Indira Gandhi National Open University
School of Sciences

BGGET-142

ECONOMIC GEOGRAPHY

BLOCK

5

SERVICE SECTOR

UNIT 17
COMMERCIAL ACTIVITIES AND SERVICES 309

UNIT 18
TRANSPORT AND FLOW NETWORKS 321

GLOSSARY 341

Course Design Committee

Prof. H. Ramachandran
Department of Geography,
University of Delhi,
Delhi

Prof. Vijayshri
Former Director
School of Sciences,
IGNOU, New Delhi

Dr. Satya Raj
Discipline of Geography,
School of Sciences,
IGNOU, New Delhi

Prof. Sachidanand Sinha
Centre for the Study of
Regional Development,
Jawaharlal Nehru University,
New Delhi

Prof. Mahendra Singh
Nathawat
Discipline of Geography,
School of Sciences,
IGNOU, New Delhi

Dr. Koppisetti Nageswara
Rao
Discipline of Geography,
School of Sciences,
IGNOU, New Delhi

Prof. N.R. Dash
Department of Geography,
The Maharaja Sayajirao
University of Baroda, Gujarat

Prof. Subhakanta Mohapatra
Discipline of Geography,
School of Sciences,
IGNOU, New Delhi

Dr. Vishal Warpa
Discipline of Geography,
School of Sciences,
IGNOU, New Delhi

Prof. Milap Chand Sharma
Centre for the Study of Regional
Development, Jawaharlal Nehru
University, New Delhi

Prof. Vijay Kumar Baraik
Discipline of Geography,
School of Sciences,
IGNOU, New Delhi

Block Preparation Team

Course Contributors

Dr. Vishal Warpa (Unit - 17)
Discipline of Geography,
School of Sciences,
IGNOU, New Delhi

Prof. Sumana Bandyopadhyay (Unit - 18)
Department of Geography,
University of Calcutta,
West Bengal, India

Editor

Prof. N. R. Dash (Retd.)
Department of Geography,
The Maharaja Sayajirao
University of Baroda, Gujarat

Course Coordinators - Dr. Vishal Warpa

Print Production

Sh. Rajiv Girdhar
A.R., MPDD, IGNOU

Sh. Hemant Parida
S.O., MPDD, IGNOU

Acknowledgement: Dr. Vishal Warpa for designing the cover page and Mr. Anil Kumar for word processing. Special thanks to Survey of India and other sources for providing maps/diagrams for educational purposes. Should any infringement and errors have occurred, the publishers and editors apologize and will be pleased to make the necessary corrections in future editions of this book.

October, 2022

© Indira Gandhi National Open University, 2022

ISBN : 978-93-5568-746-3

All rights reserved. No part of this work may be reproduced in any form, by mimeograph or any other means, without permission in writing from the Indira Gandhi National Open University.
Further information on the Indira Gandhi National Open University courses may be obtained from the University's office at Maidan Garhi, New Delhi-110 068 or the official website of IGNOU at www.ignou.ac.in. Printed and published on behalf of Indira Gandhi National Open University, New Delhi by Director, SOS, IGNOU.

Printed at: Raj Printers, A-9, Sector B-2, Tronica City, Loni (Gzb.)

BGGET- 142
Economic Geography

BLOCK 1 INTRODUCTION TO ECONOMIC GEOGRAPHY

Unit 1 Scope and Approaches
Unit 2 Concepts in Economic Geography
Unit 3 Economic Activities
Unit 4 Economic Development and Disparities

BLOCK 2 RESOURCES

Unit 5 Concept and Classification
Unit 6 Natural Resources
Unit 7 Minerals and Energy
Unit 8 Human Resources

Block 3 PRIMARY SECTOR

Unit 9 Agriculture
Unit 10 Animal Husbandry and Fishing
Unit 11 Forestry
Unit 12 Minerals and Mining Activities

Block 4 SECONDARY SECTOR

Unit 13 Industry and Manufacturing
Unit 14 Agro-Based Industries
Unit 15 Mineral and Energy Based Industries
Unit 16 Factors of Industrial Location

Block 5 SERVICE SECTOR

Unit 17 Commercial Activities and Services
Unit 18 Transport and Flow Networks

ignou THE PEOPLE'S UNIVERSITY

BLOCK 5: SERVICE SECTOR

All the sectors of economy do not operate or function by themselves. They require a definite and concrete chain of services, to make it functional corresponding to the type of a particular economic activity, which may portray regional differences from one region to another and from one place to another place. On one spectrum, services associated with a range of commercial activities form the part of service sector. On the other spectrum, it includes extensive chain of road, rail, waterways and airways networks known as transport arteries. It is not a difficult task to guess that these services are not uniformly developed across the geographical regions of the world. Availability of such services may exhibit variations from one region to other geographical regions depending on historical, economic, technological and other factors.

Fifth Block is divided into two Units that briefly deal with the diverse areas of service sector.

Unit 17 Commercial Activities:

Seventeenth Unit is devoted to the study of commercial activities. These form the very basis of economic development or so-called modern kinds of development. It will make you learn about the kinds of commercial activities, service sector along with trade blocs of the world.

Unit 18 Transport Flows and Networks:

Last Unit is devoted to the study of transport flows and networks. You will learn about the interchange networks and characteristics of transport and networks in nutshell.

Our best wishes are always with you to complete this final semester course successfully.

ignou
THE PEOPLE'S
UNIVERSITY

UNIT 17

COMMERCIAL ACTIVITIES AND SERVICES

Structure

17.1 Introduction
Expected Learning Outcomes
17.2 Types of Commercial Activities
Wholesale and Retail Trade
17.3 Types of Services
Tertiary Services
Quaternary Services
Quinary Services
17.4 International Trade and Trade Blocs
International Trade
Trade Blocs
17.5 Summary
17.6 Terminal Questions
17.7 Answers
17.8 References and Further Suggested Reading

17.1 INTRODUCTION

In the previous Units 13 to 16 of Block 4, you have learnt about the secondary sector and various types of industries supported by diverse natural resource base. As you know, transport is the only known medium in the entire inhabited regions of the world, which supports, sustains and accelerates the various categories of economic and commercial activities. This is the reason why we also call it the lifeline or engine of all spatial economic activities. You will also learn in last Unit 18 of this course that means of transport acts as a main source of communication to drive all forms of economic activities on the planet Earth.

Trade and commerce are considered as humankind's oldest avocations. In this Unit, we will focus on the commercial activities as a means of livelihood system, their different components and inter-relationships amongst each other. As we know that trade is the exchange of one or other commodities at many levels. Most of you may have heard the word 'barter' either from your elders or read it in your secondary or senior secondary classes. Barter is the earliest forms of trade, whereby one commodity was used to be exchanged for other commodity of more or less equal value. We begin, this Unit, by discussing the commercial activities and its two types namely wholesale and retail trade in Section 17.2. You will learn that these two plays pivotal role and

operate in an inter-related manner, which helps support various forms of commercial activities in its totality.

Many factors and human processes occur in the economic spheres of human societies and their inter-relationship is rather multifaceted, making the trade and commerce an active domain. To understand these complex inter-relationships, you must learn the types of services associated with three sectors of economy viz., tertiary, quaternary and quinary which we will discuss in Section 17.3. In addition, you will also learn about the pattern and trends of trade and its international dimensions while studying Section 17.4. You will get accustomed that commercial activities operate and function in a mutually agreed conditions, which reflects the dependencies of various regions on each other for the exchange of a particular commodity with each other. All such kind of commercial activities and developments led to the emergence of information and communication technologies (ICT's) and global economy, thus satisfying and fitting into the criteria of the trio of liberalisation, globalisation and privatisation (LPG), prominently since post 1990s.

In this Unit, you have been introduced to the types of commercial activities (wholesale and retail trade), types of services (tertiary, quaternary and quinary etc.), along with international trade and trade blocs. In next Unit, you will learn about the transport and flow networks that provide the absolute and directly necessary set of mobility infrastructure to make possible the movement of commodities or products between nations and across the places or geographical realms.

Expected Learning Outcomes

After studying this unit, you should be able to:

- describe the types of commercial activities;
- explain the wholesale and retail trade;
- explain the three types of services including tertiary, quaternary and quinary; and
- discuss the international trade and trade blocs.

17.2 TYPES OF COMMERCIAL ACTIVITIES

You may easily understand the rationale behind the emergence, operation and functioning of commercial activities. Geographically speaking, any two places or regions on the Earth's surface may not be identical. Each place has its own uniqueness, seen in terms of geographical and cultural characteristics (like topography, weather and climate, soil, vegetation and culture), technological, economic requirements and infrastructural facilities like transport and market institutions, etc. Therefore, these factors generate a dependency on each other for the exchange of goods and services amongst each other, which gives birth to trade and commerce. It entails the diverse kinds of movement including people, goods and services along with ideas (scientific and technical knowledge and technologies) etc., from one place to another on the planet Earth (as learnt in your second semester course titled Human Geography). There may be several reasons or factors behind such movements like economic, political, social and educational, etc. We can say

that any kind of movement that entails economic interests and linkages, both forward and backward, do facilitates the creation of trade and commerce on Earth's surface, albeit with regional variations.

In ancient times, trade used to be simple as it involved the exchange of one kind of product with another between the producers only. It is known as 'barter trade' in which value of the product (either surplus or deficit), is not paid in monetary terms. Gradually, when this form got changed into monetary terms, it started getting increasingly complex coupled with many factors. These factors could be political, social, economic and environmental, etc. besides others. Many institutions came to the fore for the smooth operation of commercial activities, which we know as trade centres. Soon after the advent of industrial revolution, trade centres or in simple words, the places that provided market facilities for buying and selling of diverse categories of products started getting more and more complex. Places having better network of transport arteries help to develop such trade centres at the road crossings or junctions much faster as compared to places having poor transport facility. For example, in places situated on the plains, plateaus and coastal regions, a trade centre may be located around such centres (commercial activity) adjacent to the nodal centres whereas in hilly and mountainous places, they may develop between two valleys or crossings near the nodal administrative centres on account of topographical factors.

Any kind of production or finished products (goods and services), be it agro-based or industry-based (like pharmaceutical, automobile, textiles, chemical etc., and many others), needs a definite system of transport and market chains and workforce to smoothly operate these. The basic idea is to connect the producer with that of consumers across the regions or places. It involves a lot of intermediaries facilitating the smooth movement of goods and services from producers to their consumers. These may include wholesale traders and retail businesses, warehouses including cold storage units (used to store perishable commodities and life-saving medicines etc.), and distribution agents at many levels. Besides, when products are transported from producer to consumer, it gives birth to many subsidiary and associated chain of commercial activities. These are assembling, storing, packaging, loading and unloading, buying and selling at many levels and scales, between wholesalers and retailers at both local to global scales. In turn, with the passage of time, intensification of such commercial activities gave birth to the towns and cities of various sizes, each with specialised commercial and administrative traits. Later on, these started expanding to the provision of crucial services related to the provision of education and healthcare systems, besides many others. These towns and cities come to be known as trade centres.

Before discussing the commercial activities and its types, we will make you learn about the trade and commerce. These two together facilitates the exchange of ideas, goods and services along with capital and technology between and amongst geographic regions or states and countries. To a layman, both of these terms may appear synonymous. However, there is little difference between the two. However, main aim of both is concerned with the buying and selling of products across regions and nations. Commerce involves the same at the actual points of physical contact i.e., at trade centres whereas trade deals with the spatial pattern and routes, trade restrictions and

regional and international trading blocs etc. Commerce deals with the wholesale and retail trade, financial services, monetary market institutions along with fiscal planning etc. These two together makes possible to bridge the gap between the demand and supply of various goods and services. There are two types of commercial activities namely wholesale and retail trade activities. Both the types are considered as a backbone or spinal structure for the success of flow of goods and services from producer to the consumer. You can say that commercial activities are like intervening layers between producer and consumer that offer the myriad forms of services in terms of infrastructure, administrative staff, points of spatial contact (markets), and also act as providers of employment to a vast segment of workforce, particularly in the tertiary sector of economy.

17.2.1 Wholesale and Retail Trade

As you know, trade mainly takes place in two forms viz., wholesale and retail. These two forms are concerned with numerous types of both retailing and wholesale industries. Both are commonly known as distributional trade or commercial activities or simply economic sectors. Needless to mention, you can easily guess that both Wholesale as well as Retail Trade Services are extremely vital for the timely and seamless movement of diverse kinds of goods and services between producers and consumers. If you think a bit deeply, it would not be difficult for you to visualise that how much of economic output and proportion of employment, both industries must be providing. The basic difference between the wholesale and retail trade lies in the type of clienteles and scale of operation. Wholesalers generally sell their products mainly to the retailers, merchants, institutions, industries and other commercial groups and sometimes to the general clients. And retailers generally sell the procured products from wholesalers in smaller quantities as per the purchasing demand of the individuals, household customers and general public etc., besides, some business units, institutional and other clients.

In case of wholesalers, the scale of operation (in terms of quantity of product sold), also remains much larger as opposed to retailers or retail traders. Wholesalers store procured items in bulk, procured from producers such as factories and manufacturing units dealing with different products (you may recall secondary economic activities as learnt in Unit 3 of First Block and Units of Third Block of this course). It is not a difficult task for you to envisage the list of finished products. It may range from grocery, readymade garments, hardware and sanitary items, medicines and healthcare equipment, automobile parts and mechanical instruments, office and household furniture, farm implements, fertilizers, chemicals and many others. You may prepare and write down the list of such products (in the page margins), which is being marketed in your locality, neighbourhood, district, state and nation. Then try to relate these in terms of users, specific usage of the products and their importance in the economic output as well as employment generation in the economy.

Basically, both wholesalers and retailers act as marketing intermediaries on behalf of those, who produce diverse range of goods and services and that of diverse segment of consumers who require these for their diverse needs.

None of these two types of services produce goods and services themselves on their own.

SAQ I

Briefly explain commercial activities and its types.

17.3 TYPES OF SERVICES

Commercial activities are supported and made possible by one major and two sub-types of dynamic commercial services. We know it as 'tertiary services' as the major type and quaternary and quinary as two higher-order sub-types or divisions of the same. These are aimed towards the generation of innovative ideas, expert advice, naive innovations along with aid to the individual entrepreneurs, business houses, firms and companies, etc. At present, due to tremendous growth in the size, operation and increasing complexities of services sector, it is important to distinguish various types of services. Globally, industries related to these three types of services employ more workforce as compared to both primary and secondary sectors of economy. Their increasing proportion provides an indication towards the changing nature of global economy. They may also lead to subsidiary developments like increasing mechanisation and dispersal of production processes, rise of huge multinational and transnational units and corporations, etc.

These kinds of services are very diverse in nature and their types as well. They may vary from a small-scale retail services like saloon and movie theatre to tourism industry related to various services, (hotels, restaurants, tours and travel agencies, religious, spiritual, health and adventure tourism etc.), to that of carrying out research on new frontiers of science and technology dealing with contemporary topical issues of relevance. Such issues may include climate change and precarious viral diseases e.g., current pandemic situation across the world, prominently since its outbreak in 2020.

Now, we will briefly discuss the latest trends in the services before embarking onto the discussion of three types of services. These are tertiary, quaternary and quinary services. Rapid growth in the diverse range of services or service industries fuelled by ever-increasing vistas of information and communication technologies, a new pattern has started emerging. Presently, service industries no longer remain dependent on the supply of raw material and vast amounts of energy. Rather, market accessibility has emerged as a far more crucial factor than these two alone. However, market has also become less significant in case of few service industries, commensurate with the advancements in telecommunication sector. These may include the employment of communication technology like Geographic Information System (GIS) to generate model for deciding the ideal locational points for setting up enterprises, industrial complexes, trading zones and office buildings etc. Setting up of large-scale services in an area, automatically brings up tangible changes, both in the natural environment or physical landscape and economic prospects of that region. The classic example could

be that of many large-scale online enterprises, like Walmart, Amazon, Flipkart and many others.

17.3.1 Tertiary Services

It refers to a variety of action-oriented services. This may encompass a whole range of services to render aid to individuals, peoples and public. Umpteen numbers of services may be brought under tertiary like retail, entertainment and transportation services, etc. These may include service and repair of electronic appliances at household level, hair cutting, purchase of household goods through online marketing, etc. In the beginning of 20th century, services based on tertiary industry witnessed significant growth, particularly in industrialised pockets of the world.

17.3.2 Quaternary Services

It is concerned with the collection, processing and manipulation of information and capital. It includes services as diverse as administrative, financial, legal, insurance and computer related services, etc. to name few prominent ones. You will be amazed to know that few of these services may get tied to the place from where they operate, for example, retail banking and some specialised administrative services are such cases, which demand face-to-face contacts. Other services can be seen functioning irrespective of their place of operation, made possible by the high-end computers and other required ancillary digital equipments with the support of modern means of telecommunication such as internet.

17.3.3 Quinary Services

It is a highly specialised kind of information-based and higher-order skill dependent service industry. Main areas of activities deal with the facilitation of complex decision-making and improvement in cognitive capacities of human resources concerned with scientific and technologically intensive research activity, augmentation in the facilities and quality of higher education sector and apex level management services etc. In India, the concentration of major complexes of Colleges and Universities and number of autonomous scientific institutions along with provision of host of ancillary quinary services, in and around capital metro city of Delhi NCR are striking examples. The proportion of workforce or human resources employed in quinary services seems to be mainly concentrated around Government headquarters (especially in capital and metro cities), Colleges and Universities, Hospitals and around corporate centres etc. Locational arrangement of quinary services, in turn, decides the nodality and developmental contours of quinary services. It may include host of research-based consultancy services and the like.

SAQ 2

What are the types of services?

17.4 INTERNATIONAL TRADE AND TRADE BLOCS

Trade simply means exchange of one or more than one commodity for monetary purpose. It may be of several types like unilateral, bilateral, trilateral and multilateral, etc. The need for trade arises on the ground of diverse requirements of human societies on one hand. On the other hand, as no two places or geographical regions on the planet Earth are similar, in terms of resources and constraints alike. In other words, no single place can be self-sufficient to meet up their diverse types of requirements. Thus, it gives birth to the dependency on one region or one human society to the other and vice-versa.

17.4.1 International Trade

We believe that you must understand the meaning of trade and the subtle difference between national and international trade. National trade takes place within one country whereas international trade happens between more than one country involving greater distances. International trade has a long history with the opening of extensive caravan routes spanning between Middle East and China and discovery of sea routes also enhanced the geographical importance of Asian continent as an important trade centre, besides many other trade routes like Silk Route. As early as 1800, the pace of international trade began accelerating supported by the steam-powered ships. It was an era of pre-industrial revolution. There used to be a great demand of Indian goods manufactured in cottage industries across the world. The items made of gold, silver, iron and brass were very popular along with the distinctive hand-carved items by woodworkers. Besides, two other progressive Asian nations, China and Japan also contributed substantially in cottage industries. Thereafter, industrial revolution heralded another dimension to the global trade and commerce.

Geography of international trade witnessed dominant transformations during 20th century. Initially in the beginning of this century, Europe and USA used to be dominant players. Since European powers had the advantage of their colonies particularly in the developing parts of the world. Besides, they also used to trade with some oceanic countries like Australia and New Zealand etc., located in the southern hemisphere. Till the beginning of First World War, the flow of trade was primarily dominated by movement of colonial powers. Thereafter, changes took place as number of countries as well as commodities started increasing substantially. Many factors can be attributed, like decline of the erstwhile British Empire, rise of USA and USSR along with development of former backward nations etc. Since then, the pattern and flow of international trade shows increasing order in terms of both quantity and range of specialised products. The trade links between nations are being influenced by social, economic, political and environmental factors.

International trade could be of three kinds on the basis of engagement, such as bilateral (between two countries), trilateral (between three countries) and multilateral (when more than three countries are engaged in trade with each other). These can be classified on the basis of various goods and services, with which you are quite familiar as under:

1. **Raw Materials:** It could be industrial and agricultural raw materials, such as, mineral ores, textile fibers, timber, wood pulp and vegetable oils, etc. The origin areas of such raw materials are naturally located at vantage points, but they either lack the threshold population or other factors like capital and technology to directly process the raw materials.

2. **Foodstuffs:** These include cereals, meat, dairy produce, beverages, fruits and vegetables, etc. Such areas where foodstuffs are found in abundance, may be having thin population base to consume the foodstuff on their own, but environmentally favorable to grow such items to fetch better economic returns. One of the examples is that of mountainous regions of western Himalayas, where vegetables like green peas and cauliflower are grown and made available during rainy seasons to the various towns and cities of India, particularly capitals.

3. **Fossil Fuels:** It includes coal and crude oil products. The importance of coal has almost reduced as crude oil outstripped the use of coal on a large-scale, barring a few least developed countries.

4. **Manufactured Goods and Services:** It includes a variety of items in two forms, i.e. finished and semi-finished, like machinery, textiles, chemical products and petroleum by-products, automobiles, computers both hardware and software, besides many others. Such products originate from the highly industrialised, developed as well as developing countries. To take advantage of economic incentives (such as Special Economic Zones, SEZs), and cheap and skilled labour, some products may be produced in more than one location, either in the same country or in other countries.

17.4.2 Trade Blocs

Many of you are already familiar with this popular concept centered on economic geography. It is related to a kind of agreement amongst the nations or group of nations, who come together to form a joint trade bloc to facilitate the trade and commerce and to develop economic relationships beyond national territorial boundaries. It may also help to ensure good political relations, better and diverse avenues of employment opportunities and increase in economic output of a member nation/nations. However, alongside such positive effects, they may also bring in few negative effects. These may be seen in terms of loss of employment in one member nation to take advantage of cheaper land and labour in another member nation, who may happen to be economically relatively weaker. This may impact the lives and livelihood prospects of workers community. Besides, it may also induce environmental problems as many private companies may only be driven by profitability criteria bothering little about environment and its precious life providing and sustaining resources. Such instances can be found happening more prominently in developing and least developed countries as against developed countries of the world.

One of the distinctive characteristics around which trade blocs are formed, revolves around either the removal or relaxation in the trade barriers across the member nations of a concerned trade bloc. Trade barriers are kind of laws

that put limits on the volume of trade across the jurisdiction of a concerned nation's boundaries. Two of the commonest kinds of trade barriers are tariff and quota systems. Tariff means imposition of taxes on the imported commodities or products whereas quota refers to imposing limits on the quantity of imported commodities or products. Now, we will discuss the important trading blocs of the world.

Complete free trade may not be possible worldwide, but it is possible on a regional level within a continent, made possible by the trade blocs. These are as old as the human civilisations. Some of the prominent ones include free trade between Hapsburg Empire and its member states during medieval times, trade union of Germany known as ‘Zollverein’ long before its unification in 1871 and provision of restriction of free trade in America as mandated by American Constitution way back in 1789. End of Second World War in the year 1945 acted as a watershed year to facilitate the growth of trade or custom unions, more importantly and successfully mainly in Europe.

One of the pioneering economic union known as ‘Benelux’ was formed by three European countries. It stands for Belgium, Netherlands and Luxemburg. Within a span of three years of its formation, it was soon joined by France, West Germany and Italy, and came to be known as European Coal and Steel Community (ECSC). Soon, it laid down the seeds for the creation of European Economic Community (EEC), which came to be popularly known as ‘Common Market’, enacted by the treaty of Rome in 1957. Initially, the main aim was to work for complete economic unity and also working out the prospects of political oneness or unity across the member states. It witnessed a tremendous growth in trade among the member states within a decade of its formation. Coinciding with this union’s formation, one more custom union was formed by seven countries, including Britain, Norway, Sweden, Denmark, Switzerland, Austria and Portugal known as European Free Trade Association (EFTA). It could achieve moderate level of success, with sluggish pace, as it was relatively weaker than EEC. Due to this reason, during 1960s, Britain and other EFTA member countries tried to become members of EFTA, but failed to do so. It was only in 1972 that continued negotiations led to the expansion when Common Market included three countries of EFTA, namely Britain, Republic of Ireland and Denmark. The number of member states kept growing further with subsequent expansions. Today, there are more than one dozen countries who happen to be the members of this ‘Common Market’, which is now known as ‘European Union’.

The success of Common Market promoted similar developments across the world such as in Latin America, North America or elsewhere in Asia and Oceania. These are known as regional level trade blocs or organisations such as North American Free Trade Agreement (NAFTA) and Association of South East Asian Nations (ASEAN). These trade agreements greatly tend to influence as to where imported goods should be produced. Likewise, most member countries of such trade blocs do enter in mutual agreements with each other pertaining to both production and import of goods or products. There are around 164 countries forming part of the World Trade Organisation (WTO). You all are familiar with WTO, which is an umbrella intergovernmental institution that takes care of the diverse facets related to trade and commerce among its member countries. There are more than hundreds of regional level

trade blocs of all the three types as already mentioned. WTO has listed around 360 such trade agreements of bilateral, trilateral and multilateral types involving only goods as well as both goods and services. To know the comprehensive details and complete list, you may check the website of WTO mentioned at the end of this Unit in Reference Section.

Since 2000, regional level trade blocs, who arrived at an agreement, started forming at an unprecedented scale. As of now, there are around 354 such trade agreements. Some of the prominent ones are EU, ASEAN, NAFTA, MERCOSUR, SAFTA, CARICOM, ANDEAN, AFTA and COMESA. There are hundreds of other trade agreements of diverse types and nature. These are also known as Supranational level organisations. Apart from economic spheres, they operate in social, cultural, political and security spheres as well.

By now, you have understood about the international trade and trade blocs and their importance in trade and commerce within a country and across the countries. You also came to know that these play very important role to shape the contours of global economy and geography of trade at local, regional, national and international levels. In turn, they may also give birth to complexities as well on account of certain social, political and environmental concerns. However, global trade makes possible the availability of several commodities, which are otherwise not available within the self-sustained and closed economies, including the most fortunate or highly developed ones.

SAQ 3

a) Discuss main features of international trade.
b) What is trade bloc?

17.5 SUMMARY

In this unit, you have learnt the following:

- Trade and commerce are one of the oldest avocations of the human civilisation.
- The current patterns and flow of trade and commerce are governed by the specialisation of commodities by one or another region.
- These could be agrarian commodities, industrial goods, consumer goods and special services etc.
- There are several major trading blocs in the world. The prominent ones are located in the Western Europe, North America, Latin America, Australia and Asian regions.
- You have learnt about the WTO that governs the trade practices across its member nations.
- You have learnt how the concepts of global economies are helpful in shrinking the absolute physical distances with the inputs taken from ICT’s.

17.6 TERMINAL QUESTIONS

1. Briefly highlight the types of commercial activities by citing suitable local examples.
2. Elaborate upon the tertiary services and its main characteristics.
3. Discuss the salient features of major trading blocs of the world.

17.7 ANSWERS

Short-Answer Questions (SAQ)

1. Commercial activities include diverse forms of economic activities entailing exchange of goods and services at local to global scales.
2. All sorts of commercial activities are supported and made possible by three kinds of services. These are known as tertiary, quaternary and quinary services.
3. a) Main features of international trade entail interdependence on each other for the exchange of various commodities, as no two geographical regions can be self-sustained to meet each and every requirement of its citizens, nation and economy.

   b) Trade bloc refers to a kind of institution, which facilitates the trade between countries and in turn provides tariffs and quota systems to protect the economic interests of a member country. Worldwide, there are hundreds of trade blocs since antiquity, both at regional, national and international levels.

Terminal Questions

1. Include two types of commercial activities namely wholesale and retail trade in your answer. Refer to Section 17.2.
2. To answer this question, you are required to include the meaning of tertiary services and its main characteristics. Refer to Section 17.3.
3. In your answer, discuss and highlight the salient features of major trade blocs of the world. Refer to Section 17.4.

17.8 REFERENCES AND FURTHER SUGGESTED READING

1. Anderson, W. P. (2012). *Economic Geography*, London and New York, Routledge.
2. Combes, P., Mayer, T. and Thisse, J.F. (2008). *Economic Geography: The Integration of Regions and Nations*, Princeton University Press.
3. Gautam, A. (2006). *Aarthik Bhugol Ke Mool Tattava*, (in Hindi), Allahabad, Sharda Pustak Bhawan.

4. Guha, J. L. and Chattoraj, P. R. (2009). *A New Approach to Economic Geography: A Study of Resources*, Kolkata, the World Press Private Limited.
5. Hartshorn, T. A. and Alexander, J. W. (1988). *Economic Geography*, New Delhi, Prentice Hall Inc. Pvt. Ltd.
6. Knowles, R. and Wareing, J. (2000*). Economic and Social Geography Made Simple*. New Delhi, Rupa and Company.
7. Knox, P., Agnew, J. and McCarthy, L. (2014). *The Geography of the World Economy*, London and New York, Routledge.
8. Leong, G. C. and Morgan, G. C. (2000). *Human and Economic Geography*, Hong Kong, Oxford University Press.
9. Saxena, H. M. (2013). *Economic Geography*, New Delhi, Rawat Publications.
10. Singh, J. (2010). *Economic Geography* (Hindi and English), Gorakhpur, Gyanoday Prakashan.
11. Wheeler, J. O. (1998). *Economic Geography*, Wiley.
12. Willington, D. E. (2008). *Economic Geography*, Husband Press.
13. https://www.wto.org/english/tratop_e/region_e/region_e.htm#facts.

ignou
THE PEOPLE'S
UNIVERSITY

UNIT 18

TRANSPORT AND FLOW NETWORKS

Structure

18.1 Introduction
Expected Learning Outcomes
18.2 Modes of Transport and their Characteristics
Land Transport
Water Transport
Air Transport
18.3 Transport Cost and Economic Distance
Transport Cost
Economic Distance
18.4 Development of Network of Interchange
18.5 Network Analysis
18.6 Summary
18.7 Terminal Questions
18.8 Answers
18.9 References and Further Suggested Reading

18.1 INTRODUCTION

In the previous Unit 17, you have learnt about the commercial activities and services. In last Unit 18 of this course, you will learn about the transport flow and networks. In Section 18.2, this unit takes you through the different modes of transport used over human history and also highlights the characteristics of each of them, with examples. This is followed by an understanding of two vital concepts in Transport Geography – cost and distance and their correlation, as discussed in Section 18.3. The factors that help people choose one mode over the other usually depends on these two factors, thus it is important to know about.

The third and fourth Sections 18.4 and 18.5 follow logically, whereby, you will understand first that when people choose different modes for efficient movement or for moving goods from one place to another, they have to depend upon multiple modes, i.e. they often need to change from land transport to marine transport or vice-versa. Also, when people or goods arrive by marine transportation modes, the transfer needs to be made from the port or docks to the destination, which can be completed by land transport or land-air-land kind of multimodal means. Subsequently, it is crucial to understand that transport routes are developed to create effective mobility and their effectiveness or efficiency must consider distance, cost and mode, only then

the networks will be completely functional in the true sense. Network analysis provides this understanding.

Expected Learning Outcomes

After completing the study of this Unit, you should be able to:

- differentiate among the modes of transport and their characteristics;
- explain the concepts of transport cost and economic distance, both used in combination to make mobility as efficient as possible;
- justify the need for multi-modality in mobility and its role in making mobility more efficient; and
- analyse the linkages between networks and communication to estimate efficiency in mobility.

18.2 MODES OF TRANSPORT AND THEIR CHARACTERISTICS

As believed by the practitioners of modern development that any kind of development gets directly governed the way diverse means of transport are developed and maintained in any geographical region. Needless to mention, transport is considered not only as the lifeline of economy of a nation, but alongside, it also acts as a propeller to open up the multifaceted avenues by interconnecting any region with the outside world.

Human mobility has been central to development of regions. Mobility is the ability to move and be moved freely and easily and means of transport to move people and goods from one place to another. Thus, different modes of transport are essentially used to move people and goods from one place to another. Since the primitive times, modes of transport have been undergoing remarkable changes and today people have a wide range of modes to choose from. Mobility is an undeniably essential aspect of human life and progress and is primarily affected by three distinct groups of factors:

a) **Physical factors:** include distance, nature of the destination and range of transport modes.
b) **Social Factors:** consist of the need for travel, ability to travel, age, gender, willingness and choice.
c) **Economic Factors:** include cost of travel by different modes, ability to pay and willingness to pay.

Through history, the modes of transport have undergone transition:

Primitive humans had no mode of transport but walked to their destinations. The hunters and gatherers often used domesticated animals as they realised the need to conserve energy and time. With time, technology helped humans to innovate newer modes of transport and fulfil their goals of travelling farther and faster. Simple innovations such as footwear, snow-shoes and the ski helped access and navigate rough and snow-covered terrain. The wheel discovered around 4500 BC was initially used as the potters wheel and gradually made its way to pulling carts, wagons and chariots. Technological progress brought improvement in the means of transport and wheeled carts

were introduced to transfer people and goods. It was the need for trade that actually opened up possibilities of improvising upon the modes of transport as also building of roads and much later, railways. The first railway transports were horse-drawn carriages using the tramlines. The steam engine changed the scenario.

While the industrial revolution set the stage for development of motorways, motorized transport evolved in Germany in 1886 when the first three-wheeled automobile was patented by Carl Benz, and subsequently, the first car rolled out of the Ford factory in 1908.

In order to identify the different modes of transport, we may categorise means of transportation as:

Land: includes roads, railways (and pipelines for liquid and gaseous goods like petroleum and natural gas, etc.).

Water: includes inland waterways and marine/oceanic vessels.

Air: includes airlines in the national and international domains.

18.2.1 Land Transport

1. **ROADS (SURFACE)**: Initially developed for non-motorised forms like walking and cycling until the 19th Century, the road surface started being used dominantly for motorized transport, so much so that in unplanned traffic zones, the pedestrian and cyclists face great threat to life. Road transportation take up much space, destroy the environment and cause pollution during its construction and also have high operation costs due to regular need for maintenance.

ESRI's World Roads data states that "the global road network traverses some 22.6 million miles (36.4 million kilometre). Placed end-to-end, the world's roads would stretch nearly a quarter of the way to the Sun." Highways, lanes and by lanes are all different forms of roads and are differentiated by length, width and carrying capacity. At present, China has the World's largest highway system at 130,000 kilometre network. USA has the largest road network. In 2019, the USA's highway network stood at 4.17 million statute miles (one statute mile is equivalent to 5,280 feet). Within the Road Transport Sector in India, passenger traffic accounts for 87 percent whereas freight traffic accounts for about 60 percent of the total. Road transport is characterised by easy access and availability, it is also a comparatively less costly mode of transport. For shorter distances, it is almost always the only mode of transport available. Railways connect large settlements and that too along a predesigned track, while Road transport offers all connectivity required between villages, towns (both intra-and inter-district) and also connects all such settlements to the railway and airway junctions. The modes of transport that traverse the roads are:

- **Bus:** These are usually public carriers and may be operated by public or private sector depending on the transport policy of a given region. They typically accommodate 40-80 persons and are the most popular mode of public transport. These may be fuel driven or battery operated, the electric bus is increasingly becoming popular as it is pollution free. They

may be single or double deckers and Mini Buses etc. Buses that have connected coaches and can bend are seen in cities with narrow lanes and by-lanes (known as Articulated Bus).

- **Trams:** It may use electricity or magnetic lines. These are environment friendly, though slower modes than the bus. These are also called street-cars or trolleys and runs on lines across public streets.
- **Public Four Wheeled Vehicles:** It is like taxis that carry digital metres and display the cost according to kilometres of travel.
- **Personalised Vehicles:** It includes four wheelers of different models based on engine capacity and design efficiency and two-wheeler modes like motorbike and scooters.
- **Public Three-Wheelers:** Apart from the above-mentioned modes available worldwide, many improvised and localised three-wheeler economy vehicles ply the roads especially in densely populated areas with a need for low-cost modes of transports. Such three-wheeler modes are auto-rickshaws that may be of different sizes like the 3-seater autos available across Indian cities (where they are called “auto” in most cities and *phatphati* in Delhi) and the larger 6-seaters seen in smaller towns, these are called the Tuk-tuk across Thailand, “San lunche” in China, “cocotaxi” in Cuba and “toktok” in Egypt, etc. Usually, they ply on sharing basis and are low-cost and affordable.
- **Rickshaws:** This mode of transport is one of the oldest modes that was hand-pulled in earlier times. In Kolkata, the hand-pulled rickshaws are still found to be used in the Central Business District (CBD), where cycle rickshaws are not permitted to ply. The hand-pulled rickshaw is often viewed as unacceptable due to the physical stress upon the rickshaw-puller, it still persists as a livelihood option. Cycle Rickshaws and Battery-Operated Rickshaws have been used more commonly as alternatives that are quicker and also more humane. Rickshaws fill the gap created by a lack of available options for travelling small distances that are more than walkable and less than a taxi ride. In cities like Kolkata, three-wheelers are not available for personal short rides, they are available for fixed routes and on sharing basis, thus people use the rickshaws as an alternative. It is also used in old parts of Indian cities, where other vehicles would create traffic issues.

2. **RAILWAYS**: Railways are characterized by operation of the vehicles on a set path or track. Railway transport includes freight and passenger trains, and lighter monorails and the maglev. Again, the construction of railways is an expensive affair and can be managed only by the public sector undertaking or a large corporate set-up. They are not independent in terms of reaching a person to his/her destination and have to be linked with other forms of transport like bus, tram, subways and taxi etc., to reach the accurate destination. In the absence of connectivity, it creates major hurdles. Railways offer the highest capacities in terms of volume and weight that can be carried.

We shall consider two categories here - surface and underground railway systems.

a) **Surface** Railways are usually the mode used for travelling or transporting people and goods to longer distances. They can be sub-urban or peripheral, connecting towns and cities located far away and also crossing international boundaries. A unique example is the London-Paris underwater trainline across the English Channel, which is 31 miles long Channel Tunnel. The US railway network is by far the largest, and freight and passenger railways taken together, it stands at 2,50,000 kilometres, followed by China with139,000 kilometre. Indian railways have a long history. Introduced in 1853, it is presently the fourth largest railway network in the World, covering 99,235 track kilometres, on which over 22,593 operating trains (13,452 passenger and 9,141 freight) carry around 24 million passengers and 203.88 million tonnes of freight daily connecting 7,083 stations across the country.

b) **Underground Rail Network**

The underground railway system, also called **underground, tube** or **metro**, is used to transport large number of passengers within urban and suburban areas. Subways are usually built under city streets for ease of construction, but they may take shortcuts and sometimes must pass under rivers. Outlying sections of the system usually emerge aboveground, becoming conventional railways or elevated transit lines. Subway trains are usually made up of a number of cars operated on the multiple-unit system (Britannica). The subway system is a major network of high-speed mass transit system and dates back to several decades in major cities across the world. The London Underground is the world's first underground passenger railway system that was started in 1863. Today it has 11 lines, transporting 5 million passengers across 272 stations on 400 kilometres of track. The Istanbul Tunnel (1867) was the first metro in continental Europe, followed by Chicago (1892), Glasgow and Budapest (1896) and Paris (1900).

18.2.2 Water Transport

Water transport may include barges, cargo, tankers, ocean liners, ships, steamers, and are used for transporting goods and people.

1. **INLAND WATERWAYS:** It comprises navigable inland water bodies like rivers, streams, canals and lakes. It can provide a competitive alternative to road and rail freight movement in many countries. Freight movement using inland waterways is not only cost-effective but is fuel-efficient. With increasing congestion and emissions from road transport system, inland waterways can provide a major scope for increased utilisation in the coming decades. Being low energy consuming, this mode is less costly compared to road transport, especially in case of freight. The history of inland waterways is as old as the history of civilisations, as Assyrians, Sumerians and Egyptians had all built complex navigation systems using inland waterways. Some of the 19th Century canal systems are the Kiel, the Suez and the Panama Canal systems. However, the major problems faced relate to the upkeep of the inland channels, which is extremely cost

escalating. A major problem is the need for regular dredging, which involves high costs. The construction of channels, locks etc., across these rivers and especially if they are dammed are even more difficult to negotiate. There is approximately 2 million kilometres of inland waterways in the world. The most extensive inland waterway systems are the Mississippi followed by the Great Lakes, the St. Lawrence and the Rhine river systems. The modes used are motorised boats and water taxis as in Venice, Brugges (Belgium), Interlaken (Switzerland) that have a highly developed canal system and also in cities with major rivers (as in Kolkata, where they are locally called ferry/steamers). Non-motorised boats are found in rural areas.

India has 14,500 kilometres of navigable waterways including rivers, canals, creeks and backwaters. Nearly 5865 kilometres of major rivers are navigable. For their maintenance, the Inland Waterways Authority was set up in 1986.

2. **MARINE TRANSPORT:** Maritime routes comprise seas and oceans and this mode of transport uses ships, carriers and barges. Maritime transport has a major limitation in that it can transport along the coast only and the maritime space laws are to be adhered very strictly. Marine transportation drives 80–90 percent of global trade, moving over 10 billion tonnes of containers, solid and liquid bulk cargo across the world's oceans annually (Walker et al., 2019). The United Nations (UN) cites that at the beginning of 2018, there were 94,171 commercial vessels in the global fleet. The International Maritime Organisation (IMO) estimated in 2012 that marine transportation contributes about 2.2 percent of anthropogenic-based emissions, down from a high of 2.8 percent in 2007 before the global economic downturn. The marine transportation system carried and delivered more than $ 1.5 trillion of goods per year through US ports, both to and from trading partners. This generates $ 5.4 trillion in economic activity per year (Encyclopaedia of Energy, 2004).

India has a vast coastline of approximate 7,517 kilometres, including the mainland as well as islands of Lakshadweep, Andaman and Nicobar. There are 12 major and 185 minor ports. Oceanic routes play an important role in the transport sector of India’s economy. Approximately, more than 90 percent of India’s foreign trade by volume and 70 percent by value are transported through oceanic routes.

18.2.3 Air Transport

Air transport is the most integrating mode of all as it connects the globe effectively and efficiently. Air travel includes travel in vehicles such as airplanes, jet aircraft and helicopters. As a sporting activity, modes of air travel like hot air balloons, blimps, gliders, hang gliders and parachutes are also used, though these do not represent modes used for general travel in reaching any destination.

There are 43,982 airports in the world, of which 15,000 are in the USA (the highest) and 487 are in India. There are over 5,000 airlines in the world, of which the American Airlines is the largest in terms of fleet size and passengers.

According to the World Civil Aviation Statistics provided by World Bank, 2,21,165 million tonne kilometre freight was carried in 2019 while the global pandemic caused it to fall to 1,80,520 million tonne. 4.558 billion passengers were carried in 2019, which fell to 1.8 billion in 2020, again due to the pandemic.

Air travel in India began in 1911. Total passenger volume in the country rose from a mere 2 million in 1980's to 168 million in 2019, but dropped to 68 million in 2020 due to the pandemic. The National carrier 'Air India' alone has served 6,649,109 passengers till date in their 49,390 flights under the '**Vande Bharat Mission'** to help Indians travel during Covid times.

We hope that you have properly learnt about the different modes of transport along with their characteristics. You will further learn about the two inter-related and applied aspects (with which many of you are already familiar) known as transport cost and economic distance in the next Section.

SAQ I

Define railways and its types.

18.3 TRANSPORT COST AND ECONOMIC DISTANCE

Transport cost acts as a facilitator and determines the range of economic activities. If transport costs are cheaper, the firms or industries set up either by a businessman, entrepreneurs or government run units may definitely benefit. Economic distance refers to the distance which a certain commodity may travel well before transport cost exceeds the value of the freight.

18.3.1 Transport Cost

Transport cost is an important determinant in selection of particular mode of transport. Any type of economic activity involves various types of cost, of which transport cost is very significant as it influences the final cost of the product. The concept of transport cost can be understood by the following points:

a. It is a function of distance. More the distance, greater is the transport cost.

b. It is also a function of frequency of modes of transportation. Journey accomplished through one mode of transport usually involves low cost than journeys completed through various modes.

c. Transport cost is also a function of topography i.e., more rugged and varying terrain causes imposition of higher transport cost. For this reason, transportation in the mountains is relatively expensive than plains and low-lying areas.

d. Amount of capital invested also has a bearing on transport cost. Water transport thus forms the cheapest mode of transport, while air transport owing to their high maintenance cost is the most expensive one.

e. The degree of competition along the same route with numbers of transport facility available to some extent influences the transport cost.

Owing to all these factors, various modes of transport involve relatively varying transport cost. Change in traffic volume, terminal cost, mode of terrain, amount of capital and regular maintenance determines the cost of transport.

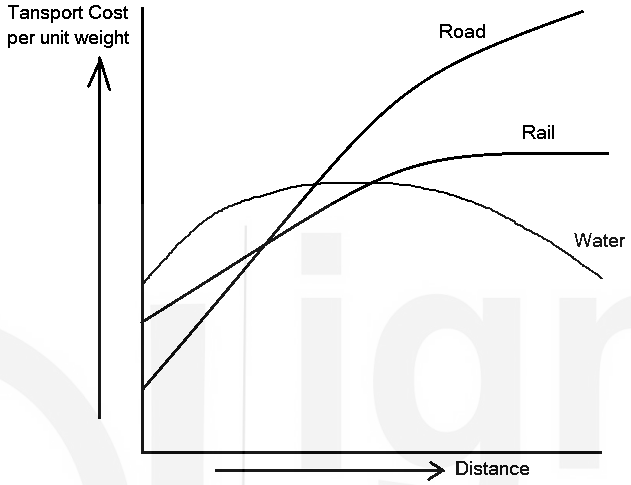


Fig. 18.1: Transport cost curves for various modes of transport.

The different types of transport cost associated with a particular mode of transport are mainly of three types:

1. **Terminal cost** includes costs of loading of goods at the point of origin, transportation of the same at intermediate points and unloading at the destination. These are part of fixed costs totally unavoidable in nature. Any mode of transport has to incur terminal cost in terms of maintenance of infrastructure (roads, railway lines or port area) and operators (bus terminus, port and airport) provision of managerial, administrative and maintenance of staffs, offices, warehouses and loading and unloading of passengers and freight. These costs are usually unaltered by any change in activity over a level of operations over a given time period; however, this cost becomes zero in case of shutdowns.

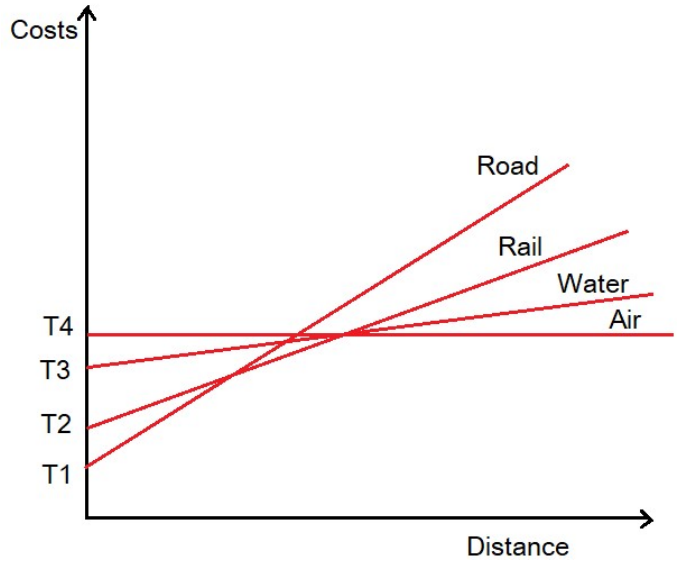


Fig. 18.2: Terminal cost curves for various modes of transport.

The above figure depicts the various terminal cost curves for road, rail, water and air. The terminal cost for airports and ports is by far the highest because of maintenance of terminals throughout the period of loading and unloading. In case of air transport, whatever be the distance covered, huge terminal cost has to be borne. Railways also involve maintenance of a huge terminal cost though much lower than that of air and waterways. Roadways involve the lowest terminal cost since loading and unloading of passengers or goods occur faster and maintenance of infrastructure is also negligible as compared to the other modes. Relative advantage of roadways over the other modes is initially understood by the terminal cost.

2. **Line haul cost** involves the cost of transporting goods or commodities to the destination over a specified route. In other words, it refers to the cost that mainly arises due to the movement of wagons/consignments/ships between the first and last yard. The various elements of line haul cost are:

    a. Fuel Cost
    b. Track and signalling cost
    c. Other transportation cost

Cost of loading, unloading or transhipment is not considered in line haul cost. The total transport fare or freight depends upon the line haul cost. Since cost of fuel is taken into consideration, the costs vary a lot depending on the type of carriage. Petrol, diesel or electric driven modes show a marked variation in line haul cost for this reason. The following table shows the variation in line haul cost depending on diesel and electric driven wagons in Indian Railways.

Table18.1: Line Haul Cost per 1000 GTKMs* for 2014-15 (in rupees)

Freight		**Coaching**	
Diesel	Electrical	Diesel	Electrical
265.09	139.65	373.51	186.08

*GTKM: Gross tonne kilometre
(Source: Ministry of Railways, Govt. of India, 2015)

Apart from the fuel cost, the availability of modes of transport also determines the variation in line haul cost along transport routes. As a result of this,

transport cost in rugged, inaccessible areas of forests and mountains increase manifold during weather extremes.

3. **Capital cost**: As the term suggests, this cost involves the investment of capital for purchase of infrastructure, wagons, cars and ships, etc. associated with the mode of transport. These are actually fixed costs and are totally unavoidable. Moreover, flow of capital is required to be consistent to maintain the efficiency of the system, increase the accessibility of movement and allow smooth and faster movement of goods and passengers. The elements included in capital costs are:

    a. Construction cost of roads, bridges, highways, railway lines, airport lines and waterway systems.
    b. Selection and acquisition of land/buildings for the purpose of construction.
    c. Installation charges of specific infrastructure.

18.3.2 Economic Distance

The Cambridge English Dictionary defines distance as the “amount of space between two places”. It is the actual physical space measured between two objects. Various disciplines have defined distance in various ways. In transport geography, it refers to the physical distance measured in terms of transport cost that is incurred to reach a destination. Thus, transport cost leads to the concept of economic distance. The economic distance is an important element in determination of locational factors in setting up of industries, markets and infrastructures. Alfred Weber in his ‘Least Cost Theory of Industrial Location’ has talked about minimising the distance and related cost of production by setting up the industries at a favourable location, where cost incurred would be the least. Following the theory of Weber, the concept of economic distance has gained widespread importance in economic and transport geography. Economic distance is considered under the following aspects:

a. Mode of transport: with differences in modes of transport, the transport cost varies leading to changes in economic distances. For example, economic distance is the highest in case of air transport.

b. Economic distance is significantly proportional to transport cost; more the cost of transportation, more is the economic distance.

c. Economic distance increases with increasing inaccessibility. Mountainous areas are characterised by the largest economic distances.

d. It is positively correlated to the number of break of bulk points. More the change in mode of transport, more is the likelihood to increase in economic distance.

SAQ 2

a. Explain the relevance of transport cost.
b. Differentiate between transport cost and economic cost.

We hope that you have learnt about the transport cost and economic distance. In the next Section, you will get an exposure about the development of network of interchange and its various forms.

18.4 DEVELOPMENT OF NETWORK OF INTERCHANGE

Network of interchange is aimed to provide a well-organised continuity within a transport chain. One of the most essential factors of the development of an advanced freight transport system is the development of multimodal or intermodal transport and the associated *commodal* and *synchro-modal* transport that has evolved in recent times.

The 1980's saw a shift in transportation as technologies developed to allow different vehicle types in different segments across different routes. The mention of the term "multimodal transport" was also found in the UN Convention document in 1980s for the first time. In order to stimulate the growth on intermodal systems, the logistics firms (transport operators) also came forward and became more competitive in terms of providing facilities to both the exporter and the importer of goods. They would essentially take up the task of the transportation of cargo from one mode to the other and manage the entire route from the shipper to the consignee. According to the Convention, **multimodal transport** can be defined as *"international transport, executed in two or more different modes, organised by a transport operator, taking full responsibility for the cargo transportation and issuing to the shipper a document for multimodal transport, covering the whole route of the cargo."*

Also, during this period, some modes were preferred over others over time, like maritime, inland waterways and rail transport came to be more preferred over road transport due to risks like accidents and environmental reasons like pollution and traffic congestion, etc.

The interaction between the different modes of transport is aimed at achieving a common goal of accessing the best characteristics and resources of the different modes during the transportation process. The results can be viable and efficient only if there is proper coordination and coherence in the functioning and linkages between different modes. An essential element is the cost of transportation that must be equally viable as much as speed of movement and safety factors.

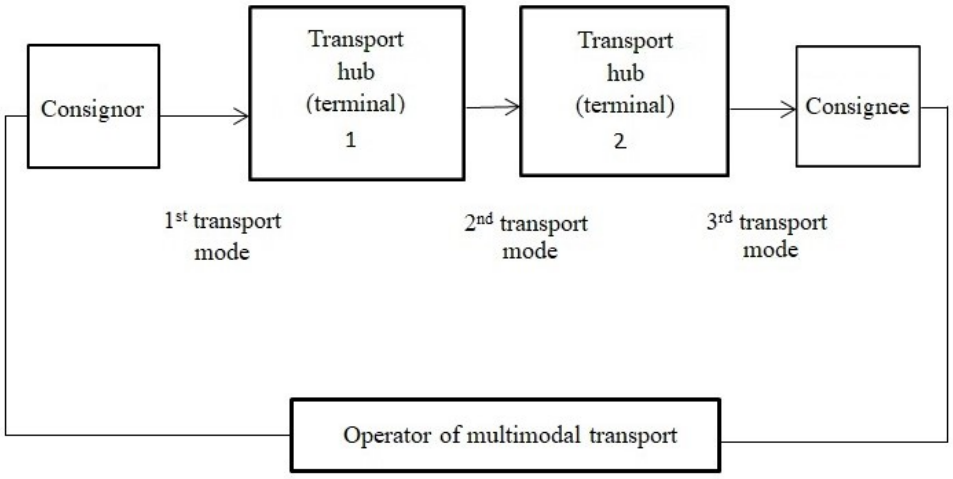


Fig.18.3: Movement of the material flow in a multimodal cargo transport scheme.
(Source: Modified from Penchsheva et. al. 2022)

Benefits of Intermodal Transfer:

Every mode of transportation has important advantages and disadvantages that create a set of comparative advantages of one over the other. In recent times, the scenario has changed to incorporate an integrated transport system which is much more flexible and uses the advantages of each mode to its best efficiency. The resultant modal competition results in the following outcomes:

a) Different modes can compete by cost and benefit.

b) Different modes may complement one another in terms of cost, speed, access and comfort, etc.

c) The markets for each mode are spatially differentiated – they exist in differentiated ways.

d) The scales of operation are varied and differentiated.

e) Gateways are created to make the modal transfer easier, such gateways facilitate different forms of partnership and trade.

f) The nature of carriage – whether freight or passenger creates a significant impact upon complementarity.

g) The efficiency depends upon the types of services. The freight carrying modes will obviously differ substantially from the passenger carrying modes. E.g., for passenger carrying modes, interchanges are required from airlines to subway, bus and taxi and that is to be location-specific, i.e., they must originate or congregate at the airport itself for the passengers to avail of facilities to reach different parts of the city or the suburbs.

In most cases of intermodal transport, at least two or more modes are involved. It is evident from global statistics that almost 80 percent of the freight transported by railways is delivered by other modes of transport and almost 70 percent of the freight moved by waterways and delivered at sea or

river ports are transferred and moved by rail. Road transport usually interacts with every other mode as goods move by road after being transferred from sea ports, airports or railway stations to reach other destinations. A good example would be carriers that are transported by ship from one port to another. They necessarily land at the port and are carried by road to the railway station or to the airport or to the destination itself. Therefore, road transport is almost inevitable in most cases. Seldom can we find railways directly serving a port. However, in case of passenger transport, most large airports in the world today provide for multimodal or intermodal transfer so that no location remains uncovered in the concept of “last-mile-connectivity”. In case of passenger transportation, multimodal services offer the passenger a choice in terms of speed and price apart from the connectivity itself. For example, if the tourist finds the hotel to be located in walking distance from a metro, he/she would prefer to directly take the metro from the airport (wherever the option is available). For reaching places not well connected through public transport, the cost disadvantages increase as the taxi remains the only alternative in the absence of public transport.

The points of direct interaction are the transport terminals – these may be the airports, sea ports, railway stations, warehouses and bus termini, etc. In earlier times and still now in less developed regions, there is much time lag and interruptions between different transport modes and the transport chain do not function as a linked system – in such cases, the freight owner of each mode unloads the goods and prepares new documentation and reservations for the next transport mode. In this case, each terminal becomes an end point for the goods being carried. Two major issues are problematic here, the cost involved as well as the time lost with the goods having to wait to be re-loaded at every changing point. The multimodal mixed system brings in the coordination between different modes and is becoming popular system these days. The process is professionally managed by logistics firms whereby a single set of documents are prepared and the company provides the services of transfer of goods from one mode to another. In this case, the owner of the goods can receive the goods without getting involved in each transfer process at each transfer node. However, in such cases, the logistic firm has to ensure the availability of slots at every stage of transfer, as also several technical factors like:

a. Availability of warehouses for storage.

b. Availability of cranes and loading-unloading equipment.

c. Availability of people to manage such equipment.

d. Capacity of the transport whether ship, railway carriage or tanks etc.

e. Sequencing the process of loading, unloading and storage where necessary.

f. The time and site availability in each transfer.

g. Managing communications like telephonic, email and fax for coordinating timings of arrivals and departures.

h. Efficiency in transferring goods from one mode to the other.

i. Using similar technologies facilitating each transfer so that knowhow is easily accessible.

j. Using efficient systems of scheduling of different movements of freight across different modes.

k. Creating an efficient system of documentation which uses common language and understanding.

l. Bearing the cost of losses and delays, in case of unprecedented situations like storms, floods, snowfall blocking roads, strikes, political turmoils, war and strife, etc.

We are aware that the volume of freight across the world is ever-increasing primarily in the post globalised world. The easy access of goods and services across borders has been enabled by large corporates for their own benefit and the reduction of complex systems and limiting paper work has been the goals achieved in the way of mobilising global capital without barriers. The logistics firms have modernised and today provide such complex services as intermodal and multimodal transport for goods, where both the buyer and seller remain at ease. Insurance cover losses due to theft or accidents are hampering this process. Altogether, the system of multimodal and intermodal transportation of the present times is already far more modernised and effective, user-friendly and such complex services are now available at much lower costs than a decade ago.

The intermodal transport system has some key challenges as well:

a. There are economic restraints – management of multiple modes is not a low-cost service and can be used only by large firms. Especially the rural and farm sector can hardly use the benefits as easily as the manufacturing industry, though in many cases crop transition is also essential.

b. In case of small shipments, the price remains inaccessible and may not be economical or efficient.

c. Reliability and security are factors that one has to rely on. Compensation laws are not always precise and corruption may help transporters against the small businessmen and users of small shipments.

d. Increasing fuel costs.

e. Lack of flexibility inspite of appreciable advancements in technology and innovations.

f. Involves high level of technologies and also technical and mechanical engineering works – in such cases repair and maintenance emerges as an expensive matter.

g. This sector is usually severely affected if movement stops at any point of time or place. Strikes, sudden unprecedented events like disasters etc., can cause havoc in this sector.

h. Time lags or delays in release of cargo, documentation errors etc., can be very expensive as in such cases the freight stays in the terminal and can't be released, causing high costs.

i. Often the transport providers try to minimise their own cost to make a profit and therefore combine several small shipments – this often leads to confusions and delays as the type of products, time of delivery, time and place of unloading may all be different.

j. With improved and flexible integrated ICT systems, the service providers fall into a tough competition to provide better services and this may affect profitability.

k. Above all, the expectations are consistently increasing as systems become more advanced.

The entire issue of intermodal transport system has differential impacts across the globe. For instance, in case of Europe where the internal borders remain open, transfer of goods has been much smoother compared to difficult borders. This has been particularly important during the pandemic lockdowns, where the free movement of essential goods and services was of prime importance to save human lives. The maintenance of supply chains became an important factor during the pandemic and during such times, the restrictions in the borders, complexities in paper work and documentation affected the population adversely. The pandemic has shown us that there is a serious need to understand the subject matter of intermodal and multimodal transport systems and each country must have a flexible and dynamic system, so that in case of emergencies restrictions can be quickly removed. And because transport workers have crucial roles to play, they should be protected by their respective country and state by adapting appropriate measures.

The pandemic situation has also made us realise that the terminals do not only cater to goods, but also there are several important inputs into the system that cater to essential human needs like shelter, toilets, sanitation facilities, health screening facilities, access to food and drinking water.

To sum up, multimodal transport systems are now at the centre of international trade and commerce due to reduced cost of transportation and efficient management of transfers from one mode to the other without having to make oneself available at each point of transition.

SAQ 3

What are the benefits of intermodal transport system?

We hope that you have learnt about the development of network of interchange that facilitates the efficient continuity within a transport chain through terminals. In last Section of this Unit, you will learn about the network analysis and its related aspects.

18.5 NETWORK ANALYSIS

Any given transport network may be formally represented by a set of LINKS and a set of NODES – essentially a link connects two nodes. A LOOP is a link with the same node at either end. A link is a line of flow whose unit may vary and flow consists of one or more commodities. Commodities are the different kinds of goods and services that are moved from source to destination in the case of transportation. The complex system consisting of links and nodes which operationalise the movement of transport from one point to the other and vice-versa comprise the NETWORK. Transport links have a few essential features:

a. They have a length (along which the vehicles move).
b. They have a cost (determined by travel time and distance).
c. They have capacity (maximum flow).

Transport networks consist of movements that correspond to the flow of commodities or people between the place of origin and destination, corresponding to specific locations like warehouse, a building, the receiver's address. In network analysis, the origin and destination are represented by nodes, referred to as Centroids. Each centroid is connected to one or more internal nodes by a link referred to as Centroid Connector.

Bell and Iida (1997) provide a clear understanding of the concept of network through two simple diagrams. Figure 18.4 is a diagrammatic representation of a network consisting of one origin centroid, two destination centroids, five links, four internal nodes, three connectors and five paths.

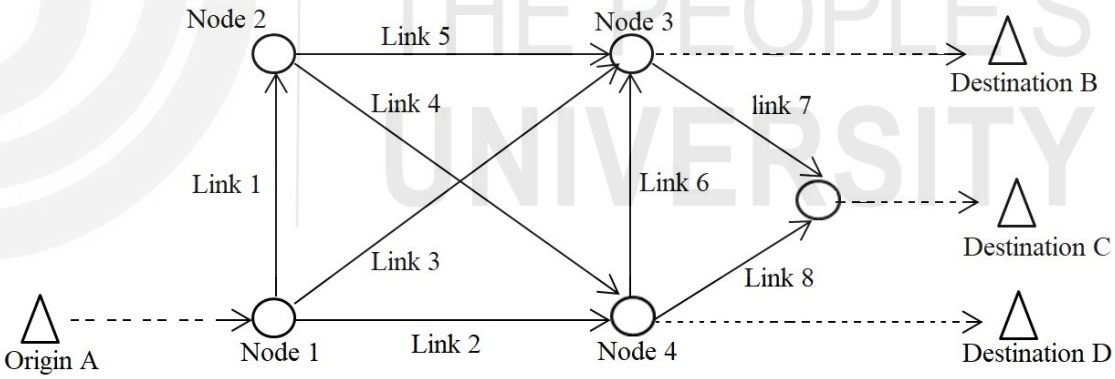


Fig.18.4: Defining a Network (an example).
(Source: Modified from Bell and Iida. 1997)

Figure 18.5 on the other hand defines some other key concepts of networks – they may emerge in three possible forms:

a. **Path:** It is a sequence of nodes connected by links in one direction.

b. **Cycle:** It is a sequence where the path has the same node at either end (a loop).

c. **Tree:** It is a network where each node can be visited once and only once.

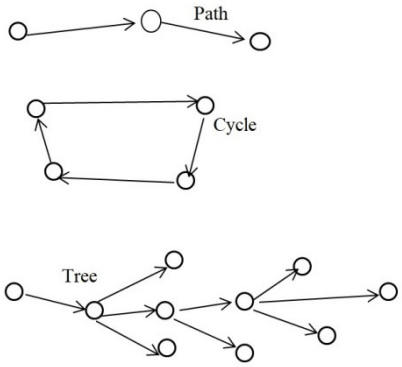


Fig. 18.5: Patterns or Network Types.
(Source: Modified from Bell and Iida. 1997)

Networks may be **Linear** as in expressways, arterial roads and railways or a **Grid Network** where a crisscross of paths in the forms of blocks exist with many origins and destinations, thus, revealing many alternative routes.

Two crucial concepts that define transport network analysis are **Accessibility** and **Connectivity.** Though similar in its apparent meaning, they are clearly differentiated concepts in Transport Geography.

Accessibility is the measure of the capacity of a location to be reached from, or to be reached by, different locations. Connectivity, on the other hand is the manner in which each node is connected to its adjacent node. Network connectivity, thus is a measure of accessibility, where the network is represented as a **Connectivity Matrix.**The number of columns and rows in this matrix is equal to the number of nodes in the network.

- A value of 1 is given for each cell where this is a connected pair, and
- A value of 0 for each cell where there is an unconnected pair.
- The summation of this matrix provides a very basic measure of accessibility, also known as the *degree of a node*:

$$C1 = \sum_{j}^{n} C_{ij}$$

- C1 = degree of a node.
- cij = connectivity between node i and node j (either 1 or 0).
- n = number of nodes.

(Source: After Rodrigue, J.P. 2020. Geography of Transport Systems)

Accessibility is essentially explained by the shortest path that can be taken to reach a destination. Detour Index and Shortest Path Analysis are important measures to find the accessibility of a particular location by locating the path with minimum distance between two nodes. It may be calculated by different methods.

Detour index is the actual journey distance calculated as a percentage of the straight line distance between two points. The straight distance, D*s*, between two nodes may be 50 kilometre but the transport distance, D*t*; (say road distance) is 75 kilometre. The detour index is thus **0.67** (D*i*=D*s*/D*r* or 50/75).

Shortest Path Analysis may be calculated by different measures, but most popular is the **Shimbel Index:** which is an index that calculates the minimum number of paths necessary to connect one node with all the nodes in a defined network. The resultant ***Shimbel Accessibility Matrix,*** also known as the D-Matrix, includes each possible node that pairs the shortest path, out of multiple alternatives provided by the existing routes or links.

SAQ 4

What is accessibility? Name two measures of accessibility in Transport Network?

18.6 SUMMARY

In this Unit, you have learnt the following:

- The different modes of transport.
- Details about land, water and air transport.
- Select features and statistics on each sub-type of modes of transport.
- Concept of transport cost and economic distance.
- The concept of Interchange or changing between different modes of transport.
- Characteristics, advantages and challenges of intermodal and multimodal transport systems.
- Definition and concepts relating to transport network analysis.

18.7 TERMINAL QUESTIONS

1. Explain the importance of Railways as a mode of transport.
2. Discuss the implications of Economic Distance.
3. What are the recent changes in the nature of multimodal transport systems?
4. What is the relevance of Network Analysis in Geography?

18.8 ANSWERS

Self-Assessment Questions (SAQ)

1. Railway transport includes freight and passenger trains, lighter monorails and the maglev. It offers the highest capacities in terms of volume and weight that can be carried. There are two categories of railway transport, namely, surface and underground railway systems.

2. Economic distance is an important element to determine the locational factors that helps in setting up of industries, markets and infrastructures. The concept of economic distance has gained widespread importance in economic and transport geography, after the theory of Weber. Economic distance includes the aspects of mode of transport and economic distance.

3. The benefits of multimodal and intermodal transportation of the present times includes - modernised and effective, user-friendly and such complex services are now available at much lower costs than a decade ago.

4. Accessibility refers to the shortest path that can be taken to reach a destination. Two important measures of accessibility are Detour Index and Shortest Path Analysis, in order to find the accessibility of a particular location.

Terminal Questions

1. To answer this question, you should discuss the role and importance of railways as a mode of transport in the economy of a geographical region. Refer to Section 18.2.

2. You are required to highlight the implications of economic distance. Refer to Section 18.3

3. You should incorporate the recent changes and its effects in the nature of multimodal transport systems. Refer to Section 18.4

4. Your answer should include the relevance of network analysis in Geography. Refer to Section 18.5.

18.9 REFERENCES AND FURTHER SUGGESTED READING

1. Anderson, W.P. (2012). *Economic Geography*, London and New York: Routledge.

2. Combes, P., Mayer, T. and Thisse, J.F. (2008). *Economic Geography*: The Integration of Regions and Nations. Princeton University Press.

3. Knox, P., Agnew, J. and McCarthy, L. (2014). *The Geography of the World Economy*, London and New York: Routledge.

4. Rodrigue J.P. (2020). *The Geography of Transport Systems* (E book available), Routledge.

5. Taaffe, E. J. and Gauthier, H. L. (1973). *Geography of Transportation*. Prentice Hall.

ignou
THE PEOPLE'S
UNIVERSITY

GLOSSARY

Commercial Activities : It refers to the whole range of economic activities, which entails exchange of goods and services for trade and commerce, involving monetary value.

Economic Cost : It refers to the physical distance measured in terms of transport cost that is incurred to reach a destination.

Inland Waterways : It means the navigable inland water bodies like rivers, streams, canals and lakes, etc.

Quaternary Services : It deals with the provision of services related to collection, processing and manipulation of information and capital.

Quinary Services : It means the provision of services that entails either high level of specific knowledge and technical prowess.

Retail Trade : It refers to a kind of trade in which the procured products or commodities from wholesalers are directly sold to the individual, household and general public customers.

Tertiary Services : It means the kind of services linked with diverse services like banking, retailing, transportation, education and routine office related professions.

Transport Cost : It means an important determinant in the selection of particular mode of transport.

Wholesale Trade : It refers to the bulk purchase of goods and services from the producers and generally selling the same to the retailers, merchants and other clients in bulk.

Notes

MPDD/IGNOU/P.O. 2.5K/October, 2022

ISBN : 978-93-5568-746-3