

Date
01.01.2016

Physical Geography : Integrated study of the natural environment on or close to the earth's surface.

↳ environment means 'that which surrounds us'

all 'energy' + all matter.

⇓

Capable of influencing man.

Also, large parts of the earth's surface cannot now be described as truly natural, because of widespread interference by man.

eg. Heavily populated areas

Highly artificial sites eg. The Palm Islands, Dubai

Physical geography has been described not so much as a basic science, but as an integration or overview of a number of earth and life sciences which give insight into the nature of man's environment.

- 1) Geomorphology
- 2) Geology
- 3) Meteorology and climatology
- 4) Biogeography

Geomorphology, climatology and biogeography determine the basic framework. However, there are other disciplines that are significantly important as:

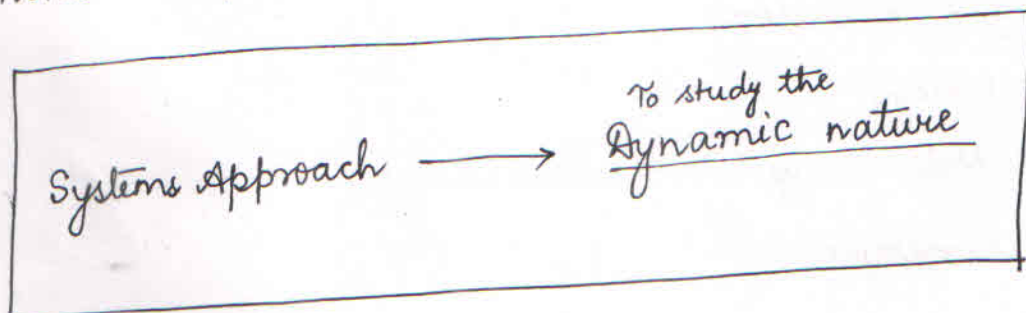
(i) Pedology i.e. the study of soils, which form an important environment link b/w landforms, climate, & plants and animals.

(ii) Hydrology: It is the study of water on earth's land areas.

(iii) Oceanography: Study of waves, tides and currents, as well as the biological characteristics of oceans.

Although the combination of features may vary from one place to the next, everywhere there exists a tendency towards dynamic balance / eqbm in which a change in one of the elements leads to adjustment in the others.

Modern physical geography tries to interpret the natural environment as a dynamic entity. One of the ways to demonstrate this is through the "system's approach".

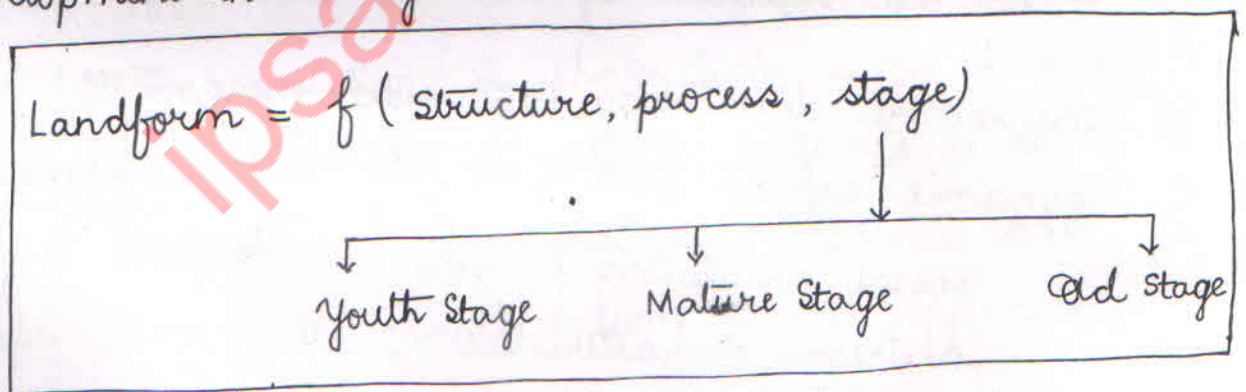


Recent trends in physical geography

Any understanding of landforms depends on an appreciation of the relative roles of:

- Climate
- Geology
- Time
- Form
- Process

In the first part of the 20th Century, much of geomorphological study placed its emphasis on climate, geology and time. In particular, the subject was dominated by W.M. Davis' Cycle of erosion. It stressed the evolution of landforms through time and suggested a classification of landforms based on their stage of development in the cycle, i.e.



The biggest drawback with this approach was its inability to accommodate effectively the dynamics of present-day processes. Eg. = It is better to know the discharge and sediment load of streams, than that they are 'young' or 'mature', as Davis described them.

In the 1950s and 1960s, a strong reaction against Davisian ideas led to their replacement by an emphasis on process/form studies, which are concerned with the relationship b/w landforms and contemporary processes. The process/form approach can be usefully placed in a systems framework.

Recent trend in weather/climate studies

- # Though there has not been much methodological shift, there has been a tremendous increase in knowledge about the upper layers of the atmosphere through satellites and remote-sensing techniques.
- # The descriptive nature of climate study - simply listing climatic facts for particular regions or climatic classification - has been replaced by modern climatology.
- # The modern climatology lays much more stress on dynamic aspects such as :
 - General circulation patterns
 - Airstream characteristics
 - Meso-scale weather systems
- # These new developments allow a much improved insight into spatial and temporal variations of climate.

Trends in biogeography

Biogeography has begun to focus much more on ecological relationships and processes, especially on energy flow and nutrient cycling. This has reemphasized the use of the ecosystem as a fundamental conceptual framework.

GENERAL TRENDS

- (i) Process-orientation
- (ii) Quantitative Revolution
- (iii) Applied nature

As a whole, physical geography in recent years has become far more process-orientated — i.e. concerned ^{in the environment} with explaining the spatial and temporal variations, in terms of the process operating — rather than simply describing distributions.

Quantitative revolution is characterized by a more systematic application of scientific methods to the subject through use of statistical procedures and maps. Some of the manifestations of this approach

- include:
- Inductive and deductive reasoning
 - Precise measurement & observation
 - Model building
 - Systems analysis

Applied nature: The subject of physical geography is becoming increasingly applied. This is partly because it is better able to do so as a result of the methodological changes (process-orientation and quantitative revolution), and partly because there is more demand for it to be so in the context of the current desire for better environmental mgmt.

CONCLUSION

The net result of these trends is that the subject is much more integrated than it has been for some time. In particular, the systems approach provides a viable common framework for several of its discrete parts.

MODELS & SYSTEMS

Date
01.01.2016

Humankind development / Any specific need



But human has close relationship with nature



Unless an understanding of this relationship is comprehended, human development cannot be furthered



But human-nature relationship is complex with numerous dimensions — some documented, some still unknown (eg. Alzheimer's).



∴ This relationship dimensions separated and studied using "models"



One-to-one / one-to-many / many-to-one cause-response mechanisms are identified.



Appropriate actions are then taken (cause) to bring out desired responses.

What are model ?

Significance ?

Utility in geography

Features

Types

ipsacharya.in

Date
21/02/2016

Population Growth Theories

1. Classical Theories (Pessimist Approach)

- Malthus
- Marx
- Ricardo

2. Neo-Malthusian Theories

Oil crisis of 1970s

- Coale-Hoover - 1958
- Paul Ehrlich's - Poplⁿ Boom
- Garrett Hardin's - Tragedy of the Commons
- Lester Brown
- The limits to growth

3. Optimist and Revisionist Theories

- Boserup
- Simon
- Int'l Poplⁿ Conference 1974
- " " " " 1984
- ICPD (1994): Int'l Conf. on Poplⁿ & Development

4. Demographic Transition Theory - Part 1 & 2 .

5. Recent times : Demographic Regime Theory.

Resource mismatch

Under-populated society $[RfS > P]$

Over-populated society $[RfS < P]$

Resources for subsistence (RfS) balances popln

Optimum population

MALTHUSIAN THEORY

1. Context

- There was ^{long-}running sentiment in the 18th century Europe that society as a whole was improving and that eventually perfection and efficiency could be reached.
- William Goodwin, friend of Malthus' father, believed that possibilities of improvement of society were limitless.
- Malthus was concerned about this running optimism and took into account past histories of civilisation to propound his theory.

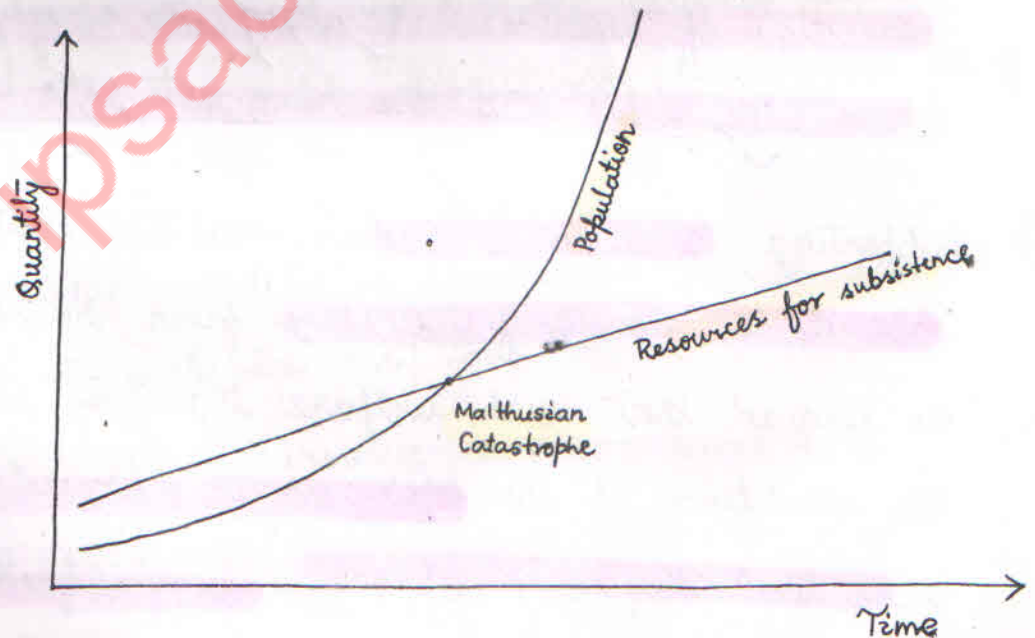
2. Concept

- ① English demographer Robert Thomas Malthus propounded the first demographic theory in his "Essay on the Principle of Population" in 1798. It was oriented towards the urgency of controlling population.

② The theory emphasizes that two universal natural laws regulate human existence worldwide, irrespective of cultural identities or economic levels of developments :=

- (1) Food is necessary to the existence of man
- (2) Passion between the sexes is necessary and will remain nearly in its present state.

③ Because of persisting passion b/w the sexes, early marriages will facilitate longer marital bondage in the reproduction age, resulting in geometrical increase in population size (1, 2, 4, 8, 16, ...). However, the resources for sustaining the population increases arithmetically (1, 2, 3, 4, 5, ...). When the population exceeds the carrying capacity, the imbalance will result in Malthusian Catastrophe.



④ To restore the balance between population and the resources, Malthus suggests two checks:

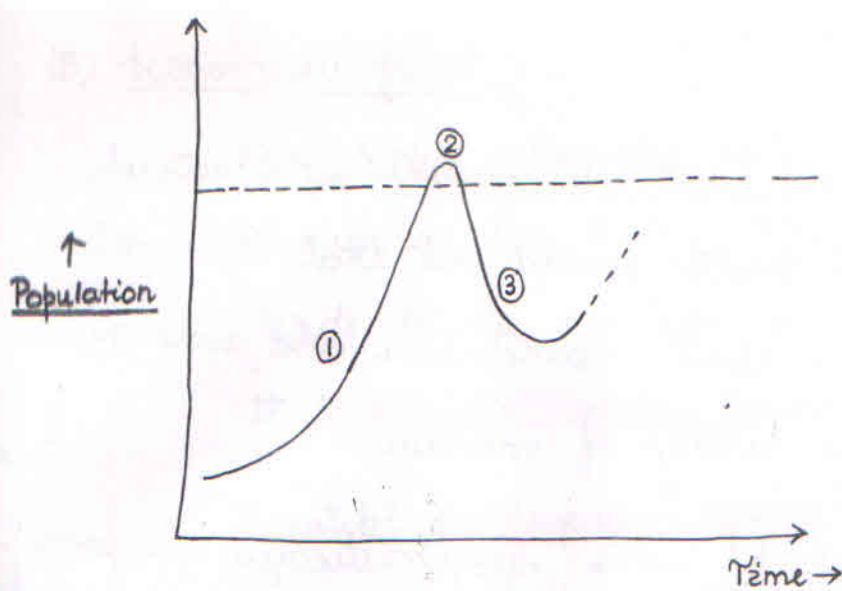
(i) Preventive Checks: These are the ^{fertility} control measures which can be undertaken by the human population. eg.

- Delay of marriage
 - Moral restraint
 - Abortions
 - Increased cost of food.
- ~~the use of contraceptives~~
x { Prostitution,
adultery, (as vice checks)

(ii) Positive Checks: These increase mortality and are often nature-induced. These do not operate continuously and include starvation, epidemics, and even scarcity-induced wars.

⑤ Failure to apply preventive checks in the first place and absence of positive checks would generate demand-supply mismatch of resources dividing the society into the haves (the rich) and the have-nots (the poor).

⑥ Supporting the capitalist setup, Malthus was strongly opposed to monetary transfers from the rich to ^{the} poor. He argued that such welfare transfers would worsen the conditions of the poor as they would mistakenly think that they can support a bigger family and thus, grow in population. Malthus also supports the wage factor in determining the population growth (like Ricardo).



- ① Population grows geometrically
- ② Population exceeds carrying capacity
- ③ Population is kept in 'check' - preventive and/or positive checks.

Fig. = Population - Growth and Checks

3. Appreciation

- (i) The simple, descriptive yet systematic approach of Malthus marked the beginning of theory-building tradition in social sciences.
- (ii) It projected the urgency of controlling the population. For the first time the relationship between population and the resources for subsistence (food) were being debated.
- (iii) The practical validity of Malthusian concept can be observed through the fact that all anti-natalist population policies involve common element of delaying legal age of marriage.
- (iv) Kingsley Davis, while admitting that the doctrines of Malthus were empirically not valid, ^{agreed that they} but were theoretically significant.

4. Criticism

- ① Ratio of geometric and arithmetic growth was severely criticized. Kenneth Smith pointed out that these ratios were based on very slender foundation and were never really proved in the history of mankind.
- ② Classification of checks was also criticized as poor as the two do not form independent categories. Also, Malthus could not connect these checks with his theory.
- ③ Technological front:
Oded Galor and David N. Weil find that population growth has been simultaneous to major technological innovations so much so that booming population since 1950s is coincided with termination of starvation-related deaths. (*)
- ④ Sociological front
 - The theory ignores the biological limit of fertility and generalises the biological need of having sex with the sociological need of giving birth.
 - Gary S. Becker and Gregg H. Lewis formalized that parents may be altruistic towards their children when making fertility decisions.
 - Neo-Malthusists argue for the adoption of birth control within marriage rather than delaying it.

(5) Economical front :

- Karl Marx strongly criticised the conclusion drawn in the theory that growth of population leads to the division of society. He emphasized that divided society leads to population growth.
- Potential positive consequences of population growth was ignored by Malthus. Ester Boserup suggested that Malthusian argument displays a reverse causation - "Population growth affects agricultural productivity rather than vice-versa".
- Tulian L. Simon highlighted that population growth may have adverse impact in the short run but due to diminishing returns, but in the long run it impacts positively through knowledge advances and economies of scale. (Simulation Model).

(6) Religious beliefs :

Malthus' religious beliefs prevented him to grasp the use of contraceptive methods and family planning.

- (7) Malthus, however, had not given sufficient importance to scientific solutions of the existing population problem. He was pessimistic in his conclusion.

Q. "Ghost of Malthus is not buried yet". Discuss.

Robert Thomas Malthus highlighted the urgency of population control in his essay on the Principle of Population as far back as 1798. He emphasized that population growth is taking place in geometric progression while the growth of the resources of subsistence is in arithmetic progression. This creates imbalance of demand and supply and results in catastrophic events like starvation, epidemics and scarcity-induced wars, if the imbalance is not properly checked.

However, technological developments, agricultural developments, changes in societal organisation, and changes in government policies have enabled humanity to avoid a situation where the number of people was greater than the capacity to sustain them. However, this fact is over-rated.

Starvation, epidemics and scarcity-related deaths are very real even today. According to International Food Policy Research Institute, ^{in 2012} out of 79 countries, 65 come under the category of alarming level of hunger. 800 million people are still going to bed hungry every night in 2015.

Epidemics like the HIV-AIDS, ebola outbreak, swine-flu are a persistent threat across the globe.

The third WW is believed to occur over the crisis of water availability. Potable water is not available in rained regions. Water scarcity alone affects around 2.8 billion people around the world and more than 1.2 billion people lack access to clean drinking water. #

Food scarcity, unemployment, overcrowding, war and social conflicts are nothing but manifestations of the 'Malthusian Catastrophe'.

The "Ghost of Malthus" is thus very real in the 21st century.

Though food production has substantially improved, the gains do not always lead to progress in the fight against starvation. It puts pressure on food prices that makes it more difficult for the poor to buy the food they need.

* Malthus's Appreciation: As a sprawling, diverse and highly populous country, India faces unique challenges that spared smaller countries, such as Uganda & SL, that have achieved impressive reductions in their disease burden.

MARXIAN CONCEPT

Karl Marx discussed his surplus population theory applicable to capitalist modes of production in the chapter "The general law of Capital accumulation" of his book CAPITAL (Vol. 1).

Marx criticised that the Malthusian conclusion that the growth of population divides the society into the rich and poor. According to Marx, population growth is not related to the alleged ignorance or moral inferiority of the poor, but is a consequence of the capitalist economic system.

CONCEPT

① CONCEPT OF CLASSES : According to Marx,

capitalist society consists of two basic classes -

(a) Capitalists who own means of production, and

(b) Workers who own nothing except their labour power

The capitalists are rich, own the means of production, control the entire production mechanism and earn profits.

The workers are, who create value addition through their labour, are however given wages which are always less than their contribution. The difference (surplus) is expropriated by the capitalists and

added to fixed capital under their possession.

② CAPITAL ACCUMULATION & RESERVE ARMY OF LABOUR:

Accumulation of capital, though, originally appearing as its quantitative extension only, results eventually in the change in its composition — a constant increase of constant capital (i.e. means of production) and a constant decline in variable capital (value of the labour power).

Technological development, rise in productivity of labour and centralization tend to decrease the ratio of variable capital further.

Unemployment and underemployment increases and, consequently, a reserve army of labour is created.

The workers are forced to subjugate under the dictates of capital, independently of the natural increase of population.

③ THE SURPLUS LABOUR:

There are four different forms of the relative surplus population or industrial reserve army, namely:

- (i) Floating surplus ✓
- (ii) Latent surplus ✓
- (iii) Stagnant surplus ✓
- (iv) Paupers ✓

Floating surplus include the people who used to have good jobs, but are now out of work.

The latent surplus consists of that segment of the population not yet fully integrated into capitalist production i.e. people living off of subsistence agriculture, and looking for monetary employment in industry.

The stagnant surplus consists of marginalised people with extremely irregular employment due to structural changes in the production process e.g. handicrafts to mechanisation.

The paupers are the lowest segment of surplus labour, who cannot adapt to capital's never ending change.

- eg.
- Able workers pauperised due to economic crisis
 - Orphans and pauper children
 - Demoralized and ragged
 - Those unable to work.

The low levels of wages and the absolute poverty in which the poor workforce live make them multiply their asset, i.e. population, they possess, with the perception of increasing workforce and thus overall income levels of the family. This causes population increase.

In Marx's viewpoint, economic classes and private property are the principal twin evils which lead to poverty, unemployment and fast growth of population. The changes in population dynamics are governed by the social systems that are created on the basis of relations of productions.

From a historical perspective, population is a socio-economic entity. It is an abstract notion if the classes of which it consists are disregarded. These classes are also meaningless if relations of production in general, and wage, labour and capital — are not explicitly considered.

Marx strongly advocated that as the cause of population growth is economic, population can be controlled only by generating more fair and equitable economic setup as in the socialist system.

CRITIQUE

- ① It is true that in capitalist society, there is surplus population on account of unemployment. But it is not correct to presume that under socialist system, there will be no need to check population growth at any stage.
eg. In USSR (erstwhile), factory workers were provided contraceptives to check birth rate.
China following one-child policy.
- ② The unprecedented growth of population is not due to reserve supply of labour but because of better health care facilities.
- ③ Increase in population does not directly lead to decline in wage rate. There are several other socio-political and economic factors.
- ④ Samont argued that the need for smaller families would be generated by the desire for better economic status.
- ⑤ Factors of religious faith and cultural norms which are responsible for the high growth rate are neglected.
- ⑥ Educational level and technological advancements are also ignored by Marx.

Q. Write short notes on :

- (1) Law of poplⁿ peculiar to the capitalist mode of prodⁿ
- (2) Reserve army of labour
- (3) Law of capital accumulation.

UPSC Mains Questions

1995 : Examine the theories about population control and explain the relative merits of these theories in limiting poplⁿ growth.

2007 : Write a note on the parameters used to describe the Demographic transitions in the developing countries like India.

2008 : Discuss the social and economic theories of population growth.

Other Questions :

- ① State the DTT. What are the major differences in demographic transition b/w developed and developing countries.
- ② Major differences in Malthusian and Marxist theories.
- ③ Write note on Vital Revolution.

UPSC [1999] = Bring out the contrast between the internal structure of the pre-industrial and industrial cities.

Date
26.01.2016

DEMOGRAPHIC TRANSITION THEORY

What is demographic transition?

It refers to the transition of a society from a situation of high mortality and high fertility to a situation of low mortality and low fertility, as it develops from a pre-industrial (agrarian) to an industrialised economic system.

Demographic Transition Model (DTM):

It is a theory demonstrating the temporal change in mortality and fertility and thus ^{total} related population in any given area.

This theory is based on an interpretation of demographic history of industrially advanced economies. It was developed by the American demographer Warren Thompson in 1929, and later ^{updated F.W.} by Notestein (1945) and Peter Haggett (1970).

Assumptions

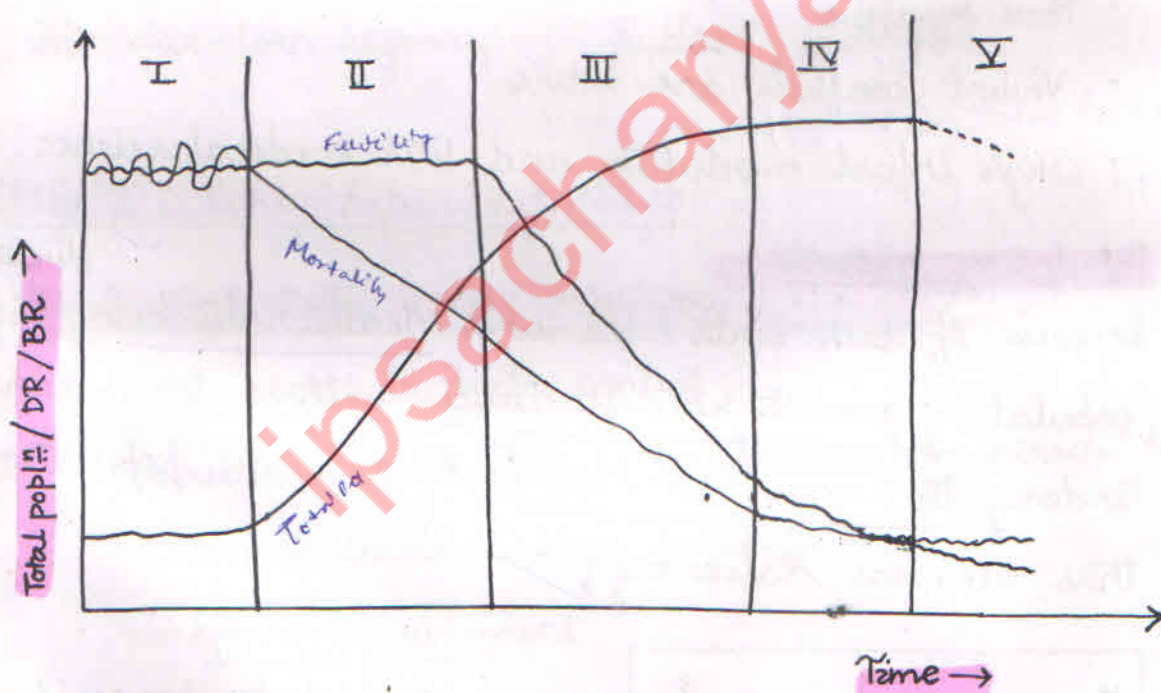
- The model incorporates three well-defined assumptions:
- (i) Both fertility and mortality changes from high-levels to low-levels in the regular temporal sequence.
 - (ii) Decline in mortality is registered much prior to the decline in fertility, which eventually declines to match mortality.

(iii) Socio-economic transformation of a society takes place simultaneous with its demographic transition.

The originally developed model had three different parts :

- Stagal transition with three stages
- Causative Components
- Predictive Elements.

In 1970, Peter Haggett incorporated the 'predictive component' part into the 'stagal transition' part, making the three-stages theory into a five-stages one.



- Stage I = High Stationary phase / Pre-Industrial stage
Stage II = Early expanding / Industrial European stage
Stage III = Late expanding / Modern European stage
Stage IV = Low stationary phase
Stage V = Declining population stage

Stage I: High Stationary Stage

This stage is also known as pre-industrial or high-fluctuating stage. It is characterised by:

① High birth rates (TFR > 35‰)

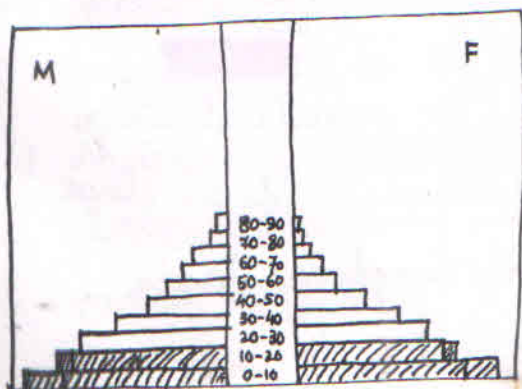
- little or no family planning; little access to birth control
- Parents have many children because few survive
- Many children are needed to work the land
- Religious beliefs and cultural traditions encouraging large families.

② High Death rates (TMR > 35‰)

- Infectious diseases and plagues
- Famine, uncertain food supplies, poor diet
- Poor hygiene
- Violent conflicts and wars
- High infant mortality and little medical science.

③ Population growth

Because of both birth rates and death rates being high, population growth rate fluctuates with a long-run tendency to remain around zero. The total population, thus, remains stationary. ✓



← Population →
[Angola in 2000]

- * Due to high BR, pyramid shape has a wide base.
- * Due to high DR, the pyramid is short-heighted. Concave shape ⇒ Low life expectancy.

④ Socio-economic characteristics

Pre-industrial and pre-modern stage with rural agrarian set-up. Low productivity levels, illiteracy, little technical know-how, limited urban development with large families as asset are dominant features.

During this stage, the society evolves in accordance with Malthusian paradigm, with population essentially determined by the food supply.

⑤ Example regions:

- (i) All human populations until 18th century
- (ii) Primitive 4th world communities like Bedouins, Masais
- (iii) War-torn regions — Sudan, Angola.

TFR - Total Fertility Rate

TMR - Total Mortality Rate

Stage II: Early Expanding Stage

① High Birth Rates (CBR > 40/1000) (TFR > 30‰) CBR - ^{Crude} Child Birth rate

- Little access to birth control
- Increasing youth population because of increased survival leads to high fertility rate
- Workforce requirement
- Religious and cultural beliefs

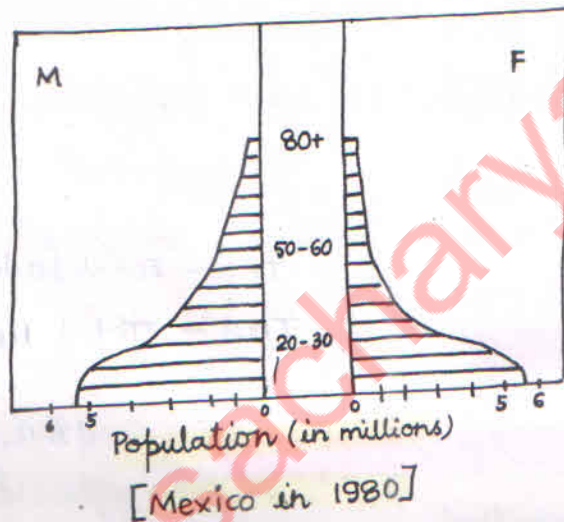
② Falling death rates (TMR > 15‰)

- Advanced medical support system
- Improved sanitation and water supply

- Improved food production - both quality and quantity
- Improved transportation and communications
- Decrease in child mortality
- Formation of nation state.

③ Population growth

Due to decreasing mortality combined with constant high fertility, rapid population growth results in population explosion towards the end of this stage.



- * Width of the base remains large due to high BR
- * Height of pyramid grows to reflect falling DR
- * Shape becomes less concave due to increased life expect.

④ Socio-economic characteristics

- Urbanisation starts and increases rapidly
- Often, social and economic problems begin on a large scale
- Dependency load is huge due to massive, young cohort (< 15 years old).
- With CBR of more than 40 live births per 1000 popl. and total fertility of more than 4.5, this stage justifies early expansion.

⑤ Example regions

- Almost all the African countries (excluding North African and South Africa)
- Afghanistan
- Yemen

NOTE: → Global avg. CBR = 27 (As per 2010-11 UN Popl. tables)

→ [Afghanistan
Niger
Somalia] CBR = 50

→ Replacement level fertility = 2.1 to 2.5

→ Global TFR = 3.3

→ Stage II countries' TFR = > 4.5

Stage III : Late Expanding Stage

It begins with the start of fall in birth rates. The characteristics of this stage are:

① Falling birth rates (CBR b/w 20 to 40)

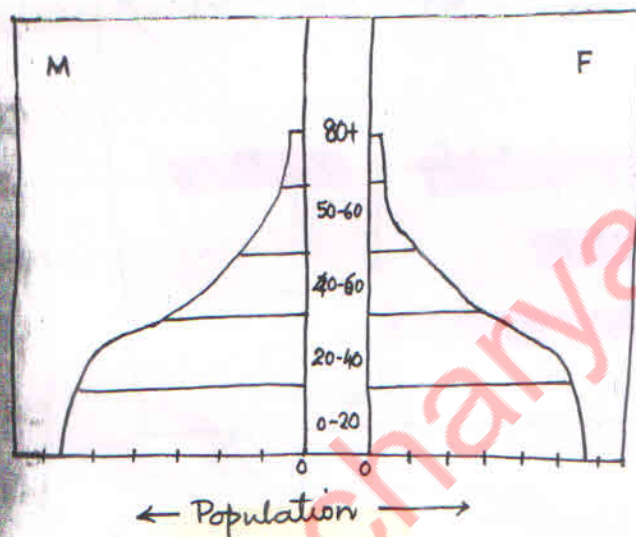
- Family planning methods utilized — contraceptives, abortions, sterilization and other govt. incentives
- Lower infant mortality rates make parents confident of their child's survival
- Increased mechanisation and industrialization means less need for labour.

- Increased desire for material possessions and less desire for large families ✓
- Emancipation of women. ✓

② Low death rates

③ Population growth:

With declining fertility and low mortality, population size grows but its rate decreases continuously. ✓



* As birth rates fall, the base begins to stabilize and eventually narrow.

* Death rates are low and stabilized - the pyramid grows higher.

④ Socio-economic characteristics

- ① Birth control is introduced and wide social acceptance begins.
- ② Population explosion ends. Moderate levels of CBR (20 to 40 live births per 1000) and TFR in the range of 2.5 to 4.5 ensures growing population with stability. ✓
- ③ Social and economic issues begin to be addressed.
- ④ Urbanisation dominates, literacy increases ✓
- ⑤ As wealth increases, desires for material possessions take over the desire for large families. ✓

⑤ Example regions

- Most Asian countries including India.
- Most Latin American countries
- Northern African countries
- South Africa

Stage IV : Low Stationary Stage

① Low birth rates :

Total fertility rates plunge to at or near replacement level (2.1 children per woman) dx while CBR goes below 20 live births per 1000. This is because :

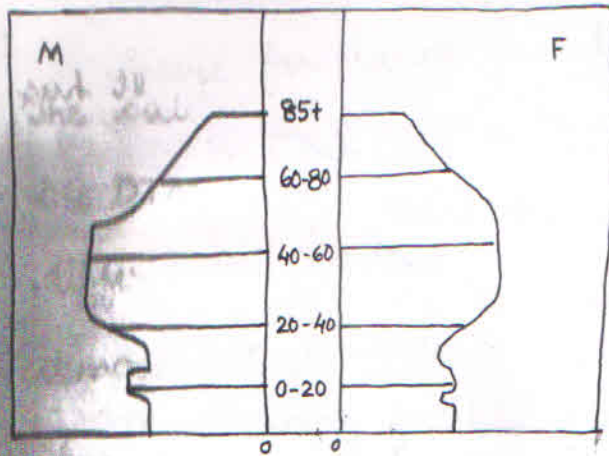
- Valuation of women beyond childbearing and motherhood becomes important.
- Increasing value is placed on material goods over family size
- Widespread use of contraception

② Death rates - low

- Capital investment in high-end medical technology
- Widespread knowledge of healthy diet and lifestyle.

③ Population growth

The combined effect of prevailing low birth and death rates makes the population size completely stable or near stability.



[Stage IV : Sweden (1998)]

- Narrow base \Rightarrow Low BR
- Wide top \Rightarrow High LE, low DR
- Bulge in the middle \Rightarrow Aging Society

LE - Life expectancy

④ Socio-economic characteristics

- Age structure has become older.
- Dependency load is small because of large 'working age-group'.
- Population is highly industrialised and urbanised
- Technical know-how is abundant
- Population growth no longer a socio-economic issue.

⑤ Example regions

- Developed 'New World' which started their demographic cycle slightly later than European countries
- Successful anti-natalist countries which completely skipped one of the stages of demographic cycle. eg. China, Kazakhstan, Turkey and Uruguay.
- Singapore, Hong Kong, Japan.

Stage IV was outlined in the predictive element in the original model.

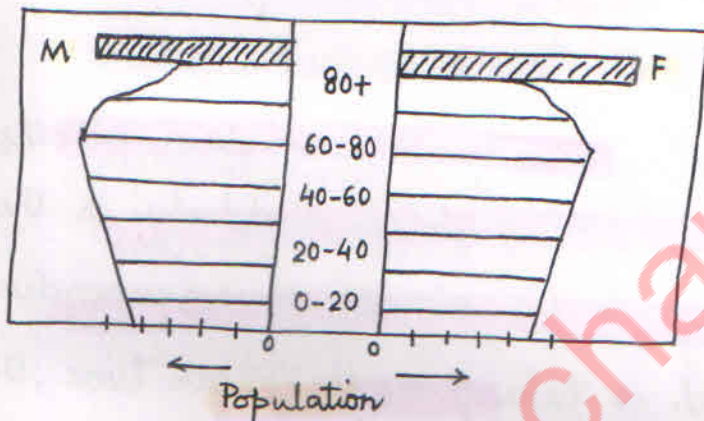
Stage V: Declining Population Stage

predictive component in the

It was also included in the original DTT model. It has the following characteristics:

- ① Declining fertility
- ② Low mortality
- ③ Population growth

In this stage, the declining fertility declines below mortality making total population decline. The population growth rate is negative.



* The pyramid seems to be inverted.

* Aging Society

④ Socio-economic characteristics

- Old age morbidity issues
- TFR below replacement levels (in the range of 1.8 or less) justifies the threat of depopulation.
- Marriage age increases ✓
- Society highly technology-driven ✓
- Reversal of social security expenses from young to old population.

⑤ Example region: Most of the European countries.

2. CAUSATIVE COMPONENTS

The causative components outlined by the propounders of the DTM denote the attempt to explain the reasons of different countries experiencing different stages of demographic transition. For example:

(a) Developed countries:

In these countries, it took a very long time for mortality and fertility to decline and since the changes in both of them was slow, they did not experience population explosion.

(b) Developing countries:

In these countries, mortality remained high till the middle of the 20th century and declined suddenly in the 3rd quarter of the century. In the absence of corresponding decline in fertility, which is taking much longer time, they experienced very rapid population growth rate, often exceeding 3%, implying a doubling time of 23 years.

These differences in demographic transition for different countries have been attributed by Trewartha and Chung to the dual characteristics of man, namely - biological and cultural.

Biologically, human character show similar traits globally. However, culturally there is major difference regulating fertility and mortality patterns. In the cultural dimension, economic growth is also of prominent significance as economic development is formally recognised to be the most effective contraception.

It is easy for any state to work effectively towards reducing death rates and improving health facilities that everyone welcomes but it is difficult to change reproductive behaviour which required sustained motivation on the part of individual couples.

CRITICISM of DTM

Among all the theories, DTT is ^{most} known to population sociologists but is also the most criticized theory. It suffers from a number of limitations:

- ① It only summarizes the empirical experience of some industrially advanced countries — of Europe, Anglo-America and Australia. It does not present a coherent theoretical framework to establish relationship between development and demographic transition.
- ② Loschky and Wildcose asserted that the DTT is neither predictive nor its stages are sequential and inevitable. eg. China has entered the third stage of demographic transition owing to strict one-child policy adopted by the Chinese government in the 1980s.
- ③ It completely ignores the role of migration in affecting the population size and the related socio-economic development parameters.
- ④ It does not tell how much time the demographic transition will take
- ⑤ It does not explain the causes of changes in death and birth rates.

- ⑥ This model postulates ever decreasing fertility rates. However, recent research data show that at advanced HDI levels, further development can lead to increasing fertility rates.

Appraisal of the DTT

- ① The DTT does provide an effective portrayal of the world's demographic history at macro level of generalisation.
- ② As an empirical generalisation, the theory help in understanding the transition process for any country provided the situational context is properly understood.
- ③ It warns the developed nations in stage four about the threat of depopulation.
- ④ The model became the basis for similar models including the Migration Transition Model and the Epidemiological Transition Model, which predict the patterns of international and intra-national migration flows and the characteristics of disease respectively.

Recent literature on demographic trends :

In recent literature on demographic trends, social scientists are talking of second and third demographic transitions. The transition discussed in the DTT is called the first transition.

Second demographic transition refers to rapid fall in fertility to the below replacement level in the industrially advanced countries, mostly after a brief period of baby boom after WWII.

The third transition refers to increase in fertility in lowest low fertility countries whose mechanism is not yet understood.

It is difficult to say whether societies will experience increased fertility after the second transition, and in what circumstances. Today it confronts the developed countries. As and when the developing countries will achieve the replacement or below replacement level fertility, this issue will become important for them also.

VITAL REVOLUTION

It is the marked historical change in the rate of reproduction in a society characterised by the achievement of a stable equilibrium of low death and birth rates. It corresponds to the rise in population growth rates after 1750.

Demographic transition stage II and onwards. Reasons, socio-economic characteristics and the regions experiencing this 'vital revolution' across the global at different times.

Parameters used to describe DT

1) Birth rate

- CBR, SBR
- TFR
- Causes, Data

2) Death Rate

- CDR, SDR
- TMR
- Causes, Data

3) Population growth rate

- N.I.
- N.D.
- Poplⁿ explosion
- Poplⁿ stabilisation

Settlement Theories

① Walter Christaller's Central Place Theory
— 1933

② August Losch's Modified CPT
— 1940, 1954

ipsacharya.in

Date
27. Jan. 2016

CENTRAL PLACE THEORY

- Walter Christaller (1933)

CPT is a spatial theory in urban geography that attempts to explain the number, location, size, spacing and functions of a settlement within an urban system.

It was proposed by the German geographer Walter Christaller in his book "Central Places in Southern Germany" in 1933. He for the first time followed the quantitative tradition in theory building and ^{his theory} deductively produces a settlement pattern under specified conditions.

The theory is DETERMINISTIC in the sense that it elicits a particular effect from a particular cause i.e. there is an inevitability of occurrence of a certain set of events under specified conditions.

Central Places in
Southern Germany, 1933

Assumptions:

Christaller based his theory on a set of geo-ecological and socio-cultural conditions:

- ① The landscape is an isotropic surface - uniform in terrain and climatic conditions
- ② The distribution of population and their income level are almost the same
- ③ Both the consumer and the seller are rational economic creatures who try to optimize their profits.

- ④ There is same demand for goods and services in the geographical space (closed system)
- ⑤ The consumers being rational would opt to travel the least distance to attain desired goods and services.
- ⑥ There is equal ease and opportunity of movement in all directions and transport costs are proportional to distance.

Theory

Christaller identified every settlement to be a central place. It is defined as a market place providing goods and services to its own population along with the population of lower ranking settlements. ** (See Next page)

Market place providing goods & services to its own pop & lower ranking settlements

He concluded that :

- (a) Ranks of the settlements are determined by the nature of goods and services provided by them.
- (b) In a given settlement system, there are always larger number of smaller settlements and smaller number of larger settlements.

$$\text{No. of settlement} \propto \frac{1}{\text{Size of Settlement}}$$

- (c) All the settlements in a given hierarchy will be equispaced and provide absolute similar goods & services. However, as the size of a settlement increases, the number of higher order services will also increase i.e. a greater degree of specialisation.

(d) Christaller identified that with increase in the hierarchy of settlements, increasing functional capacity will result in increase of the size of sphere of influence.

(e) The larger the settlements grow in size, the greater the distance b/w them i.e.

$$\left(\text{Distance b/w similar settlement} \right) \propto \left(\text{Size of the settlement} \right)$$

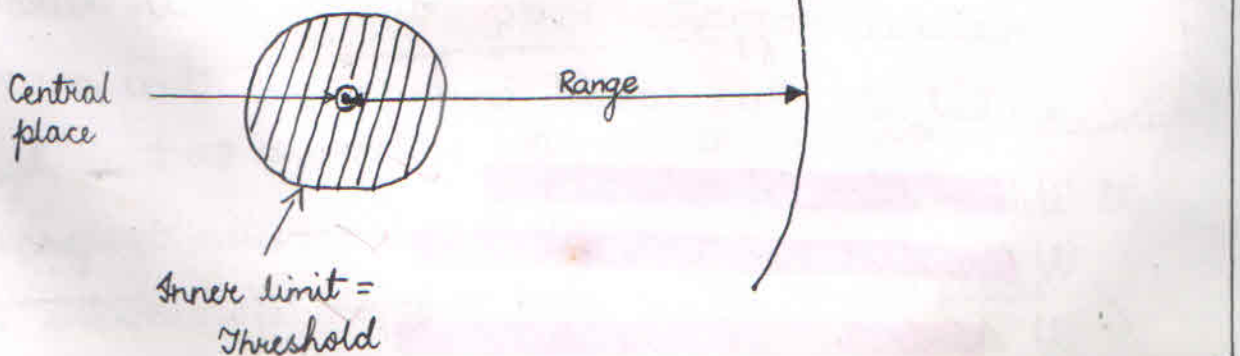
The higher the order of the goods and services, the larger is their range and the longer ^{the distance} people are willing to travel to acquire them.

P.T.O.

** Christaller based his theory on the two concepts of threshold and range =

(1) Threshold _{for a good} := It is the minimum market (population/income) needed to bring about the commercial viability for an establishment selling that good alone. It is the determining factor in the location of any central place.

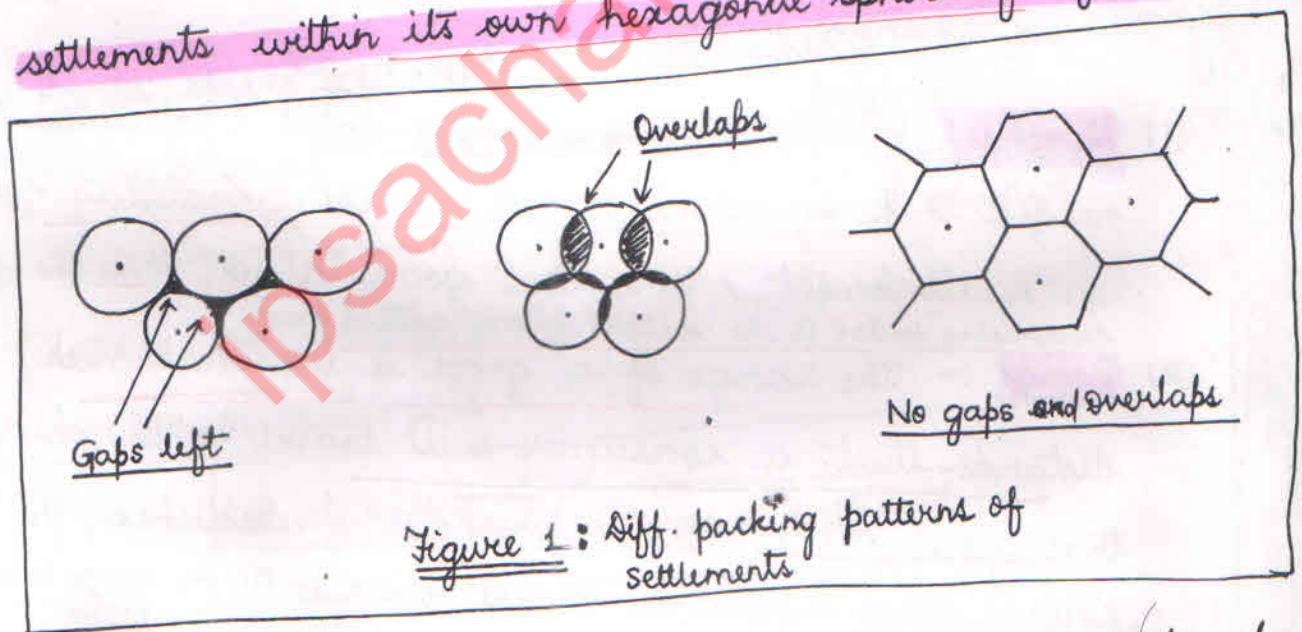
(2) Range := The range of a good is the maximum distance that a consumer will travel to purchase that good alone. Once a threshold is established, the central place expands its market area until the range is reached.



Recognising co-existing settlement and each situated in the centre of the region it serves, Christaller generalised the sphere of influence to be circular. However, with either overlaps or gaps, he eventually moulded it to be hexagon, denoting equi-spacing of 6 lower order settlements around a central place. [Figure 1]

Pattern of Nesting :

For each hierarchical level of central places, there is a corresponding network of hexagonal spheres of influence (complementary areas). Each higher order settlement includes the sphere of influence of all lower order settlements within its own hexagonal sphere of influence.



Christaller suggested three ways in which hierarchical spatial structure would be organized. These are :-

- (1) Marketing Principle ($k=3$) ✓
- (2) Transportation Principle ($k=4$) ✓
- (3) Administrative Principle ($k=7$) ✓

'k' shows how much the sphere of influence of the central place takes in.

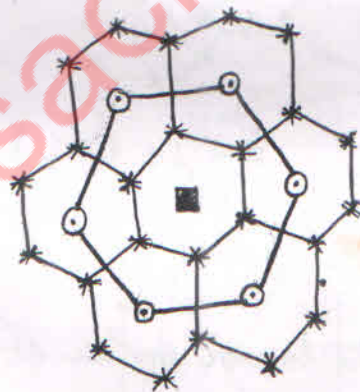
Marketing Principle (k=3)

In this principle, lower order settlements are placed at the corners of hexagon with the ^{higher order} central place at the centre.

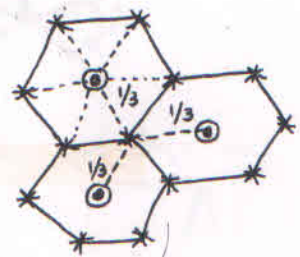
Each lower order settlement is thus equidistant to three higher order settlements. Rational consumers will divide themselves into 3 equal parts with central place receiving $\frac{1}{3}$ rd of population of each lower ranking settlement.

Therefore, including its own population, each higher order settlement will serve 3 lower order settlements in total i.e.

k=3. eg. 1 megacity will serve 3 cities, 9 towns and 27 villages.



○ = City
* = Town



$$k = \left(1 + 6 \times \frac{1}{3}\right) = 3$$

A. Marketing Principle (k=3)

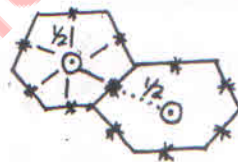
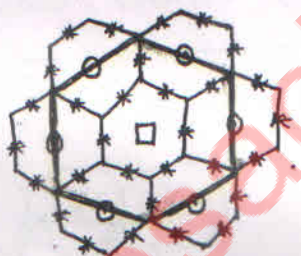
Although in k=3 marketing network the distance is minimized, the transport network is not the most efficient because there is no intermediate transport links b/w the larger places.

2. Transportation Principle ($k=4$)

In this principle, lower order settlement develops along the transport route connecting 2 higher order settlements.

Since the lower order settlement is equi-distant from two higher settlements, the population tends to get divided into two equal parts. The central place thus receives half of the population of each lower ranking settlement. Combining its own population, each central place serves four settlements, i.e. $k=4$.

eg. each megacity serves 4 cities, 16 towns and 64 villages.



$$k = \left(1 + 6 \times \frac{1}{2}\right) = 4$$

B. Transport Principle

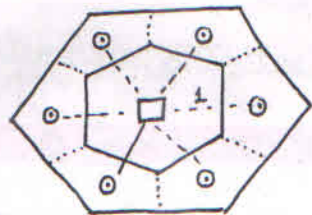
In this system of nesting, the lower order centres are all located along the roads linking the higher order centres. This alignment leads to minimization of road length.

However, for each higher order centre, there are now four centres of immediate lower order, as opposed to three under the marketing principle.

3. Administrative Principle (k=7)

has administrative

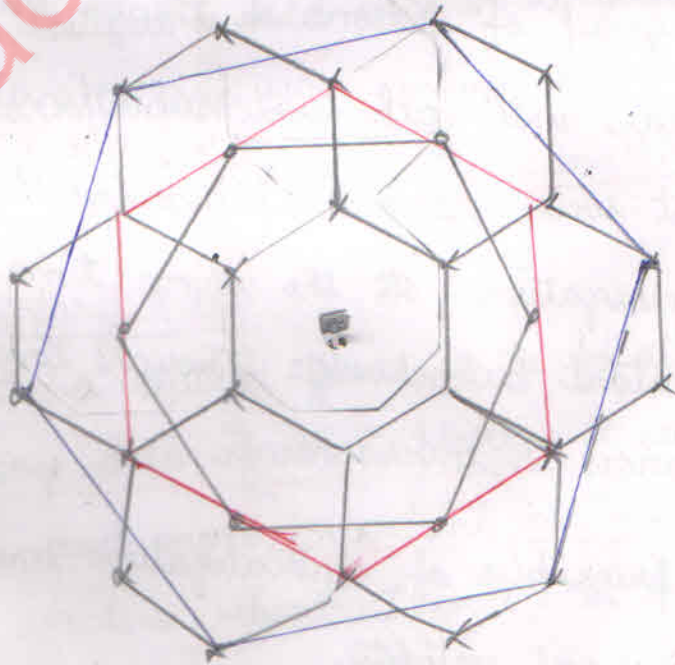
In this principle, higher order settlement control over the lower order market place. The market areas of the smaller settlements are completely enclosed within the market area of the larger settlement. This principle forms the most recognised part of the CPT since it involves well-demarcated sphere of influence justifying the practical validity of $k=7$.



$$k = (1 + 6 \times 1) = 7$$

C. Administrative Principle

Eg. In India, all district boundaries.



$$k = 3$$

$$k = 4$$

$$k = 7$$

Fundamental Concepts Ingrained in the CPT

The CPT builds on the foundational concepts of :

(i) Centralization

(ii) Hierarchy

All matter in the universe, whether organic or inorganic, has a core (or focal point) and a periphery. Similarly, the smaller settlements are organized around a larger settlement which serves as a focal point for all the lower settlements around it. It is not, however, necessary that the focal point has to be at the geometric centre of the settlements. Centralization is thus not a geometrical concept. It is concerned with the relationship between a central settlement and peripheral settlements.

Hierarchy refers to the organization of a group of persons or things into successive ranks or grades with each level subordinate to the one above. Most socio-economic phenomena have a hierarchical organization. At the same time, hierarchies are not constant but change through time, according to the changes in ^{its} environment.

The principles of centralization and hierarchy have universal validity.

See from Atk's note

Derivative Concepts

There are six major derivative concepts in the CPT:

- 1) Concept of central place
- 2) Concept of complementary area
- 3) Concept of central goods and services
- 4) Concept of range of goods
- 5) Concept of threshold
- 6) Concept of centrality.

1. Concept of Central Place

A central place is a settlement which serves as a focal point for a number of other settlements which are dependent on it. To be a central place, a settlement must offer some service of a very regular nature with daily periodicity, to the settlements around it.

For example:

- A place where a festival is held once in a year or weekly rural markets are NOT central places.
- Midtown Manhattan is a central place in NYC, USA.

2. Concept of Complementary Area

The area for which a central place is the focal point is the complementary area of that place. It would be larger for bigger and more important central places and smaller for the less important ones. In a theoretical sense, the complementary area is a collection of settlements of lesser importance.

(3) Concept of Central Goods and Services

The primary function of a central place is to offer goods and services. The central place activities are thus essentially tertiary in nature. The goods offered may range from ordinary to luxurious. Large central places offer, in addition, goods and services that are less frequently required and which cost more like higher medical institutions and costly medical facilities.

(4) Concept of Range of Goods

The range of a good is the maximum distance that a consumer is willing to travel to purchase that good alone. It is measured in terms of time taken and transportation cost incurred, which influence the demand in accordance with the distance from central place.

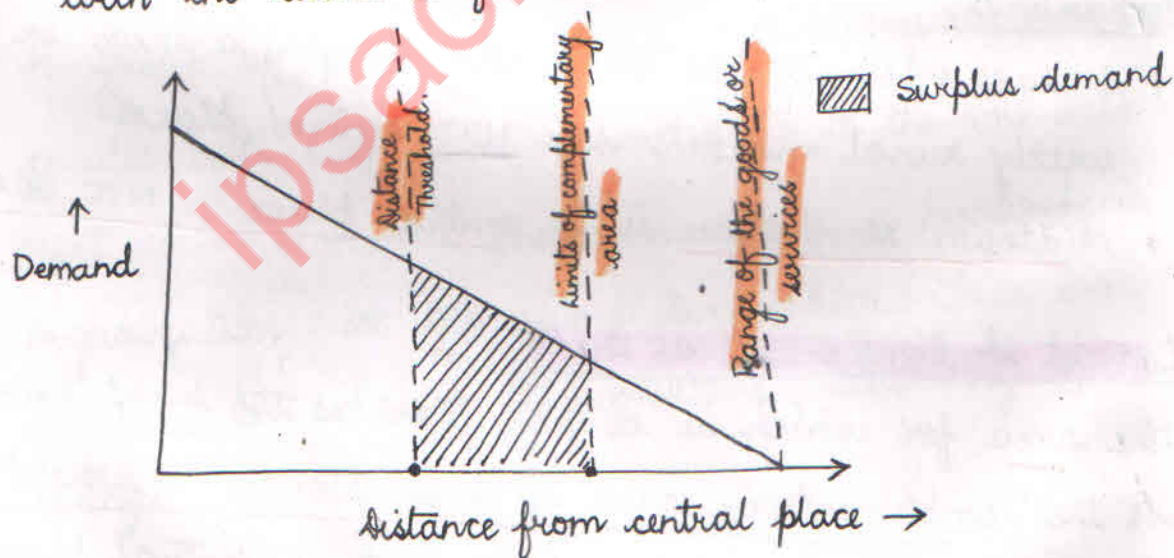


Figure: The frictional effect of distance

In practical life, one would not ordinarily walk/travel more than a kilometre, but for luxury items one might be willing to travel a hundred kms to a big city.

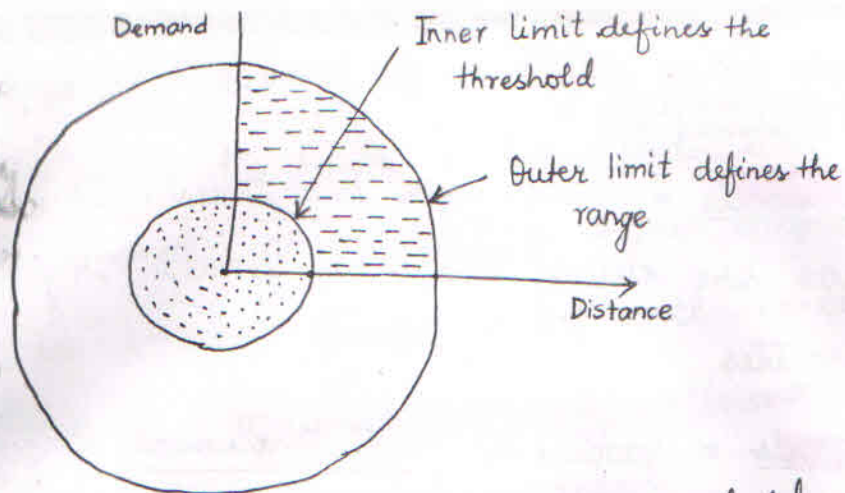


Figure: Range of Goods and Threshold

(5) Concept of Threshold

Threshold for a good is the minimum market (population or income) needed to bring about the commercial viability for an establishment selling that good alone. It is the determining factor in the location of any central place. Only after threshold is established can a central place think about expanding its market area upto the range.

(6) Concept of Centrality

The centrality of a place refers to its functional importance, which depends upon the number and variety of goods and services it provides to its complementary area.

Order of Goods / Services

- ① Lower order goods = goods with low thresholds and small market areas are called low order goods. They occupy low order centres.
- ② High order goods = goods with high thresholds are called high order goods and they occupy high order centres.
- ③ Middle order goods = good with thresholds in between the lower and higher order goods, sold at intermediate order centres.

It is the order of goods and services that grade the central place.

IMP

Assessment of the CPT

① LIMITATIONS / CRITICISMS :

- (i) An isotropic surface is ideal, rarely found in the real world.
- (ii) The behaviour of consumers and sellers is not always rational. It can be unpredictable many a time.
- (iii) The economic determinism of the theory takes no account of random historical factors that can influence the settlement pattern. Settlements are generally random and not evenly spaced as propounded by Christaller.
- (iv) The hexagonal sphere of influence is too theoretical and rarely found in real world.

(v) Sphere of influence of a higher order settlement is large only w.r.t. the higher order goods that it offer. The lower order goods that a higher order settlement offers have smaller spheres of influence. Hence, a central place has multiple sphere of influence based on the different goods and services.

(vi) The theory is suitable primarily for agricultural regions, because modern innovations like efficient, ^{faster} transportation, communication, internet, malls etc. have reduced the distance between the consumers and the sellers.

(vii) The fixed value of 'k' shows poor approximation with reality. The CPT is a static formulation that relates to the distribution of service centres under assumed conditions at one point in time. It does not incorporate the temporal aspect in the development of central place.

(viii) The model does not take into consideration the location of industries and governmental influence, which invariably modify the centrality of settlements and threshold of goods.

(ix) No real world settlement system can be expected to conform to all the assumptions of Christaller's model.

② PRESENT DAY APPLICABILITY :

even as an ideal, the CPT of Christaller is useful and finds many applications. Kolars and Nystuen suggest that the main contributions of both Christaller and Losch have been as much to stimulate further geographical thought as to give us any absolute explanations of the real world.

The theory has stimulated much work in relation to retailing and consumer behaviour, and in the fields of physical and social planning.

- ① It provides a rationale for selective location and efficient division of space and functions.
- ② It has drawn attention to country and inter-town interdependence in terms of the functional and behavioural dimension.
- ③ The ^{hierarchy} distribution of settlements from hamlets to metropolis though uneven is not disorderly. The CPT seeks to analyse the function and hierarchical orderliness in the settlement landscape.
- ④ The theory encourages us to think of individual settlements in their wider context and seek some order in the spacing and inter-relatedness of settlements.

(5) While centrality of settlements is sought in the location economies, social and administrative structure and their various forms. eg. location of temples, churches, university, hospitals etc.

(6) The CPT helps us to identify more clearly the role of settlements as places of trade and ^{the way the trade} its influence the emerging settlement pattern in a region.

(7) The CPT has been used as a guideline for relocation policy and this was incorporated as an integral part of regional planning in Germany.

(8) Examples:

(a) The newly reclaimed polders of the Netherlands on which settlements have developed

(b) The Fens of East Anglia in the UK also provide a large expanse of flat land with no natural barriers to settlement development.

(c) Cambridge, England is a good example of a k=4 'Transport Model' central place.

Use of CPT in the delineation of Medical Care Regions in California, USA.

CENTRAL PLACE SYSTEMS IN INDIA

The key elements of the system of central places as proposed by Walter Christaller are:

(i) Hierarchy of settlements

(ii) Ordering of settlements

(iii) Even spacing of settlements of different level

These elements operate ^{differently} under specific circumstances — marketing, transportation and administrative.

India represents hierarchy from the point of view of administration and demography.

① Administration

India has a six-level hierarchy of settlements — National capital at the top, state capitals, district HQs, tehsil towns, block development centres and gram panchayat centres. The national and state capitals are metropolitan cities, district centres and tehsil towns are recognised urban places while block headquarters are large villages having a population of 5000 and most of them are not recognised urban places.

The administrative hierarchy ($k=7$) of settlements in India differ considerably from the CPT.

Theoretically,

Theoretically there is a ratio of 1:7 between the number of settlements of higher and lower orders. In India, the ratio of districts to states is almost $1:19$, while there are ~~as~~ as many as 38 ^{gram panchayats per} community development block.

The number of tehsils per district is slightly over six and this corresponds to administrative principle somewhat closely.

While
consider

While theoretically the spacing between settlements of lower and higher orders should increase by a factor of 2:6, in most cases, this ratio is much larger in India.

(2) Demography Demography

The census has identified various levels of settlements on the basis of size of population. The settlements range from million cities to revenue villages having less than 500 population. This categorization is based only on population size and has an element of arbitrariness in that the population limits of various categories are not based on any specific rationale. [Despite the various constraints, the settlements in India bear a close resemblance to the marketing principle ($k=3$). While the CPT prescribes a ratio of spacing of higher order centres to the immediate lower order centres as $1:1.72$, the actual ratios of spacing vary from 1.41 to 1.83 , except two exceptions.

The major exception relates to the million cities, which are in fact primate cities.

Therefore, it cannot be conclusively proved that the CPT apply to Indian conditions. At the same time, by accomodating the theory w.r.t. the real world scenario, it cannot be rejected completely as well.

ipsacharya.in

LOSCH LOCATION MODEL

August

August Losch made the first attempt to develop a general theory of location with the major emphasis on demand in his book "The Spatial Organization of the Economy" in 1940. Losch sought to explain the size and shape of market areas within which a location would command the largest revenue. His study was based on the urban places of entire Germany in which he took into consideration 150 commodities and services, including the manufacturing and industries. Unlike Walter Christaller, whose system of central places began with the highest order, Losch began with a system of lowest-order (self-sufficient) farms.

Assumptions

- ① an isotropic plain ✓
- ② Constant supply of goods/services
- ③ Evenly distributed population and identical preferences among them.
- ④ Entrepreneurs act as economic rational creature, their main aim being profit maximisation. ✓
- ⑤ New production plants could enter market if profitable. ✓

- ⑥ Demand decreases with an increase in price. If the price increase is the result of an increase in transport costs, demand would decrease with distance from a production centre. The demand curve would be cone-shaped and the market area circular.

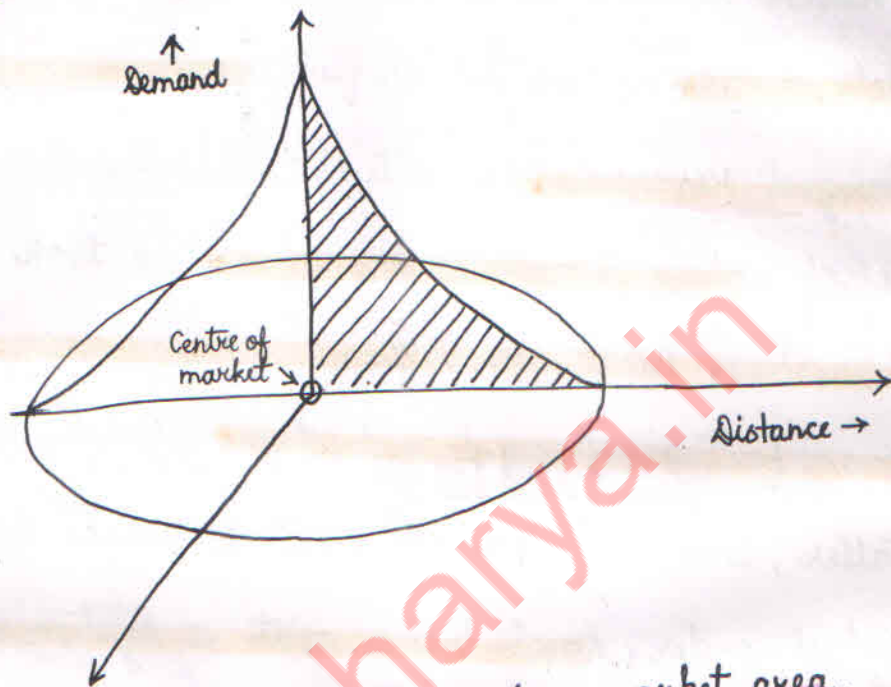


Figure: Derivation of circular market area.

Theory
Losch treated each "function" (commodity or service) having a separate range, threshold and hexagonal hinterland. Wherever feasible, establishments in these functions were clustered in the same settlements, but in his system, all central places with a "function" of particular threshold need not contain examples of all "functions" with smaller thresholds. This results in a more complicated pattern of central places, which can incorporate

Other urban functions (such as manufacturing and industries).

There are many producers located on the plain, each equidistant from the other. As such their market areas are circular. The size of the market area is dependent on the number of entrepreneurs/producers. The competition increases as other producers develop on the plain and the market areas become hexagonal to avoid overlaps and the exclusion of some areas. They also become smaller as large profits are competed away.

Each product will have a different market area (threshold) depending upon the relative importance of transport costs in its price, and different patterns of production centre. In other words, the size of hexagon varies with each distinct product.

To obtain a spatial structure, efficient for both the producer and the consumer, Losch arranged the hexagons around a common production centre by rotating them so that the maximum number of hexagons coincided. 12 sectors thus emerged, arranged alternately, so that six sectors had many economic activities (points of maximum demand) and six others had relatively few. The points of maximum demand emerge as concentration of industry.

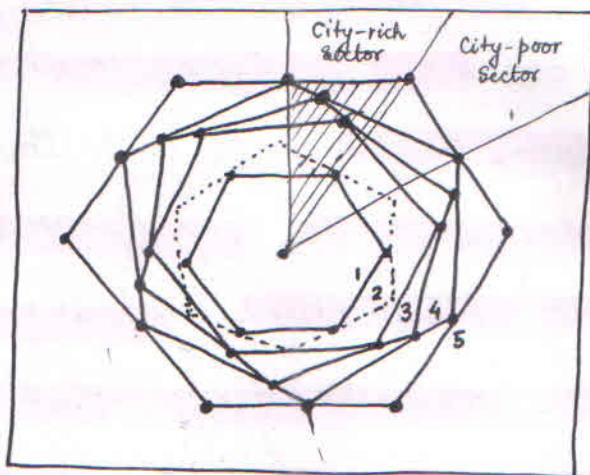
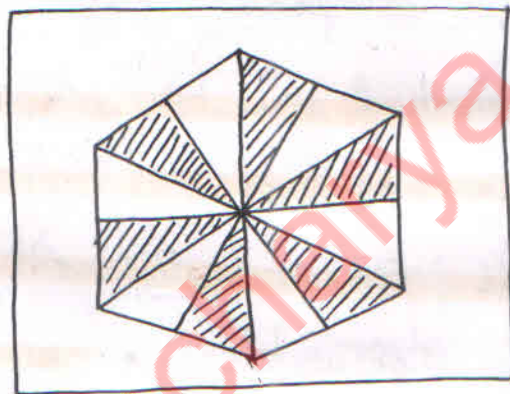


Figure : Rotation of hexagon around the central point



 City-rich sector
 City-poor sector

Figure : Alternate sectors of demand

The city-rich sectors have relatively many higher order central places while the city-poor sectors represent centres relatively of poor services.

The Loschian hierarchy is far less rigid. It consists of a nearly continuous sequence of centres rather than distinct tiers, so that:

- (i) settlements of the same size need not have the same function.
- (ii) larger places need not necessarily have all the functions of the same smaller central places.

CRITICISM OF LOSCH

Abstract
Losch's ~~land~~ economic landscape theory has been criticized for its abstract nature and its failure to take into consideration the problems arising from the locational inter-dependence of manufacturing factories and plants. Losch is also criticized for overemphasizing demand.

Overlapping of market places
The model presents a very complicated picture of the services and manufacturing thresholds. The market for products does not occur in isolation as they overlap. Location equilibrium between a firm and its market, therefore, rarely occurs using the profit-maximization philosophy. As more firms appear, profits are eroded and optimal locational circumstances change.

Broader list of entrepreneurs
Besides, Losch's calculation of market demand was too crude and ignored many of the difficulties an entrepreneur would encounter in trying to estimate demand as a basis for their locational decision.

CHRISTALLER & LOSCH - COMPARISON

A "Central Place Theory" was attempted by both Christaller and Losch. They both used similar, though not ^{all} the same, assumptions but their approaches were quite different.

Read from Alok's Note

- ① In Christaller's scheme, the hierarchy is composed of a series of discrete levels in which a centre produces exactly the same mix of goods as every other centre at the same hierarchical level. Losch's hierarchy by contrast is far less rigid. Centres of the same size (in terms of economic activity) are less regular and may produce quite different combinations of goods.
- ② Christaller's concept is based on the consumers and seller's behaviour, transport and administrative services, while Losch took into consideration 150 commodities and services and developed over 40 networks.
- ③ While Losch considers first the commodity with the smallest market area and then introduces other commodities with successively larger market areas, Christaller starts with the largest market area and then turns to commodities with ever smaller market areas. Thus, Christaller constructs his system from top-to-bottom while Losch builds his starting from bottom.
- ④ In Christaller's model, the higher order central places have all the functions of the lower order, while in the case of Losch it is not necessary.
- ⑤ Losch's model incorporates other urban functions also such as manufacturing and industries.

⑥ Christaller's theory predicted a stepped hierarchical form of city-size distribution i.e. all places in an order had the same population, while Losch's model is more ~~closely~~ ^{closely} in line with the theoretical results of the rank-size rule.

Similarities

- The theories of Christaller and Losch are central to much of the early works undertaken during geography's Quantitative Revolution in the 1960s.
- Both the models stress on the distance minimizing pattern of consumer's shopping choice.
- Both the models have been of great importance in the regional planning both in the developed and the developing countries.

Date
02.02.2016

VON THUNEN'S AGRICULTURE LOCATION MODEL

In 1826, German economist and practicing farmer J.H. Von Thunen propounded the first analysis of agriculture land-use on quantitative lines in his book - "The Isolated State". His ideas were based on his studies of the works of Adam Smith and his own empirical experience. His theory is deterministic and normative in nature, with a partial equilibrium approach designed to explain the type of agricultural production that would be best carried out at a given location.

Assum
Agriculture is governed primarily by three basic factors - environment, people and economic factors. Of these, Thunen considered only the economic factors to show how and why agricultural land-use varies with distance from the market.

Postulates

Thunen had two basic postulates:

- (i) The intensity of production of a particular crop declines with the distance from the market. Intensity of production is a measure of the amount of inputs per unit area of land.

eg. The greater the amount of money, labour and fertilisers etc that are used, the greater the intensity of agricultural production.

(ii) The type of land-use will vary with distance from the market.

The main focus across the theory was based on the cost factors and maximisation of profits.

Assumptions

Since von Thunen's theory is deterministic and normative, it simplifies the real world situation through many assumptions:

- ① There exists a geographical region with isolated economic characteristics called the isolated state (isolierte staat). It has self-sufficing existence with no commercial links with the rest of the world.
- ② It has an isotropic plain ^{with similar soil fertility throughout}. The city is located at its centre while the rest of the region is agricultural.
- ③ The city is the sole market for the surplus production from agricultural area, which in turn is the sole supplier of commodities to the city.
- ④ Farmers are rational economic creature oriented towards profit-maximisation and capable of converting quality and quantity of yield as per market demand.

- ⑤) There is only one form of transport - "ox-or horse-carts".
- ⑥) Transportation cost increases with increase in the distance travelled and weight of the commodity displaced.
- ⑦) In the market, all farmers receive the same price for a particular commodity and there is no market manipulation.

Theory

• principle: The theory is constructed around the concept of locational "Economic" rent, which is the return generated of a crop due to its location. It emphasizes that all farmers will produce on their land that commodity which yields the 'highest' rent, and so will maximize their profit.

This rent (LR) is dependent on the production costs per unit of the commodity (C), its market price (M), the yield per unit of land (Y) and the distance from the market to the production point (x), through the relation:

$$LR = Y(M - C) - YxT$$

where, T = Transport rate per unit of distance.

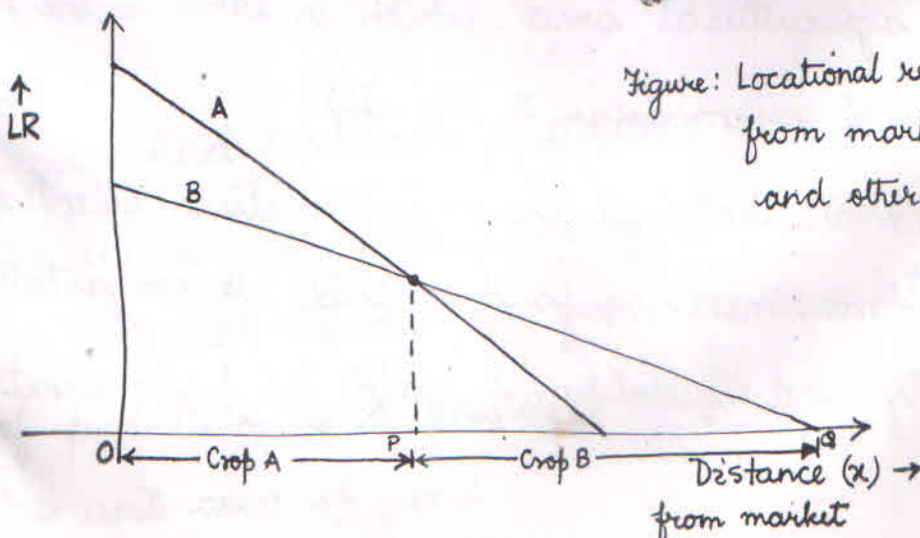


Figure: Locational rent and distance from market of one crop (A) and other crop (B).

Since the LR for crop A is greater than that of crop B upto the distance OP from the market (at O), it would be profitable for the farmers to grow crop A upto OP. Similarly, beyond OP, the farmers would be maximizing their profit (LR) by growing crop B.

Since Thunen assumed all other factors like same yield (isotropic plain with same soil & climate characteristics), same market price, same production cost, ~~Thunen~~ he concluded that the locational rent and hence location of agricultural regions will be determined by the cost of transportation.

Intensity model :

Because of the decrease in the land value with increase in distance from the market (centre of the isolated state), Thunen segregated intensive culture in the inner margins of the isolated state and extensive culture towards the periphery.

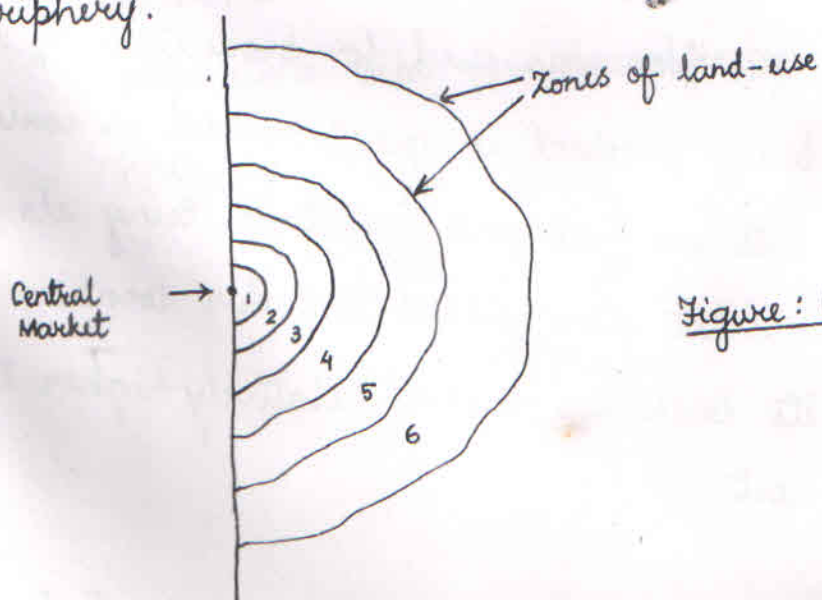


Figure : Concentric Land use

In the intensive culture ^{region}, he demarcated three zones of land-use

- (i) Market gardening and milk production (Zone 1)
- (ii) Firewood and lumber production (Zone 2)
- (iii) Crop farming without fallow (Zone 3)

In the extensive land use category, he incorporated:

- (i) Crop farming, fallow and pastures (Zone 4)
- (ii) Three-field system (of crop, wood, dairy) (Zone 5)
- (iii) Extensive grazing land (livestock rearing)

The difference between the zones 3, 4 and 5 was in the intensity of cultivation. As the distance from the market increased, the intensity of crop production decreased with a consequent reduction in yields.

Zone 1: Production of fresh milk, vegetables, fruits and flowers was concentrated in this zone, nearest to the city, because of the perishable nature of these products. The fertility of the land was maintained through manuring.

Zone 2: This zone was used for production of wood, a bulky product in great demand in early 19th century both as fuel and ^{for} furniture. Being close to the market also yielded a higher location rent, since its bulkiness meant relatively higher transport cost.

Zone 3: Intensive arable zone with a six-fold crop rotation, no fallow land and stall-fed cattle.

Zone 4: less intensive arable zone with seven-year crop rotation - one year each for rye, barley and oats; three years of pastures, and one year fallow. The products sent to the market from this zone were - rye, butter, cheese and occasionally live-animals to be slaughtered in the city. These products do not perish so quickly and therefore, could be produced at a considerably greater distance from the market.

Zone 5: The three-field system involved division of land for three kinds of use - one-third for field crops (rye), $\frac{1}{3}$ rd for pastures and the rest left fallow.

Zone 6: The farther zone, it was devoted to livestock farming. Because of ^{great} distance to market, field crops did not produce so high a rent as the production of butter, cheese or live animals. Consequently, only cattle were kept for slaughtering in the outermost zone.

Modifications to the original theory

Von Thunen incorporated two modifying factors in his classic model of concentric zonations, which changed the shape of the land-use pattern in the form of parallel running belts. The gradation of land-use was, however, retained. These modifying factors are :=

- (1) Incorporation of a navigable river: The mode of water transport was faster and more cost-effective (only $\frac{1}{10}$ th as much as on land).
- (2) Development of secondary node i.e. a smaller city acting as a competing market centre.

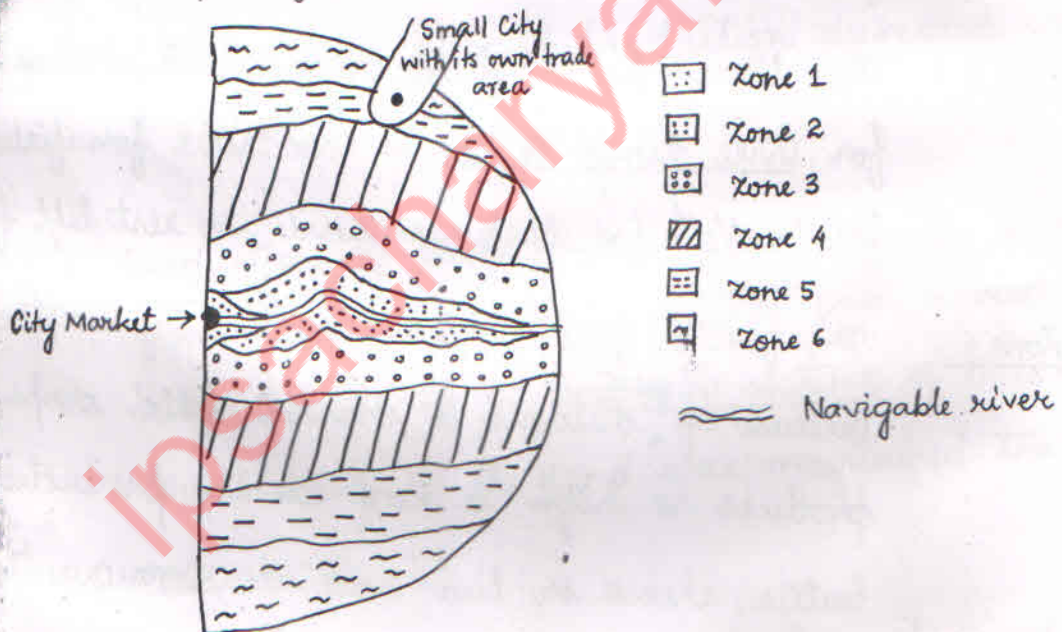


Figure: Modified 'isolated state'

Appraisal and

Application of locational model of agriculture:

- ① The generalised locational model presented by Von Thunen marked the beginning of land-use analysis and that too in quantitative tradition. It focusses attention on economic factors, particularly transport costs and distance to market, contrary to earlier geographers who were sub-ordinated by the factors of physical environment when attempting to ^{land} use patterns.
- ② It attempted the concept of locational rent theory which has great significance in both rural and urban land use studies.
- ③ The assumptions of von Thunen led to more researches in the field of locational rent theories, crop intensity and cropping patterns. Eg. Alonso's model of zonal patterns of intra-urban land use. Sinclair's Theory of land use.
- ④ Every aspect of the theory ^{can be seen} as applicable in the global perspective
 - (i) Every market node has market gardening zone involving commercial production to cater the market demand.
 - (ii) Land value do marks decrease with increasing distance from central node, regulating globally applicable 'transition' of intensive land use towards inner part of the settlement and extensive in the periphery.

(iii) weight Transportation cost ~~increased~~ ^{regulated by} ~~due to~~ distance travelled and weight of the commodity displaced is applicable worldwide.

(iv) Heavier commodities, being sensitive to displacement, has production centres in proximity to the market and along navigable waterways.

It is therefore concluded that von Thunen's work still provides a useful framework for organising agricultural activities at the micro, meso and macro levels.

CRITICISM

The main criticism of von Thunen's model is that ^{it} is based on unrealistic assumptions.

- ① The existence of isotropic isolated estate and only one market centre do not apply in the present time.
- ② modern transport system deviates from the principle of constant tonne-km cost. eg. Today, the larger the distance, the lower is the transportation cost.
- ③ Neglect of demand of an agricultural commodity, which significantly affects the cropping-pattern and crop land-use intensity.
- ④ Less recognition of the role of environmental factors as determinants of land-use patterns.

- ⑤ Man is not a rational or economic person always as assumed by von Thunen. Eg. In many of the East European countries, Russia and China, the cooperative and collective farming has been developed in which the decision-making process lies with the political authority.
- ⑥ Technological innovations like ^{faster} transport, communications, refrigeration facilities have flipped the entire trade scenario with international markets, longer shelf-life of perishable commodities etc. This has modified the concept of locational rent and the crop land-use pattern. Eg. livestock products are exported from Australia and NZ to Europe.

However, it should be kept in mind while criticizing the concept that the model was developed in 1826 when the means of transportation and communication were not so well developed, and isolated estates were found in greater parts of the world.

Global examples

- ① In Netherlands, man hours per hectare decrease with distance from the farmsteads. (Intensive to extensive culture).

- ② In Cyprus, villages are surrounded by successive rings of vegetables, olives, grain, vineyards and goat pastures.
- ③ Market gardening is still a feature of rural-urban fringe
E.g. USA, Switzerland, France.
- ④ Ronald Horwath (1969) found localised circulation system of land-use around Addis Ababa, Ethiopia — presence of an inner wood-producing zone of eucalyptus forest around the city. The zone was wedge-shaped rather than a ring, reflecting the greater
- ⑤ Piers Blaikie (1971) observed that small farmers in north India adjust land-use to distance from their villages in order to reduce the total amount of work to be completed.
- ⑥ The major agricultural regions of the USA developed largely within the framework of Von Thunen's model.
- ⑦ Europe can still be visualised as a set of Von Thunen rings. Production is most intense in the area centred on the Low countries, Denmark, north Germany, northern France and south-eastern England.

Relevance of the Thunen Model to Indian Conditions

In many of the underdeveloped and developing countries of the world, in the villages, cropping belts are found.

eg. In the villages of the Great Plains of India, concentric pattern of land use can be observed around the village/rural settlements. The highly fertile and heavily manured lands around the village settlements ^(innermost zone) are devoted to the perishable commodities like vegetables, potatoes and orchards, while the land lying in the middle belt is given to cereal crops like rice, wheat, barley, maize, pulses and sugarcane. The land lying in the fringe zone is generally devoted to inferior cereals like bajra, guar and millets.

Prof. M. Shafi tested the model in the Koil tehsil of the Aligarh district (UP). He opined that the land use intensity decreases with increasing distance from the intensively tubewell irrigated areas.

Prof. Thujar Singh and Prof. Shayan Kaur also tested the von Thunen model in the different parts of Punjab and they concluded that the model cannot be applied in its original form as the extension of irrigation facilities and dense network of means of transportation and communications have affected the cropping patterns and land-use intensity significantly.

The introduction of tubewell irrigation in the Great Plains of India has modified the concentric pattern of crop land-use. Today, the farmers with better economic status are able to produce perishable crops even in the distant fields from the market and settlement. The consolidation of land holdings in India has also modified the crop intensity rings as each of the farmers is interested in growing commodities ^{for} his own family consumption as well as some marketable crops for earning cash to pay dues and charges. Despite these changes and modifications, the land-use intensity decreases with the increase in distance from the settlements, provided the physical environment and living standard of the farmers are the same. Further, the diffusion of HYVs has made the model almost ~~irrelevant~~ irrelevant both at the micro and meso levels. ^{Faster means of} Transportation means and communications ensure delivery of perishable commodities at long distances.

The model, thus, no longer is operative in India in its original form.

Sinclair's Theory of Agricultural Land Use [NOT IN SYLLABUS in 1967]

R. Sinclair modified Von Thunen's original hypothesis to suggest alternative land-use pattern in the context of urban growth. He suggested that although in developed economies, land-use pattern is governed by economic or locational rent, but the major force influencing the spatial variation in such rent is not just the transportation cost. It also include the massive urban expansion that has occurred on a scale not envisaged in Von Thunen's time. The urban sprawl has a damaging effect on land values and that causes the reversal of land-use patterns. Agriculture, actually, becomes more productive and efficient away from town.

Land that is expected to urbanise has a higher value than the rural land. This is on account of anticipation by developers and building speculators. Few farmers are willing to cultivate this land over which suburban blight hangs. Instead, they allow their fields to deteriorate ~~into~~ through half-hearted agricultural activity or else let them become vacant altogether with the intention of selling at the most profitable to the speculative newcomers. As the damaging effect of urban sprawl

diminishes further apart, farmland importance increases, as do the agricultural efficiency and productivity.

The value of land, therefore, is lower very close to an expanding urban centre and increases with distance as the likelihood of urban encroachment declines.

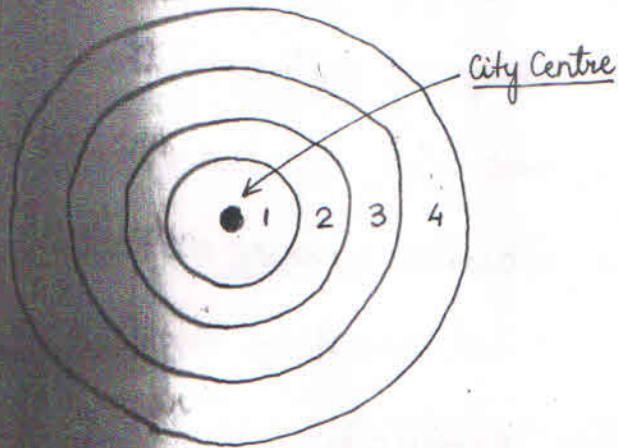


Figure: SINCLAIR'S MODEL CONCENTRIC ZONATIONS

Zone 1:

Adjacent of urban area, this zone represents land changing to urban use. Some part is held by speculators, some part used for industrialized farming, poultry, greenhouses etc.

Zone 2:

Vacant land: with no sub-divisions yet, it is the zone of uncertainty. Owners await most profitable time to sell. The land may be leased temporarily for grazing or recreation.

Zone 3:

Zone of transitory agriculture with field crops and animals. Low levels of intensity ^{are} observed.

Zone 4:

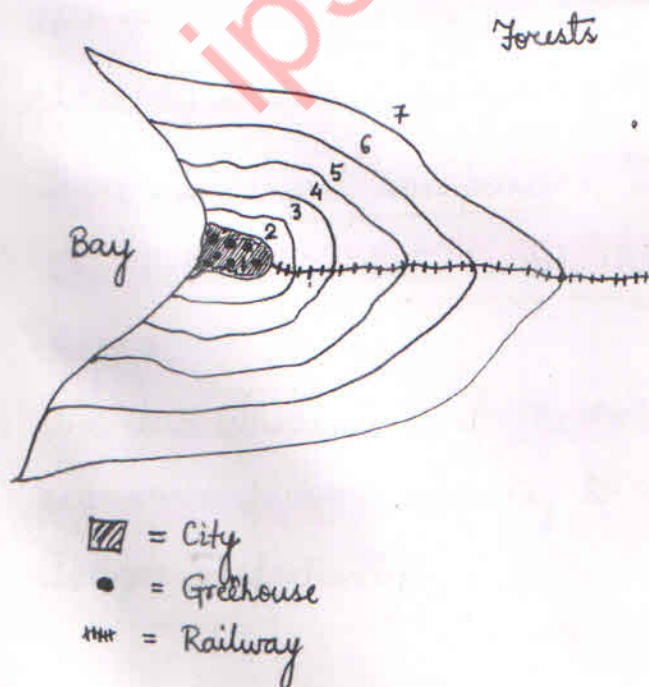
Dairying and field crop zone outside the "area of anticipation".

Examples

- Some Mid-West cities in the USA
- Some British country towns

Olof Jonasson's Theory [NOT IN SYLLABUS]

Swedish geographer Olof Jonasson modified Von Thunen's theory in 1925 by calculating the locational rent on the basis of market and means of transportation. He arranged the zones of agricultural land-use around the industrial centres (of Europe and North America). In both the continents the most intensive development of agriculture is the hay and pastures region in which the industrial centres are located. Around these pastures are arranged concentrically, the successive grades of land-use — grain farming, pasturing and forestry.



Zone 1 : The city itself with immediate environs, greenhouse, floriculture.

Zone 2 : Truck products, fruits, potatoes and tobacco

Zone 3 : Dairy products, beef cattle, sheep for mutton, forage crops, flax and fibres.

Zone 4 : General farming, grain hay, livestock

Zone 5 : Bread cereals and flax for oil

Zone 6 : Cattle, horses, sheep, canned meats, bones, tallow & hides.

Zone 7 : The outermost peripheral areas having forests.

Example regions :

- Edward Plateau in Texas (USA).

- Europe

Zone 1 & 2 : Horticulture

Zone 3 & 4 : Intensive agriculture with intensive dairying

Zone 5 : Extensive agriculture

Zone 6 : Extensive pasture

Zone 7 : Forest culture.

WEBER'S INDUSTRIAL LOCATION THEORY

German economist Alfred Weber formulated his least cost theory of industrial location in 1909. Based on purely deductive approach, the theory was published in his classic work titled "Über den Standort der Industrien". The theory tries to explain and predict the minimum cost location of an industry, ^{and} to establish the role of transport cost in the selection of industrial location, irrespective of socio-economic and political conditions. The nature of the theory is deterministic and normative.

Assumptions:

Weber's theory of industrial location is applicable only when certain optimal conditions are available:

- ① The region under consideration is an isotropic plane and has a self-supporting economy. There is uniformity and stability in its socio-economic and political environment.
- ② There is perfect competition in the market.
- ③ The labour is static and the wages are uniform in the region.
- ④ The industrialists and the labourers are rational and economic persons who try to optimize their profits and wages respectively.

- ✓ ⑤ Transportation cost varies proportionately to the distance travelled and weight of displaced commodity.
- ✓ ⑥ There is uniform demand for a product at all stations, resulting in a uniform price, and therefore the industry located at the point of least costs would get the highest profits.

Raw Materials

Weber, on the basis of quality and purity, divided the raw materials into two categories:

- (a) Ubiquitous raw materials - those found everywhere, like air, water, land, soil, sunshine etc.
- (b) Fixed raw materials - those confined to particular places.
eg. - Iron, copper, uranium etc.

On the basis of weight reduction in the manufacturing process, the raw materials are classified as:

- ✓ (i) Pure raw materials whose weight remains the same even after processing and manufacturing Pure - No wt loss
- ✓ (ii) Impure or weight-losing raw materials which register weight reduction after manufacturing.

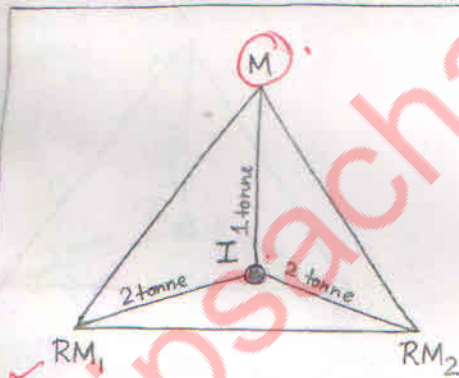
Theory

Weber applied the mentioned assumptions to interpret the factors responsible for the location of industries:

- ✓ ① Influence of transport - Locational triangles
- ✓ ② Influence of labour cost - Concept of isodapanes
- ✓ ③ Industrial agglomerations.

① Locational Triangles

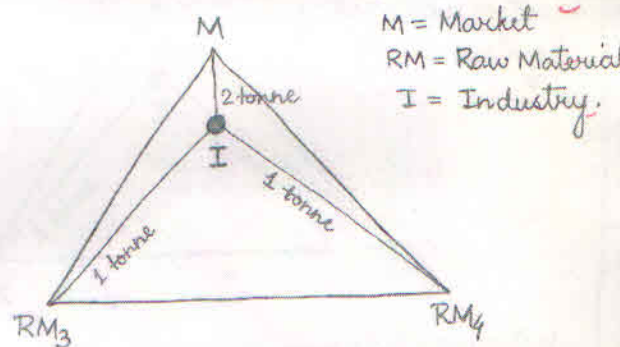
Weber integrated the role of raw material, market and transport cost with the support of locational triangles in cases involving two raw materials. He presumed the base of the triangle to be representing raw material sources and the apex to be the market. He concluded that industries utilising weight-losing raw materials should be located near the sources of raw materials. On the other hand, industries using pure raw materials or producing heavier products must be located near the market. These locations represent the least cost on account of less transportation costs of raw materials and finished products.



Weight-losing raw-material oriented industry.

Eg. Metallurgical industries

↓ Iron ↓ Steel ↓ Metals



Weight-gaining market-oriented industry. Eg. Assemblage industries. Near Market

If there is only single raw material, then also weight-losing raw materials would cause the least cost location of industry near the source of raw material. The weight-gaining final products would result in location of industries near the market.

In order to find out whether industries are market-oriented or raw material-oriented, Weber devised a simple Material Index (MI) formula :

$$MI = \frac{\text{Weight of the localised raw material}}{\text{Weight of the final product}}$$

Industries with an MI of 1 or ^{less than} close to 1 are located close to the market while those with MI greater than 1 are located near the raw material.

Influence of labour cost

Examining the effects of labour costs on location, he opined that industries would be located away from the point of least transport costs to the point of least labour costs if savings in labour costs were greater than any additional transport costs involved in such a move. In such scenarios, the least cost location of the industry can be outside the locational triangle.

In this analysis, he outlined isotims, isodapanes and critical isodapane. Isotims are lines representing points of equal transport costs from one source of a raw material or to one market. An isodapane represents points of additional transport costs around the Weberian minimum-total-transport-cost point. It is obtained by summing up of transport costs to multiple material locations and/or markets via intersecting isotim surfaces. The critical isodapane is where the labour cost savings is in balance to additional transport costs and thus, beyond it, least-cost

Locations do not exist.

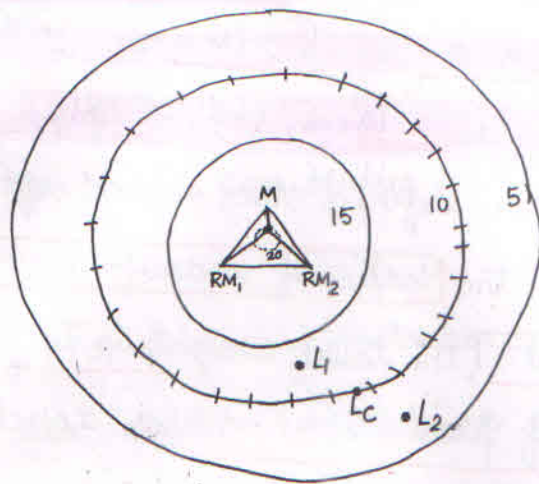


Figure: Least Cost Location and critical isodapane.

+++ Critical Isodapane

L_1 : Least Cost Location since labour cost savings ^(LCS) more than additional transport cost (ATC) ✓

L_2 : Not LCL because $LCS < ATC$.

L_c : $LCS = ATC$ ✓

Industrial Agglomerations

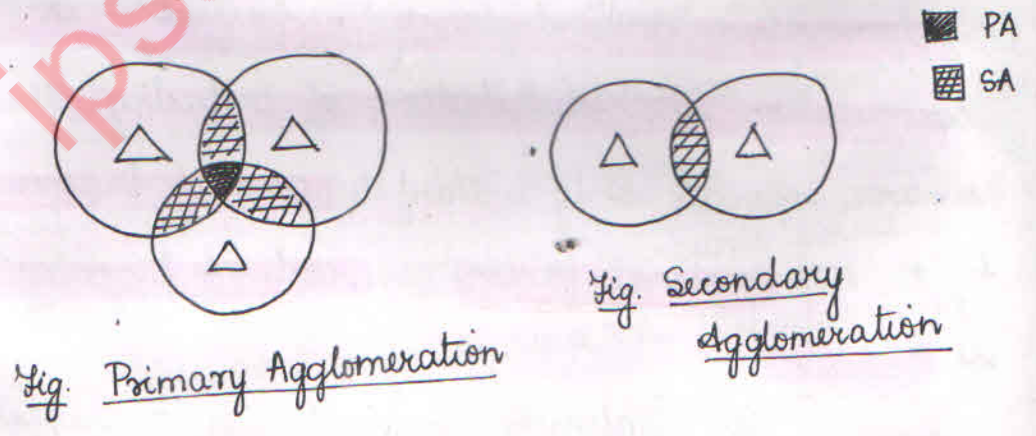
With the recognition of critical isodapane (L_c) around every locational triangle, Weber identified secondary causes — agglomerative and deglomerative factors — in the local accumulation and distribution of industry. These factors, however, operate only within the general framework formed by the two regional factors i.e. costs of transport and cost of labour.

An agglomerative factor is a cheapering of production or marketing which results from the fact that production is carried out at one place. Eg. — Banking, insurance, external economies etc.

A deglomerative factor is a cheapering of production due to decentralization of production i.e. production in more than one place. Eg. Local taxes, cost of land, labour cost, transport cost.

Weber defined the concept of 'coefficient of manufacture' as the ratio of manufacturing cost to the locational weight (the total weight to be transported during all the stages of production). Weber concluded that agglomeration is encouraged with high coefficient of manufacture and deglomeration with low coefficient of manufacture.

In spatial terms, agglomerations are overlaps of critical isodapanes, resulting in agglomeration economies (benefits & savings). The primary agglomerations involve overlap of three critical isodapanes providing three-fold benefits whereas the secondary agglomerations involve overlap of two critical isodapanes.



Coefficient of manufacture = $\frac{\text{Manufacturing cost}}{\text{Locational weight}}$
Locational weight = Total wt. to be transported during all the stages of production
 High CoM \rightarrow Agglomeration encouraged
 Low CoM \rightarrow Deglomeration encouraged

8. Short Notes on:

- Split Location

- Locational coupling

} Weber

Apart from agglomerative and deglomerative factors, Weber also indicated two more possibilities - split location and locational coupling.

- ① Split Location: According to Weber, when weight-losing raw materials are used in production process, a split of production into several locations i.e. carrying out different activities at different places will be advantageous. Such industries have a tendency of split location. However, the limiting condition is the technical feasibility of splitting the production process.

eg. In paper industry, the raw material used is wood (weight-losing), the intermediate product is pulp while the final product is paper. Since paper industry is driven primarily by consumption, the final product tends to be near the market. However, the heavier raw material demands the industry to be close to its own source.

As per the concept of split location, the manufacture of pulp may be carried on near the supplies of raw materials and the second stage of paper manufacture near the consumption outlet.

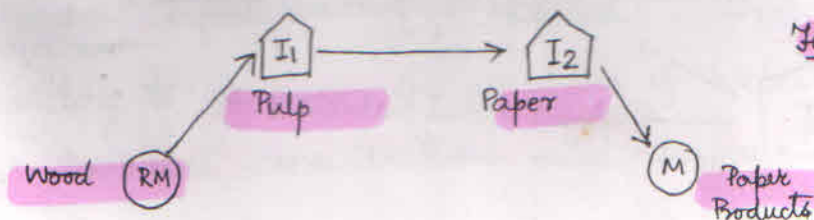


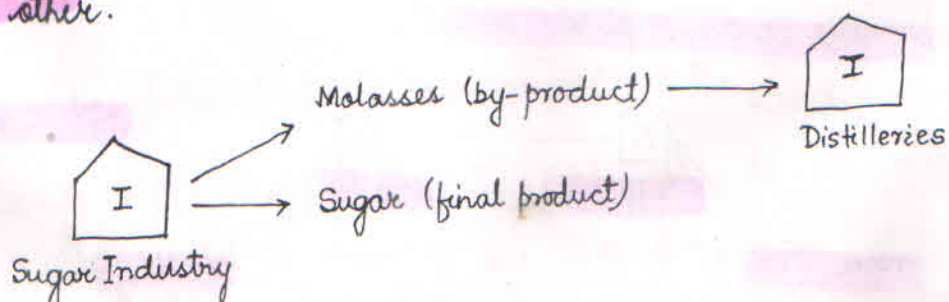
Fig. = Split location

② Locational Coupling :

It is concerned with the advantages of setting up different types of industries in the same locality. The production of quite different articles may be combined in one plant because several raw material may diverge from a common source. Eg. Chemical industry, garment industry, manufacturers of overcoats, shawls etc.

Locational coupling arises due to connections through materials. If the bye-product of an industry happens to be the raw material of another industry then two industries may select a single place of location. For instance, to utilise molasses which is a by-product of the sugar industry the distilleries are invariably located near sugar factories.

It is seen that market connections between two industries will bring about locational coupling. In other words, product of an industry may enter into another industry without being used as material or half finished product. For example - the main product and the wrapping material are brought together only for packing the main product. There is no organic connection between the two except that connection to link the market of the one with the other.



CRITICISM of WEBER'S LOCATION THEORY

Sargent Florence
Predohl —
Robinson —
Dennison —

Alfred Weber's theory received criticism at the hands of Sargent Florence, Andreas Predohl, SR Dennison and A. Robinson on various grounds:

1. Unrealistic Approach - According to Sargent Florence, Weber's analysis is based on unrealistic approach and deductive reasoning. Vague generalisation cannot provide solutions to the theory of location of industry as non-economic consideration also influences location, which are not mentioned in 'pure theory.' The analysis also lacks explanation regarding location both from historical and social forces.
2. Andreas Predohl criticised the theory as ^{being} a selective one. The distinction made between primary and secondary factors is in itself artificial, illogical and arbitrary.
3. Austin Robinson said that the distinction between raw materials as ubiquitous and localised material is an artificial one.
4. Weber's assumptions of fixed labour centres and unlimited supplies of labour are unrealistic. The concept of unlimited supply is irrelevant while further rise of industry would create new demand, hence, new labour centres.
5. Transportation costs are ^{not} dependent only on the distance travelled and weight displaced. Factors like mode of transport, infrastructure etc. also influence the cost.
6. According to Dennison, the analysis of Weber is overburdened with technical considerations and coefficients.

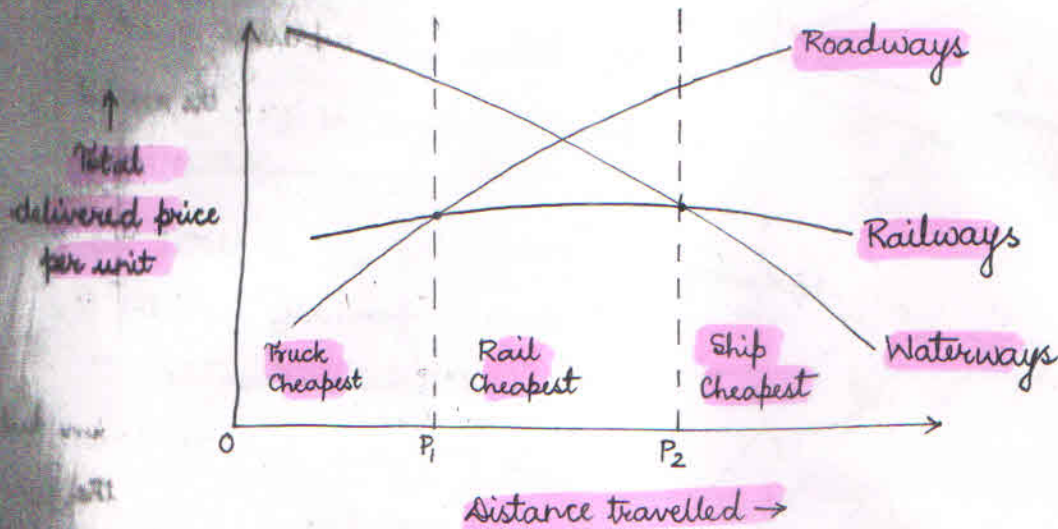
He further adds that such an analysis should be based on cost and price considerations. Eg. Weber should have measured labour costs in monetary terms rather than in 'tons miles'.

7. In a competitive market structure, the assumption of fixed points of consumption is unrealistic. Consumption centres in reality change and buyers are generally scattered all over. Globalisation and online market have also emerged.

APPRAISAL OF WEBER'S LEAST COST MODEL

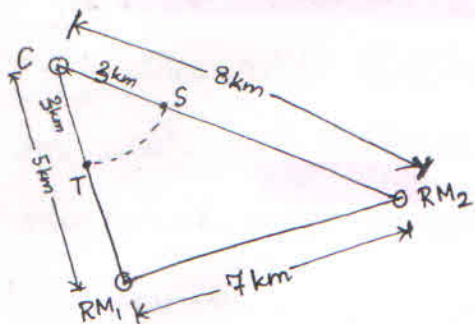
The least cost school established by Alfred Weber has been the most convincing and most followed school in the analysis of industrial locations. Following this school, Hoover⁽¹⁹⁴⁸⁾ attempted the classification of transportation cost not just in accordance to the distance travelled and weight of commodity displaced but also by the level of processing, called as the variable cost. He also outlined fixed cost as the determiner of least cost location and recognised it as terminal cost. He criticized Weber's analysis of near raw materials and near market locations of industries and advocated that the number of terminals in the production process should be minimised. By combining fixed costs and variable costs, he based his theory on delivered prices.

He also provided an analysis of cheapest means of transport in comparative reference.



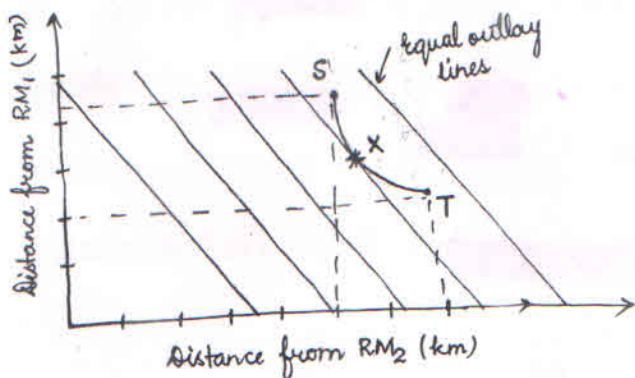
Walter Isard Theory of Substitution :=

In the same least cost school, Isard (1956) in his concept of substitution, emphasized upon agglomeration diseconomies i.e. generation of negative returns in due course of agglomerating tendencies in a given location. He linked the location theory to the general theory of economics through the substitution principle, and propounded that the selection of a manufacturing site from among alternative locations can be viewed as substituting expenditures among the various production factors such that the best site is chosen. In this regard, he also emphasized that substituting the raw material is the only practical way of continuing with profit mobilisation as it facilitates decentralised growth.



Weberian situation of one market (C) and two raw materials RM_1 & RM_2 .

Line (curve) from T to S represent a set of possible locations at 3 kms from the market.



Distance from RM_1 is plotted against distance from RM_2 w.r.t. the line T-S (called transformation line).

At T, distance from RM_1 is only 2 km but 7 km from RM_2 . Conversely, at S, the distances are 4 km and 5 km respectively.

As one moves along the transformation line (T-S), distances are increasing wrt one material site as they are decreasing for other.

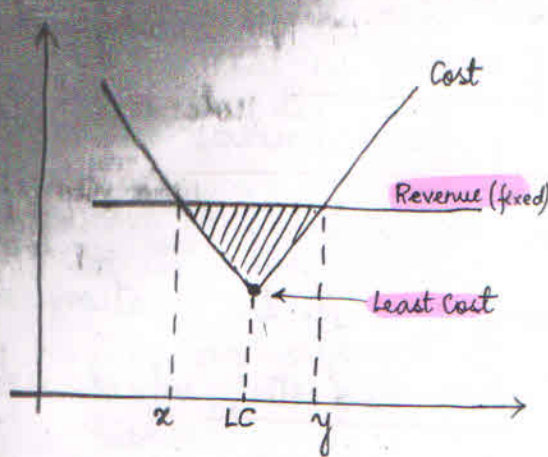
If these distances correspond to transport costs, then the transport costs for one source are being substituted for the cost of the second material source.

On drawing the equal outlay lines depicting the costs of transporting material from the two sources, the one tangent to the T-S line (curve) will give the point of optimum location (X).

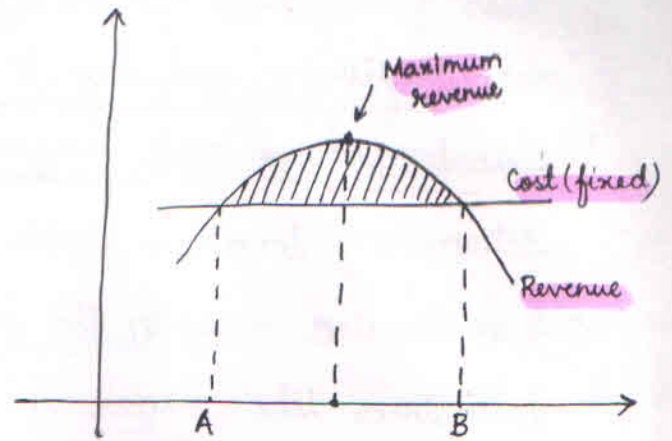
Smith's Theory of Industrial Location

D.M. Smith added market-oriented variations to the least cost school in his approach of spatial margins of profitability. Spatial margins are locations ^{or regions} outside which a firm would make loss. Treating both least cost and maximum revenue in his space-cost curve and space-revenue curve, he identified that profitable locations are within that distance

where "cost is less than revenue or revenue is more than cost."



Space - Cost Curve



Space - Revenue Curve

Fig. = Spatial Margins of Profitability

The main drawback of Smith's model is that it is a static one, confined to a particular point in time, with definite locations for optimal points and margins of profitability. In fact, the conditions in the real world are dynamic, changing through time. Manufacturers may never even try to find the most profitable location, because they realise that its spatial location will change.

CONCLUSION:

The classical approaches presented by Weber and the practical amendments outlined by Smith largely proves to be insufficient in explaining modern industrialisation, which involves global inter-dependence, bigger and complicated links, environmental concerns, labour-union related challenges and government policies, which are not incorporated in any of the classical approaches.

PRESENT DAY VALIDATION :=

Weber formulated his theory within the context of heavy manufacturing industry in Germany in the 19th Century, when transportation costs played a fundamental role in determining location decision. Applicability of Weber's concept can be seen even in the present time in the location of industries like sugar, and iron and steel, which are located near the availability of raw materials. The availability of cheap labour has encouraged General Motors to set up manufacturing plants in Vietnam. The labour-oriented location of Dabur Company in Nepal is another example. The example of industrial agglomeration is found in the Industrial complexes. Adityapur near Jamshedpur is one of the largest industrial agglomerations in Asia.

Also Read
Alok's Note

But with improved transportation, emerging technologies & globalisation, the industrial composition and organisation have changed. Advances in communications and the rise of a knowledge-based economy have significantly contributed to this change. Today, advertising and branding of products have become an important aspect for revenue generation. The political support systems and government policies affect the market and price considerations to a great extent. Thus, with new innovations, the importance of Weber's theory seems to have diminished.

QUESTIONS IN UPSC

- 2001 : Bring out the main points of difference between the CPT of Christaller and Losch.
- 2008 : Examine the concept of sphere of urban influence and discuss the qualitative and quantitative methods used in its delimitation.
- 2007 : Give an account of functional bases to central place hierarchy.
- 2011 : Critically examine the salient feature of CPT propounded by Christaller and Losch.
- 2012 : Distance decay principle's relevance in Indian cities.
- CPT
- Von Thunen
- 2013 : Relevance of Heartland theory in contemporary world.
- 1992 : Discuss on the theories of Industrial Location propounded by : Weber, Hoover, and Smith.
- 1993 : Define rimland and discuss, with specific examples, the criteria for its delimitation.
- 1994 : Discuss von Thunen's model of agricultural land-use and examine if the model is applicable to India.
- 1997 : Critically examine Weber's Theory of industrial location.
- 2000 : Explain the basis and applicability of Christaller's CPT. Bring out the recent modification.
- 2003 : Critically examine the stages of Economic growth model propounded by Rostov. Illustrate with suitable examples.

2004: To what extent are the Heartland and Rimland theories helpful in understanding the world political situation today. Express your opinion clearly.

2005: Examine the Heartland theory, and assess its merits and demerits.

2011: Isodapane in the Theory of Industrial Location. [180 words]

2011: Distinguish b/w boundaries and frontiers. Identify different types of boundaries.

2011: Discuss systems approach and its applicability in geography.

2013: Basic postulates of CPT of Christaller. [250 words]

2014: Critically analyse application of models in geography. [150 words]

2014: Explain the necessary conditions of takeoff and subsequent stages of development of a nation as propounded by Rostow. [20 marks, 300 words]

2014: Give suitable examples to describe the importance of system analysis in geographical studies. [15 marks]

2015: Marx's views on pop^l is more humanistic. Comment (150 words)

2015: Discuss the relevance of von Thunen's model on agricultural location in the contemporary context.

GEOPOLITICAL IDEAS : MACKINDER'S

Date: 03.03.2016

HEARTLAND THEORY

Development of political geography is primarily credited to German scholar Friedrich Ratzel (1901) who propounded the organic state concept in his social Darwinism. He compared state with an organism with the potentialities of growing or dying. This approach of political geography prevailed as the practical approach during the first half of 20th century. However, it marked its sequential decline in the evolution of contemporary geopolitical equations.

Counterbalancing Ratzel's idea, American scholar Mahan initiated geo-political ideas emphasizing that political importance and equations are outcomes of locations. His geo-political ideas were strongly enriched by his disciple British Scholar Mackinder.

HEARTLAND THEORY OF MACKINDER

British geographer Sir Halford Mackinder propounded his geopolitical concept in a paper in 1904 titled "The Geographical Pivot of History". He interpreted history as essentially a struggle between land and sea powers, and elucidated his formula of "geographical causation in world history".

later taking note of transformations and changes, he modified his thesis in his textbook - "Democratic Ideas and Reality" (1919) and in his research paper of 1943 titled - "The Round World and Winning of Peace".

1904

In 1904, Mackinder presented his first research paper in front of the Royal Geographic Society. Mackinder outlined that on the global scale, the earth surface consisted of a huge and continuous landmass called the World Island and some isolated islands. The former consists of Europe, Asia and Africa while the latter included North and South America, Australia, Great Britain and Japan. The World Island accounted for $\frac{2}{3}$ rd of the total land area and $\frac{7}{8}$ th of the world population. Mackinder suggested that the Columbian era of sea power, which had given Europe its pivotal role for the past 400 years was being eclipsed by the ascendancy of land-based powers and in particular with a new 'geopolitical pivot of history' of Eurasia.

Mackinder envisioned the landmass of the world in three tiers:

- ① PIVOT AREA := It included the region extensive between river Volga in the west to Siberia in the east. Surrounded by mountains on its east, west and south and by the ice-bound frozen Arctic on its north, this region could not be encroached upon by the sea routes and was, therefore, strategically secure like a natural fortress.

It shows the highest potential of becoming the node of politico-economic growth of the world.

② INNER or MARGINAL CRESCENT : It consists of an arch of coastland surrounding the pivot area and characterized by drainage into navigable seas. It included Europe west of the Urals, South-West Asia outside the Iranian upland, S.A. SE Asia and most of China.

③ OUTER or INSULAR CRESCENT : It was demarcated as the region beyond the inner crescent and included the continents of North and South America, Australia, Africa south of Sahara, Great Britain and Japan.

Relevance / Importance of 1904 paper : It marked the first major attempt of demarcating map of world in geo-political relevant territories. It was, therefore, given stronger support by the geographic society encouraging Mackinder to enlarge his geopolitical ideas.

1919

In his subsequent empirical observations, Mackinder prominently identified the growing significance of western Europe on economic front in administering the regulation of global trade and on military front with the German invasion of Russia. The October Revolution of 1917 marking the end of the rule of Russian Czar and establishment of Soviet Socialist Republic was also integrated by Mackinder in his ideas.

In 1919, Mackinder in his book "Democratic Ideas and Reality" renamed the pivot area as "Heartland" and defined it as the region to which, under modern conditions, sea power can be refused access, though the western part of it lies without the region of Arctic and continental drainage. The modified 'strategic Heartland' thus included the Baltic Sea, the navigable middle and lower Danube, the Black Sea, Asia Minor (Turkey), Armenia, Persia (Iran), Tibet and China, along with the USSR.

enlargement of pivot area shranked the inner crescent with outer crescent remaining the same. In the light of German invasion, Mackinder identified that 'as the heartland can be intruded only via European Steppes, the controller of eastern Europe will control the heartland and thus the world. (2) The heartland will grow as the node of political, technological, cultural and economic growth of the world. (3) It will evolve as a super power. Heartland had inaccessibility, natural fortification & enormous resources.

Relevance: Mackinder's projections of 1919 practically evolved with the growth of USSR as global world power. It justified Mackinder's idea of ^{controller of} heartland controlling the world.

(4) He gave famous quotation - 'Who commands Eastern Europe rules the Heartland / Who commands heartland rules the World island / Who commands the world islands rules the world.'

1943

→ 1943

In his paper 'The Round World and the Winning of the Peace' (1943)

Mackinder clearly recognized that the two sides of the North Atlantic were bound together by mutually supporting links of sea and air communications and that the combined industrial and military strength of the USA and western Europe was a force to reckon with. He regarded this geostrategic area comprising eastern USA, North Atlantic Ocean and western Europe as the 'Midland Basin', posing as an effective counterbalance to the emerging political power potential of the Eurasian Heartland.

Moreover, he identified the presence of adversity zones both within the heartland and the mid-land collectively recognising it as Lena-land. It was extensive from River Lena via East Siberian Mountains to Bering Strait, Alaska and Western Cordilleras. Owing to rugged topography and forest cover, this region was of little economic value.

∴ The geopolitical ideas of Mackinder are one of the most dynamic, progressive and practically utilised example.

Halford Mackinder

Pivot ←

The geographical pivot of History - 1904

Democratic ideas and Reality - 1919

The Round World & the winning of the Peace - 1943

Heartland

Midland Basin

Nicholas Spykman - Geography of Peace - 1944

Heartland as zone of Adversities

incorporated as Reinland

CRITICISM

The pioneer geo-strategic model of Mackinder remained valid till the existence of former USSR i.e. 1991. However, it was opened to criticism way back in 1940s. Some of the criticism include:

- ① Oversimplification: Mackinder oversimplified history in a deterministic fashion as a struggle between land and sea powers, and neglected the physical, socio-economic and cultural factors.
- ② Use of Mercator's Projection: This projection shows the true shape but distorts the area of a region on 2-D map. East-west exaggeration near the poles is matched with North-south exaggeration, showing higher latitudinal regions exceptionally large. Mackinder's use of this projection created a false picture regarding the unlimited expanse of Arctic ice to the north of the Heartland, whereas the Heartland lies face-to-face with North America across the Arctic while seen on Azimuthal Polar Projection.
- ③ Mackinder wrongly equated power potential with geographical area and corresponding inflated resources.
- ④ Ignoring growth of air-power: Modern geo-politician Sprout (1965) identified that Mackinder avoided air power, despite its substantive development and utilisation during WW II, to maintain the originally defined natural protection as the causative component in development of pivot

or heartland.

- ⑥ Ignoring adversities in the heartland: The heartland is not very resourceful. The greater part of it is wasteland incapable of supporting large population. Spykman developed his entire theory of Rimland criticising heartland as 'area of adversity'.

CONCLUSION

Mackinder's geopolitical ideas both in terms of its dynamism and applicability in form of former USSR is considered to be one of the most appropriate and long-followed geopolitical viewpoint. His projections about former USSR and possibility of beginning of cold war make his analysis based on elaborate empirical analysis rather than speculative work.

Criticism (Contd.)

- ⑥ The rising importance of trade has propelled the countries of South Asia, East Asia, SE Asia such as India, China, which could not have been predicted in Mackinder's time.
- ⑦ The contemporary world has also seen the rise of non-state players like drug cartels, terrorist groups etc. and supranational players like UN, WTO, NATO, WB etc. which are probably more important determinants in the global geopolitics. The rise of MNCs and global issues like climate change further adds complexity in the world order.

Date
01/02/2016

SPYKMAN'S RIMLAND THEORY

In 1944, Nicholas Spykman presented his elaborate geo-political ideas in the text entitled "The Geography of Peace", giving a very different interpretation of the relative importance of Mackinder's 'Heartland' vis-a-vis the inner crescent. He ^{with regard to} considered geographical features - topography, terrain and climate - as important determinants in the foreign policy because of its emphasis on spatial variations. Spykman introduced the term 'Rimland' for the region included in Mackinder's inner crescent.

Spykman emphasized that the projected heartland is a zone of adversities, possessing only partial centrality on the map of the world. It includes unfavourable physiography and climate, general absence of arable land, absence of mineral and energy resources, complete isolation from the developed maritime route of global trade and above all demographically sparse and ethnically primitive location. It lacks in the possibility of economic growth and hence its projection as 'heartland' is completely imaginary.

On the other hand, Spykman's Rimland included:

- Maritime Europe
- Crude oil rich West Asia
- Agricultural, mineral and population nodes of South and East Asia
- Potential maritime zones of SE Asia.

Combined to the outlined heartland, his rimland projected near complete Eurasia making him conclude that "the controller

of rimland will be controlling Eurasia, thus the world."

He reasoned that the fortress location of Heartland being its weakness, if the Rimland consolidate itself, it can force the heartland to be confined within its boundaries. Thus, geopolitics is not simply a struggle between the land and the sea powers rather it includes the struggle and conflicts between members of Rimland who will compete against one another to assert their influence on the Rimland.

Appraisal

In spite of the fact that his work was published way back in 1940s, the presence of the ^{former} USSR representing the heartland resulted in the failure to generate ^{desired} support and encouragement for his geopolitical idea.

The American policy of containment of communism was aimed to prevent any consolidation of Rimland and the former USSR. The US had consistently

build to build a tier of defence against the former USSR. The NATO, Baghdad Pact subsequently known as the Central Territorial Organisation (CENTO), and the South-east Asian Territorial Organisation were made by the USA to keep an eye on the defence of the Rimland and to prevent the Soviet influence in the Rimland. As a part of the containment of communism policy, Russia and USA have fought covert wars in Afghanistan, Vietnam and Korea during the Cold War era.

With the disintegration of the USSR in 1991, the adversities highlighted by Spykman became evident with most of the Central Asian countries (except Kazakhstan, Belarus, Moldova and entire Siberian Russia) lacking in favourable economic growth. This justified the criticism of heartland by Spykman.

In the post-Cold War era, single nodal world order involves the priority of Eurasia, which are as important Rimlands in terms of China, India, Russia and Gulf countries. For the USA to maintain its geopolitical prominence, it is necessary to integrate Eurasian rimlands. Rimlands-oriented geopolitical equations have further become complicated with ever increasing demographic and economic capacity of China and India.

This has resulted in gradual shift of global economic node towards east.

The conflicts between the Rimland countries and rising importance of Rimland regions can also be seen in present day developments, ^{such as} the Iran-Arab conflict in West Asia, rise of Indian Ocean rim countries, ASEAN. The Russian annexation of Crimea is also an important development.

CRITICISM

- ① The Rimland Theory has been criticized on the ground of advancement of war technology and nuclear deterrent.
- ② It has also been criticized on the ground that Spykman underestimated the role of world community and that of the UNO.
- ③ Moreover, at present, world is like a village and international law does not permit any territorial expansion.
- ④ The state is no longer a living organism in the sense of Ratzel's Lebensraum. It is the time of economic imperialism and not that of political colonization.

* Ratzel applied the word "LEBENSRAUM" (Living Space) as a term of human geography, to describe physical geography, habitat as a factor that influences the human activities in the course of a people, developing into a society.

Nazis adopted it for the aggressive territorial expansion of Germany into Greater Germanic Reich. Hitler believed that eastern Europe had to be conquered to create a vast German empire for more physical space, a greater population and some territories to supply food & raw material.

Page No. 05-02-16

LAWS OF INTERNATIONAL BOUNDARIES & FRONTIERS

Geopolitically the terms "nation" and "state" are distinct from each other. While the state is an organized community living under a unified political system with concrete political territory, 'nation' refers to a group / community of people sharing a common language, culture, ethnicity, descent or history i.e. having a sense of belongingness. A nation has no required geographical tie in.

Evolution of political map of world is largely associated with the development of nation paving way to the development of state. In this transformation, the buffer zone, no man's land, transitional zone — more prominently referred as frontiers pave way to boundaries.

BOUNDARY

A boundary is a line established by law, treaty, accord or practice that marks the limit of a political unit's territory.

It may be physical or man-made.

Physical boundaries follow natural features such as rivers (eg the Rio Grande b/w Mexico and USA). The man-made geometric boundaries follow lines of latitude (eg. 49th parallel b/w USA and Canada), and longitude (large parts of the boundary b/w Botswana and Namibia). There are also functional boundaries based on the relationship that a boundary line had shared w/ the surrounding cultural.....

landscape at the time of its demarcation.

CLASSIFICATION OF INTERNATIONAL BOUNDARIES

There are two important systems of classification of international boundaries :

① Functional or genetic classification

It is based on the relationship that a boundary line had shared with the surrounding cultural landscape at the time of its demarcation. It is thus temporal in nature and includes :

- Antecedent boundaries
- Subsequent boundaries
- Superimposed boundaries
- Relict boundaries.

② Morphological classification

This is based on the demarcation of boundaries and their fixation on the ground following physical features, geometrical lines or certain ethnic factors. These correspond respectively to ::

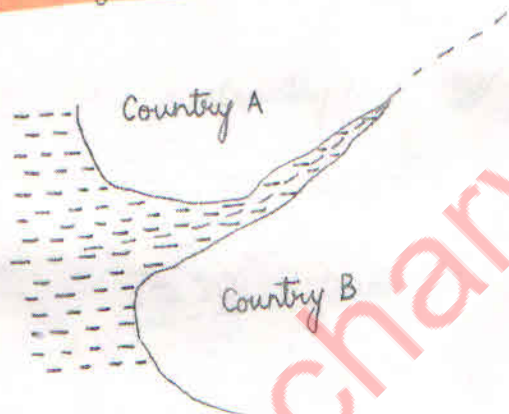
- Physical or physiographic boundaries
- Geometrical or straightline boundaries
- Ethnic or anthropogeographic boundaries

In most boundaries, however, more than one criterion of delimitation may be involved. Most boundaries are, therefore, complex in nature.

① FUNCTIONAL / GENETIC CLASSIFICATION

(a) Antecedent Boundaries:

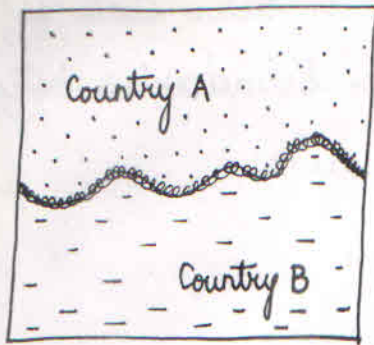
Boundaries that predated the evolution of natural landscape are called antecedent boundaries. They are the most common type to come across in the New World. Here international boundaries were generally agreed upon at the conference table even before the concerned territory was fully explored, and colonized. These boundaries commonly corresponds to a physical feature like mountains, rivers, bays etc.



Example: Malaysia - Indonesia on the island of Borneo due to the presence of mountain ranges.

(b) Subsequent boundaries

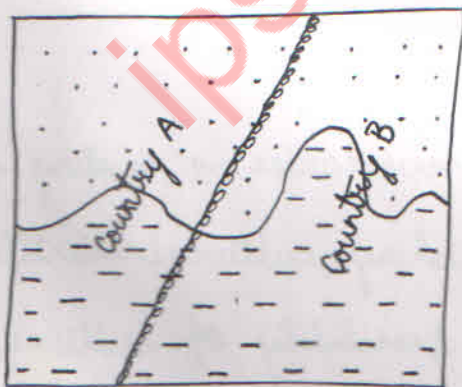
These boundaries are those whose definition and demarcation had followed the evolution of cultural landscape. Such boundaries often conform to ethnic - cultural divisions of the landscape, specially, the divisions of language and religion. These are thus result of long-term processes. The demarcation is through mutual agreement b/w the two neighbouring communities. Eg. China - Vietnam.



Subsequent boundary - set after mutual agreement by the settlements on both sides. Often correspond to their respective ecumene.

(c) Superimposed Boundaries

A superimposed boundary is a boundary imposed upon an area by outside or conquering power ignoring the socio-cultural divisions among the communities. These are thus subsequent boundaries of a special type as it ^{are} also drawn after the cultural landscape had fully evolved.
 eg. Most colonial boundaries in Africa. In many cases, single communities were divided into two or more states.
 The boundaries of Ghana, Nigeria, Togoland, Benin (Dahomey) and Somalian Republic are some of the examples.



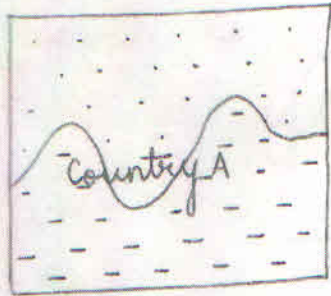
Boundary imposed from outside and may not reflect existing cultural landscape. Indonesia-Papua New Guinea.

(d) Relict boundaries

These represent boundaries which have lost political function but which may still be distinguishable in the cultural landscape.

Such boundaries emerge when a smaller state is merged in a larger one or when former boundaries between states are abandoned and redrawn.

Examples: East and West Germany
North and South Vietnam



No longer a boundary, often due to political changes. Still a visible imprint on the landscape.

② MORPHOLOGICAL BOUNDARIES :

(a) Geographic / Physical / Physiographic boundaries :

These boundaries include the physiographic units in demarcating the political territories of neighbouring states.

These boundaries involve mountains, rivers, lakes, straits, deserts and forests as significant examples.

(i) Mountain boundaries

These largely are antecedent boundaries i.e. existing prior to the development of distinguishing cultural identities.

They completely restricts the possibility of cultural exchange and thus, development of frontiers. At the same time, the location of boundary line along a mountain range often poses difficult problems. This is because...

of a number of factors:

- (i) Absence of well-defined crest line.
- (ii) Where crest lines exist, they are often divided by transverse valleys.
- (iii) Presence of several semi-parallel ranges.

examples: B/w Chile and Argentina along the Andes
B/w India and Tibet along eastern Himalayas
(MacMohar line).

(b) Rivers as Int'l Boundaries

Many of the international boundaries are riverine. The advantages of selecting a river as boundary are:

- (i) It is a clearly marked feature on the map
- (ii) It is more narrowly defined feature than mountains
- (iii) Wide, unfoldable streams offered a barrier to communications and as such, were thought to possess some military value by providing a line of defense.

generally the mid-stream is defined as the international boundary. As such, after each flood the mid-stream may change its course disturbing the boundary. The problem of administration and crime control are also serious in case of river boundaries.

examples: Rio-Grande river (USA-Mexico)

Paraguay-Parana (Paraguay-Argentina)

Schamati River (India-Bangladesh)

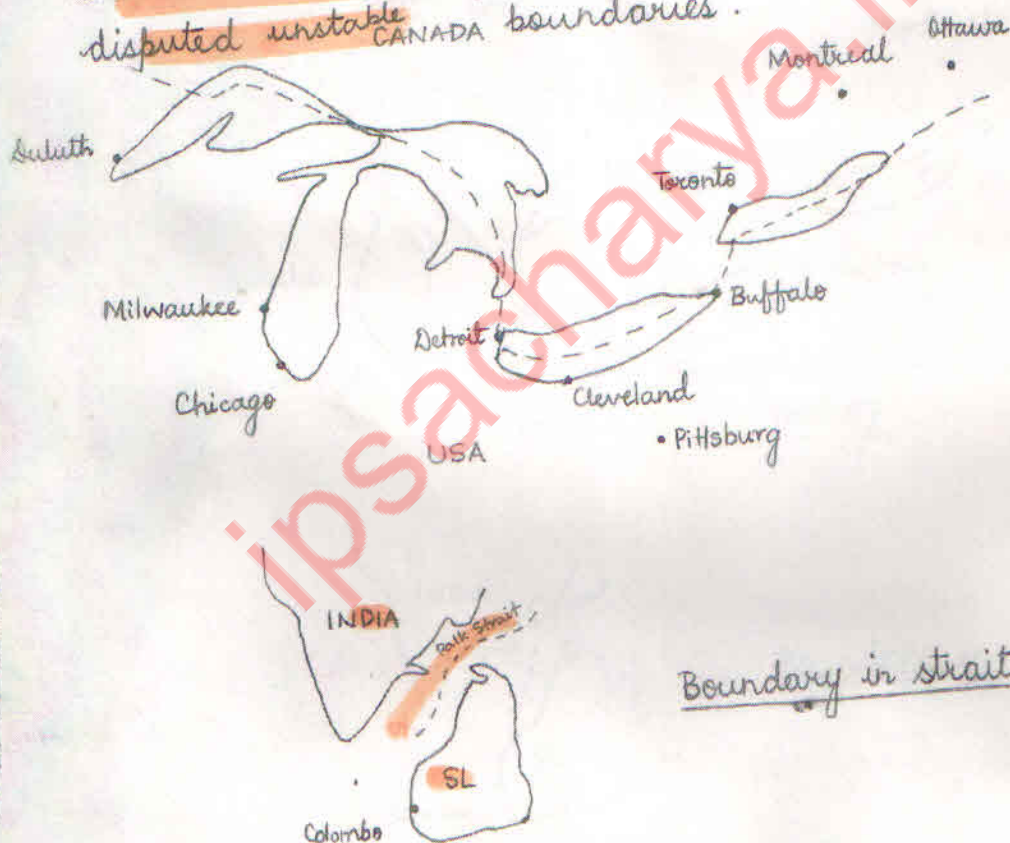
River Orange (Namibia - South Africa)

River Amur (China - Russia).

The riverine boundaries are generally subsequent.

(c) Lacustrine^{and strait} Boundaries :

According to international law, the boundaries in lakes and straits are drawn at equal distance from the base of the respective countries from which the territorial sea is measured. The Great Lakes (except L. Michigan) form the most stable lake boundary while L. Victoria and L. Chad represent disputed unstable CANADA boundaries.



Boundary in lakes

Boundary in strait.

(d) Forest, Swamp, Deserts

By their nature, forests, swamps and deserts act as cultural divides.

- The Sahara desert, throughout the history, separated the European dominated culture of the Mediterranean basins from the distinctive African culture.
- On the borders of Finland, Russia, Poland and Lithuania, forests form the boundary.
- Marshes served as boundary b/w Belarus and Poland during the two world wars.

(b) GEOMETRICAL BOUNDARIES

Largely subsequent boundaries, these are demarcated in reference to the graticule network (latitude and longitude). Examples:

- Maximum of Africa
- 49° N latitude - US & Canada ✓
- 141° W longitude - Alaska (US) and Canada.

The state of Gambia in western Africa has its boundaries fixed by arcs drawn from the centre of river Gambia.

(c) CULTURAL OR ANTHROPOGEOGRAPHIC BOUNDARY

These boundaries can be consequent or relict or both, and are the result of sequential evolution of cultural ideologies. These boundaries were drawn to separate political communities with different cultural aspects creating differences in nationalism. For example:

- Political partition of former USSR

- Berlin Wall, Germany
- North and south Vietnam
- India - Pakistan

NOTE

China - Russia = River Amur

India - China = E^o Himalayas

Spain - France = Pyrenees

Romania - Bulgaria = River Danube (longest river of Europe)

US - Canada = Great Lakes

49°N Latitude

141°W Longitude

US - Mexico = River Rio-Grande

Chile - Argentina = Andes

Namibia - S. Africa = River Orange

Niger - Chad - Nigeria = Lake Chad

Uganda - Kenya - Tanzania = Lake Victoria

LAWS OF INT'L BOUNDARIES

The laws of international boundaries are commonly followed procedure in demarcating boundaries between the nation states. These generally followed procedures, however, are not applied to each and every political boundary evolved on the map of the world. However, in the absence of any written norms, these procedures are demarcated as informal laws.

These include :

① Territorial Allocation

- Peaceful

• Purchase

• Quasi-Judicial settlement / arbitral tribunal

• Plebiscite (public opinion)

- Forced (armed annexation)

② Delimitation

③ Demarcation

④ Administration.

These four stages of boundary evolution was suggested by Jones (1945).

① Territorial Allocation

It is the first step in the development of international boundary and involves the division of the territories among the concerned player either by peaceful means or by the use of force.

In the peaceful territorial allocation, purchasing the territory has evolved as the potential way with USA purchasing Arizona and New Mexico from Mexico in 1854, and Alaska from Russia in 1857.

The arbitral award or quasi-judicial settlement represent the method of territorial allocation that involves international mediation. Originally, it involved big range of provisions as mandates, protectorates, trusteeships. However, with increasing controversies w.r.t. such adjustments leading to the annexation of territories by the trustees, it presently restricts itself to disputes settlement between the countries. Significant examples include:

- Arbitral award of 1884 granting the benefit of territory to USA in the change of course of river Rio Grande.
- 1926 arbitral award transferring Mosul (richest on-shore crude oil producing region) to Iraq from Turkey.

1968 Kutch Tribunal awarding 320 sq. kms. of area of salt marshes to Pakistan.

The public opinion or plebiscite, though formally has been part of potential means of territorial allocation, has come into use in carving out East Timor from Indonesia with UN-supervised polls. Carving out of South Sudan from Sudan further re-established plebiscite as a valid method of territorial allocation.

The forced territorial allocation involve armed annexation of territories. It completely lacks the delimitation and demarcation steps and the annexor can administer the annexed territory. In comp the contemporary geopolitical scene, prominent examples include:

- (i) Armed annexation of Manchuria, Paracel and Spratly Islands by China.
- (ii) Ryukyu Islands by Japan.
- (iii) Franz Josef Land by Russia.
- (iv) Falkland Island by the UK.
- (v) Pakistan-Occupied-Kashmir by Pakistan.

Delimitation

It involves the selection of a specific boundary site through national discussions on geographical feasibility ^{and} political stability of negotiated international boundary. It is largely followed on by signing up of treaty or political agreement.

Demarcation

It is concerned with marking the boundary on the ground after the process of delimitation is sealed. It requires the joint survey teams, supplied with the best possible maps suitably marked and annotated to proceed into the borderland and mark the boundary on the ground by monuments and in forested areas by cleared vistas between monuments.

Administration

It relates to provisions for supervising the maintenance of the boundary.

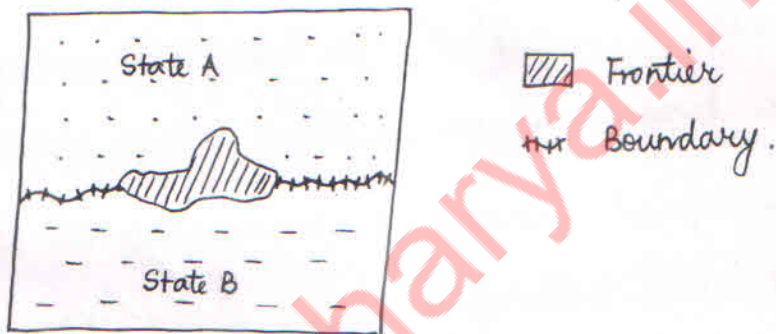
It must not be presumed that all boundaries have passed through the stages of allocation, delimitation and demarcation in a chronological sequence. In some cases, the original allocating line has been demarcated with no intervening delimitation. In other cases, there has been

more than one delimitation before demarcation occurred. There are many international boundaries that have never been demarcated. There are also many boundaries that passed through the first three stages of settlement and were then ignored. Often, especially in Africa, the demarcated boundary was not administered and in some cases, sections of the boundary were obliterated by natural processes and human intervention.

ipsacharya.in

FRONTIERS

Frontiers are zones of varying width, separating the ecumene (fully developed and politically and economically integrated parts) of a given pair of states. These may consist of uninhabited or sparsely populated areas of marginal utility at the current level of technology, so that the states on either sides may not feel the need to define the precise real limit of their political jurisdiction.



Frontiers and boundaries represent successive stages in the development of the same phenomenon — need for safety and security of states.

In the past, large stretches of territory, unfit for ^{human} occupation, were left out as protective barriers behind which states developed in relative safety. With the growing population of the communities, pressure on land increased and gradually the states extended their control in the frontier zone. Thus, in course of time, pairs of states faced each other not along a zone but a line — the frontier replaced by the modern international boundary.

Developments in resource-use technology further accelerated the process of frontierward extension of states since the hitherto 'unfit' area can now be put to multiple use.

The nature of the modern state was, in itself, a most important factor in the change-over from the frontier^{zone} to the boundary line. The modern state requires well-defined limits to its jurisdiction on the ground for multifarious activities - administration of law and order, taxation, defence and trade. Without a linear boundary it would be impossible to know where the sovereignty of one state ended and that of its neighbour began.

Distinction between boundaries and frontiers :

Kristoff (1958) highlighted the main distinctions b/w boundaries and frontiers :

- ① Frontiers are outward-oriented whereas boundaries are inward-oriented. Frontier did not mark the limit or end of a political unit. Rather it represented the beginning in that it indicated the direction for future territorial expansion of the state. In contrast, boundary stands for something that bounds a given political unit.
- ② A frontier is an integrating factor between states on either side while a boundary is a 'separating factor'.

The frontiers provide an excellent opportunity for mutual-inter-penetration and sway between the communities of the neighbouring states. The boundary remains essentially a barrier, impeding integration across the two peripheral borderlines.

- ③ Frontiers are transitional between geographical regions, rather than between states. They are, therefore, geographical rather than political in nature. Boundaries are, however, purely political in function and origin.
- ④ Frontiers are areal and boundaries are linear in character. The frontiers may be described as natural but the boundaries are artificial, since they are selected, defined and demarcated by man.
- ⑤ Frontiers, whether physical, linguistic, religious or ethnic cannot be moved. It may change its character, and lose much of its frontier function, but it must remain in situ. In contrast, boundaries are movable. Until the Second WW, almost every shift in the balance of power between neighbouring pair of states, used to be reflected in a shift in the location of the boundary line.

Maritime International Boundaries

The maritime boundaries have been demarcated in the context of UNCLOS. UNCLOS is an international agreement that resulted from the third UN Conference on the Law of the Sea (UNCLOS III) ^{in 1982}. It defines the rights and responsibilities of nations w.r.t. their use of the world's oceans, establishing guidelines for businesses, the environment and the management of marine natural resources. UNCLOS came into force in 1994.

UNCLOS also demarcates the political and economic jurisdiction of the maritime states. For the landlocked countries belonging to the rim region, it provides for appropriated jurisdiction. The maritime zonations was attempted with the objective of minimising the politico-economic tussles between the neighbouring maritime states, to facilitate peaceful co-existence and favourable economic utilisation of extractable and non-extractable marine resources. Among the demarcated maritime zones, based on appropriate baseline, following are included:

- 1) Inland water
- 2) Territorial water
- 3) Contiguous Zone
- 4) EEZ
- 5) Open water / High Sea.

① The appropriate baseline is drawn by connecting all the major projecting peninsulas of maritime states by appropriating the interest of all the neighbouring maritime states. It is with this baseline that all the distances are measured.

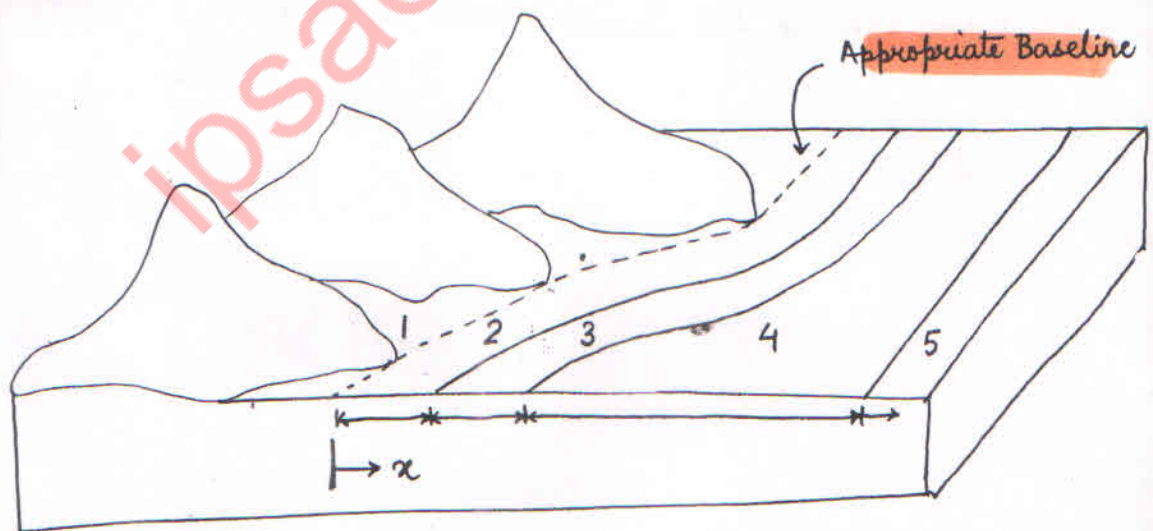
② The inland water is demarcated within the baseline and includes rivers, lakes, lagoons, creek inlets, bays, ports and any waters of the low-tide line. The maritime states have complete political authority.

③ The territorial water forms the first maritime zone beyond the appropriate baseline. It extends upto 12 nautical miles (22 kms) from the baseline, unless this impinges on the territorial seas of a neighbouring state, when compromise has to be reached. States exercise total sovereignty over these waters, except for the rights of innocent passage. Deployment of naval forces, custom excise obligations are thus applied to the territorial waters.

④ In larger water bodies with lesser number of maritime states, extension of territorial water to maximum distance of 24 nautical miles from appropriate baseline is called contiguous zone. In other words, it is the area 12 nm the limit of the territorial waters.

The states are free to apply customs and other national regulations here.

- ⑤ Beyond the territorial waters or contiguous zone, **EEZ** forms the largest maritime zone that extends upto 200 nautical miles from the appropriate baseline. In this zone, the maritime states exclusive economic rights of exploration and exploitation, though there is complete absence of military or customs obligations. In case of third party intervention, 'prior consent' norm is applied.
- ⑥ Beyond the EEZ is **open water or high seas**, which is open to global community. There is complete freedom of movement within them.



- 1 - Inland Water
- 2 - Territorial Water
- 3 - Contiguous Zone
- 4 - EEZ
- 5 - Open water / High Seas

Lesotho, Swaziland - maritime through South Africa
Nepal, Bhutan - maritime through India.

International Seabed Authority (ISA)

- ① ISA is an autonomous international organisation estd. under the 1982 UNCLOS and the 1994 Agreement relating to UNCLOS.
- ② It is based in Kingston, Jamaica.
- ③ It was established to organize, regulate and control all mineral-related activities in the international seabed area beyond the limits of national jurisdictions.

Recently India explored the area allotted by ISA in Central Indian Ocean for polymetallic nodules that are rich in metals like cobalt, nickel and manganese. India is also in the process of obtaining allotment for polymetallic sulphides, from ISA, in the Indian Ocean region.