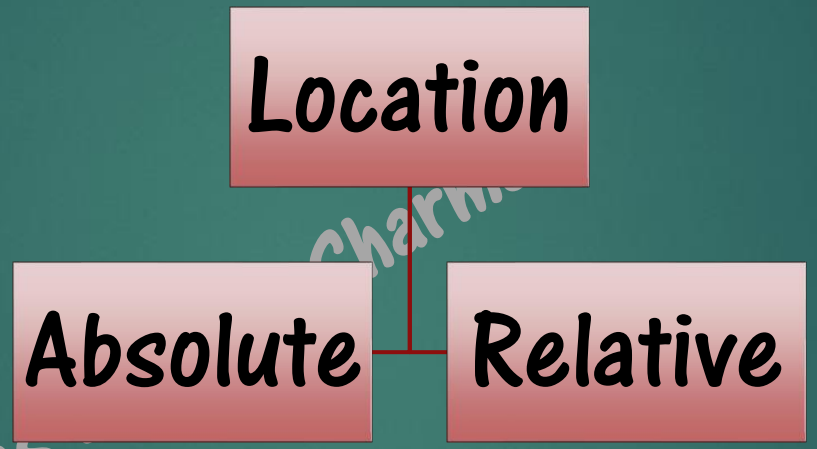
Elements and Factors of Localization of Industry

LOCATION OF INDUSTRY: "WHERE" & "WHY THERE"

- Theories are needed to **explain** the location of industry
- Theories are also needed to **predict** suitable locations for future developments.
- Our questions to be:
    1. Is the distribution of industries simply **random**?
    2. Or is it arranged in an **ordered** pattern?

- The ***locational decisions*** are taken within a framework of a set of conditions which limits the range of activity of manufacturers in some direction and encourages it in others.
- Conditions: Physical, Economic, Social & Political: ***Variables affecting location of industry***

Geographic location ????



- Absolute Location: Latitude, Longitude
- Relative Location: Connection with other nearby places

Approaches to the problem of Location of Industry:

1. By explaining why certain areas are attractive to industry
   कुछ क्षेत्र उद्योग के लिए आकर्षक क्यों हैं?
   (Seeks to identify the advantages that the region offers)

2. By explaining why certain industries are attracted to particular areas (multi locational case)
   कुछ उद्योग विशेष क्षेत्रों की ओर ही क्यों आकर्षित होते हैं?
   (Emphasize upon the explanation of the distribution of particular industries)

Factors affecting Location:

1. Geographical
- Raw material
- Power
- Market
- Labor
- Transportation
- Water

2. Non-Geographical
- Political
- Economic
- Social
- Historical

Geographical Factors:

1. Raw-material:

- Weight-losing industries: Jute mills, Sugar industry, Iron & Steel, Cement, Paper-Pulp
- Modern industry is so complex that a **wide range of raw materials** is necessary for its growth.
- Industries which use heavy and bulky raw materials in their primary stage in large quantities are usually located near the supply of the raw materials.
- **Reducing Importance: improved transportation, substitutes, use of semi-processed products, less wastage in manufacturing**

2. Source of Energy:

- Regular supply of power is a pre-requisite for the localization of industries.
- **Coal, mineral oil and hydro-electricity** are the three important conventional sources of power. ***Most of the industries tend to concentrate at the source of power.***
- The **iron and steel industry** which mainly depends on large quantities of coking coal as source of power are frequently tied to **coal fields**.
- Others like the e**lectro-metallurgical** and **electro-chemical industries**, which are great users of **cheap hydro-electric power**, are generally found in the areas of hydro-power production, for instance, Aluminium industry.

2. Source of Energy: …

- ***In recent times petroleum can be easily piped and electricity can be transmitted over long distances by wires, it is possible to disperse the industry over a larger area.***
- Thus, more than all other factors affecting the location of large and heavy industries, quite often they are established at a point which has the best economic advantage in obtaining power and raw materials.
- Eg. Electrochemical, Electrometallurgical, Aluminum
- **Mobility of Power has improved**
- **Alternatives sources**: Solar, Wind, Natural gas, Biomass
- Tata Iron and Steel Plant at Jamshedpur, the new Aluminium producing units at Korba (Chhattisgarh) and Renukoot (Uttar Pradesh), the copper smelting plant at Khetri (Rajasthan) and the fertilizer factory at Nangal (Punjab) are near the sources of power and raw material deposits, although other factors have also played their role.
- ***With the innovation of other sources of power like electricity, gas, oil, etc. the power factor became more flexible leading to dispersal and decentralization of industries.***

3. Market:

- Industry produce good for sale therefore nearness to market is essential for quick disposal of manufactured goods.
- **Concentration** of *labour, power, money*, etc.

  Therefore, helps in reducing the transport cost and enables the consumer to get things at cheaper rates.
- It is becoming more and more true that industries are seeking locations as near as possible to their markets; it has been remarked that market attractions are now so great that a **market location is being increasingly regarded as the normal one**, and that a location elsewhere needs very strong justification.
- **Larger it is, greater the attraction it exerts.**
- **Type of Goods Produced: Weight-gaining industries, Fragility, Perishability, Large sized, Price of finished goods, Industry using ubiquitous raw material as input**

4. Labour:

- Availability
- Cost
- Skilled
- Mobility of Labour
- Management

- उपलब्धता
- लागत
- कुशल
- श्रम की गतिशीलता
- प्रबंध

4. Labour:...

- Labour supply is important in two respects
  - (a) workers in large numbers are often required,
  - (b) people with skill or technical expertise are needed

Estall and Buchanan showed in 1961 that labour costs can vary between **62 per cent** in **clothing** and related industries to **29** per cent in the **chemical** industry; in the fabricated **metal products** industries they work out at **43** per cent.

- Increasing mechanization: yet the light consumer goods and agro-based industries generally require a plentiful of labour supply.
- Adequate supply of cheap and skilled labour is necessary for industry. **The attraction of an industry towards labour centres depends on the ratio of labour cost to the total cost of production which Weber calls 'Labour cost of Index'.**
- The availability of skilled workers in the interior parts of Bombay region was one of the factors responsible for the initial concentration of cotton textile industry in the region.

5. Transportation:

- Locational attraction where 'Transportation cost' is minimum.
- Elements of transport cost:

I. **Operating Cost:** cost required to run and develop transportation facility

Line-Haul cost: costs which are incurred in the process of moving and which are made up principally of Fuel costs and Wages. **(Long haul advantage) (Break-of-Bulk) (Back-Haul cost)**

Overhead cost: represents the cost of equipment involved. (Ship, Railway, Shops, Offices)

Transfer cost: made up of indirect cost (Insurance cover)

II. Profit & Freight Rates:

- *Determinants of transport cost:*

i. **Distance**

ii. Type of **terrain** to be covered

iii. Means of **Transportation**

iv. Type of **commodity**

v. Degree of **competition** from other Carriers

6. Other:

- **Site and Services:** Existence of public utility services, cheapness of the value of the site, amenities attached to a particular site like
  - level of ground,
  - the nature of vegetation and
  - location of allied activities influence the location of an industry to a certain extent.
- **Natural and Climatic Considerations:** Natural and climatic considerations include the level of ground, topography of a region, water facilities, drainage facilities, disposal of waste products, etc.
- These factors sometimes influence the location of industries.

  For instance, in the case of **cotton textile industry**, **humid climate** provides an added advantage since the frequency of yarn breakage is low. The humid climate of Bombay in India and Manchester in Britain offered great scope for the development of cotton textile industry in those centres.

Non- Geographical factors

1. Capital:

- Modern industries are **capital-intensive** (पूंजी-गहन) and require **huge investments** (भारी निवेश). **Capitalists are available in urban centres.**
- **The availability of capital at cheap rates of interests and in adequate amount is a dominating factor influencing industrial location.**

For instance, a review of locational history of Indian cotton textile industry indicates that concentration of the industry in and around Bombay in the early days was mainly due to the presence of rich and enterprising *Parsi* and *Bhatia* merchants, who supplied vast financial resources.

- Capital can be analyzed in two ways:
    a. ***Mobile***: Monetary capital मौद्रिक पूंजी
    b. ***Immobile***: Infrastructure (Geographical Implications) {Heavy Machines}
- Monetary capital is not so mobile beyond a country's borders. (Why??)
    1. Doubt in its return and safety
    2. Restrictions posed by the governments सरकारों द्वारा लगाए गए प्रतिबंध

2. Government Intervention सरकारी हस्तक्षेप :

- **Encourage & Restricts** प्रोत्साहित और प्रतिबंधित
- To ensure **optimum use** (अधिकतम उपयोग) **of country's available resource**
- To **decrease the regional inequalities** (क्षेत्रीय असमानताओं) in ***wealth*** and ***development***
- ***To release stress (pollution, heavy clustering) from big industrial and urban centres***
- **Strategic** (सामरिक)**decisions:** to move key industries to '**safe**' locations during war time
- In accordance to the regional planning policies aimed at reducing serious regional imbalances. **It is of relevance to examine the influence of India's Five Year plans on industrial location in the country. The emergence of suitable industries in south India around new nuclei of public sector plants and their dispersal to backward potential areas has taken place due to Government policies.**
- **We may conclude by noting that the traditional explanation of a location of industry at a geographically favorable point is no longer true. Location of oil refinery at Mathura, coach factory at Kapurthala and fertilizer plant at Jagdishpur are some of the results of government policies.**
- Development of **SEZ**
- **Tax structure** and economic **policies**

3. Human Factor:

- Decisions
- Innovations
- Prevailing Socio-economic system

3. मानव कारक:

- निर्णय
- नवाचार
- प्रचलित सामाजिक-आर्थिक व्यवस्था

Conclusion:

- The problems of finding the location of industry is complex.
- Locational factors are not operating in isolation but in combination
- The relative importance of these factors varies from ***time to time***, from ***area to area***, from ***industry to industry***, and within different types of ***economy***, making it **difficult to draw general conclusions**.
- **Not all the factors that have operated have been in favourable, and that most good locations have been those where the number of favourable factors have outweighed the unfavourable ones.**
- **The task of geographer is to discern the major trends out of this apparent chaos of reality.**

भूगोलवेत्ता का कार्य इस वास्तविकता की अराजक परिस्तिथि में प्रमुख रुझानों को स्पष्ट करना है।

Centralization & Decentralization of Industry

उद्योग का केन्द्रीयकरण और विकेंद्रीकरण

Advantages of Localization:

1. **Firstly,** a localized product gains reputation and thus it becomes easy for a firm to find **good market** within and outside the country. On the basis of reputation, it is generally able to charge higher prices than the products of their counterparts situated elsewhere. For instance, the sports and leather goods manufactured in Sialkot have acquired very good commercial reputation and it is easy to sell them at good prices.
2. **Secondly,** when an industry is located in a particular region, it is easy to get **skilled labor** of the industry, industrial skill passes on from father to son.
3. **Thirdly,** localization leads to **promotion and growth of subsidiary industries** (ancillary industries).

Advantages of Localization…:

4. **Fourthly,** it results in the **development of specialized research institutions.**
5. **Fifthly,** it leads to the **spread of fast means of communication and transport.**
6. **Sixthly,** localization encourages the **development of financial facilities**. When banks and other financing cooperation find profitable field for investment in a locality, they at once open their branches there.
7. **Finally,** localization provides opportunities both for **workers** and the **industrialists** to understand each other and to form themselves into an **organization** in order to safeguard their respective interest.

Decentralization of Industries

उद्योगों का विकेंद्रीकरण

Pull factors:

- ✓ Improvement of Energy supply
- ✓ Technological improvements over use of raw-material
- ✓ Means of Transportation
- ✓ Strategic decisions
- ✓ Govt. policies to discourage regional imbalance in backward areas.

Pull factors:

- ✓ ऊर्जा आपूर्ति में सुधार
- ✓ कच्चे माल के उपयोग पर तकनीकी सुधार
- ✓ परिवहन के साधन
- ✓ रणनीतिक निर्णय
- ✓ सरकार। पिछड़े क्षेत्रों में क्षेत्रीय असंतुलन को हतोत्साहित करने की नीतियां।

Decentralization of Industries

उद्योगों का विकेंद्रीकरण

Push factors:

- ✓ Congestion
- ✓ Pollution

Push factors:

- ✓ भीड़-भाड़
- ✓ प्रदूषण

Geographical Inertia:

It is the stage at which an industry prefers to run in its former location although the main alluring factors are gone.

- **Industries don't move from an area, despite the locational disadvantages**
- **Raw material source are depleted**
- **Energy crisis has emerged**

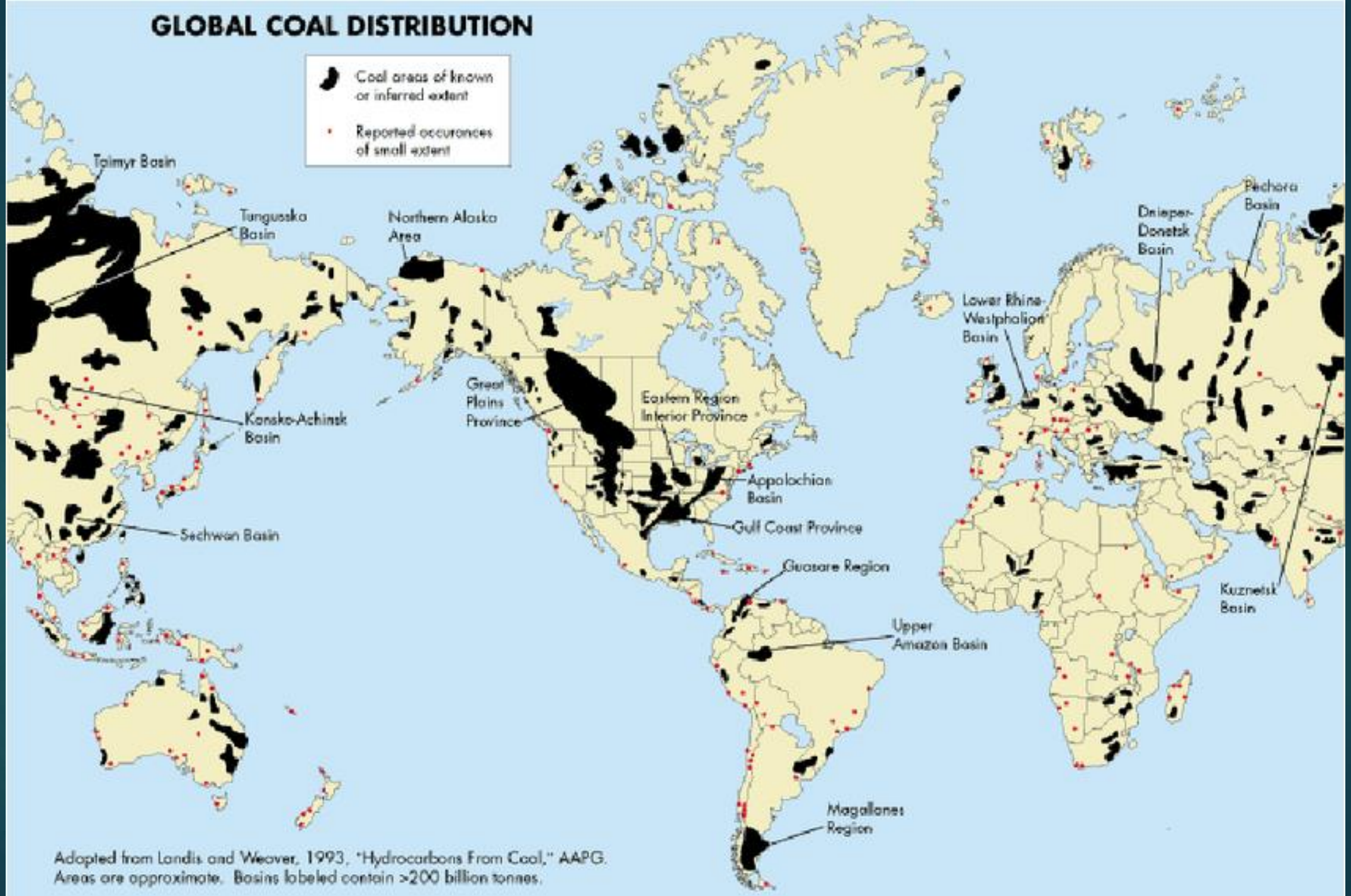
- Capital immobility
- Secondary advantages: Economies of Localization
- Industry attracts industry: Concentrations and Linkages
- Environment: Climate

भौगोलिक जड़ता:

- यह वह चरण है जिस में एक उद्योग अपने पूर्व स्थान पर ही कार्य करना पसंद करता है, जबकि वहां अब मुख्य आकर्षक कारक नहीं रहे।
- स्थानीय नुकसान के बावजूद उद्योग एक क्षेत्र से नहीं चलते हैं
- कच्चे माल का स्रोत घट गया है
- ऊर्जा संकट सामने है
- पूंजी गतिहीनता
- द्वितीयक लाभ:स्थनीयकरण की अर्थव्यवस्थाएँ
- उद्योग उद्योग को आकर्षित करता है: एकाग्रता और संबंध
- पर्यावरण: जलवायु

Disadvantages of Localization:

1. **Demand decreases:** It is dangerous when the demand for the localized products declines due to the growth of **foreign competition** or due to the **changes in the tastes** of the people. In that case there will be mass unemployment in the particular localized industries.
2. Localization results in the **economic dependence of one region** on the other or of one, if the commodity demanded is one of the basic necessities of life, it can cause much inconvenience to the depending nations.
3. People are forced to get **specialized only one type** of work in a localized industry. If they wish to go to another place, they **may face difficulty in getting employment**.
4. During war, a localized industry can easily be made a target for bombardment and the whole industry can be ruined to ashes. So it is not wise to place all eggs in one basket. The industry should be decentralized. It should be spread out in various parts of the country so that it may not become an easy target for enemy's air attack.


GLOBAL COAL DISTRIBUTION
Coal areas of known or inferred extent
Reported occurances of small extent
Taimyr Basin
Tunguska Basin
Northern Alaska Area
Kansko-Achinsk Basin
Sechwan Basin
Great Plains Province
Eastern Region Interior Province
Appalachian Basin
Gulf Coast Province
Guasare Region
Upper Amazon Basin
Magallanes Region
Lower Rhine-Westphalian Basin
Dnieper-Donetsk Basin
Pechora Basin
Kuznetsk Basin
Adopted from Landis and Weaver, 1993, "Hydrocarbons From Coal," AAPG.
Areas are approximate. Basins labeled contain >200 billion tonnes.

M.A. Semester I

Economic Geography, Unit – II, a

Central Place Theory

Walter Christaller's Ideas

Urmi Sharma

Assistant Professor, Geography

Settlements

- Earth's surface's part settled by humans
- **"Human settlements means the totality of the human community – whether city, town or village – with all the social, material, organizational, spiritual and cultural elements that sustain it."**

  -UN, 1976
- **Imprint of interaction of man** with his physical and ecological world
- **Settlement geography** describes and explains the:
  - ✓ Settlements' location
  - ✓ Building material
  - ✓ Form and structure,
  - ✓ Functions and processes that produced them over time

Settlements across the world…

Lets' fly through Google Earth

Geographical Understanding…

- Size
- Spacing

To identify the order present if any, or logic underlying the *Size* relationships and *Spatial Distribution* of towns.

Major works…

- "Rank- Size Rule", *G. K. Zipf, 1949*
- "The Law of Primate City", *Mark Jefferson, 1939*
- ??? Spacing
- ??? Distribution
- Urban Hierarchies
- Central Place Theories

Central Place Theory (CPT)

Basic Concepts

Central Place ?

- The term *Central Place* is used to describe a settlement providing one or more services for the population living outside it.
- "Centrality", the degree to which a town serves its surrounding area, and can only be measured in terms of the goods and services offered.
- Central place functions: *Generalized* & *Specialized*

(Lower & Higher order functions)

- Threshold population: minimum population required to sustain a service

Lower and Higher order functions…

Lower-order functions:

- Rudimentary but essential
- Small threshold population
- Eg.: *newspaper stalls, groceries, bakeries, post offices* etc.

Higher-order functions:

- Highly specialized
- Large threshold population
- Jewelry, large shopping malls, arcades, Universities, Specialty hospitals

Christaller's CPT

- His work "***Die zentralen Orte in .Suddeutschland***" aka **"Central Places in Southern Germany"**, **1933**
- His quest:

  "Are there laws which determine the *Number*, *Distribution* and *Size* of towns?"

- Establishment of **Deductive theory** which reveals **'Ordering Principle'** in the distribution of towns.

Assumptions…

1. An *Isotropic Surface :*
   - Flat uniform plain
   - Equal population density
   - No variation in wealth or income
   - Provide equal ease and opportunities of movement in all directions

Assumptions…

2. Centres develop as settlements, like villages or towns are distributed equally apart, say 4 km.
3. Development of *road network and technological advancements* will lead to evolution of production centres.
4. Arrange in equilateral triangle pattern

Assumptions…

5. Circular trading area evolve
6. Hexagonal network lattice: to avoid '*overlap*' zones and '*void* areas in circular pattern.
7. Each higher-order centre will *serve* its all lower-order areas.

Central Place Theory (CPT)…

Basic Concepts

- The **Sphere of Influence** is the area under influence of the Central Place.
- Two concepts:

1. **Threshold population:**
   - ✓ **minimum population** required to sustain a service
   - ✓ assuming **uniformity** of income, consumption and taste it can be measured in terms of population number

Central Place Theory (CPT)…

Basic Concepts

2. Range of a good or service:

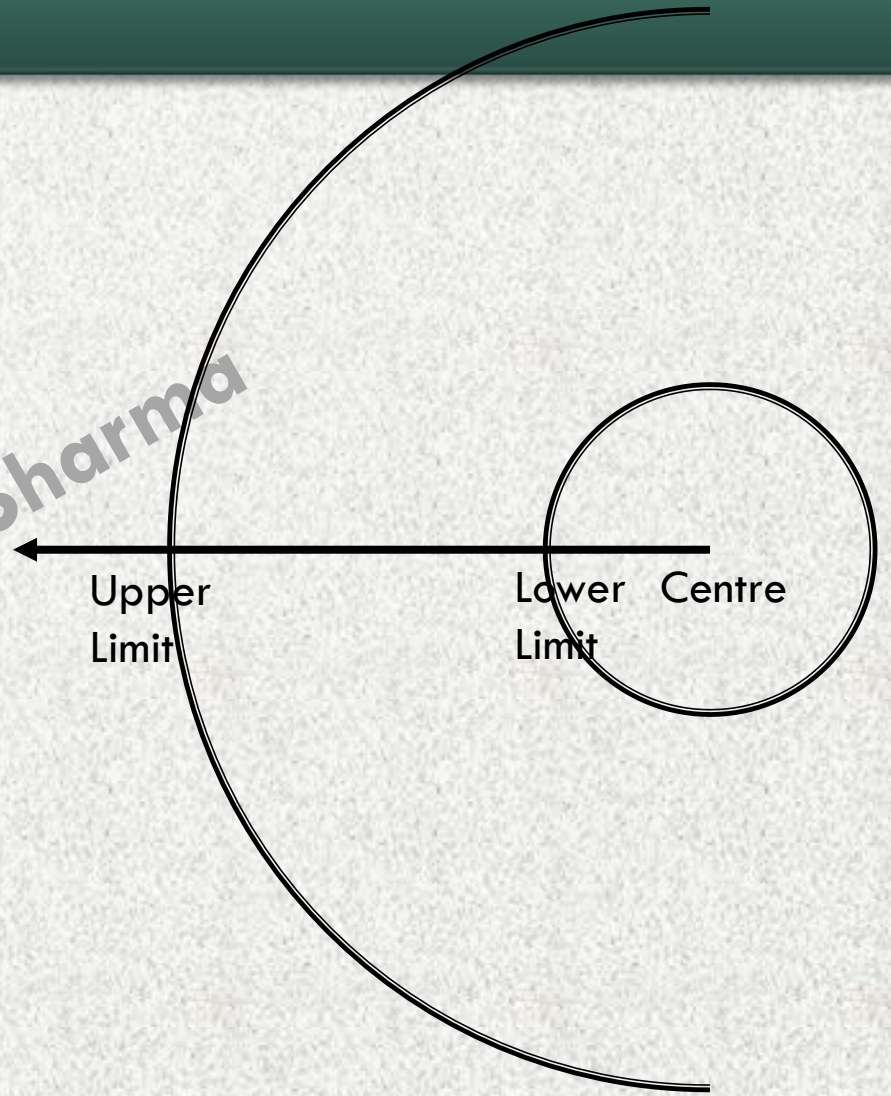
- ✓ This is the maximum distance over which people will travel to purchase a good or derive a service offered at a central place
- ✓ At some range from the centre the inconvenience of travel measured in terms of ***time, cost and trouble*** will outweigh the value or need of the good, or
- ✓ **An alternative centre,** nearer, becomes available

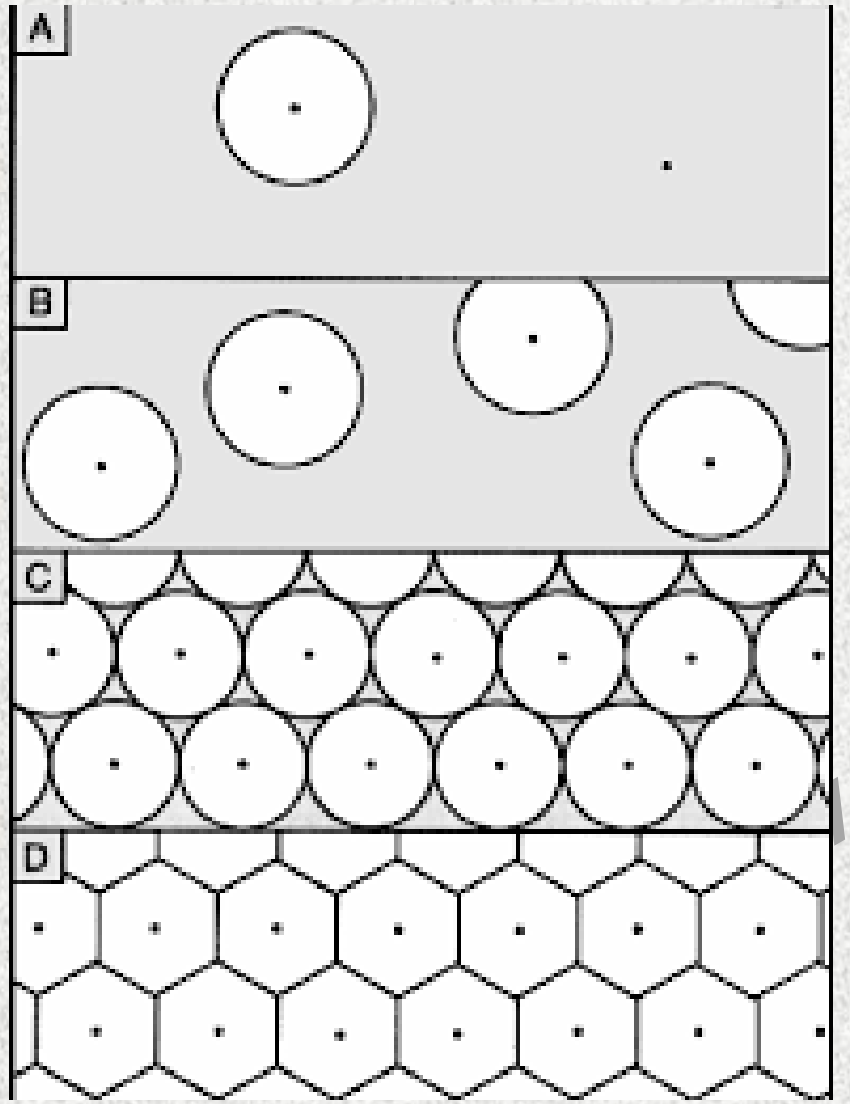
Central Place Theory (CPT)…

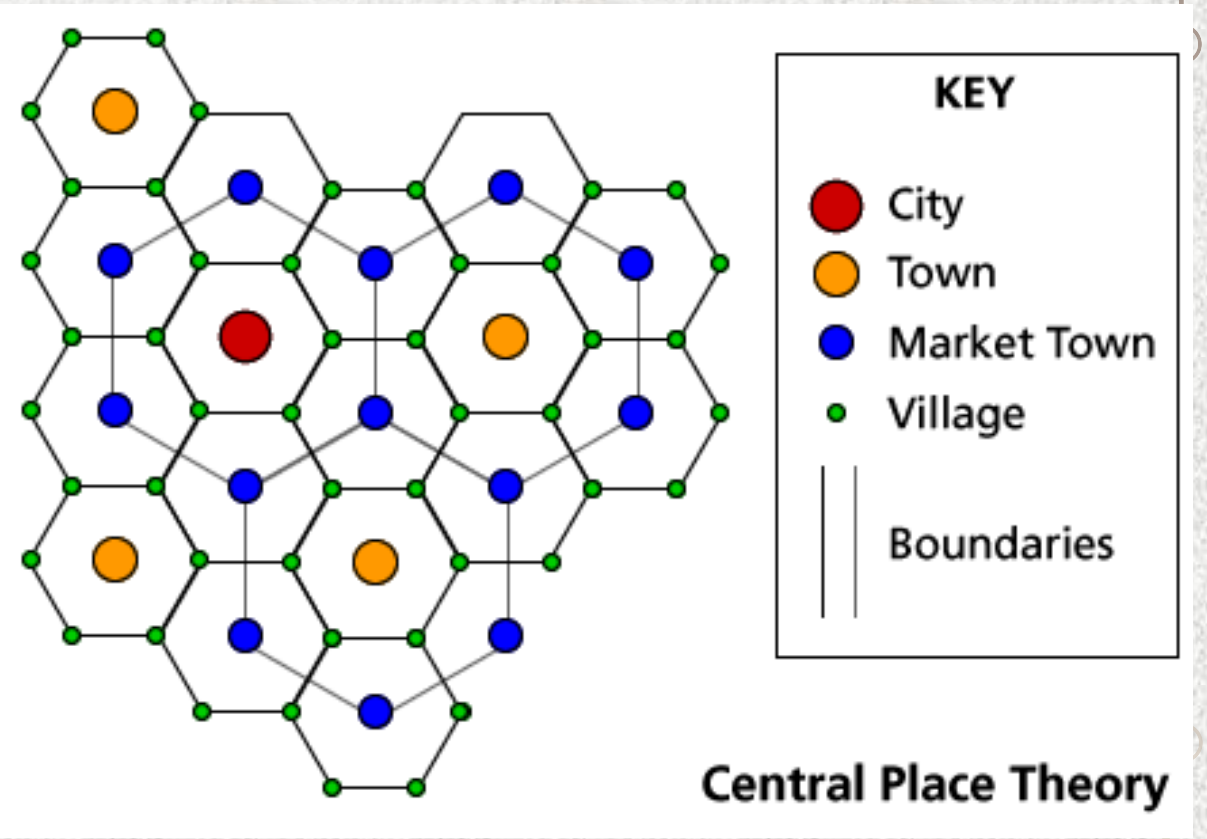
Basic Concepts

These two concepts sets the two limits in relation to each good and service

- **Lower limit**: Threshold Population
- **Upper limit**: Range of a good or service




A
B
C
D


KEY
City
Town
Market Town
Village
Boundaries
Central Place Theory

Arrangement of Central Places

- Christaller noted three different arrangements of central places according to the following principles:

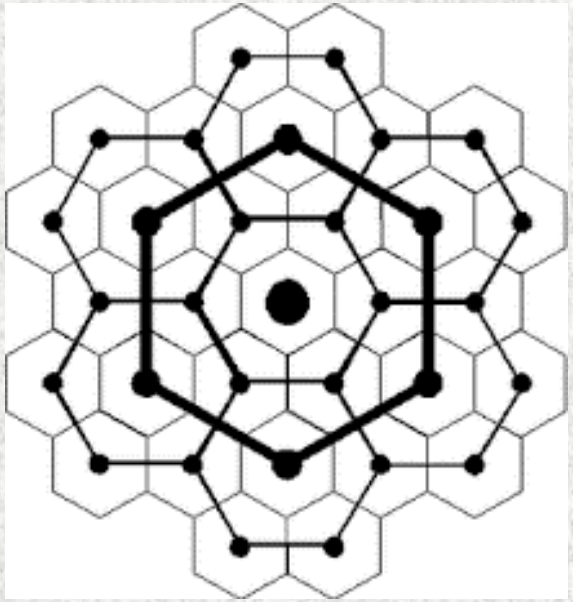
1. The Marketing principle (K=3 system)
2. The Transportation principle (K=4 system)
3. The Administrative principle (K=7 system)

k - Principle

- *k* = The total number of lower order centres that are served by the higher order centre.
- *k* is a constant
- It would apply to all levels through hierarchy

k = 3 *“Marketing Principle”*

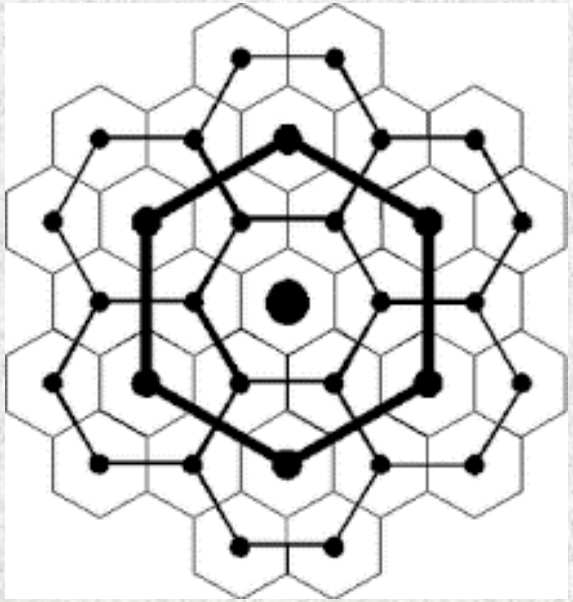
- The market area of a higher-order place (node) occupies **1/3rd of the market area** of each of the consecutive lower size place (node) which lies on its neighbor
- **All areas are served from minimum set of central places & the distance travelled is minimized.**
- The lower size nodes **(6 in numbers and 2nd larger circles)** are located at the corner of a largest hexagon around low value the high-order settlement



k = 1 + 6×1/3 = 3

k = 3 *"Marketing Principle"*

- Each high-order settlement gets 1/3rd of each satellite settlement (which are 6 in total)
- The territory is covered by a minimum number of urban centres. Each centre has three options to purchase goods and services of a higher order centre.
- The number of settlements at progressively less specialized levels follows the geometric progression 1, 3, 9, 27,....
- This means that the k = 3 relationship, each market area of a higher-order centre contains three market areas of a lower order centre.



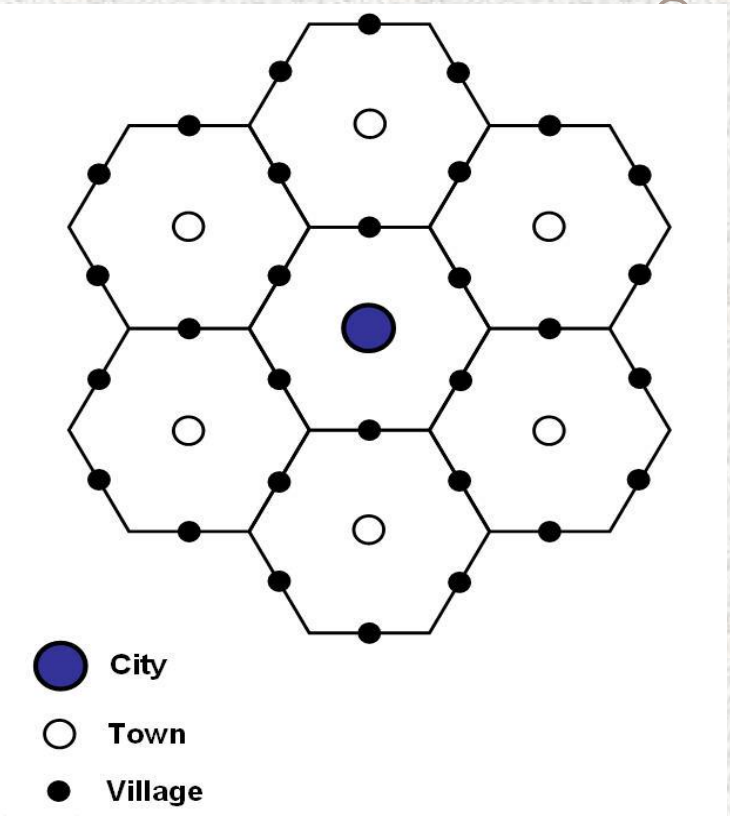
$$k = 1 + 6 \times 1/3 = 3$$

k = 3 *“Marketing Principle”* …

Type of Centre i.e. Rank of order	No. of complementary regions	Range of Region in Kilometres
M (Marketort) Market Locations	729	4
A (Armtsort) Office Towns	243	6.9
K (Kreisstadt) County Seats	81	12
B (Bezirksstadt) Main District	27	20.7
G (Gaustadt) Administartive Centre	9	36
P (Provinzstadt) Provincial City	3	62.1
L (Landsadt) Main Regional Centre	1	108

k = 4 "*Traffic Principle*"

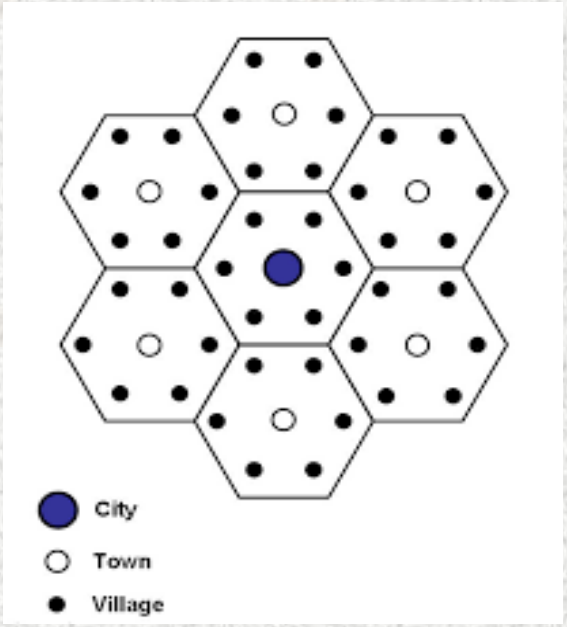
- The distribution is such that as many places as possible lie on main transport routes connecting higher order centres.
- Central places are located on the main transport routes connecting the higher order center.
- The market area of a higher-order place includes a half of the market area of each of the six neighboring lower-order places
- 1, 4, 16, 64,...



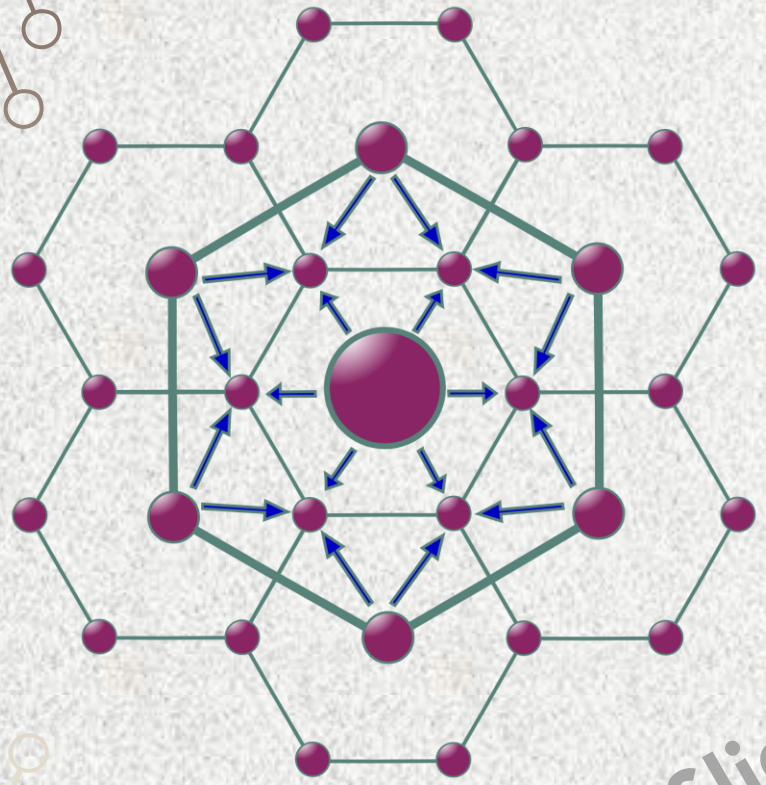
$$k = 1 + 6 \times 1/2 = 4$$

k = 7 "*Administrative Principle*"

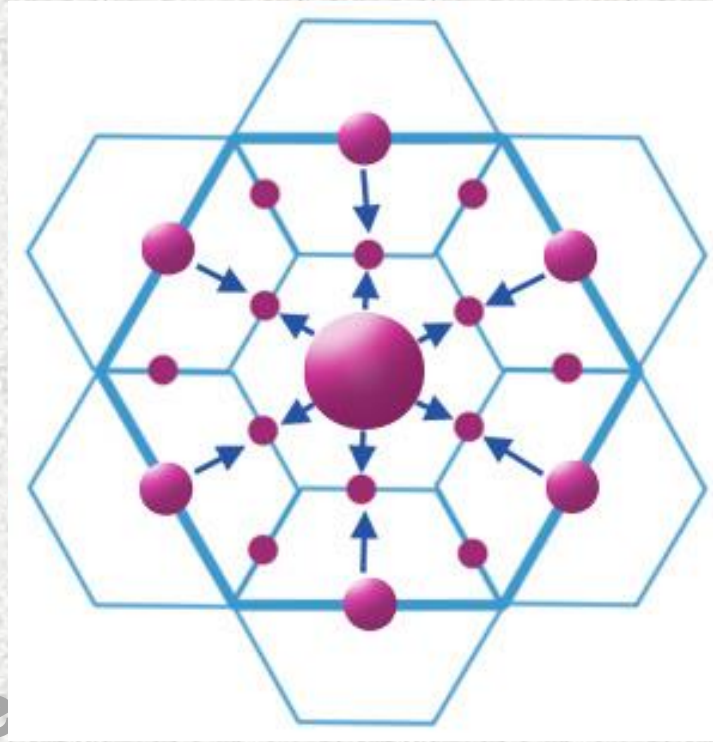
- Efficient administration is the control in this case and this will demand a clear separation of all complementary regions for they cannot be shared administratively.
- All the 6 lower order centres are fully subordinate to the higher order centre
- 1, 7, 49, 343,...



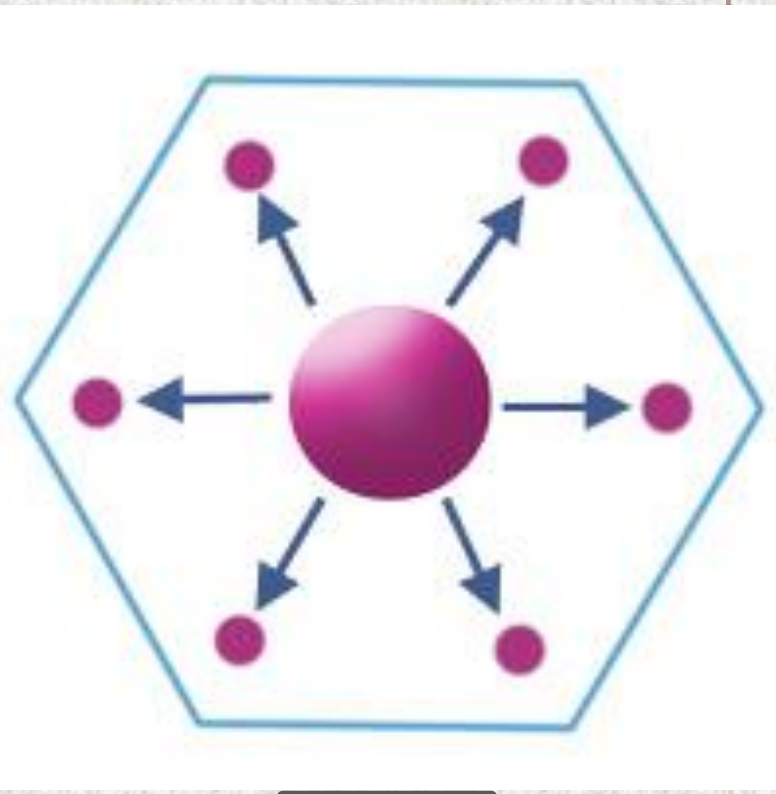
k = 1 + 6 = 7



k = 3



k = 4



k = 7

Evaluation…

The theory does a reasonably good job of describing the spatial pattern of urbanization. No other economic theory explains why there is a hierarchy of urban centers.

+ Spatial interdependence of the centres: location of commercial centres, trade and service activities, consumer market, etc.

+ Functional wholeness of the system

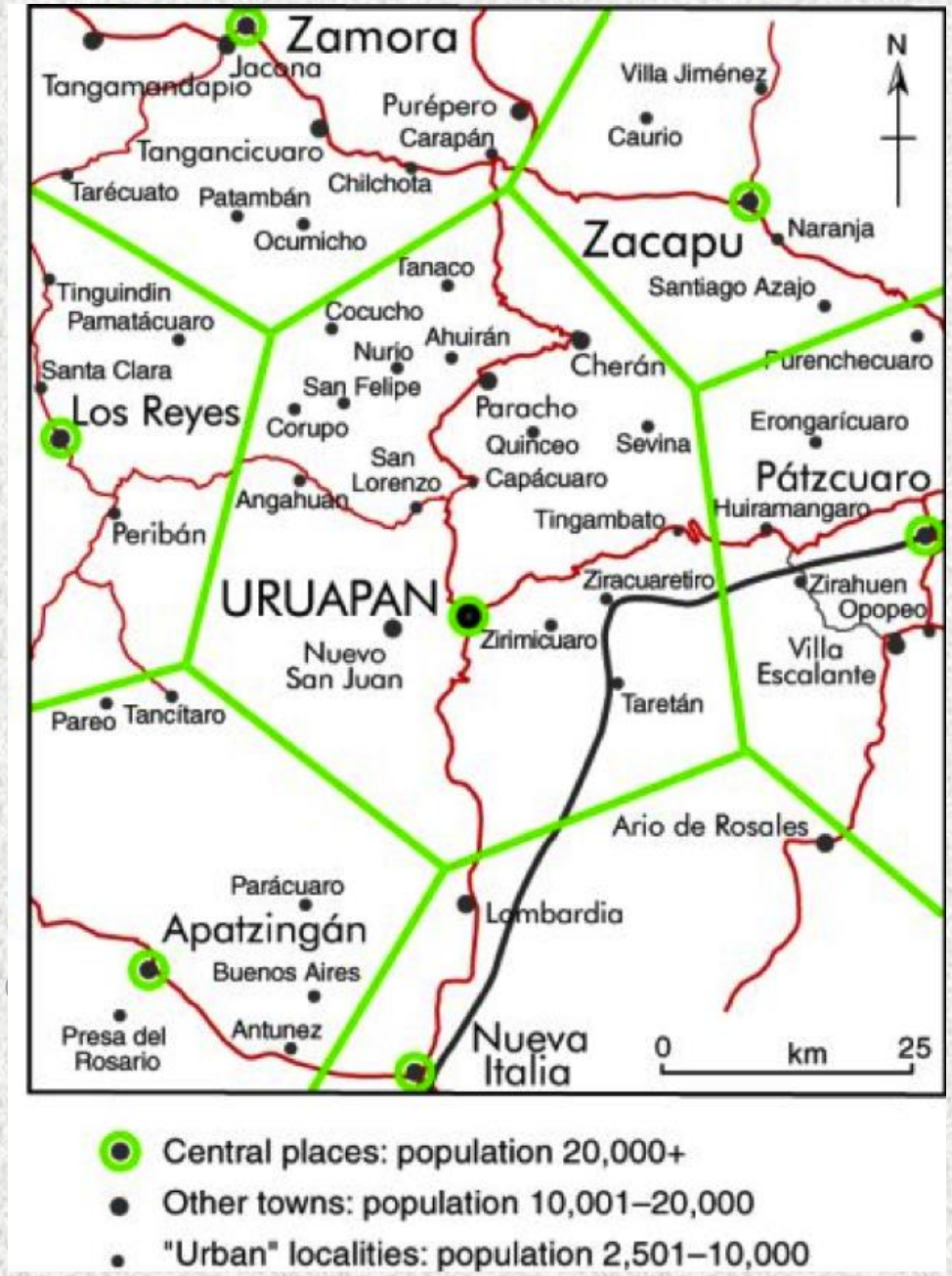
Evaluation…

- Assumption of isotropic surface:

- Large areas of flat land rarely exist – transport is uneven
- There are many forms of *transport cost.* Distance perspective is just not the only case
- People and wealth are not evenly distributed. Purchasing power is different
- People do not always go to the nearest place
- Perfect competition is unreal
- Shopping habits have changed
- Non economic factors (culture, politics, leadership) may be important but not evenly distributed

- Over-simplification of market, transport, administration concepts
- Fixed k value: August Losch's *dynamic* k concept

Central Mexico



Cost

Cost Factor in Economic System

- Industrialists desire for maximum profit.

Profit = Income - Cost

- Profit is **not evenly distributed** in space.
- There exists maximum profit sites.
- A geographer can help identify these sites.
- Differences in different levels of profit depends upon:

1. Equal incomes but different costs
2. Equal cost but different income.

- It is observed often that the industrialist may strive for cutting the cost instead of maximizing the profit

Types of costs

Production cost

Transportation cost

Production Cost

Elements, Spatial Variation and Locational Impact

Factors influencing cost of product in the process of Production

- Production is the **process** through which various types of **products are produced**.
- One of the most important activities performed by man in order to **fulfill his needs**
- The production of any goods or services involves **bringing them together within a particular system of various inputs**
- These are then combined in some productive way in the **transformation stage of the system to produce an output for which there is an identified demand.**
- **The cost of any product in the process of production primarily depends upon:**

  (i) Change in the form of product, i.e., final production of a product from raw material,

  (ii) Price rise, and

  (iii) Place and right of exchange.
- In the whole process of production, cost factor is considered to be the most important, which not only includes the price of raw material but is also determined by **labor, capital, technology**, etc.

Production Function

This is often expressed in the following way:

$$O = f(K, L, Q, T)$$

Where

- ✓ **O** is the **output** of the system
- ✓ **K** is the **land** factor of production including **physical resources of all kinds**
- ✓ **L** is the **labor** used in transforming inputs into outputs
- ✓ **Q** is the **capital** allied in the production process, for instance in buildings, plant, etc.
- ✓ **T** is broadly interpreted as the **technological** component, the stock of methods and techniques applied in producing output

The essence of the production function as it is expressed above is that the output of a productive system is **the sum function of the amounts of land, labor, capital and technology**

Although, this represents the system in its most highly generalized form.

Factors having direct impact on spatial pattern of cost in a production process

The following four factors have a direct impact on spatial pattern of cost in a production process:

(i) Natural resources,

(ii) Labor,

(iii) Capital,

(iv) Technical knowledge

1. Natural Resources:

- All the resources available on land including soil, minerals, water, forest, air and other living organisms.
- Most of the resources have very **uneven distribution** and their **impact on spatial pattern** of **economy** is more.
- Thus influence **cost of production** which **varies from places to place**
- Among the factors affecting the cost of production, **the availability of resources is an important one:**

(i) Ubiquitous Material:

- Available **everywhere** such as *air*, *soil*, *sunshine*, etc.

(ii) Localized Material:

- Available at **some particular places** such as *iron ore, coal, copper, lead, zinc and several other minerals*. These resources have direct impact on cost of production.

1. Natural Resources…

(iii) Pure Material:

- These are **found in pure form** in nature itself

(iv) Gross Material:

- These materials are not pure and found in mixed or impure form such as bauxite, diamond, etc.
- Transportation of Raw Material

  These are imported or brought from other places to the place of production thus incurs transportation cost.
- The other factors affecting cost of natural resources are
  - ✓Easy **availability** of resources,
  - ✓The **quantity** of resources,
  - ✓The **quality** of resources,
  - ✓The **weight** of the resources and
  - ✓Cost of **technology** in obtaining the resources
- The above mentioned aspects of resources not only influence the cost of production but also the spatial economy. The establishment of industries and growth and development of agriculture often depends upon the natural resources.

2. Labor:

- ✓ Labor factor in the production function **varies widely from one activity to another.**
- ✓ Where **labor is evenly distributed spatially**, flexible in skill and productivity as the simplified model implicitly assumed, and then it would have no locational significance.
- ✓ But, in realistic circumstances, labor is unevenly distributed over space and structurally differentiated by skill and productivity.

Thus labor does influence the location of economic activity in space

- ✓ **Weber** recognized the importance of labor costs as a "**locational factor**"

2. Labor…

- ✓ **Availability**
- ✓ **Cost**
- ✓ **Skilled**
- ✓ **Mobility** of Labor
- ✓ **Management**

- ✓ The **skill of labor** also sometime becomes a factor.
- ✓ In the past, the existence of such skills exerted a far **more powerful locational pull** on the **craft-based industries**.
- ✓ The **precision instrument, fashion, gun, jewelry, textile and clothing industries** are strongly attracted to particular sites and maintained there by the availability of specialized skills.

Spatial variations in the cost of labor:

- ✓ The cost to a production system of employing labor to perform its transformation or processing operations is expressed in terms of the

  Wages, salaries, and additional benefits paid to employees per unit of output.

- ✓ There are two variables here: the wages and salaries themselves and
- ✓ The productivity of labor (the amount of output achieved)

1. **Wages and salaries** may vary from place to place, from time to time, and from industry to industry in accordance generally, although by no means exclusively, with prevailing supply and demand conditions for this factor.
2. Similarly, the **productivity of labor** varies with space, time, and social conditions.

- ✓ For a variety of reasons (*social*, *demographic*, *economic*), there is wide variation in the supply of different types of labor: ***skilled*** and ***unskilled***, ***male*** and ***female***, ***productive*** and ***unproductive***.

Spatial variations in the cost of labor:

- ✓ The labor is not infinitely mobile
- ✓ Long-distance labor cost and distance of labor movements have to be examined in the context of migration
- ✓ The other factors influencing spatial variations in labor cost are
  - **Differential capital to labor ratios**,
  - **Differential income elasticities of demand** (it is calculated as the ratio of the percentage change in quantity demanded to the percentage change in **income**) for the products of industrial and agricultural regions;
  - **Differential cost of living** –

  all serve to influence the ***geographical pattern of wage rates*** with significant disparities within space economy

Spatial variations in the cost of labor:

- ✓ The productivity of labor depends upon many things that may be summarized under the heading of labor attitudes.
  - High rates of **labor turnover** (refers to the ratio of a number of employees who leave a company through attrition, dismissal or resignation to the total number of employees on the payroll in that period),
  - **Recurring absenteeism,**
  - **Resistance to change** in industrial practice,
  - **Difficult labor relations** in general
- ✓ In the search for industrial locations, labor relations and productivity considerations may take precedence over direct wage rates when the significance of the labor factor is considered.
- ✓ For all the above mentioned reasons, labor supplies and labor costs vary significantly from place to place and exert differential locational attractions.

3. CAPITAL:

- Capital is a key ingredient in the production
- Capital, thus, is defined as all those man-made aids to further production such as ***tools, machinery plant and equipment, including everything man-made***

  which is not consumed for its own sake but which is used up in the process of making other goods.
- All economic activities make use of some capital.
- There is a **wide variation in capital intensity** from industry to industry.

Spatial Variation in the Cost of Capital:

- The accumulation of capital within an economic region depends upon the relationship between
  - ✓ supply of investment funds and the amount of net capital inflow and
  - ✓ the demand for such funds
- In some regions, **capital may have been accumulating over a long period** to give a large basic stock of physical capital
  - ✓in the sense of ***plant***, ***equipment***, and ***infrastructural*** facilities as well as
  - ✓an ***abundant supply of monetary investment capital*** from **savings** out of profits and wages
- **These regions may also be large sources of demand for capital**, the high levels of profits within them absorbing internally generated investment funds and drawing in addition from outside.

Spatial Variation in the Cost of Capital…

- Other regions, perhaps old-established but less successful,

  may still exhibit a **large accumulation of physical capital** and may, from the fruits of a more successful past still **accumulate large supplies of investment capital**

- They may, however, be unable to absorb all of this investment capital within themselves and **stand out as regions of capital surplus**

- At the other end of the scale, **developing areas,** perhaps **new frontiers for settlement** may be sources of a **limited supply of capital but may at the same time exert a powerful demand for capital inputs** through the potential returns to be had from mining and agricultural ventures.

- Thus, over space as well as over time and from one industry to another, there exists variation in levels of supply and demand for capital as a factor of production.

4. Technical Knowledge:

- Technical knowledge is a pre-requisite for the production system.
- This knowledge is accumulated by means of two processes: **inventions** and **innovations**
- ***Invention*** is the introduction of new production processes and techniques to the existing stock of knowledge.
- ***Innovation*** is the adoption of those processes and their translation into actual production processes.
- All industries require some level technology, although some of them are technology-intensive industries, while others need a limited technology.
- In industries such as aircraft, electronics, communications and scientific instruments, the importance of technical knowledge is very great.
- For others, such as food, timber, and textiles, there is less drive to expand resources on maintaining new inputs of technical knowledge.

4. Technical Knowledge…

- Both (innovation and invention)depend upon the application of **substantial investment inputs** and upon the **willingness of entrepreneurs** to utilize their capital resources in this way.
- They therefore **tend to exhibit a space preference** for those locations with **ready availability of investment funds.**
- **All forms of invention and innovation** have a tendency toward spatially **localized patterns of evolution.**
- Technical knowledge, therefore, may be considered a **spatially localized factor**
- Its localization tends to be oriented towards
  - ✓ **the large and more successful existing concentrations of production and**
  - ✓ **the geographical network of communications.**
- In terms of mobility it behaves like the other non-land production factors: It is sensitive to movement over space, it tends to be attenuated by distance, and it is channeled along existing lines of movement and interaction.
- Production function is always defined with respect to a given technology. **If there is an improvement in the technique of production, then increased output can be obtained with the same physical inputs.**

THANKS…

Transportation Cost

- ***Transport costs are a monetary measure of what the transport provider must pay to produce transportation services***
- Locational attraction where '**Transportation cost' is minimum**.
- Elements of transport cost:

I. **Operating Cost:** cost required to run and develop transportation facility.

Line-Haul cost: costs which are incurred in the process of moving and which are made up principally of Fuel costs and Wages. **(Long haul advantage) (Break-of-Bulk) (Back-Haul cost)**

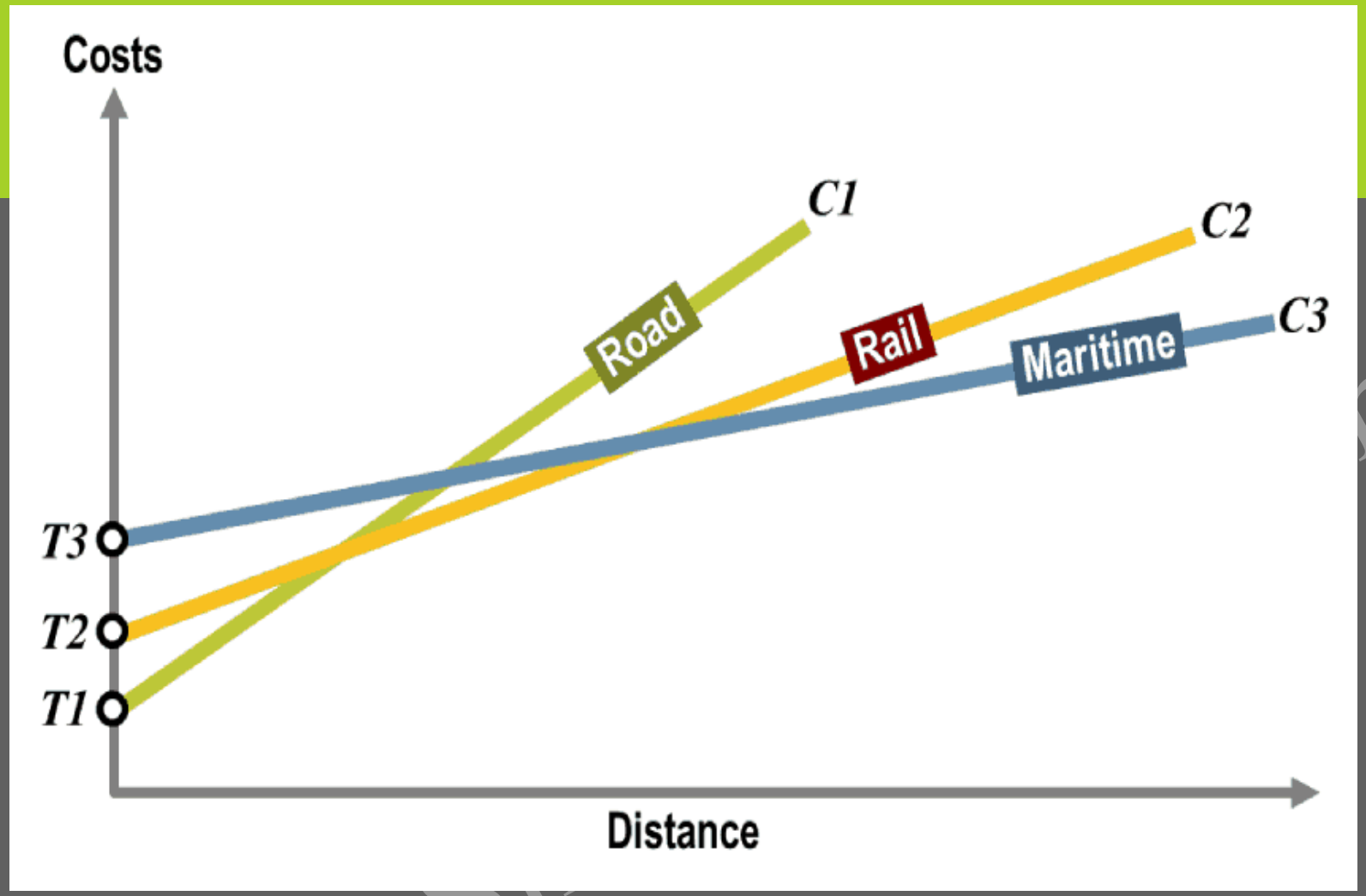
Overhead cost: represents the cost of equipment involved. (Ship, Railway, Shops, Offices)

Transfer cost: made up of indirect cost (Insurance cover)

II. **Profit & Freight Rates:**

Terminal Cost

- Costs that are related to the ***loading, transshipment*** and ***unloading***.
- Two major terminal costs can be considered
    1. loading and unloading at the origin and destination, which are unavoidable, and
    2. intermediate (transshipment) costs that can be avoided
- For complex transport terminals, such as ports and airports, terminal costs can involve a wide array of components, including docking / gate fees, handling charges and pilotage / traffic control fees.



The above graph represents a simplified assumption concerning transport costs for three modes; **road, rail and maritime.**

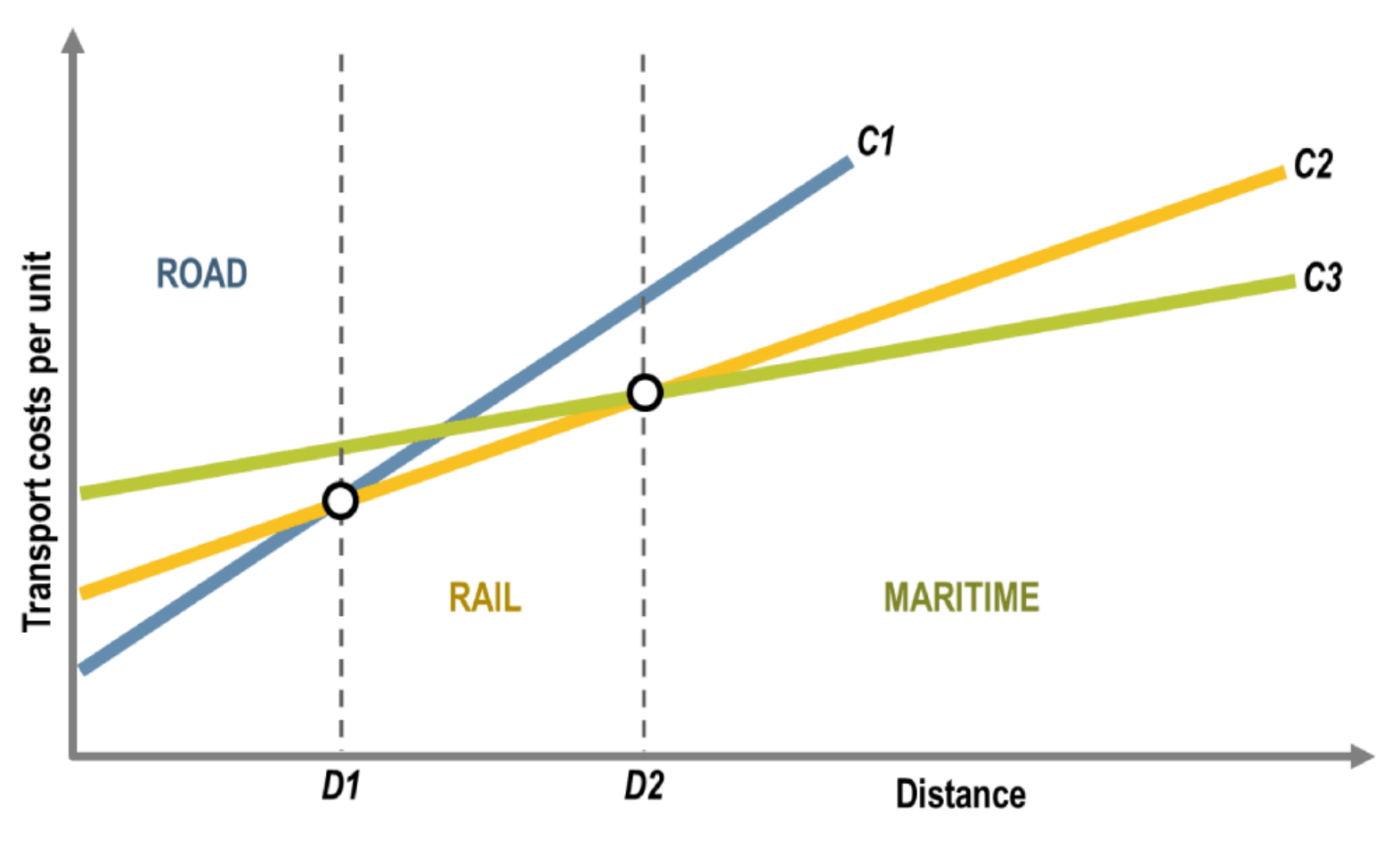
It only considers the cost of loading and transport to destination, but not unloading.

The cost functions all begin at some point up the cost axis, which represents terminal costs.

Because of different terminal costs, maritime shipping (T3; port costs) and rail (T2) have significant disadvantage compared to road (T1) over short distances.

Line-Haul Cost

- Costs that are a ***function of the distance*** over which a unit of freight or passenger is carried.
- They include **labor** and **fuel** and commonly *exclude transshipment* costs.
- **Long-haul advantage:**
- **Break-of-Bulk:** A point (or a **break in bulk** point) is a place where cargo is **shifted from one form of transport to another**. The most obvious example of this would be a sea port or an airport. At such places, cargo comes in on a ship or an airplane
- **Backhaul:** It is the return movement of a **transport** vehicle from its original destination to its original point of departure. An empty **backhaul** is not economically viable, so most of the companies will take **advantage** of this practice to compete on **transport** costs.



Using a simple linear distance effect, road, rail and maritime transport have respectively a C1, C2 and C3 cost functions.

- While road has a lower cost for short distances, its cost increases faster than rail and maritime costs.
- At a distance D1, it becomes more profitable to use rail transport than road transport
- While from a distance D2, maritime transport becomes more advantageous

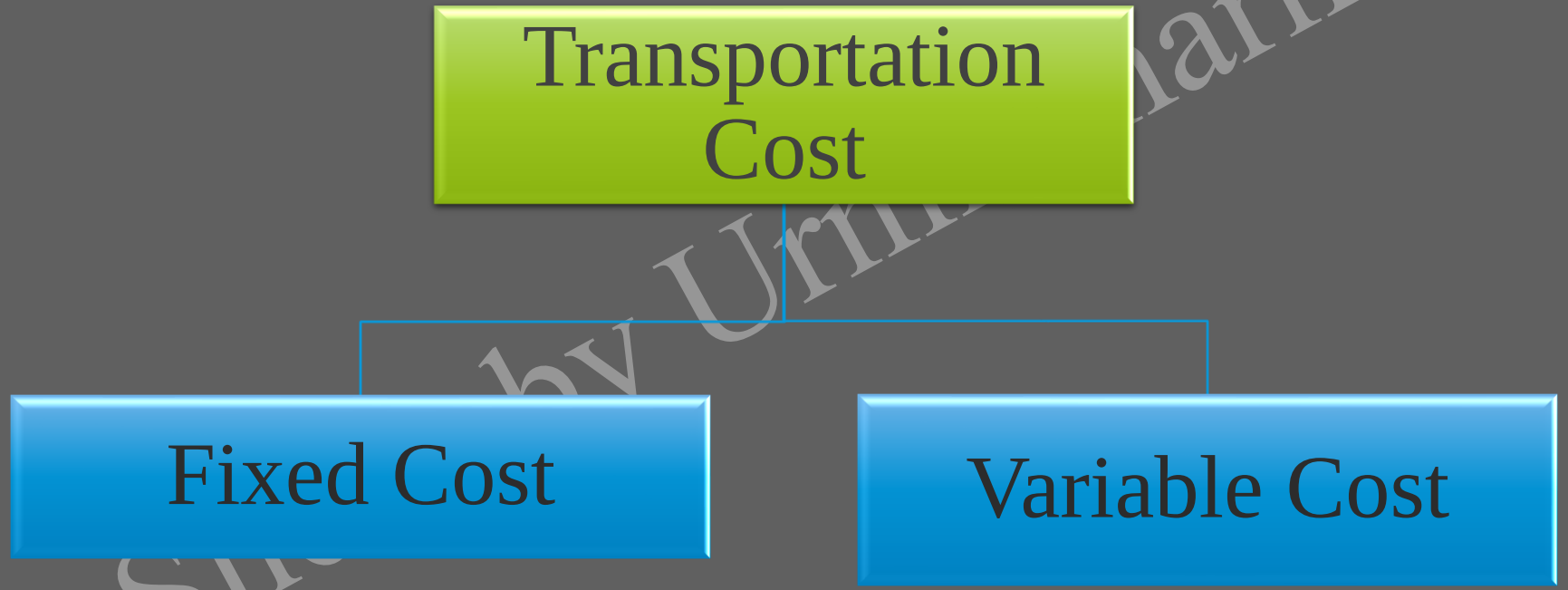
Overhead Cost

- Cost of equipment involved
  - **infrastructures, terminals and vehicles**
  - **Railway tracks, station**
  - **Repair shops**
  - **Ports, harbors**
  - **Offices**
- They include the **purchase or major enhancement of fixed assets**, which can often be a one-time event
- Since physical assets tend to depreciate over time, capital investments are required on a regular basis for their maintenance

Transfer Cost

- Made up of **Indirect costs**
  - ✓ **Insurance**
  - ✓ **Toll tax**

Other two broad categories of transport costs:



Fixed Costs

- They include:

(i) Cost of providing the infrastructure (i.e., the roads, the port or the railway line)

(ii) Cost of providing, equipping and staffing the terminal facilities (i.e., bus depots, railway stations or airports)

(iii)Cost of providing, managerial, administrative and maintenance staff and their offices and workshop.

- These costs are **'inescapable'** because they cannot be avoided
- They also do not vary with the level of traffic, but remain independent of it.

Variable Cost

- ✓ These are costs incurred by the actual movement of traffic
- ✓ Therefore vary with the level of the traffic passing.
- ✓ They include the cost of **fuel, crew wages and the maintenance of vehicles** due to the operation of those vehicles in traffic service, for example, the **replacement of worn bus tyre or routine inspection of an aircraft after so many hours of being airborne.**
- ✓ They are called '**escapable**' because they can be avoided or escaped by not running a particular train, suspending a particular flight or a private motorist leaving his or her car in the garage and walking to the shops.
- ✓ Because of differences in the basic technology of the various transport modes, the proportion of **fixed (inescapable) and variable (escapable) costs** in the total costs varies as between those modes.
- ✓ For example, the railway is characterized by having a high proportion of fixed costs in its total costs.

Fixed Costs

- ✓ Terminal facilities
- ✓ Transport equipment
- ✓ Carrier administration
- ✓ Roadway acquisition and maintenance [Infrastructure (road, rail, pipeline, navigation, etc.)]

Variable Costs

- ✓ Fuel
- ✓ Labor
- ✓ Equipment maintenance
- ✓ Handling, pickup & delivery, taxes

Comparative cost analysis

Mode	Fixed Cost	Variable Cost
Road	Low	Medium
Railway	High	Low
Water	Moderate	Low
Air	High	High
Pipeline	High	Low