

Economic Measures:

- **More employment opportunities:**

The first and foremost measure is to raise, the employment avenues in rural as well as urban areas.

- **Development of Agriculture and Industry:**

If agriculture and industry are properly developed, large number of people will get employment. When their income is increased they would improve their standard of living and adopt small family norms.

- **Standard of Living:**

Improved standard of living acts as a deterrent to large family norm. In order to maintain their higher standard of living people prefer to have a small family.

- **Urbanization:**

It is on record that people in urban areas have low birth rate than those living in rural areas. Urbanization should therefore be encouraged.

Other Measures:

- **Late Marriage:**

As far as possible, marriage should be solemnized at the age of 30 years.

- **Self Control:**

According to some experts, self control is one of the powerful methods to control the population. It is an ideal and healthy approach and people should be provided to follow. It helps in reducing birth rate.

- **Family Planning:**

This method implies family by choice and not by chance. By applying preventive measures, people can regulate birth rate.

- **Publicity:**

The communication media like T.V., radio and newspaper are the good means to propagate the benefits of the planned family to the uneducated and illiterate persons especially in the rural and backward areas of country.

- **Incentives:**

The govt. can give various types of incentives to the people to adopt birth control measures.

- **Employment to Woman:**

Another method to check the population is to provide employment to women. Women should be given incentive to give services in different fields.

THANK TOU

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