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TOURISM GEOGRAPHY

MBA (Tourism & Travel Management)

FIRST YEAR, PAPER –II

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M.B.A (TTM) : TOURISM GEOGRAPHY

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This book is exclusively prepared for the use of students of M.B.A (TTM) Centre for Distance Education, Acharya Nagarjuna University and this book is meant for limited Circulation only.

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FOREWORD

Since its establishment in 1976, Acharya Nagarjuna University has been forging ahead in the path of progress and dynamism, offering a variety of courses and research contributions. I am extremely happy that by gaining 'A^{+}' grade from the NAAC in the year2024, Acharya Nagarjuna University is offering educational opportunities at the UG, PG levels apart from research degrees to students from over221 affiliated colleges spread over the two districts of Guntur and Prakasam.

The University has also started the Centre for Distance Education in 2003-04 with the aim of taking higher education to the doorstep of all the sectors of the society. The centre will be a great help to those who cannot join in colleges, those who cannot afford the exorbitant fees as regular students, and even to housewives desirous of pursuing higher studies. Acharya Nagarjuna University has started offering B.Sc., B.A., B.B.A., and B.Com courses at the Degree level and M.A., M.Com., M.Sc., M.B.A., and L.L.M., courses at the PG level from the academic year 2003-2004 onwards.

To facilitate easier understanding by students studying through the distance mode, these self-instruction materials have been prepared by eminent and experienced teachers. The lessons have been drafted with great care and expertise in the stipulated time by these teachers. Constructive ideas and scholarly suggestions are welcome from students and teachers involved respectively. Such ideas will be incorporated for the greater efficacy of this distance mode of education. For clarification of doubts and feedback, weekly classes and contact classes will be arranged at the UG and PG levels respectively.

It is my aim that students getting higher education through the Centre for Distance Education should improve their qualification, have better employment opportunities and in turn be part of country's progress. It is my fond desire that in the years to come, the Centre for Distance Education will go from strength to strength in the form of new courses and by catering to larger number of people. My congratulations to all the Directors, Academic Coordinators, Editors and Lesson-writers of the Centre who have helped in these endeavors.

Prof.K. GangadharaRao
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102TT26: TOURISM GEOGRAPHY

Objectives

a) To acquaint with the interdependence between geography and tourism;
b) To familiarize with the locales, attractions, and accessibility to major tourist destinations across the continents.
c) To be able to plan tour itineraries of various countries across time zones.

Unit-I

GEOGRAPHY: Importance of Geography in Tourism Prospective. Physical Geography of India. Distribution of Rivers, Mountains, Plateaus,& Plains, Climate and Vegetation. Physical Geography of World-Political of Continents and Oceans.

Learning Outcome:

- Acquiring a thorough understanding of the physical geography of India

Unit-II

MAP READING: Elements of Map Reading, Latitude, Longitude, International Date Line, Day Light Saving Time, Scale Representation, GIS & Remote Sensing, Time Zones, Calculation of Times, GMT Variations, Concept of Elapsed Time & Flying Time, Google maps.

Learning Outcome:

- Practical understanding of the implementation of map reading.

Unit - III

TOURISM TRANSPORTATION SYSTEM OF THE WORLD: Air Transportation-IATA Areas, Sub Areas-global indicators. Major Airports in the World and India. Rail Transportation Network-Major Railway Systems of the World-Brit rail, Amtrak, euro rail. Special Packages are offered by Indian Railways. Water Transportation System in India-Inland Water Highways.

Learning Outcome:

- Utilization of various modes of transportation existing in the world.

Unit - IV

TOURISM RESOURCES IN INDIA: UNESCO Sites-Cultural & Heritage Tourism Destinations -Wild Life Tourism Resources- Land-Based Destinations - Water-Based Destinations

Learning Outcome:

- A clean understanding of tourism resources in India

Unit -V

TOURISM RESOURCES IN A.P: Cultural & Heritage Tourism Destinations -Ecotourism Destinations – Religious Tourism Destinations -Special Interest Tourism Destinations.

Learning Outcome:

- Acquiring Tourism Destination knowledge of Andhra Pradesh

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1. Geography of Travel, Tourism and Adventure Tourism – P.C.Sinha.
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3. International Travel and Tourism Training Programme – Foundation Jan.2002 – IATA Aviation Training and Development Institute.
4. World Geography – NCERT.
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Lesson - 1

FUNDAMENTALS OF GEOGRAPHY

OBJECTIVES

After studying this lesson , you should be able

- To study the Geography significance
- To know the role of Geography in Tourism
- To Understand connection between Geography and Tourism

STRUCTURE

1.1 INTRODUCTION

1.2 MEANING OF GEOGRAPHY

1.3 SCOPE OF GEOGRAPHY

1.4 GEOGRAPHICAL IMPORTANCE OF TOURISM ASPECTS

1.5 ROLE OF TOURISM GEOGRAPHY

1.6 CONNECT BETWEEN TOURISM AND GEOGRAPHY

1.1 INTRODUCTION

Geography is the study of landscapes, environment, inhabitants and the environment. In other words it is the study of the physical features of earth. The distribution of natural features or the occurrence of some natural features is uneven, that shows the complexities of nature and the co-existence of human beings with the local environment. This can be called as the spatialcharacteristic.

Tourism, as you know by now, is the movement of people and the movement take place either near to their home environment/familiar places or strange places, unknown destinations or new areas. Tourists movements to various places are characterized by various factors such as the attractiveness of the place, distance from their home etc. The Location of a destination, the climate of place, activities that can be undertaken in that destinations are all based on geography. That is the reason why Geography plays a very important role in the development of tourism activities at any destination and this unit will allow you a chance to understand this linkage between tourism and geography.

1.2 MEANING OF GEOGRAPHY

The term "GEOGRAPHY" was first coined by "ERATOSTHENESE", Greek scholar, who lived between 276-194BC. In Greek language „GEO' means EARTH and „GRAPHOS' mean DESCRIPTION. When these two words clubbed, it gives the Earth, whose age is 4600 millions of years as per the "BIG BANG THEORY".

We the human beings along with flora and fauna live on the surface of the planet Earth in many ways the life of both flora and fauna are affected by our surroundings. The entire living beings depend on the natural resources for their existence in the surrounding areas on the earth which is home to live along with other creatures, whether big and small. The planet earth's shape is oval and its surface is not uniform with variations in its physical features. On the planet Earth, there are mountains, hills, valleys, plains, plateaus, oceans, seas, lakes, rivers, deserts, forests and wilderness. Apart from this, clear variations in the social and cultural features in the human society. The human society spread all over the planet Earth, these are villages, towns, cities, roads, railways, seaports, commercial markets and many other elements developed by human beings across the entire periods of their cultural developments. The physical environment has provided the stage, on which human societies enacted the drama of their creative skills the form of tools and techniques which were invented and evolved in the process of their cultural progress.

The planet earth has always been considered as the abode of human beings and thus, scientist's defined "earth as the abode of human beings" The earth in realty is always multifaceted and also multidimensional.

Geography Means

"Geography is concerned with the description and explanation of the areal differentiation of the earth's surface"-Richard Hartshorne "Geography studies the differences of phenomena usually related in different parts of the earth surface"- Hettner

1.3 SCOPE OF GEOGRAPHY

Geography has acquired the status of science that explains the arrangements of various natural and cultural features on the Plant Earth surface. In general, the natural phenomena like mountains, rivers, lakes etc. change slowly while the cultural elements like buildings, roads, crops, change in a fast manner to confirm growth and progress century wise and also regional wise. Travelling from one place to another we notice that the trees

number and types of trees change from area to area. All this because of continuous interaction between the environment in which we live in and the way we use it. The study of geography is about observing such patterns.

Another aspect of geography is to understand the factors, how do social, cultural, economic and demographic factors change our physical landscape and create new or altered landscapes by human interventions. For example, human settlements are transformation of forests or barren lands for living purpose by human being.

As earlier, even today geographical information about an area is available through reports, travel diaries and gazetteers. At present maps can be drawn by using satellite images using Geographic Information Systems (GIS)tools.

Thus, the scope of geography is in various disciplines, like armed forces, environment management, water resources, disaster management, meteorology and planning and various social sciences. Apart from that, a geographer helps in day to day life like tourism, housing and health related activities and more.

1.4 GEOGRAPHICAL IMPORTANCE OF TOURISM ASPECTS

There are many theories and definitions to what can be understood through the termoftourismgeographyandresearchersarestilldebatingonwhatisandisn't included in this rather large field of study. The content of tourism geography is complex, making a connection between the two concepts of geography and tourism, being rather new compared especially with the term of geography. The beginning of the science can be traced at the beginning of the 20th century, although tourism was being used inside the study of geography long before. By the 1950s, tourism geography began to be accepted as its own domain, especially in scientific works from USA andGermany.

The first definitions were pretty vague and incomplete, G. Chabot (1964) stating that *geography* and tourism are two terms predestined to be joined because every geographer has to necessarily be doubled by the qualities of a tourist and also reciprocally, we can say that in every tourist there is a hidden geographer, because the intelligent tourist is actually a geographer that has not discovered himself. As more and more researchers began to study this new field, the accuracy and depth of the definitions began to improve. Geography is fundamental to the study of tourism, because tourism in geographical form is true in its nature. Tourism occurs in places, it involves movement and activities between places and it is an activity in which both place characteristics and personal self-identities are formed, through relationships that are created among places, landscapes and people.

Physical geography provides the essential background, against which tourism places are created and environmental impacts and concerns are major issues, that must be considered in managing the development of tourism places.

Characteristics of the tourism system relating to the geography

1. Rural tourism: Focused on countryside
2. Urban tourism: Focused on town &cities
3. Spa tourism: Travel for health &wellness
4. Sport tourism: Focused on spectators travelling to sports events.
5. Eco tourism: Based on nature
6. Heritage tourism: Focused on heritage cities and Heritage buildings.

1.5 ROLE OF TOURISM GEOGRAPHY

In the 21st century the importance and popularity of tourism increased, especially in the last two or three decades, becoming one of the biggest industries in the world, so did the role of tourism in geography and its study. While before there were few mentions of tourism related facts in any book or research of geography, today we cannot imagine any geographical descriptions without a separate chapter on tourism. Still rather raw andsimple,

L. Merlo (1969) considers this science as being a branch of geography that studies the position and appearance of tourist centers, their individual natural and cultural-historical characteristics, the attractions and traditions in the context of the area where they are found, the transportation network assuring the accessibility and the links with other tourist centers. Tourism is essentially a geographical phenomenon, regarding the transfer of people and services through space and time, so a special domain dedicated to the research of the interconnections between tourism and geography was inevitable. Although the scientific field is new, the connections of geography and travel can be traced to ancient times, when geographers had no other way of describing the world than traveling and seeing it forthem.

1.6 THE CONNECT BETWEEN TOURISM AND GEOGRAPHY

The connections between tourism and geography are linked to specific terms such as place, location, space, accessibility, scale and others. This science also has an integrative character, containing key elements from all fields of geography, physical, human and

economic. Besides this, tourism geography also has many common points with other sciences, including history, geology, biology, art, economy and so on.

In more modern times, the tourism geography has become to achieve a broader definition, regarding the study of the spatial and temporal genesis, repartition and unfolding of the tourism phenomenon, being considered as a complex and specific interaction at the level of the geographic environment. As such, tourism geography studies things like the tourist resources (natural or man-made), the tourism infrastructure (transportation, accommodation, etc.), the types and forms of tourism, the tourist circulation (statistical research), tourist markets, as well as other domains. The areas of geographical interest in tourism are stated by S. Williams (1998), including the effect of scale, spatial distributions of tourist phenomena, tourism impacts, planning for tourism and spatial modeling of tourism development.

There is also another link between the two domains, as the primary factor which attracts tourists to a certain area is geography, with all its specific elements. The interconnections go a lot deeper, as tourists usually choose a certain destination primarily through the perceived experience of that place, as they envision its geographical characteristics; they use means of transportation to travel over the land or water surface, creating what we call tourism fluxes or the tourist circulation. While visiting a certain place, tourists actively discover and appreciate the geography of that place, from the landscapes with their typical forms, to the traditions of the local population, all while benefiting the local economy and using its resources. In conclusion, tourism geography studies the relations between places, landscapes and people, describing travel and tourism as an economic, social and cultural activity. More concisely, it is all about the spatial and temporal dynamics, as well as the interactions between the tourismresources.

Keywords

1. Geography: Geography is the study of landscapes, environment, inhabitants and the environment.
2. Tourism : Travelling from one place to another for leisure purpose
3. Landscapes:All the visible features of an area of land, often considered in terms of their aesthetic appeal.
4. Environment:The surroundings or conditions in which a person, animal, or plant lives or operates.
5. Inhabitants:A person or animal that lives in or occupies a place.

Self Assessment Questions

1. Define geography and its relation to the tourism?
2. Explain the significance of geography
3. What is the Connection between Tourism and Geography?

Further Readings

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LESSON 2

NORTH AMERICA PHYSICAL GEOGRAPHY

8
OBJECTIVES

After studying this lesson, you should be able

- To study about the physical geography of North America
- To gain knowledge on South America
- To understand physical features of North America

STRUCTURE

2.1 WESTERN REGION

2.2 GREAT PLAINS

2.3 CANADIAN SHIELD

2.4 EASTERN REGION

2.5 CARIBBEAN REGION

2.6 NATURAL WONDERS

15
North America: Physical Geography

NORTH AMERICA

education

North America, the third-largest continent, extends from the tiny Aleutian Islands in the northwest to the Isthmus of Panama in the south. The continent includes the enormous island of Greenland in the northeast and the small island countries and territories that dot the Caribbean Sea and western North Atlantic Ocean. In the far north, the continent stretches halfway around the world, from Greenland to the Aleutians. But at Panama's narrowest part, the continent is just 50 kilometers (31 miles)across.

North America can be divided into five physical regions:

The mountainous west, the Great Plains, the Canadian Shield, the varied eastern region, and the Caribbean. Mexico and Central Americas western coast are connected to the mountainous west, while its lowlands and coastal plains extend into the eastern region. Within these regions are all the major types of biomes in the world. A biome is a community of animals and plants spreading over an extensive area with a relatively uniform climate. Some diverse biomes represented in North America include desert, grassland, tundra, and coral reefs.

2.1 WESTERN REGION

Young mountains rise in the west. The most familiar of these mountains are probably the Rockies, North America's largest chain. The Rockies stretch from the province of British Columbia, Canada, to the U.S. state of New Mexico.

The Rocky Mountains are part of a system of parallel mountain ranges known as the Cordilleras. A cordillera is a long series of mountain ranges. Although cordilleras exist all over the world, in North America, "the Cordilleras" indicate the massive mountain ranges in the western part of the continent. The Cordilleras extend from Canada all the way to the Isthmus of Panama.

The Sierra Madre mountain system is part of the Cordilleras. The Sierra Madre stretch from the southwestern United States to Honduras. The Sierra Madre include many high volcanoes (up to 5,636 meters, or 18,500 feet) that stretch across Mexico south of the cities of Guadalajara and Mexico City.

Volcanic mountain ranges in Guatemala, Honduras, Nicaragua, Costa Rica, and Panama are also considered part of the Cordilleras. Volcanic eruptions and earthquakes occur frequently in this region. Volcanic activity can destroy towns and cities. It also contributes to the rich, fertile soils of the region.

The temperate rain forest supports a wide variety of life. The Sitka spruce, western red cedar, and Douglas fir are trees native to North America's temperate rain forest. Some

of these trees grow to more than 90 meters (300 feet) tall and 3 meters (10 feet) in diameter. Black bears, Roosevelt elk, and marmots are indigenous animal species.

The three major desert regions of North America—the Sonoran, Mojave, and Chihuahuan—are all in the American southwest and northern Mexico. These large deserts are located in the rain shadows of nearby mountains. The mountains block precipitation and accelerate the movement of hot, dry wind over these regions. The Sonoran is in the rain shadow of the Coast Ranges, the Mojave is in the shadow of the Sierra Nevada, and the Chihuahuan is in the shadow of the Sierra Madre.

Notable desert plant species includes the saguaro cactus, Joshua tree, and mesquite. Animal species include the roadrunner, Gila monster, and rattlesnake.

2.2 GREAT PLAINS

The Great Plains lie in the middle of the continent. Deep, rich soil blankets large areas of the plains in Canada and the United States. Grain grown in this region, called the "Breadbasket of North America," feeds a large part of the world. The Great Plains are also home to rich deposits of oil and natural gas..

The grassland or prairie regions of the Great Plains make up the largest biome in North America. Extreme weather prevents the growth of large plants but is perfectly suited to the native grasses that dominate the region.

Native grasses vary in size from 2 meters (7 feet) in tallgrass prairies to only 20 or 25 centimeters (8 or 10 inches) in shortgrass prairies. Native animal species include bison, prairie dogs, and grasshoppers.

2.3 CANADIAN SHIELD

The Canadian Shield is a raised but relatively flat plateau. It extends over eastern, central, and northwestern Canada. The Canadian Shield is characterized by a rocky landscape pocked by an astounding number of lakes.

The tundra, stretching along the northern borders of Alaska and Canada to the Hudson Bay area, is a biome common to the Canadian Shield. Tundra is where low temperatures and precipitation levels hinder tree growth. The tundra is characterized by permafrost—soil that is frozen for two or more years. This permafrost keeps moisture near the soil's surface, promoting vegetation growth even in the extreme, Arctic conditions of the tundra.

2.4 EASTERN REGION

This varied region includes the Appalachian Mountains and the Atlantic coastal plain. North America's older mountain ranges, including the Appalachians, rise near the east coast of the United States and Canada. These areas have been mined for rich deposits of coal and other minerals for hundreds of years.

The Atlantic coastal plain extends from river, marsh, and wetland regions east of the mountains toward the sandy beaches of the Atlantic coast. Wetland areas are a biome of the eastern region and consist of areas of land whose soil is saturated with permanent or seasonal moisture. The Florida Everglades is the largest wetland system in the United States, covering more than 11,137 square kilometers (4,300 square miles) of southern Florida.

2.5 CARIBBEAN REGION

The Caribbean Region includes more than 7,000 islands, islets, reefs, and cays. The region's islands and smaller islets are varied in their topography; some have relatively flat and sandy terrain while others are rugged, mountainous, and volcanic.

The coral reefs and cays of the Caribbean Sea are among the most spectacular biomes in North America. A reef is a ridge of jagged rock, coral, or sand just above or below the surface of the sea. Some coral reefs surround islands, such as the Bahamas, Antigua, and Barbados. Others are found off the Florida Keys, a chain of cays—small islands situated on a coral reef platform—near the southern coast of the U.S. state of Florida.

Coral reefs are made of millions of tiny animals—corals—that form a hard shell around their bodies. This hard surface provides a rich community for algae and plants such as seagrass. Brightly colored tropical fish, as well as sharks, sea turtles, sea stars, and sea horses, are animals native to the Caribbean's coral reefs.

2.6 NATURAL WONDERS

North America's varied landscape features many natural wonders. It has deep canyons, such as Copper Canyon in the Mexican state of Chihuahua. Denali, the continent's highest peak, stands at 6,194 meters (20,320 feet) within Denali National Park and Preserve in the U.S. state of Alaska. Yellowstone National Park, in the U.S. states of Wyoming, Montana, and Idaho, has some of the world's most active geysers. Canada's Bay of Fundy has the greatest tidal range in the world. The Great Lakes form the planet's

largest area of freshwater. The Mississippi River, at 3,730 kilometers (2,320 miles) long, is one of the longest river systems in the world and drains all or parts of 31 U.S. states.

***South America*: Physical Geography**

South America, the fourth-largest continent, extends from the Gulf of Darién in the northwest to the archipelago of Tierra del Fuego in the south.

South America can be divided into three physical regions:
Mountains and highlands, river basins, and coastal plains. Mountains and coastal plains generally run in a north-south direction, while highlands and river basins generally run in an east-west direction.

South America's extreme geographic variation contributes to the continent's large number of biomes. Within a few hundred kilometers, South America's coastal plains" dry desert biome rises to the rugged alpine biome of the Andes mountains. One of the continent's river basins (the Amazon) is defined by dense, tropical rain forest, while the other (Paraná) is made up of vast grasslands. With an unparalleled number of plant and animal species, South America"s rich biodiversity is unique among the world's continents.

MOUNTAINS & HIGHLANDS

South America"s primary mountain system, the Andes, is also the world's longest.

The range covers about 8,850 kilometers (5,500 miles). Situated on the far western edge of the continent, the Andes stretch from the southern tip to the northernmost coast of South America. There are hundreds of peaks more than 4,500 meters (15,000 feet) tall, many of which are volcanic.

The highest peak in the Andes, Aconcagua, stands at 6,962 meters (22,841 feet) and straddles the Argentina-Chile border. Aconcagua is the tallest mountain outside Asia.

High plateaus are also a feature of the Andes. The altiplano of Peru and Bolivia, for example, has an elevation of about 3,700 meters (12,300 feet). The Patagonia region of Argentina and Chile consists of lower-elevation plateaus
and rugged glaciers.

Most plants in the alpine biome are small, and their leaves are stiff and strong to protect them from frost and drought. The largest herb in the world, *Puya raimondii*, is known as the Queen of the Andes. A *Puya raimondii* can live for 100 years and can grow to more than 9 meters (30 feet) tall. The leaves of this endangered species all grow from one woody stem, allowing moisture to run down the leaves to the base of the plant.

RiverBasins

South America has three important river basins: the Amazon, Orinoco, and Paraguay/Paraná. The Amazon River basin has an area of almost 7 million square kilometers (2.7 million square miles), making it the largest watershed in the world. The basin, which covers most of northern South America, is fed by tributaries from the glaciers of the Andes. Every second, the Amazon River empties 209,000 cubic meters (7,381,000 cubic feet) of freshwater into the Atlantic Ocean.

The Amazon River is the life force of the equally vast Amazon rain forest, which makes up about half of the rain forest of the entire planet. This tropical biome has as many as 100 different tree species on a single acre, including the rubber tree, silk cotton tree, and Brazil nut tree. Other important plant species include palms, ferns, and ropelike vines known as lianas that network throughout the rain forest"s dense canopy.

COASTAL PLAINS

A coastal plain is an area of low, flat land next to a seacoast. South American coastal plains are found on the northeastern coast of Brazil, on the Atlantic Ocean, and the western, Pacific coast of Peru and Chile. The coastal plains of northeastern Brazil are

extremely dry. The Brazilian Highlands act as a wedge that pushes moist sea winds away from the coastal plains.

The Atacama Desert is part of the western coastal plain. The Atacama is considered the driest region in the world. The average rainfall is about 1 millimeter (0.04 inches) a year, and some parts of the Atacama have never had rain in recorded history.

KEY WORDS

1. **Coastal Plains:** A coastal plain is flat, low-lying land adjacent to a sea coast
2. **Mountains And Highlands**: Highlands or uplands are any mountainous region or elevated mountainous plateau.
3. **Caribbean Region:** The Caribbean is a region of the Americas that consists of the Caribbean Sea, its islands and the surrounding coasts.
4. **Canadian Shield:** The Canadian Shield, also called the Laurentian Plateau, or Bouclier canadien, is a large area of exposed Precambrian igneous and high-grade metamorphic rocks that forms the ancient geological core of the North American continent.

SELF ASSESSMENT QUESTIONS

1.Write about the physical geography of North America

2.Describe the physical geography of South America

3. Write about the Canadian shield

4. Describe about the mountain and highlands

FURTHER READINGS

1. Michael hall (1999), Geography of Travel and Tourism, Routledge, London.
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LESSON 3

EUROPE& AFRICA

OBJECTIVE

After studying this lesson, you should be able

- To study the physical geography of Europe
- To know about the African diversity
- To study about the European plain

STRUCTURE

3.1 Introduction

3.2 Western Uplands

3.3 North European Plain

3.4 Central Uplands

3.5 Alpine Mountains

3.6 Flora & Fauna

Europe: Physical Geography

3.1 INTRODUCTION

Europe is the second-smallest continent. Only Oceania has less landmass. Europe extends from the island nation of Iceland in the west to the Ural Mountains of Russia in the east. Europe northernmost point is the Svalbard archipelago of Norway, and it reaches as far south as the islands of Greece and Malta.

Europe is sometimes described as a peninsula of peninsulas. A peninsula is a piece of land surrounded by water on three sides. Europe is a peninsula of the Eurasian supercontinent and is bordered by the Arctic Ocean to the north, the Atlantic Ocean to the west, and the Mediterranean, Black, and Caspian Seas to the south.

Europe main peninsulas are the Iberian, Italian, and Balkan, located in southern Europe, and the Scandinavian and Jutland, located in northern Europe. The link between these peninsulas has made Europe a dominant economic, social, and cultural force throughout recorded history.

Europe can be divided into four major physical regions, running from north to south: Western Uplands, North European Plain, Central Uplands, and Alpine Mountains.

3.2 WESTERN UPLANDS

The Western Uplands, also known as the Northern Highlands, curve up the western edge of Europe and define the physical landscape of Scandinavia (Norway, Sweden, and Denmark), Finland, Iceland, Scotland, Ireland, the Brittany region of France, Spain, and Portugal.

3.3 NORTH EUROPEAN PLAIN

The North European Plain extends from the southern United Kingdom east to Russia. It includes parts of France, Belgium, the Netherlands, Germany, Denmark, Poland, the Baltic states (Estonia, Latvia, and Lithuania), and Belarus.

3.4 CENTRAL UPLANDS

The Central Uplands extend east-west across central Europe and include western France and Belgium, southern Germany, the Czech Republic, and parts of northern Switzerland and Austria.

3.5 ALPINE MOUNTAINS

The Alpine Mountains include ranges in the Italian and Balkan peninsulas, northern Spain, and southern France. The region includes the mountains of the Alps, Pyrenees, Apennines, Dinaric Alps, Balkans, and Carpathians.

High elevations, rugged plateaus, and steeply sloping land define the region. Europe highest peak, Mount Elbrus (5,642 meters/18,510 feet), is in the Caucasus mountains of Russia. The Alpine region also includes active volcanoes, such as Mount Etna and Mount Vesuvius in Italy.

3.6 FLORA & FAUNA

Much like its physical regions, Europe plant and animal communities follow a general north-south orientation. The tundra, found in Iceland and the northern reaches of Scandinavia and Russia, is a treeless region where small mosses, lichens, and ferns grow. Huge herds of reindeer feed on these tiny plants.

The taiga, which stretches across northern Europe just south of the tundra, is composed of coniferous forests, with trees such as pine, spruce, and fir. Moose, bear, and elk are native to the European taiga.

Africa physical geography

AFRICA

Introduction

Africa, the second-largest continent, is bounded by the Mediterranean Sea, the Red Sea, the Indian Ocean, and the Atlantic Ocean. It is divided in half almost equally by the Equator.Africa physical geography, environment and resources, and human geography can be considered separately.

Africa has eight major physical regions: the Sahara, the Sahel, the Ethiopian Highlands, the savanna, the Swahili Coast, the rain forest, the African Great Lakes, and Southern Africa. Some of these regions cover large bands of the continent, such as the Sahara and Sahel, while others are isolated areas, such as the Ethiopian Highlands and the Great Lakes. Each of these regions has unique animal and plant communities.

Sahara

The Sahara is the worlds largest hot desert, covering 8.5 million square kilometers (3.3 million square miles), about the size of the South American country of Brazil. Defining Africa's northern bulge, the Sahara makes up 25 percent of the continent.

The Sahara has a number of distinct physical features, including ergs, regs, hamadas, and oases. Ergs, which cover 20 percent of the Sahara, are sand dunes that stretch for hundreds of kilometers at heights of more than 300 meters (1,000 feet). Ergs cover most of Algeria and Libya and parts of Mali and Nigeria. Ergs can contain large quantities of salt, which is sold for industrial and food use.

Regs are plains of sand and gravel that make up 70 percent of the Sahara. The gravel can be black, red, or white. Regs are the remains of prehistoric seabeds and riverbeds, but are now nearly waterless.

Hamadas are elevated plateaus of rock and stone that reach heights of 3,353 meters (11,000 feet). They include the Atlas Mountains, which stretch from southwestern Morocco to northeastern Tunisia; the Tibesti Mountains of southern Libya and northern Chad; and the Ahaggar Mountains in southern Algeria.

An oasis is a hub of water in the desert, often in the form of springs, wells, or irrigation systems. About 75 percent of the Saharas population lives in oases, which make up only 2,071 square kilometers (800 square miles) of the deserts vast area.

The Saharas animal and plant communities have adapted to the regions extremely dry conditions. The kidneys of the jerboa, a type of rodent, produce highly concentrated urine that minimizes water loss. A dromedary camel conserves water by changing its body temperature so it doesn't sweat as the day gets hotter. The scorpion limits its activities to

night, burrowing into the cooler sands beneath the surface during the day. The scorpion, a predator, also absorbs water from the flesh of its prey.

Saharan plants survive thanks to root systems that plunge as far as 24 meters (80 feet) underground. In parts of the Sahara, plants cannot take root at all. In the southern Libyan Desert, for instance, no greenery exists for more than 195 kilometers (120 miles).

Sahel

The Sahel is a narrow band of semi-arid land that forms a transition zone between the Sahara to the north and the savannas to the south. It is made up of flat, barren plains that stretch roughly 5,400 kilometers (3,300 miles) across Africa, from Senegal to Sudan. The Sahel contains the fertile delta of the Niger, one of Africa longest rivers. Unfortunately, the Sahel fertile land is rapidly becoming desert as a result of drought, deforestation, and intensive agriculture. This process is known as desertification.

The Sahel's animal communities are constantly scavenging for scarce water and vegetation resources. The Senegal gerbil, the most common mammal in the Sahel and measuring only a few centimeters, consumes as much as 10 percent of the Sahel's plants. The Sahel's green vegetation only emerges during the rainy season, but is often quickly harvested by farmers or consumed by animals. Baobabs are drought- and fire-resistant trees with trunks that are often 15 meters (50 feet) wide and as tall as 26 meters (85 feet). Acacia, whose deep root systems are ideal for semi-arid climates, are among the most common trees found in the Sahel. Cram-cram, a prickly grass, is the primary fodder for Sahel herds such as zebu cattle.

Ethiopian Highlands

The Ethiopian Highlands began to rise 75 million years ago, as magma from Earths mantle uplifted a broad dome of ancient rock. This dome was later split as Africa's continental crust pulled apart, creating the Great Rift Valley system. Today, this valley cuts through the Ethiopian Highlands from the southwest to the northeast. The Ethiopian Highlands are home to 80 percent of Africas tallest mountains.

The highlands craggy landscape is perfect for nimble animal species. Native species such as the Walia ibex, an endangered wild goat, and the gelada baboon live in the ledges and rocky outposts of the Simien Mountains. The most emblematic highlands species is probably the Ethiopian wolf, which is now on the brink of extinction.

Important plant species native to the Ethiopian Highlands include the Ethiopian rose, Africas only native rose, and the ensete, a tall, thick, rubbery plant that is a close relative of the banana.

Savanna

Savannas, or grasslands, cover almost half of Africa, more than 13 million square kilometers (5 million square miles). These grasslands make up most of central Africa, beginning south of the Sahara and the Sahel and ending north of the continents southern tip.

Among Africa many savanna regions, the Serengeti (or Serengeti Plains) is the most well-known. The Serengeti is a vast, undulating plain that stretches 30,000 square kilometers (11,583 square miles) from Kenya's Maasai-Mara game reserve to Tanzania's Serengeti National Park.

The Serengeti is home to one of the continents highest concentrations of large mammal species, including lions, hyenas, zebras, giraffes, and elephants. Each year, more than 1 million wildebeest travel in a circular migration, following seasonal rains, across the Serengeti Plains. Their grazing and trampling of grass allows new grasses to grow, while their waste helps fertilize the soil.

Swahili Coast

The Swahili Coast stretches about 1,610 kilometers (1,000 miles) along the Indian Ocean, from Somalia to Mozambique. The nearby coral reefs and barrier islands protect the coast from severe weather.

There is not a lot of animal life on the sandy Swahili Coast. The golden-rumped elephant shrew, an insect-eating rodent with a long snout, is common. A small, primitive species of primate known as the bush baby inhabits vegetated areas of the Swahili Coast. Bush babies, which have enormous eyes for hunting at night, feed primarily on insects, fruit, and leaves.

These more vegetated areas are located on a narrow strip just inland from the coastal sands. Heavy cultivation has diminished the diversity of plant species in this interior area of the Swahili Coast. Mangrove forests are the most common vegetation. Mangroves have exposed root systems. This allows the trees to absorb oxygen directly from the air, as well as from the nutrient-poor soil.

Rain Forest

Most of Africa's native rain forest has been destroyed by development, agriculture, and forestry. Today, 80 percent of Africa rain forest is concentrated in central Africa, along the Congo River basin. Africa's rain forests have a rich variety of animal life; a 6-kilometer (4-mile) patch could contain up to 400 bird species, 150 butterfly species, and 60 species of amphibians. Important mammals include African forest elephants, gorillas, the black colobus monkey, and the okapi, a donkey-like giraffe.

The driver ant is one of Africa most aggressive rain forest species. Driver ants move in columns of up to 20 million across the rain forest floor, and will eat anything from toxic millipedes to reptiles and small mammals.

The African rain forests plant community is even more diverse, with an estimated 8,000 plant species documented. More than 1,100 of these species are endemic, or found nowhere else on Earth. Only 10 percent of the plants in the African rain forest have been identified.

African Great Lakes

The Great Lakes are located in nine countries that surround the Great Rift Valley. As the African continent separated from Saudi Arabia, large, deep cracks were created in the Earths surface. These cracks were later filled with water. This geologic process created some of the largest and deepest lakes in the world. There are seven major African Great Lakes: Lake Albert, Lake Edward, Lake Kivu, Lake Malawi, Lake Tanganyika, Lake Turkana, and Lake Victoria. Lake Victoria, the largest lake in Africa, is the southern source of the Nile River, the longest river in the world.

The African Great Lakes region has a diverse range of aquatic and terrestrial animal life. Fish include the 45-kilogram (100-pound) Nile perch and the 2.5-centimeter (1-inch) cichlid. Migrating savanna animals, such as wildebeest, use the lakes as watering holes. Hippos and crocodiles call the region their home. The Great Lakes about everything from rain forest to savanna plant communities. However, invasive species like the water hyacinth and papyrus have begun to take over entire shorelines, endangering animals and plants.

Southern Africa

The region of Southern Africa is dominated by the Kaapvaal craton, a shelf of bedrock that is more than 2.6 billion years old. Rocky features of Southern Africa include plateaus and mountains, such as the Drakensberg range. Southern Africa is the epicenter of Africa well-known reserves, which protect animal species such as lions, elephants, baboons, white rhinos, and Burchells zebras. Other important animal species include the impala, a type

of deer, and the springbok, a type of gazelle that can spring several feet into the air to avoid predators.

Southern Africa Cape Floral Region is one of the richest areas for plants in the world. While the Cape Floral Region covers less than 0.5 percent of Africa, it is home to nearly 20 percent of the continents flora. The giant protea, South Africa national flower, is found in the Cape Floral Region.

Keywords

1. North European Plain:The North European Plain is a geomorphological region in Europe, mostly in Poland, Denmark, Germany, Belgium, the Netherlands, with small parts of northern France and Czech republic

2. Central Uplands: The Central Uplands is one of the three major natural regions of Germany and covers most of the land area of the country. To the north lies the North German Plain or Northern Lowland; to the south, the Alps and the Alpine Foreland.

3 . Alpine Mountains: The Alps are the highest and most extensive mountain range system that lies entirely in Europe, and stretching approximately 1,200 kilometres across eight Alpine countries

4.Sahel: The Sahel is the ecoclimatic and biogeographic zone of transition in Africa between the Sahara to the north and the Sudanian Savanna to the south.

5.Ethiopian Highlands:The Ethiopian Highlands is a rugged mass of mountains in Ethiopia, situated in the Horn region in northeast Africa

SELF ASSESSMENT QUESTIONS

1.Describe the physical geography of Europe

2. Explain the diversity of African geography

FURTHER READINGS

1. Michael hall (1999), Geography of Travel and Tourism, Routledge, London.
2. C. Michael Hall & Stephen J. Page (2006), The Geography of Tourism and Recreation-Environment, Place and Space, Third Edition, Routledge, London.
3. Robinson H.A. (1976), Geography of Tourism Mac Donald & Evans, ltd,.
4. Travel Information Manual, IATA, Netherlands, 2009.
5. World Atlas.

Lesson Writer

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LESSON 4

ASIA & AUSTRALIA

OBJECTIVES

After studying this lesson, you should be able

- To gain knowledge on Asia Geography
- To understand the Physical Geography of Australia

STRUCTURE

4.1 Introduction

4.2 Mountain Systems

4.3 Plateaus

4.4 Plains, Steppes, and Desert

4.5 Freshwater

4.6 Terrestrial Flora and Fauna

4.7 Aquatic Flora and Fauna

Asia: Physical Geography

ASIA

4.1 INTRODUCTION

Asia is the largest of the world's continents, covering approximately 30 percent of the Earth's land area. It is also the world's most populous continent, with roughly 60 percent of the total population.

Asia makes up the eastern portion of the Eurasian supercontinent; Europe occupies the western portion. The border between the two continents is debated. However, most geographers define Asia's western border as an indirect line that follows the Ural Mountains, the Caucasus Mountains, and the Caspian and Black Seas. Asia is bordered by the Arctic, Pacific, and Indian Oceans.

Asia can be divided into five major physical regions: mountain systems; plateaus; plains, steppes, and deserts; freshwater environments; and saltwater environments.

4.2 MOUNTAIN SYSTEMS

The Himalaya Mountains extend for about 2,500 kilometers (1,550 miles), separating the Indian subcontinent from there of Asia. The Indian subcontinent, once connected to Africa, collided with the Eurasian continent about 50 million to 55 million years ago, forming the Himalayas. The Indian subcontinent is still crashing northward into Asia, and the Himalayas are growing about 5 centimeters (2 inches) every year.

The Himalayas cover more than 612,000 square kilometers (236,000 square miles), passing through the northern states of India and making up most of the terrain of Nepal and Bhutan. The Himalayas are so vast that they are composed of three different mountain belts. The northernmost belt, known as the Great Himalayas, has the highest average elevation at 6,096 meters (20,000 feet). The belt contains nine of the highest peaks in the world, which all reach more than 7,925 meters (26,000 feet) tall. This belt includes the highest mountain summit in the world, Mount Everest, which stands at 8,850 meters (29,035 feet).

4.3 PLATEAUS

Asia is home to many plateaus, areas of relatively level high ground. The Iranian plateau covers more than 3.6 million square kilometers (1.4 million square miles), encompassing most of Iran, Afghanistan, and Pakistan. The plateau is not uniformly flat, but contains some high mountains and low river basins. The highest mountain peak is Damavand, at 5,610 meters (18,410 feet). The plateau also has two large deserts, the Dasht-e Kavir and Dasht-eLut.

The Deccan Plateau makes up most of the southern part of India. The plateau's average elevation is about 600 meters (2,000 feet). It is bordered by three mountain ranges: the Satpura Range in the north, and the Eastern and Western Ghats on either side. The plateau and its main waterways—the Godavari and Krishna rivers—gently slope toward the Eastern Ghats and the Bay of Bengal.

The Tibetan Plateau is usually considered the largest and highest area ever to exist in the history of Earth. Known as the "Rooftop of the World," the plateau covers an area about half the size of the contiguous United States and averages more than 5,000 meters (16,400 feet) above sea level. The Tibetan Plateau is extremely important to the world's water cycle because of its tremendous number of glaciers. These glaciers contain the largest volume of ice outside the poles. The ice and Snow from these glaciers feed Asia's largest rivers. Approximately 2 billion people depend on the rivers fed by the plateau's glaciers.

4.4 PLAINS, STEPPES, AND DESERT

The West Siberian Plain, located in central Russia, is considered one of the world's largest areas of continuous flatland. It extends from north to south about 2,400 kilometers (1,500 miles) and from west to east about 1,900 kilometers (1,200 miles). With more than 50 percent of its area at less than 100 meters (330 feet) above sea level, the plain contains some of the world's largest swamps and flood plains.

Central Asia is dominated by a steppe landscape, a large area of flat, un forested grassland. Mongolia can be divided into different steppe zones: the mountain forest steppe, the arid steppe, and the desert steppe. These zones transition from the country's mountainous region in the north to the Gobi Desert on the southern border with China.

The Rub'al Khali desert, considered the world's largests and sea, covers an area larger than France across Saudi Arabia, Oman, the United Arab Emirates, and Yemen. It holds roughly half as much sands Africa's Sahara desert, even though it is 15 times smaller in size. The desert is known as the Empty Quarter because it is virtually inhospitable to humans except for Bedouin tribes that live on its edges.

4.5 FRESHWATER

Lake Baikal, located in southern Russia, is the deepest lake in the world, reaching a depth of 1,620 meters (5,315 feet). The lake contains 20 percent of the world's unfrozen freshwater, making it the largest reservoir on Earth. It is also the world's oldest lake, at 25

million years old. The Yangtze is the longest river in Asia and the third longest in the world (behind the Amazon of South America and the Nile of Africa). Reaching 6,300 kilometers (3,915 miles) in length, the Yangtze moves east from the glaciers of the Tibetan Plateau to the river's mouth on the East China Sea. The Yangtze considered the life blood of China. It drains one fifth of the country's land area home to one- third of its population, and contributes greatly to China's economy.

The Tigris and Euphrates Rivers begin in the highlands of eastern Turkey and flow through Syria and Iraq, joining in the city of Qurna, Iraq, before emptying into the Persian Gulf. The land between the two rivers, known as Mesopotamia, was the center of the earliest civilizations, including Sumer and the Akkadian Empire.

Today, the Tigris-Euphrates river system is under threat from increased agricultural and industrial use. These pressures have caused desertification and increased salts in the soil, severely damaging local watershed habitats.

The Bay of Bengal is the largest bay in the world, covering almost 2.2 million square kilometers (839,000 square miles) and bordering Bangladesh, India, Sri Lanka, and Burma. Many large rivers, including the Ganges and Brahmaputra, empty into the bay. The briny wetlands formed by the Ganges-Brahmaputra on the Bay of Bengal is the largest delta in the world.

4.6 Terrestrial Flora and Fauna

Botanists nickname China the "Mother of Gardens." It has more flowering plant species than North and South America combined. Because China has such diverse landscapes, from the arid Gobi Desert to the tropical rain forests of Yunnan Province, many flowers can adapt to climates all over the world. From roses to peonies, many familiar flowers most likely originated in northern China. China is the likely origin of such fruit trees as peaches and oranges. China is also home to the dawn redwood, the only redwood tree found outside North America.

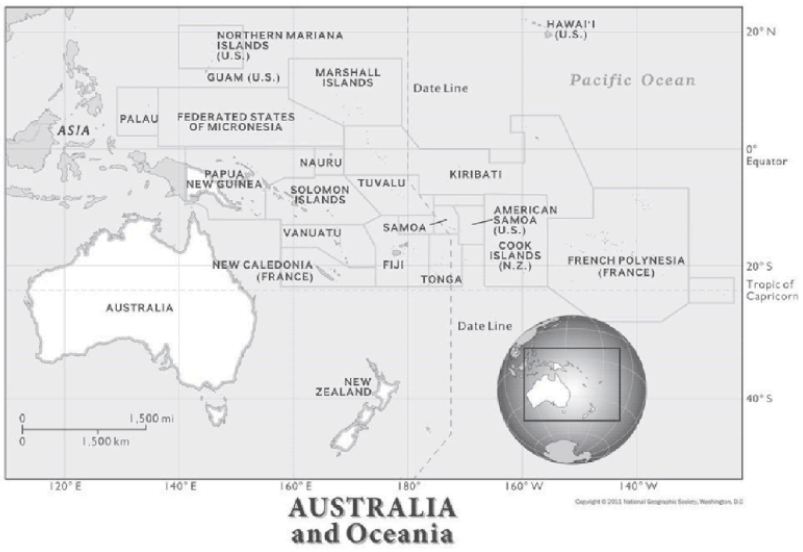
4.7 Aquatic Flora and Fauna

The fresh water and marine habitats of Asia offer incredible biodiversity. Lake Baikal's age and isolation make it a unique biological site. Aquatic life has been able to evolve for millions of years relatively undisturbed, producing a rich variety of flora and fauna. The lake is known as the "Galápagos of Russia" because of its importance to the

study of evolutionary science. It has 1,340 species of animals and 570 species of plants. The Bay of Bengal, on the Indian Ocean, is one of the world's largest tropical marine ecosystems. The bay is home to dozens of marine mammals, including the bottlenose dolphin, spinner dolphin, spotted dolphin, and Bryde's whale. The bay also supports healthy tuna, jack, and marlin fisheries.

The Sundarbans is a wetland area that forms at the delta of the Ganges and Brahamaputra rivers. The Sundarbans is a huge mangrove forest. Mangroves are hardy trees that are able to withstand the powerful, salty tides of the Bay of Bengal as well as the freshwater flows from the Ganges and Brahamaputra. In addition to mangroves, the Sundarbans is forested by palm trees and swamp grasses.

Australia & Oceania physical geography



AUSTRALIA and Oceania

Introduction

Oceania is a region made up of thousands of islands throughout the Central and South Pacific Ocean. It includes Australia, the smallest continent in terms of total land area. Most of Australia and Oceania is under the Pacific, a vast body of water that is larger than

all the Earth's continental landmasses and islands combined. The name "Oceania" justly establishes the Pacific Ocean as the defining characteristic of the continent.

Oceania is dominated by the nation of Australia. The other two major landmasses of Oceania are the micro continent of Zealandia, which includes the country of New Zealand, and the western half of the island of New Guinea, made up of the nation of Papua New Guinea. Oceania also includes three island regions: Melanesia, Micronesia, and Polynesia (including the U.S. state of Hawaii).

Oceania can be divided into three island groups: continental islands, high islands, and low islands. The islands in each group are formed in different ways and are made up of different materials. Continental islands have a variety of physical features, while high and low islands are fairly uniform in their physical geography.

Continental Islands

Continental islands were once attached to continents before sea level changes and tectonic activity isolated them. Tectonic activity refers to the movement and collision of different sections, or plates, of the Earth's crust.

Australia, Zealandia, and New Guinea are continental islands. These three regions share some physical features. All three have mountain ranges or highlands—the Great Dividing Range in Australia; the North Island Volcanic Plateau and Southern Alps in New Zealand; and the New Guinea Highlands in Papua New Guinea.

These highlands are fold mountains, created as tectonic plates pressed together and pushed land upward. New Zealand and Papua New Guinea also have volcanic features as a result of tectonic activity.

Although they share some landscape features, each of these regions has distinct physical features that resulted from different environmental processes. Australia"s landscape is dominated by the Outback, a region of deserts and semi-arid land. The Outback is a result of the continent's large inland plains, its location along the dry Tropic of Capricorn, and its proximity to cool, dry, southerly winds. New

Zealand's glaciers are a result of the islands' high elevations and proximity to cool, moisture-bearing winds. Papua New Guinea"s highland rain forests are a result of the island's high elevations, proximity to tropical, moisture-bearing winds, and location right below the warm Equator.

High Islands

High islands, also called volcanic islands, are created as volcanic eruptions build up land over time. These eruptions begin under water, when hot magma is cooled and hardened by the ocean. Over time, this activity creates islands with a steep central peak—hence the name "high island." Ridges and valleys radiate outward from the peak toward the coastline.

The island region of Melanesia contains many high islands because it is a major part of the "Ring of Fire," a string of volcanoes around the boundary of the Pacific Ocean. This part of the Ring of Fire is on the boundary of the Pacific plate and the Australian plate. This is a convergent plate boundary, where the two plates move toward each other. Important volcanic mountains in Melanesia include Mount Tomanivi, Fiji; Mount Lamington, Papua New Guinea; and Mount Yasur, Vanuatu.

Marine Flora and Fauna

The marine environment is an important and influential physical region in Australia and Oceania. The region is composed of three marine realms: Temperate Australasia, Central Indo-Pacific, and Eastern Indo-Pacific. Marine realms are large ocean regions where animal and plant life are similar because of shared environmental and evolutionary factors.

The Temperate Australasia realm includes the seas surrounding the southern half of Australia andthe islandsof NewZealand.Thisrealmisoneofthe world's richest areas for seabirds. Its cold, nutrient-rich waters support a diversity of plants and fish that seabirds feed on. These seabirds include different species ofalbatross, petrel, and shearwater, as well as the Australasian gannet and rockhopperpenguin.

The Central Indo-Pacific realm includes the seas surrounding the northern half of Australia, Papua New Guinea, Solomon Islands, Vanuatu, New Caledonia, Fiji, and Tonga. This marine realm has the greatest diversity of tropical coral in the world and includes the world's two largest coral formations: Australia's Great Barrier Reef and the New Caledonia Barrier Reef. The Great Barrier Reef, a UNESCO World Heritage Site off the coast of northeast Australia, is 344,400 square kilometers (133,000 square miles).

The Great Barrier Reef and the New Caledonia Barrier Reef are underwater hotspots for biodiversity. The Great Barrier Reef is home to 30 species of whales, dolphins, and porpoises; six species of sea turtles; 215 species of birds; and more than 1,500 species of fish. The New Caledonia Barrier Reef is home to 600 species of sponges, 5,500 species of

mollusks, 5,000 species of crustaceans, and at least 1,000 species of fish.

KEYWORDS

1. Steppes: A steppe may be semi-arid or covered with grass or with shrubs or with both, depending on the season and latitude.

2. Desert. A desert is a barren area of landscape where little precipitation occurs and, consequently, living conditions are hostile for plant and animal life

3. Fauna: Fauna is all of the animal life present in a particular region or time. The corresponding term for plants is flora.

4. **Flora:** Flora, fauna and other forms of life such as fungi are collectively referred to as biota

SELF ASSESSMENT QUESTIONS

1. Explain the physical geography of Asia
2. Elaborate Diversity of Australia Geography
3. Write about the Great Barrier Reef

FURTHER READINGS

1. Michael hall (1999), Geography of Travel and Tourism, Routledge, London.
2. C. Michael Hall & Stephen J. Page (2006), The Geography of Tourism and Recreation-Environment, Place and Space, Third Edition, Routledge, London.
3. Robinson H.A. (1976), Geography of Tourism Mac Donald & Evans, ltd,.
4. Travel Information Manual, IATA, Netherlands, 2009.
5. World Atlas.

Lesson Writer

M.Narendra

LESSON 5

MAP READING

OBJECTIVES

After studying this lesson, you should be able

- Practical understanding for implementation of map reading
- To study about the map elements.

Structure

5.1 Latitude
5.2 Longitude
5.3 Equator
5.4 Tropic of Capricorn
5.5 Tropic of Cancer
5.6 Arctic and Antarctic Circle
5.7 Prime Meridian
5.8 International Date Line
5.9 Indian Standard Time
5.10 Map

5.1 LATITUDE

While lines of latitude run across a map east-west, the point of latitude makes the n0rth-south position of a point on earth. Lines of latitude start at 0 degrees at the equator and end a 90 degrees at the North and South Poles. Everything north of the equator is known as the Northern Hemisphere and everything south of the equator is known as the Southern Hemisphere.

Lines of latitude are called parallels and in total there are 180 degrees of latitude. The distance between each degree of latitude is about 69 miles (110 kilometers). The five major parallels of latitudes from north to south are called: Arctic Circle, Tropic of Cancer, Equator, Tropic of Capricorn, and the Antarctic Circle. On a maps where the orientation of the map is

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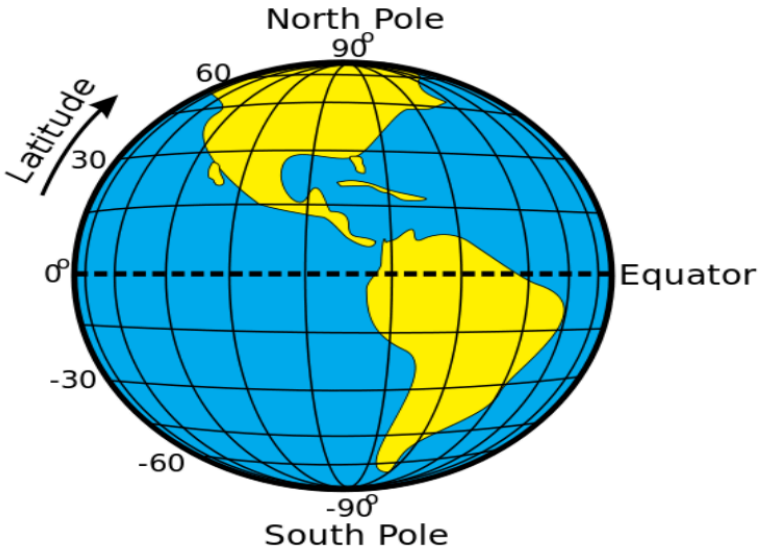
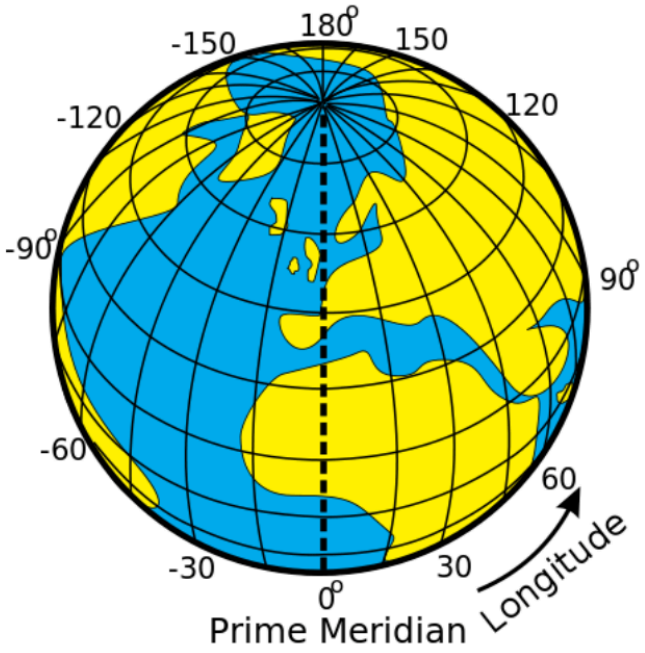
either due north or due south, latitude appears as horizontal lines.



5.2 LONGITUDE

Longitude lines run north-south and mark the position east-west of a point. Lines of longitude are known as meridians. These lines run from pole to pole, crossing the equator at right angles. There are 360 degrees of latitude and the latitude line of 0 degrees is known as the Prime Meridian and it divides the world into the Eastern Hemisphere and the Western Hemisphere (-180 degrees of longitude west and 180 degrees of longitude east).

The distance between longitudes narrows the further away from the equator. The distance between longitudes at the equator is the same as latitude, roughly 69 miles. At 45 degrees north or south, the distance between is about 49 miles (79 km). The distance between longitudes reaches zero at the poles as the lines of meridian converge at that point.



5.3 EQUATOR

The equator divides the earth into the Northern Hemisphere and the Southern Hemisphere is marks the location of 0 degrees latitude. The equator marks the locations on earth that are equidistance from the North and South Poles. The equator crosses 78.7% water and 25.3% land and is about 24,901 miles (40,075 km) long.

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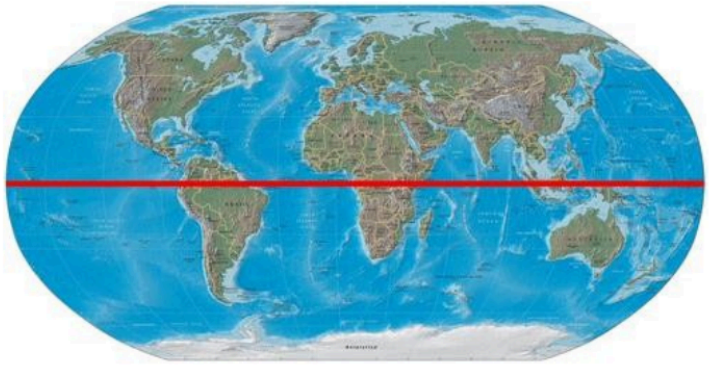

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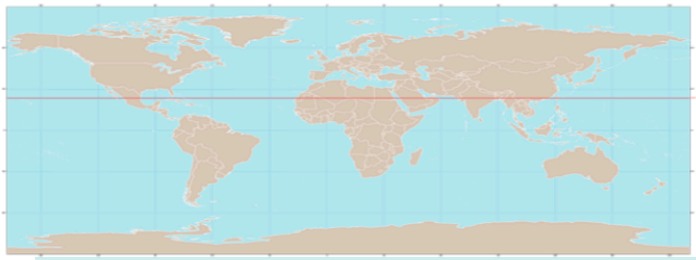
5.4 TROPIC OF CANCER

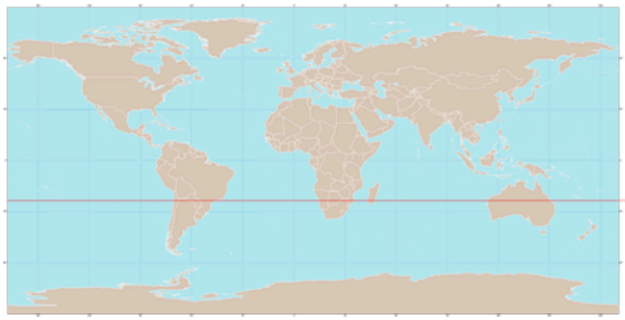
The Tropic of Cancer marks the location where the sun reaches the zenith at this latitude. The exact latitude is not a fixed point and the latest measurement for 2014 is 23° 26′ 14.675″ (23° 26′ 16″). The summer solstice, which occurs on either June 20 or 21 of each year, marks the day on which the sun shines vertically over this parallel.



MAP WITH THE RED LINE MARKING THE TROPIC OF CANCER.

5.5 TROPIC OF CAPRICORN

Moving every year, the Tropic of Capricorn is the parallel line of latitude that is currently located at 23° 26′ 14.440″. The winter solstice, which occurs on either December 21 or 22 of each year, marks the day on which the sun shines vertically over this line.



ON THIS MAP, THE TROPIC OF CAPRICORN IS MARKED WITH A RED LINE.

5.6 ARCTIC AND ANTARCTIC CIRCLES

The Arctic and Antarctic Circles are the parallels of latitude that are roughly 66.5 degrees (66° 33′ 44″ (or 66.5622°). The region above the Arctic Circle, which includes the North Pole, is known as the Arctic. The region south of the Antarctic Circle, which includes the South Pole, is known as the Antarctic.

5.7 PRIME MERIDIAN

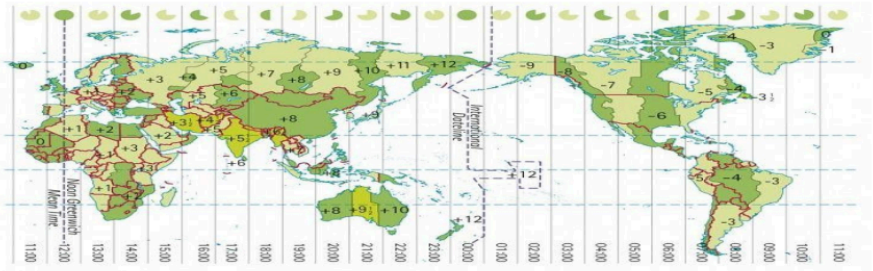
The line of longitude where the degree is zero is known as the Prime Meridian. Passing through the Royal Observatory, Greenwich, England, it is also known as the Greenwich Meridian and divides the earth into two equal halves known as the Eastern Hemisphere and the Western Hemisphere.

5.8 INTERNATIONAL DATE LINE

While the world is divided into 24 time zones, there has to be a place where there is a difference in days, somewhere the day truly "starts" on the planet. The 180° line of longitude is approximately where the International Date Line passes. The time at this longitude is exactly 12 hours from the 00 longitude, irrespective of one travels westward or eastward from the Prime Meridian. We know that time increases east of the Prime Meridian and decreases to its west. Hence, for a person moving east of the Prime Meridian, the time would be 12 hours less than the time at 0° longitude. For another person moving westward, the time would be 12 hours more than the Prime Meridian. For example, a person moving eastward on Tuesday will count the day as Wednesday once the International Date Line is crossed. Similarly, another person starting his journey on the same day, but moving westward will count the day as Monday after crossing the line.

5.9 THE INDIAN STANDARD TIME

THE INDIAN STANDARD TIME is calculated from 82°30'E meridian passing through Mirzapur. Therefore, IST is plus 5.30 hours from the GMT ((82°30' x 4) (60 minutes=5 hours 30 minutes). Similarly, all countries of the world choose the standard meridian within their territory to determine the time within their administrative boundaries. The countries with large eastwest span may choose more than one standard meridian to get more than one time zone such as Russia, Canada and the United States of America. The world is divided into 24 major time zones.



Major time zones of the world

5.10 MAP READING AND CARTOGRAPHY

Map is a diagrammatic or pictorial representation of an area of land, sea showing various features (Political, Physical etc.). Maps represent the spatial features that maps aims to represent. Maps are widely used to understand the political boundaries, roads, rail routes, while features such as economic activities, population, physical resources, drainage, weather, etc. are mainly used by scientists, researchers, officials etc.

Cartography refers to the study of maps and the process of map making. Usually maps are prepared in a flat surface. Different projection methods are used to create maps.

Cartography: It is a combination of two word 'carta' which means map and 'graphy' that is something written or represented in the specified manner, or about a specified subject. In other words, it is an art, technique, or practice of compiling or drawing maps or charts. It is the systematic representation of the Earth or a part of the Earth with its meridians and parallels upon a flat surface. The technology has transform the cartography because before that drawing maps are the only concern and now cartographic process is concerned with data manipulation, data capture, image processing and visual display.

Elements of Map

Scale

It is an expression of ratio of distance in the map. It corresponds to the distance on the earth's surface. When maps are prepared according to scales, it represents the accuracy of the distribution of space.

Legends

To understand the map easily map makers use various symbols. Colours, signs, pictures, diagrams etc. are used to depict information related to rivers, roads rail routes, political boundaries, monuments, etc. various types of graphs and colour pattern are also used to represent the statistical information related to a particular area.

Projections

Projections mean the representation of an area of earth in a paper. As you know, the

shape of the earth is oblate spheroid, when the map is produced there are several issues faced by a map maker. In order to avoid the distortions (angular relationships, correct directional relations along the circle, area, lines, distance) the following types of projections are used. Conic, Cylindrical and Azimuthal.

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Calculation of local time

The world is divided in to 24 time zones. It begins with the Prime Meridian, which is also known as Greenwich Mean Time (GMT). It is also known as Universal Time Coordinated (UTC). Certain countries modify their standard time during the summer by advancing one hour or a fraction of an hour in some areas. This is known as Day Light Saving Time. To know the local time, the following steps may be followed. (Manual)

(a) Find out the GMT (Greenwich Mean Time/Universal TimeCoordinated).

(b) Find the time difference between GMT and localtime

(c) Calculate the local time by adding/deducting the time difference (from GMT) according to the location fromGMT.

e.g.1. Find out the local time of Delhi if the GMT is12:00 hours.

find the local time of Delhi, we should know the time difference from GMT

Indian Standard Time is 5.30 hours ahead of G.M.T. (+5.30)

T he local time at Delhi is 12:00 + 5.30 = 17:30 hours

e.g. 2. Find out the local time of Kingston (Jamaica) if the time at GMT is 12:00 hours

T he standard time of Kingston is 5 hours behind GMT

Hence the local time at Kingston is 12:00 hours – 5 hours =>07:00 hours.

Though various time format can be used, 24 hours clock is used to express time in air and rail travel in India or International Travel as a standard time format.

e.g. 3. The local time at Delhi is 13:45 hours on 05 April 2012, what is the local time at Bangkok.

(Time difference from GMT: Delhi = +5.30 hours, Bangkok =+7 hours)

Local Time at Delhi = 13:45 hrs.

Local Time at Bangkok = 13:45 + 5.30 hrs. (difference of time difference of Bangkok time at Delhi Time)

Therefore local time at Bangkok is 15:15 hours on 05 April 2012, when it is 13:45 hours at

Delhi on 05 April 2012.

e.g. 4. What is the local time at Manama (Bahrain) when the local time at Delhi is 15:30 hours on 06 August 2012.

GMT difference with Manama = + 3.00hrs.

Local time at Delhi = 15:30 hrs. (GMT difference with India = 5.30 hrs.)

Local time at Manama = 5.30 -3.00 = 5.30 hrs (time difference between India and Bahrain is 5.30 hrs.).

Therefore local time at Manama is 14:00 hrs (15:30-5.30) on 06 August 2012 when it is the local time at Delhi is 15:30 hours on the said date.

e.g. 5.what is the local time at Delhi, when it is 08:00 hours in Caracas (Venezuela) on 15 September 2012. (GMT difference = -4 hrs).

GMT difference with Caracas = -4.00hrs.

Indian Standard Time is 5.30 hrs ahead of GMT, while Venezuela standard time is 4 hours behind GMT. Hence, the total time difference between India and Venezuela is 5.30 + 4 = 9.30hours. Therefore the local time at Delhi is 17:30 hours on 15 September 2012, when it is08:00 hours in Caracas (Venezuela) on 15 September 2012.

Elapsed time

Definition

It is the amount of time that passes from the start of an event to its finish. In simple terms, elapsed time is the time that goes by from one time (say 3:15pm) to another (6:25pm). The first thing you always do when solving for elapsed time is to find out your starttime and end time. Here, start time is 3:15 pm and end time is 6:25 pm. Looking at a clock, we know that the next hour to pass after start time 3:15 pm would be 4:00pm. So, counting from 3:15 to 4:00 there are 45 minutes between the two times. Similarly, counting from 6:00pm to 6:25pm, we see that there are 25 minutes between the two times. We have now to count the hours in the middle. We see that there are two hours between 4:00pm and 6:00pm. The final step in finding out our elapsed time is to add together these durations

KEYWORDS

1.Cartography: Cartography is the science and art of map-making. This field of study deals with the conception, production, and study of maps and charts

2.Legends: A map legend or key is a visual explanation of the symbols used on the map.

3.International Date Line: The International Date Line (IDL) is an imaginary line of demarcation on the surface of Earth that runs from the North Pole to the South Pole and demarcates the change of one calendar day to the next.

SELF ASSESSMENTQUESTIONS

1. What is latitude and longitude
2. Define international date line and prime meridian
3. Define map and its elements
4. What is meant by Elapsed Time

FURTHER READINGS

1. Michael hall (1999), Geography of Travel and Tourism, Routledge, London.
2. C. Michael Hall & Stephen J. Page (2006), The Geography of Tourism and Recreation-Environment, Place and Space, Third Edition, Routledge, London.
3. Robinson H.A. (1976), Geography of Tourism Mac Donald & Evans, ltd,.
4. Travel Information Manual, IATA, Netherlands, 2009.
5. World Atlas.

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LESSON 6

GEOINFORMATION SYSTEM

OBJECTIVES

After studying this lesson, you should be able

- To Study Functions Of GIS
- To Understand The Operations Of GIS
- To Know about The Data Models

STRUCTURE

6.1 INTRODUCTION

6.2 HISTORY OF GIS

6.3 GIS OBJECTIVES

6.4 ELEMENTS OF A GIS

6.5 DATA MODELS

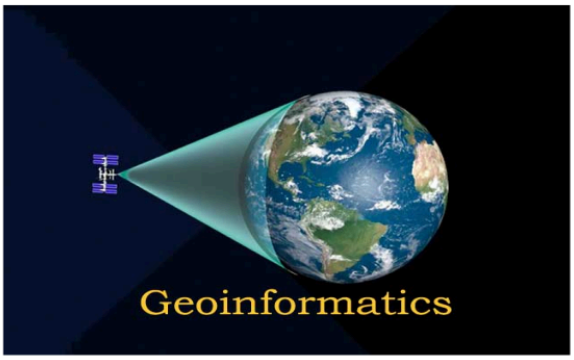
6.6 APPLICATION OF GEOINFORMATICS

6.1INTRODUCTION

Geoinformatics has been described as "the science and technology dealing with the structure and character of spatial information, its capture, its classification and qualification, its storage, processing, portrayal and dissemination, including the infrastructure necessary to secure optimal use of this information "or "the art, science or technology dealing with the acquisition, storage, processing production, presentation and dissemination of geoinformation".

Geomatics is a similarly used term which encompasses geoinformatics, but geomatics focuses more so on surveying. Geoinformatics has at its core the technologies supporting the processes of acquiring, analyzing and visualizing spatial data. Both geomatics and geoinformatics include and rely heavily upon the theory and practical implications of geodesy.

Geography and earth science increasingly rely on digital spatial data acquired from remotely sensed images analyzed by geographical information systems (GIS) and visualized on paper or the computer screen.



6.2 HISTORY OF GIS

The GIS history dates back to 1960 when computer based GIS have been used and their manual procedures were in life 100 years earlier or so. The initial developments originated in North America with the organizations such as US Bureau of the Census, The US Geological Survey and The Harvard Laboratory for computer graphics and Environmental Systems Research Institute (commercial). Canadian Geographic Information Systems (CGIS) in Canada, Natural Experimental Research Center (NREC), Department of Environment (DOE) and other notable organizations in U.K. were involved in early developments. The laboratory for Computer Graphics and Spatial Analysis of the Harvard Graduate School of Design and the State University of New York at Buffalo achieved worldwide recognition. Commercial agencies started to develop and offer GIS software. Among them were today's market leaders ESRI, Intergraph, Laserscan, Autodesk etc.

In India the major developments have happened during the last one- decade with significant contribution coming from Department of Space emphasizing the GIS applications for Natural Resources Management. Notable among them are Natural Resource Information System (NRIS), Integrated Mission for Sustainable Development (IMSD) and Bio-diversity Characterization at National Level. IIRS is also playing a major role in GIS through education and training programs at the National and International level. Recently the commercial organizations in India have realized the importance of GIS for many applications like natural resource management, infrastructure development, facility management, business/market applications etc. and many GIS based projects according to the user organization requirements were developed.

6.3 GIS OBJECTIVES

- ✓ Maximize the efficiency of planning and decision making
- ✓ Provide efficient means for data distribution and handling
- ✓ Elimination of redundant data base – minimized uplication
- ✓ Capacity to integrate information from many sources
- ✓ Complex analysis/query involving geographical referenced data to generate new information.

6.4 ELEMENTS OF A GIS:

The GIS has been divided into four elements. They are hardware, software, data, and liveware. Table-2 gives complete details of different elements.

Table 2: Details of Elements of GIS

S. No.	Elements of GIS	Details
1.	Hardware	Type of Computer Platforms Modest Personnel Computers High performance workstations Minicomputers Mainframe computers Input Devices Scanners Digitizers Tape drivers CD Keyboard Graphic Monitor Output Devices Plotters Printers
2.	Software	Input Modules Editing MRP Manipulation/ Analysis Modules Modeling Capability
3.	Data	Attribute Data Spatial Data Remote Sensing

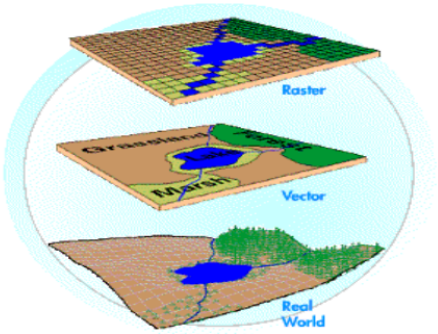
		Data Global Database
4.	Liveware	People responsible for digitizing, Implementing using GIS Trained personnel

6.5DATA MODELS

Conversion of real world geographical variation into discrete objects is done through data models. It represents the linkage between the real world domain of geographic data and computer representation of these features. Data models discussed here are for representing the spatial information.

Data models are of two types: Raster and Vector. In raster type of representation of the geographical data, a set of cells located by coordinate is used; each cell is independently addressed with the value of an attribute. Each cell contains a single value and every location corresponds to a cell. One set of cell and associated value is a LAYER. Raster models are simple with which spatial analysis is easier and faster. Raster data models require a huge volume of data to bestored, fitness of data is limited by cell size and output is less beautiful.

Figure 1 shows vector and raster data representation of the real world phenomena.



Vector data model uses line segments or points represented by their explicit x, y coordinates to identify locations. Connecting set of line segments forms area objects. Vector data models require less storage space, outputs are appreciable, Estimation of area/perimeter is accurate and editing is faster and convenient. Spatial analysis is difficult with respect to writing the software program.

Layers and Coverages

The common requirement to access data on the basis of one or more classes has resulted in several GIS employing organizational schemes in which all data of a particular level of classification, such as roads, rivers or vegetation types are grouped into so called layers or coverages. The concept of layers is to be found in both vector and raster models. The layers can be combined with each other in various ways to create new layers that are a function of the individual ones. The characteristic of each layer within a layer-based GIS is that all locations with each layer may be said to belong to a single Arial region or cell, whether it be a polygon bounded by lines in vector system, or a grid cell in a Raster system. But it is possible for each region to have multiple attributes. The Figure 2 shows layers and coverage concept in GIS.

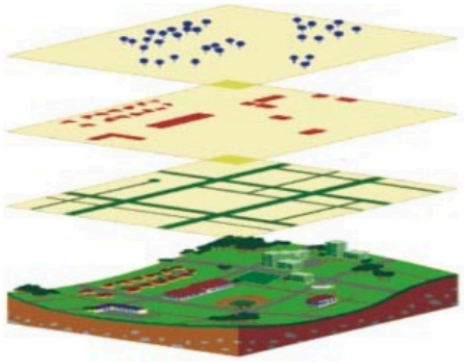


Figure 2: Layers and Coverage concept in GIS

Data Structures

There are number of different ways to organize the data inside the information system. The choice of data structure affects both Data storage volume and processing efficiency. Many GIS software's have specialized capabilities for storing and manipulating attribute data in addition to spatial information. Three basic data structures are – Relational, Hierarchical and Network.

Relational data structure organizes the data in terms of two-dimensional tables where each table is a separate file (Table 3). Each row in the table is a record and each record has a set of attributes. Each column in the table is an attribute. Different tables are related through the use of a common identifier called KEY.

6.6 APPLICATION OF GEOINFORMATICS

1. It is used for urban planning and land use management.
2. It is used for car navigation.
3. It is used for creating virtual globes.
4. It is used for environmental modelling and analysis.
5. It is used in agriculture, meteorology and to study the climate change.
6. It is used for oceanography and atmosphere modelling.
7. It is used in telecommunications, criminology and crime simulation.
8. It is used in aviation, biodiversity conservation and maritime transport.
9. It is used in disaster risk management.

KEY TERMS

1.**Geo informatics** :Geoinformatics is the science and the technology which develops and uses information science infrastructure to address the problems of geography, cartography, geosciences and related branches of science and engineering.

Data Structures: There are number of different ways to organize the data inside the information system.

SELF ASSESSMENT QUESTIONS

1.Define Geo-information System

2.What Are the Applications Of GIS

3. What are the elements of GIS

FURTHER READINGS

1. Michael hall (1999), Geography of Travel and Tourism, Routledge, London.
2. C. Michael Hall & Stephen J. Page (2006), The Geography of Tourism and Recreation-Environment, Place and Space, Third Edition, Routledge, London.
3. Robinson H.A. (1976), Geography of Tourism Mac Donald & Evans, ltd,.
4. Travel Information Manual, IATA, Netherlands, 2009.
5. World Atlas.

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LESSON 7

BASIC CONCEPTS OF REMOTE SENSING

OBJECTIVES

After studying this lesson, you should be able

- To understand the working of Remote Sensing
- To know about the passive/active Remote Sensing

STRUCTURE

7.1 Introduction
7.2 Electromagnetic Energy
7.3 Principles of Remote Sensing
7.4 Main stages in remote sensing
7.5 Passive/ Active Remote Sensing
7.6 Remote Sensing Platforms
7.7 Ideal Remote Sensing System
7.8 Characteristics of Real Remote Sensing Systems

7.1 INTRODUCTION

Remote sensing is an art and science of obtaining information about an object or feature without physically coming in contact with that object or feature. Humans apply remote sensing in their day-to-day business, through vision, hearing and sense of smell. The data collected can be of many forms: variations in acoustic wave distributions (e.g., sonar), variations in force distributions (e.g., gravity meter), variations in electromagnetic energy distributions (e.g., eye) etc. These remotely collected data through various sensors may be analyzed to obtain information about the objects or features under investigation. In this course we will deal with remote sensing through electromagnetic energy sensors only.

Thus, remote sensing is the process of inferring surface parameters from measurements of the electromagnetic radiation (EMR) from the Earth's surface. This EMR can either be reflected or emitted from the Earth's surface. In other words, remote sensing is detecting and measuring electromagnetic (EM) energy emanating or reflected from distant objects made of various materials, so that we can identify and categorize these objects by class or type, substance and spatial distribution [American Society of Photogrammetry,1975].

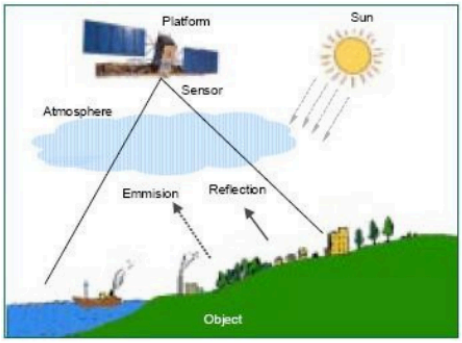

Fig. 1. Schematic representation of remote sensing technique (Source: http://geoportal.icimod.org)

Remote sensing provides a means of observing large areas at finer spatial and temporal frequencies. It finds extensive applications in civil engineering including watershed studies, hydrological states and fluxes simulation, hydrological modeling, disaster management services such as flood and drought warning and monitoring, damage assessment in case of natural calamities, environmental monitoring, urban planning etc.

Basic concepts of remote sensing are introduced below.

7.2.1 ELECTROMAGNETIC ENERGY

Electromagnetic energy or electromagnetic radiation (EMR) is the energy propagated in the form of an advancing interaction between electric and magnetic fields (Sabbins, 1978). It travels with the velocity of light. Visible light, ultraviolet rays, infrared rays, heat, radio waves, X-rays all are different forms of electro-magnetic energy.

7.3 PRINCIPLES OF REMOTE SENSING

Different objects reflect or emit different amounts of energy in different bands of the electromagnetic spectrum. The amount of energy reflected or emitted depends on the properties of both the material and the incident energy (angle of incidence, intensity and wavelength). Detection and discrimination of objects or surface features is done through the uniqueness of the reflected or emitted electromagnetic radiation from the object.

7.4 MAIN STAGES IN REMOTE SENSING ARE THE FOLLOWING.

A. Emission of electromagnetic radiation

- The Sun or an EMR source located on the platform

B. Transmission of energy from the source to the object

- Absorption and scattering of the EMR while transmission

C. Interaction of EMR with the object and subsequent reflection and emission

D. Transmission of energy from the object to the sensor

E. Recording of energy by the sensor

- Photographic or non-photographic sensors

F. Transmission of the recorded information to the ground station

G. Processing of the data into digital or hard copy image

H. Analysis of data

These stages are shown in Fig. 3.

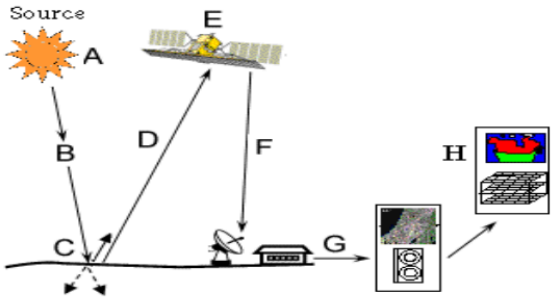

Fig.3 Important stages in remote sensing

7.5 PASSIVE/ ACTIVE REMOTE SENSING

Depending on the source of electromagnetic energy, remote sensing can be classified as passive or active remote sensing.

In the case of passive remote sensing, source of energy is that naturally available such as the Sun. Most of the remote sensing systems work in passive mode using solar energy as the source of EMR. Solar energy reflected by the targets at specific wavelength bands are recorded using sensors onboard air-borne or space borne platforms. In order to ensure ample signal strength received at the sensor, wavelength / energy bands capable of traversing through the atmosphere, without significant loss through atmospheric interactions, are

generally used in remote sensing

Any object which is at a temperature above 0^{o}K (Kelvin) emits some radiation, which is approximately proportional to the fourth power of the temperature of the object. Thus the Earth also emits some radiation since its ambient temperature is about 300^{o} K. Passive sensors can also be used to measure the Earth's radiance but they are not very popular as the energy content is very low.

As a simple analogy, passive remote sensing is similar to taking a picture with an ordinary camera whereas active remote sensing is analogous to taking a picture with camera having built-in flash (Fig. 5).

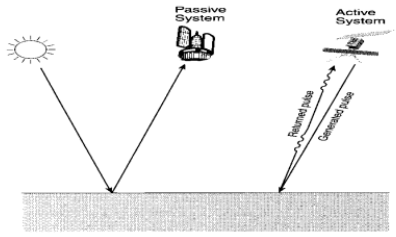

Fig. 5 Schematic representation of passive and active remote sensing

7.6 REMOTE SENSING PLATFORMS

Remote sensing platforms can be classified as follows, based on the elevation from the Earth's surface at which these platforms are placed.

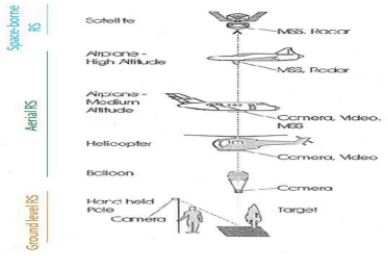

Fig. 6. Remote sensing platforms

(Modified from http://www.ilmb.gov.bc.ca/risc/pubs/aquatic/aerialvideo/assets/figure1.gif)

7.6.1 IDEAL REMOTE SENSING SYSTEM

The basic components of an ideal remote sensing system include:

i. A Uniform Energy Source which provides energy over all wavelengths, at a constant, known, high level ofoutput

ii. A Non-interfering Atmosphere which will not modify either the energy transmitted from the source or emitted (or reflected) from the object in any manner.

iii. A Series of Unique Energy/Matter Interactions at the Earth's Surface which generate reflected and/or emitted signals that are selective with respect to wavelength and also unique to each object or earth surface feature type.

iv. A Super Sensor which is highly sensitive to all wavelengths. A super sensor would be simple, reliable, accurate, economical, and requires no power or space. This sensor yields data on the absolute brightness (or radiance) from a scene as a function of wavelength.

v. A Real-Time Data Handling System which generates the instance radiance versus wavelength response and processes into an interpretable format in real time. The data derived is unique to a particular terrain and hence provide insight into its physical- chemical-biological state.

vi. Multiple Data Users having knowledge in their respective disciplines and also in remote sensing data acquisition and analysis techniques. The information collected will be available to them faster and at less expense. This information will aid the users in various decision making processes and also further in implementing these decisions.

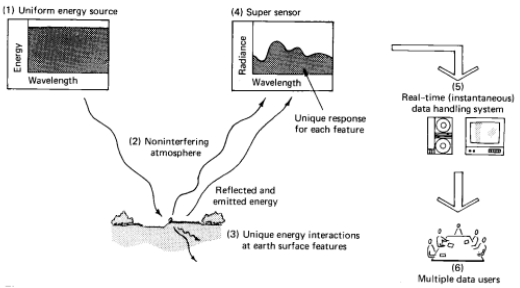

Fig. 7 Components of an ideal remote sensing system

7.6.2 CHARACTERISTICS OF REAL REMOTE SENSING SYSTEMS

Real remote sensing systems employed in general operation and utility have many shortcomings when compared with an ideal system explained above.

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i. Energy Source: The energy sources for real systems are usually non-uniform over various wavelengths and also vary with time and space. This has major effect on the passive remote sensing systems. The spectral distribution of reflected sunlight varies both temporally and spatially. Earth surface materials also emit energy to varying degrees of efficiency. A real remote sensing system needs calibration for source characteristics.

ii. The Atmosphere: The atmosphere modifies the spectral distribution and strength of the energy received or emitted (Fig. 8). The effect of atmospheric interaction varies with the wavelength associated, sensor used and the sensing application. Calibration is required to eliminate or compensate these atmospheric effects.

iii. The Energy/Matter Interactions at the Earth's Surface: Remote sensing is based on the principle that each and every material reflects or emits energy in a unique, known way. However, spectral signatures may be similar for different material types. This makes differentiation difficult. Also, the knowledge of most of the energy/matter interactions for earth surface features is either at elementary level or even completely unknown.

iv. The Sensor: Real sensors have fixed limits of spectral sensitivity i.e., they are not sensitive to all wavelengths. Also, they have limited spatial resolution (efficiency in recording spatial details). Selection of a sensor requires a trade-off between spatial resolution and spectral sensitivity. For example, while photographic systems have very good spatial resolution and poor spectral sensitivity, non-photographic systems have poor spatial resolution.

v. The Data Handling System: Human intervention is necessary for processing sensor data; even though machines are also included in data handling. This makes the idea of real time data handling almost impossible. The amount of data generated by the sensors far exceeds the data handling capacity.

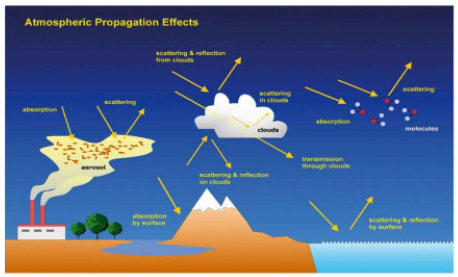

Fig. 8. Interactions of the electromagnetic energy with the atmosphere (Source: https://earth.esa.int/)

KEYWORDS

1. Remote Sensing: the scanning of the earth by satellite or high-flying aircraft in order to obtain information about it
2. Active RemoteSensing: Active sensors, provide their own source of energy to illuminate the objects they observe
3. ElectromagneticEnergy:Electromagnetic energy is a form of energy that is reflected or emitted from objects in the form of electrical and magnetic waves that can travel through space.

SELF ASSESSMENTQUESTIONS

1.Define remote sensing?

2.what are the Characteristics of Real Remote Sensing Systems?

3.what is active remote sensing?

FURTHER READINGS

1. Michael hall (1999), Geography of Travel and Tourism, Routledge, London.
2. C. Michael Hall & Stephen J. Page (2006), The Geography of Tourism and Recreation-Environment, Place and Space, Third Edition, Routledge, London.
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4. Travel Information Manual, IATA, Netherlands, 2009.
5. World Atlas.

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Lesson – 8

PHYSICAL GEOGRAPHY OF INDIA

8.0 Objectives

After studying this lesson, you should be able to:

- To give basic knowledge about physical geography of India
- To learn the geographical features in India
- To understand the various geographical based products

Structure:

8.1 Introduction

8.2 Physical geography of India

8.3 Geography Based Products

8.4 Keywords

8.5 Self-Assessment Questions

8.6 Further Readings

8.1 INTRODUCTION

The term "GEOGRAPHY" was first coined by "ERATOSTHENES", Greek scholar, who lived between 276-194BC. In the Greek language 'GEO' means EARTH and 'GRAPHOS' mean DESCRIPTION. When these two words clubbed, it gives the Earth, whose age is 4600 millions of years as per the "BIG BANG THEORY".

We the human beings along with flora and fauna live on the surface of the planet Earth in many ways the life of both flora and fauna are affected by our surroundings. The entire living beings depend on the natural resources for their existence in the surrounding areas on the earth which is home to live along with other creatures, whether big and small. The planet earth's shape is oval and its surface is not uniform with variations in its physical features.

India having rich geographically features, which are mountains, plains, plateaus, hills, valleys, Coastal regions, islands, seas, lakes, rivers, deserts, and forests. So yes, these are the physical geography features of our country. Geography gives us insight into how physical features and living things develop in the past. India is the seventh-largest country in the world, with a total area of 3,287,263 square kilometers.

8.2 India- Physical Geography of India

The physical geography shows and explains the physical features of the terrain and it covers the landscapes. India can be divided into different physical divisions. They are:

a) Mountains
b) North Indian Plain
c) Peninsular Plateau
d) Coastal regions
e) Islands
f) Seas
g) Lakes
h) Hills
i) Valleys
j) Deserts
k) forests

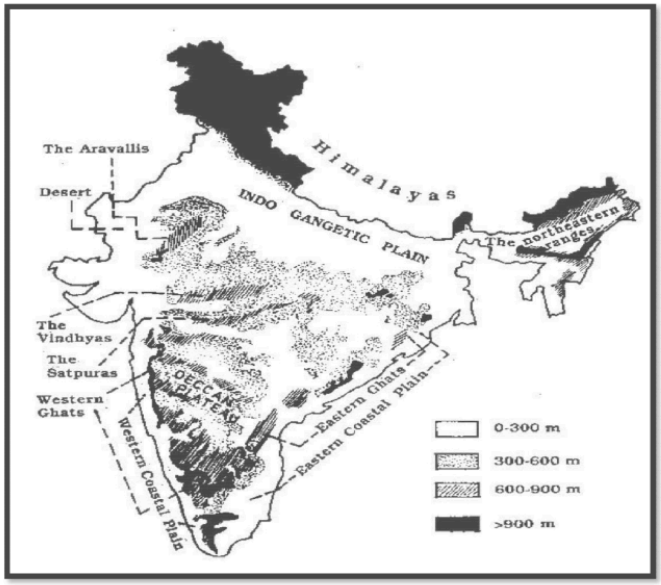

Fig -13.1 Physical Geography of India

A. **Mountains**

The Himalayan Mountains are located in the northern region of India. These mountain ranges start from the Pamir Knot in the west and extend up to Purvanchal in the east. They extend over 2,500 km. These Mountains have been formed during different stages of the continental drift of the Gondwanaland mass. The Himalayan

Mountains are covered with snow. The Himalayan Mountains are divided into 3 major ranges.

a) **The Greater Himalayas** – The Greater Himalayas is also known as Himadri Range. The Average height of Greater Himalayas is 6000 meters. Mount Everest is the highest mountain in the world. Above 8,000 meters (26,000 ft.) elevation, there is not enough oxygen. This Mountain zone is known as the "death zone". The rainy season of this region is June to September. In this Region, the Rainfall has varied from 100 CM to 200 cm. In Greater Himalayas Region the trees are found only up to a height of 10,000 ft. Sal, Pine, Sagwan, Fir, and Sir are the major types of trees found in this region.

Some of the Important Mountains in Greater Himalayan Range

- **Mount Everest** – The Mount Everest is the "Tallest mountain." in the World. The Height of Mount Everest is 29,029 ft. (8,848 m) above the sea surface. The Mount Everest has various names such as Chomolungma in Tibet and Sagarmatha in Nepal. In 1841, Mount Everest has been discovered by George Everest, a Surveyor General of India. In 1865, Everest was given its official English name of the Royal Geographical Society, upon a recommendation by Andrew Waugh, the British Surveyor General of India. The mountain lies on the borders of Nepal, India, and Tibet.
- **Karakoram (K2) -** K2 Mountain is the second - highest mountain in the world, the height of this mountain is 8,611 m (28,250 ft.) above sea level. K2 Mountain has initially discovered by the British photographer and voyager, Henry Godwin-Austen. It is also known as Mount Godwin-Austen or "Chhogori", K2 Mountain is located in the Karakoram Range. The K2 Mountain is first used by the Great Trigonometrical Survey of British India. Thomas Montgomerie has made the first survey of the Karakoram Range.
- **Kangchenjunga** – The Kangchenjunga Mountain is the third highest mountain in the world. The height of this mountain is 8,586 m (28,169 ft.) above sea level. The official spelling "Kangchenjunga" is adopted by **Douglas Freshfield,** and **Alexander Mitchell Kellas**. The Royal Geographical Society has given the best indication of the Tibetan pronunciation. This Mountain has a number of alternative spellings like Kangchendzönga, Khangchendzonga, and Kanchenjunga. The brothers Hermann, Adolf and Robert Schlagintweit explained the local name the meaning of **'Kanchinjínga'** in the Tibetan language is "**The five treasures of the high**

snow"."**[kaŋ] Gangs**" pronounced meaning **snow, ice**; **"[tœn]Chen"** pronounced meaning **great**; "**mzod**" meaning **treasure**; "**lnga**" meaning **five.**

b) The Lesser Himalayas

The Lesser Himalayas is also known as Himachal. The Average height of Lesser Himalayas is 3500 – 4500 meters. These Lesser Himalayas are extending into the south to the Shivalik range. The valleys & hill stations are located in this Himachal range. The important hill stations are located in lesser Himalayas, like Darjeeling, Almora, Nainital, Shimla, and Mussourie. These hill stations are the best tourist spots in India. Heavy Snowfall observed in these areas between the months of December to February. During summers, the temperature remains between 18 °C to 20 °C. The Rainy season off in this region in July, the rainfall is up to 150 cm.

c) The Outer Himalayas or Siwalik

The Siwalik Ranges average height is (1,000 to 1,500 meters) above sea level. The Siwalik region is a chain of low-lying hills formed through fluvial deposits like sand, clay, and pebbles. The rainy season of this region is June to September. In this Region, the Rainfall varies 150 cm to 220 cm. Siwalik ranges contain Dehradun valley, Udhampur valley, and Kotli valley. During the summer, the temperature varies from 28 °C to 33 °C and winter temperature varies from 4 °C to 9 °C.

B. North Indian Plain

The North Indian plain is situated between the Himalayan Mountains in the north and the peninsular plateau in the south and is formed by the alluvium plains dominated by three main rivers, the Indus, Ganges, and the Brahmaputra along with their main tributaries. The total area of this plain is 700,000 km2 (270,000 sq mi). This Plain is a very fertile land for Agriculture and it is the main occupation of the people. Many perennial rivers flow across the plain. In this plain the land is very flat; it is easy to construct irrigation canals. In this plain transportation facilities are excellent; this is very helpful to establish the industries. 40% of the total population of India live here and it is called "The heart of India".

C. Peninsular Plateau

The Peninsular Plateau is the largest physical division in the Indian subcontinent. It is formed by the hard rocks. The Narmada rift valley has divides the peninsular plateau into two separate parts. They are the Malwa plateau and the Deccan plateau. The total area of Peninsular Plateau is 7, 05,000 sq. km. The Malwa plateau is situated by the Aravalli hills in the north-west and the Vindhya Mountains in the south. Mt. Guru

Shikhar is the highest peak on the Aravallis hills. The Malwa plateau slopes towards the Gangetic Plain. The Deccan plateau is surrounded by the Satpura hills, the Mahadeo hills, the Maikala range, the Amarkantak hills and the Rajmahal hills in the north and the Western Ghats in the west and the Eastern Ghats in the east. The Western Ghats and the Eastern Ghats meet in the Nilgiri hills. The Peninsular plateau has more economic importance because of its rich mineral resources and many rivers located in this region. These rivers very help to the generation of hydroelectric power. The plateau is also suitable for the cultivation of cotton and the dense forests are the home of many wild animals.

D. **Coastal Plains**

India has a long coastal line. India's total coastline is 7516.6 km, out of which mainland coastline is 6100 km and islands' coastline is 1197 km. Indian coastline has touches nine states and four union territories. The Coastal Plains extends from Gujarat in the west to the Gangetic delta in the east. The Indians Coastal Plains are divided into Western coast and Eastern coastal plains. The western coastal plain lies between the Western Ghats and the Arabian Sea. The western coastal plain is Located between the Kutch in the north to Kanyakumari in the south, with a length of about 1,500 km. The western coastal plain is divided into the Malabar Coast, Karnataka Coast, Konkan Coast, and Gujarat coast. The coastline is straight and affected by the South-West Monsoon winds over a period of six months. This coastal plain having harbors like Mumbai (INBOM), Mormugao (INMRM), Cochin (INCOK), Mangalore (INIXE), Karwar (INKRW), Nhava Sheva (INNSA) and Kandla (INIXY) are the important ports on the West Coast. The Eastern coast extends from Kanyakumari to the Gangetic delta and between the Eastern Ghats and the Bay of Bengal. The Eastern coast consists of the deltas of rivers Mahanadi, Godavari, Krishna and Kaveri. This Coast has some saltwater lakes like Chilka Lake of Orissa and Pulicat Lake of Tamilnadu. The Eastern Coast has been divided into 2 parts. They are Coromandel Coast in the south and the Utkal coast in the north. The coastal regions are very useful for agriculture, trade, industrial centers, tourist centers, fishing and salt making. These coastal plains play a very important role in the economic development of India's GDP.

E. **Islands**

An island is any piece of sub-continental land that is surrounded by water. The distinctiveness of the island lies in its beautiful silvery beaches, marine life

flourishing with rare species of plants, animals and corals, meandering mangrove-lines creeks and the tropical evergreen rain forests. India subcontinent consists of 615 islands. Out of these 572 islands are located in the Bay of Bengal and the remaining 43 islands are located in the Arabian Sea. Apart from these, some coral islands located in the Gulf of Mannar and Khambat regions.

The Andaman and Nicobar Islands located in the Bay of Bengal ocean, these islands formed in the narrow chain to the north-south direction extending between 6 39 N and 14 34 N. The Major islands in the Andaman and Nicobar, they are

i. North Andaman
ii. Middle Andaman
iii. South Andaman
iv. Little Andaman
v. Car Nicobar
vi. Little Nicobar
vii. Great Nicobar

Port Blair is the administrative capital of the Andaman and Nicobar Islands; it is located in South Andaman. The Andaman and Nicobar Islands are also known as the Emerald Islands. The Andaman and Nicobar Islands in the Bay of Bengal consist of hard volcanic rocks.

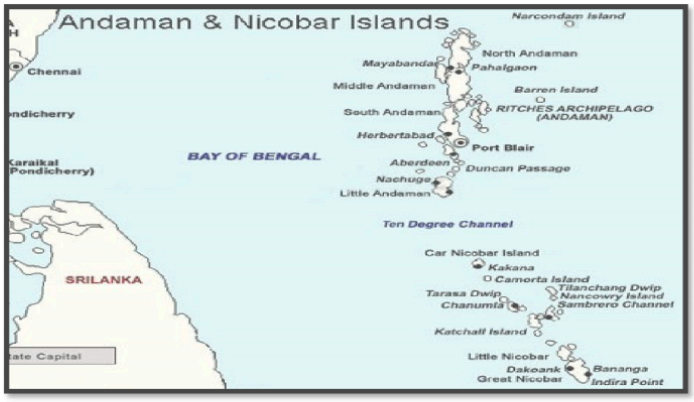

Fig -13.2 Andaman and Nicobar Islands

Source - https://www.usgs.gov/countries-and-continents/india

Lakshadweep Islands Located in the Arabian Sea, It is a group of 36 islands and has a total land area of 32 square kilometers and extending between 8 N and 12 N latitude.

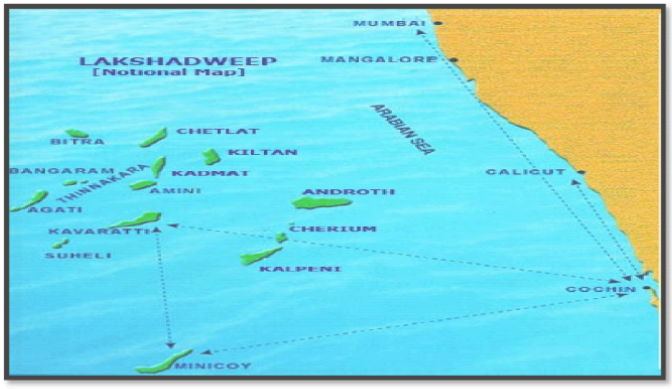

Fig -3.3 Lakshadweep Islands

Source - https://www.usgs.gov/countries-and-continents/india

It is recognized as the union territory of India Subcontinent. In Sanskrit, Lakshadweep means "Hundred Thousand Islands".True to its name, these islands are very picturesque and provide a true vacation for those who love beaches, water sports and verities of marine food. This union territory was formed on November 1st, 1956. The Lakshadweep Islands, the state animal is the butterfly-fish; the state bird is the sooty tern and the state tree is breadfruit. These Islands more languages spoken i.e Malayalam, Hindi, Mahi, and Tamil.Kavaratti is the administrative capital of the Lakshadweep Islands. Lakshadweep islands in the Arabian Sea are formed by corals.

'Lakshadweep' is a group of beautiful islands, located some 400km off India's west coast into the Arabian Sea. The islands, though all are equally mystical and beautiful, each offers a unique blend of tourist places. Some islands have been promoted for diving and water sports; still, others have been developed, So that people enjoy the charm of relaxation and natural enjoyment with such Islands.

Famous Islands in India

Havelock Island – HavelockIsland is famous island in Andaman. Spread in an area of 113 sq. km. and located 39 km of north-east of Port Blair, Havelock Island offers a perfect beach vacation in Andaman. The white sand beaches of this congenial and

imposing island are fringed with rain-fed forests making them quite beautiful destinations to see in India. Famous Radhanagar Beach and Elephant Beach are also part of Havelock Island.

Neil Island – Located30 km southwards of the Andaman Islands, Neil Island is treated as a tiny gem. It has several allures and thus is known as one of the best Islands in Andaman and Nicobar Islands. On the Northeast side of Port Blair, Neil Island is the Vegetable bowl of Andaman, owing to the farming practices that take place there. Some of such attractions in Neil Island are impressive bio-diversity, unexplored coral reefs, lush tropical forests and clean white sandy beaches. It has some wonderful beaches, ideal for leisure as well as adventure tourists.

Examples of Islands

- Havelock Island – Andaman
- Neil Island – Andaman
- Barren Island – Andaman
- Narcondam Island – Andaman
- Great Nicobar Island – Nicobar
- Minicoy – Lakshadweep
- Agatti Island – Lakshadweep
- Bhavani Island – Vijayawada, Andhra Pradesh
- Hope Island– Kakinada, Andhra Pradesh
- Chorao – Goa

8.3 Geography Based Products

Geography means to study the nature and relative arrangement of places and physical features on the surface of the planet earth. They are –

I. Lakes
II. Waterfalls.
III. Mangroves
IV. Caves
V. Beaches
VI. Valleys
VII. Deserts
VIII. Wildlife sanctuaries
IX. National parks
X. Forests (see the 15th lesson)

XI. Rivers (See the 14th lesson)

XII. Mountains – (See the 13.2)

I. Lakes

Lakes are valued as natural water sources and for fishing, water transport, recreation, and tourism. Six major types of lakes are found in India, as follows -

i. **Tectonic Lakes** – lakes formed by the deformation and resulting lateral and vertical movements of the Earth's crust. Examples: Wular lake (Jammu and Kashmir), Kummaon lake (Uttarakhand)

ii. **Volcanic lakes -** Lakes formed from volcanic explosive activities or collapse during a volcanic eruption. Examples: Lunar lake(Maharashtra)

iii. **Lagoon Lakes** – Lagoons formed by spits and bars in coastal areas. These are called as lagoon lakes. Examples: Chilika Lake (Orissa), Pulicat (Tamilnadu) and Kolleru (AP)

iv. **Glacial Lake** – A glacial lake is a body of water with origins from glacier activity.Example: Khurpatal Lake (Uttarakhand), Malwa Tal (Uttarakhand).

v. **Other lakes** – Dal Lake (Kashmir), Udaisagar (Rajasthan), Hussain Sagar (Telangana), Loktok (Manipur), Vembanad (Kerala).

II. Waterfalls

India having numerous majestic waterfalls. These scintillating cascades are famous picnic spots and excursion destinations round the year and forever.

Types of Waterfalls:

i. **Block**: Water descends from a relatively wide stream or river.

ii. **Cascade**: Water descends a series of rock steps.

iii. **Cataract**: A large, powerful waterfall.

iv. **Chute:** A large quantity of water forced through a narrow, vertical passage.

v. **Fan:** Water spreads horizontally as it descends while remaining in contact with bedrock.

vi. **Frozen**: Any waterfall which has some element of ice.

vii. **Horsetail:** Descending water maintains some contact with bedrock.

viii. **Plunge:** Water descends vertically, losing contact with the bedrock surface.

ix. **Punchbowl:** Water descends in a constricted form and then spreads out in a wider pool.

x. **Segmented:** Distinctly separate flows of water form as it descends.

xi. **Tiered:** Water drops in a series of distinct steps or falls.

xii. **Multi-stepped:** A series of waterfalls one after another of roughly the same size each with its own sunken plunge pool.

Examples

i. Dudhsagar Waterfall – Goa
ii. Jog Waterfall – Karnataka
iii. Nohsngithiang Waterfall – Meghalaya
iv. Thoseghar Waterfall – Maharashtra
v. Athirappilly Waterfall – Kerala
vi. Courtallam Waterfall – Tamil Nadu
vii. Talakona Waterfall – Andhra Pradesh
viii. Khandadhar Waterfall – Orissa
ix. Chitrakot Waterfall – Chhattisgarh
x. Dhuandhar Waterfall – Madhya Pradesh

III. Mangroves

These are the Salt –tolerant ecosystems that found mainly tropical, sub-tropical areas. A mangrove is a small tree that grows in coastal saline or brackish water. The term is also used for tropical coastal vegetation consisting of such species. The mangrove biome is a distinct saline woodland or shrub land habitat characterized by depositional coastal environments, Mangroves Forest is the home of low and medium height of various types of trees. The swamps protect coastal areas of India and home to so many species of Aquatic Birds, Water Animals and Reptiles.

Examples

i. Sundarbans – West Bengal
ii. Bhitarkanika Mangroves, Odisha
iii. Godavari – Krishna Mangroves, Andhra Pradesh
iv. Pichavaram Mangroves, Tamil Nadu
v. Baratang Island Mangroves, Andaman

IV. Caves

Caves as natural resources can be great potential for tourism development and in return increase the growth of the economy of its host residents as well as help the government to achieve environmental awareness and environmental education and protecting the environment.

Caves are reflecting at our wonderful past, there are many caves in India that is worth exploring. The caves that reflects the rich culture and tradition of India. Cave tourism

is becoming increasingly important to tourism development and as such tourists are motivated to visit caves for its inherent natural landscape features. Caves are part of nature or ecotourism that is capable of attracting tourists from different parts of the world. These natural landscapes are found fascinating and valuable to tourists. Tourist visits caves for recreation, education, and sometimes for adventure and People who explore caves often wear battery powered headlamps and sometimes torch lights.

Famous Caves in India

- Elephant Island Caves, Mumbai
- Badami Caves, Karnataka
- Ajanta and Ellora Caves, Aurangabad
- Dungeshwari Cave Temples, Bihar
- Khandagiri Caves, Odisha
- Carla Caves, Maharashtra
- Borra Caves, Vishakhapatnam, Andhra Pradesh
- Belum caves, Kurnool, Andhra Pradesh
- Bhimbetka Cave, Madhya Pradesh
- Koteshwar Temple Cave, Uttarakhand
- Varah Caves, Tamil Nadu

V. Beaches

India is gifted with some of the best beaches in the world spread across the coastal lines of Southern India. Coastal areas of India- Bay of Bengal in east and Arabian Sea in the west with the length of 7,517 km endowed by the nature. Beaches are one of the best creations of nature. India has a very rich culture in terms of beaches, natural beauty and landscapes. Beaches are perfect for the honeymoon couples to enjoy their happy moments in a very cheerful manner with nature. Beaches are very much useful for sun bath for capture of Vitamin D to the tourists without paying any amount to nature. The sun provides abundant amount of Vitamin D on free of cost.

Beach Activities

i. Sun Bath
ii. Sports- Beach Volleyball etc.
iii. Adventure Activates - Scuba Diving, Banana Boat Rides, Dinghy Sailing, Parasailing, Wind Surfing, Water Skiing etc.
iv. Eateries - Marine food
v. Spa

vi. Shopping

Examples of Beaches -

i. Agonda Beach –Goa
ii. Baga Beach – Goa
iii. Marina Beach –Tamilnadu
iv. Elliot's Beach – Tamilnadu
v. Radhanagar Beach – Andaman Nicobar Island
vi. Bangaram beach - Lakshadweep islands
vii. Rama Krishna Beach –Andhra Pradesh
viii. Rushikonda Beach – Andhra Pradesh
ix. Puri Beach – Orissa
x. Kovalam Beach –Kerala

VI. Valleys

The valleys of India constitute a great wonderland for tourists across the world who is seeking a dose of adventurous sports. These valleys having low density, snow-capped peaks and pervading Monastery and Temples make together amazing locations to be hankered. Valleys, forming wonderful natural beauty of India, appeal large number of fun-loving and adventure seeking people, and captivate them with their innate natural beauty.

Types of Valleys

River Valley: A river valley is formed by the erosive action of water flowing over the land. These valleys are usually V-shaped with steep walls. If a river valley becomes particularly deep, it's often referred to as a canyon or gorge.

Glacial Valley: During the Pleistocene Era, glaciers covered huge areas of North America. As these walls of ice moved across the landscape, they carved out valleys similar to how a bulldozer might dig a trench. Because of the breadth and weight of glaciers, these valleys are wider and have flat bottoms with a contour similar to a 'U' shape.

Flat-Floored Valley: The most common type of valley in the world, most flat-floored valleys began their existence as either a river or glacial valley. Over time, rivers and streams spread across the valley, persistently eroding its edges while levelling out its bottom. The result is a flattened contour characterized by many slow-moving waterways

Famous valleys in India

i. Kashmir Valley – Jammu & Kashmir
ii. Kangra Valley – Himachal Pradesh
iii. Sutlej Valley – Punjab
iv. Dibang Valley – Arunachal Pradesh
v. Ketti Valley – Ooty, Tamilnadu
vi. Valley Of Flowers – Uttarakhand
vii. Spiti Valley – Himachal Pradesh
viii. Chambal Valley – Madhya Pradesh
ix. Yumthang Valley – Sikkim
x. Silent Valley – Kerala
xi. Araku Valley – Andhra Pradesh
xii. Dzukou Valley – Nagaland

VII. Deserts

Deserts in India are mainly spread over the States of Rajasthan and Southern portion of Gujarat and Punjab. Their eloquent history and never changing dynamics have surely a catch of eye among sightseers around the globe. World famous Thar Desert is spread over huge area of more than 200,000 km2 (77,000 sq. mi.). It is one of the very important tourist places in India.

Thar Desert

Thar Desert extends into two states of North West India (Rajasthan and Gujarat) and in the eastern region of the neighbouring country, Pakistan also. The desert is bordered by Indus and Sutlej River in the west and the Aravalli ranges in the east. The alluvial plains of Haryana and Punjab occupy the northern region. Thar Desert in India fascinates tourists by giving an amazing evergreen opportunity to enjoy its world famous Camel Safari. 'Thar Desert' is also known as the Great Indian Desert.

VIII. Wildlife Sanctuaries

Wildlife sanctuaries are established by (The International Union for Conservation of Nature) IUCN under category IV protected areas. India has 543 wildlife sanctuaries. Wildlife sanctuaries which are protected habitats for local plants and animal species. Wildlife sanctuaries give them a safe place to live naturally. Wildlife sanctuaries preserve nature, biodiversity, and threatened species. Project Tiger is a wildlife conservation program has been administrated by National Tiger Conservation

Authority in India since 1973. Project Tiger program is specially started for the protection of Bengal Tigers in India.

Examples of Wildlife sanctuaries

- Bhadra Wildlife Sanctuary (Karnataka)
- Chinnar Wildlife Sanctuary (Kerala)
- Jaldapara Wild life Sanctuary (West Bengal)
- Mudumalai Wild life Sanctuary (Tamilnadu)
- Palamau Wild life Sanctuary (Bihar)
- Anaimalai Wild life Sanctuary (Tamilnadu)
- Vedanthagal Birds Sanctuary (Tamilnadu)
- Krishna wildlife Sanctuary (Andhra Pradesh)

IX. National Parks

A national park (IUCN Category II) is similar to a wildlife area in its size and its main objective of protecting, functioning ecosystems. National parks tend to be more lenient with human visitation and its supporting infrastructure. National parks are managed in a way that may contribute to local economies through promoting educational and recreational tourism on a scale that will not reduce the effectiveness of conservation efforts.

Famous National Parks in India

- Jim Corbett National Park – Uttarakhand
- Kanha National Park – Madhya Pradesh
- Ranthambore National Park – Rajasthan
- Kaziranga National Park – Assam
- Gir National Park – Gujarat
- Periyar National Park – Kerala
- Bandhavgarh National Park – Madhya Pradesh
- Bandipur National Park – Karnataka
- Sundarbans National Park – Kolkata
- Keoladeo National Park - Rajasthan
- Nagarhole National Park – Karnataka

8.4. Keywords

Geography – The study of the physical features of the earth and its atmosphere, and of human activity

Mountain – A large natural elevation of the earth's surface rising abruptly from the surrounding level; a large steep hill.

Plateau – Area of a high plain

Island – A piece of land surrounded by water

Lake – A large area of water surrounded by land.

Mangrove – A tree or shrub which grows in tidal, chiefly tropical, coastal swamps, having numerous tangled roots that grow above ground and form dense thickets

Waterfall - a cascade of water falling from a height, formed when a river or stream flows over a precipice or steep incline.

Cave – A natural underground chamber in a hillside or cliff.

8.5 Self-Assessment Questions

1. Write a brief note Physical Geography of India?
2. Briefly explain the Physical divisions of India?
3. Explain the various Geography Based Products in India?

8.6 Further Readings

1. Geography of India by Majid Husain, September 2017
2. Physical Geography by Savindra Singh, January 2017
3. India a Comprehensive Geography, by D. R. Khullar, January 2018.

Lesson Writer

K.Rajesh

Lesson – 9

DISTRIBUTION OF RIVERS

Objectives

After studying this lesson, you should be able to:

- To give the basic knowledge of Indian Rives and its distribution
- To understand the various types of rivers in India

Structure:

9.1 Rivers

9.2 Types of Rivers

9.3 National Water Ways

9.4 Keywords

9.5 Self-Assessment Questions

9.6 Further Readings

9.1 RIVERS

A River is a natural flowing watercourse, usually freshwater, flowing towards an ocean, sea, lake or another river. Rivers are also one of the Nature-based products. The Rivers are playing an important role in life's humans and animals; River water is very helpful for various purposes such as drinking, cleaning, washing, etc. Rivers provide us with fresh drinking water. It is one of the biggest sources of fresh drinking water. In the entire water-bodies, 80% of water is saline water which cannot be consumed by humans and the remaining 20% water is drinking water. Every living persons and animals need to rely heavily upon the rivers for drinking water.In India major cities are situated on the banks of rivers, as they are, used as a source of water, for obtaining food, and for transport.

Most of the rivers begin life as a tiny stream running down a mountain slope. They are fed by melting snow and ice, or by rainwater running off the land.The water follows cracks and folds in the land as it flows downhill. Small streams meet and join together, growing larger and larger until the flow can be called a river.

9.2 TYPES OF RIVER SYSTEMS IN INDIA

The Indian River system is classified into 2 types; they are Himalayan Rivers and Peninsular Rivers.

Fig -3.4.River systems of India

Source – Maps of India

a) **The Himalayan Rivers** – The Himalayan Rivers are originating from the Himalayas and flow through the Northern Plains.The major Himalayan River systems are

I. **The Indus River System** - The Indus River is an important river in India. It is also called as Sindhu River in the early Hindu Scriptures and mythological texts. The Indus River originates near the Mansarovar Lake in the Tibetan plateau, on the northern slopes of the Kailash Mountain Range. It flows westwards, it enters India in Jammu and Kashmir, further flows through Himachal Pradesh, Punjab and enters Pakistan. Flowing further westwards, it reaches the Arabian Sea near Karachi. Indus is the largest river in Pakistan and is the country's national river. The Indus River having 5 major tributary rivers from the eastern Punjab Plain.

These five rivers—the Jhelum, Chenab, Ravi, Beas, and Sutlej—give the name Punjab ("Five Rivers") to the region divided between Pakistan and India. The total length of the Indus River is 3,180 km.

II. **The Ganga River System** – The Ganga River is the largest river system in India. It originates in the Gangotri glaciers. Ganga River is the holiest river in India and serves as the lifeline of northern India. It is the most sacred river in the Hindu religion. Ganga River has been a symbol of divinity, spirituality, purity, and moksha. Ganga is the second wife of Lord Shiva. The Ganga is a trans-boundary river of Asia which flows through India and Bangladesh. The 2,525 km river rises in the western Himalayas in the Indian state of Uttarakhand, and flows south and east through the Gangetic Plain of India and Bangladesh, eventually emptying into the Bay of Bengal. Yamuna River is the largest tributary of the Ganga River. These are the major tributaries of River Ganga is Son River, Ghaghara River, Gomti River, and Yamuna River.

III. **The Brahmaputra River System** - The Brahmaputra River is one of the largest rivers in India. It is also called Tsangpo in Tibet. It has its origin in the Himalayas of Tibet. The Brahmaputra is a trans-boundary river, it flows through Tibet, India, and Bangladesh. The total length of this river 2,900 km (1,800 mi). It originates in the Angsi glacier of the Himalayas in Tibet. It enters India in Arunachal Pradesh and is called the Dihang River. It is joined by many other tributaries; the Dibang, the Lohit, the Kenula to form the main Brahmaputra River and flows its longest course through Assam, enters Bangladesh and finally falls into the Bay of Bengal.

b) **The Peninsular River system** – Peninsular river system formed by the Western Ghats, it runs from north to south close to the western coast.

Rivers flowing towards the east into the Bay of Bengal –The Godavari, The Krishna, The Mahanadi, and The Kaveri (with its main tributaries) and the Rivers flowing towards the west into the Arabian Sea – The Narmada, and Tapti (with its main tributaries).

i. **The Godavari River** - The Godavari is India's second-longest river after the Ganga. The total length of the Godavari River is 1465 Kilometers. The river originates from Trimbak and then flows in the east across the Deccan Plateau traversing through the Trimbakeshwar, Nashik, Kopargaon, Paitha, Nanded, Rajahmundry, Adilabad and Bhadrachalam.The Godavari is a sacred river and there are several places of pilgrimage on its banks. Trimbakeshwar, Nasik, and,

Bhadrachalam are major pilgrimage sites. Every twelve years, the Pushkaram festival, is held on the banks of the Godavari.

ii. **The Krishna River** - Krishna River or Krishnaveni is one of the longest rivers in Peninsular India. Krishna River originates at Mahabaleshwar in Maharashtra. It flows through Karnataka, Telangana, and Andhra Pradesh to finally pour into the Bay of Bengal. It is believed that Krishna Bai Temple in the Old Mahabaleshwar is the birthplace of river Krishna. Krishna Bai Temple is an ancient Shiva shrine where a stream comes out of the mouth of a cow. This stream further cascades to become the Krishna River. The Major Tributaries of Krishna River is Venna River, Koyna River, Dudhganga River, Bhima River Ghataprabha River, Malaprabha River, Tungabhadra River, Musi River, and Dindi River. The Total length of the Krishna River is 1400 km.

iii. **The Mahanadi River** - The Mahanadi River is one of the major river in East Central India.Mahanadi River originates at Sihava Mountains of Chhattisgarh. Mahanadi River flows through the states of Jharkhand, Chhattisgarh, and Orissa. The Total length of this river is 858km. The major tributaries of Mahanadi are Seonath, Jonk, Hasdo, Mand, Ib River, Ong, and Tel River. Mahanadi flows through cities Sambalpur, Cuttack and Banki.

iv. **The Kaveri River** – The KaveriRiver or Cauvery is a major river in Southern India and originates in Kogadu, Karnataka.in the form of a spring at Brahmagiri Hill at Talakaveri. The Total length of the Kaveri River is 805 km.The major tributaries of Kaveri River Hemavati, Moyari, Shimsha, Arkavati, Honnuhole, Kabini, Bhavani, Noyill, and Amaravati. The Kaveri River flows through the states of Karnataka and Tamil Nadu.

v. **The Narmada River** – The Narmada River is a major river in Central India. It is also called as Nerbudda River. The Narmada River originates at Amarkantak in Madhya Pradesh. The Total length of the Narmada River is 1312 km and it the largest river in Gujarat. The Narmada is a mythological being, called Ma (Mother) the Narmada by her devotees, which means "one who endows bliss". She is believed to have been born from Shiva's sweat as he danced his Tandava, and so is referred to as his daughter. It flows through the states of Madhya Pradesh, Maharashtra, and Gujarat and meets the Gulf of Cambay and this river flows to the west side, finally, it reaches the Arabian Sea. It is one of river that run from east to west. These are tributaries of Narmada River are Burhner River, Banjar

River, Sher River, Shakkar River, Dudhi River, Tawa River, Ganjal River, Chhota Tawa River, Kaveri River, Kundi River, Goi River, Karjan River, Hiran River, Tendoni River, Choral River, Kolar River, Man River, Uri River, Hatni River, and Orsang River.

vi. **The Tapti River** – Tapti River in central India, rising in the Gawilgarh Hills of the central Deccan plateau in south-central Madhya Pradesh state. The Total length of this River is 724 km, it is one of the rivers that run from east to west. Tāptī is the daughter of Surya & Chaya. She is the sister of Lord Shani & Bhadra. It flows through the states of Madhya Pradesh, Maharashtra, and Gujarat and finally, it reaches the Arabian Sea. The Tapti River's three major tributaries—the Purna, Girna, and Panjhra—flow from the south in Maharashtra state. It flows through the cities of Nepanagar, Multai, Burhanpur, Bhusawal, and Surat.

Advantages of rivers

1. The river banks have attracted settlers from ancient times. These settlements have now become big cities.
2. Using rivers for irrigation, navigation, hydro-power generation is of special significance.
3. Rivers help to develop tourism and provide recreation to the Tourists.
4. Use for Drinking water
5. It is essential for human, agricultural and industrial activities.
6. Using rivers for agricultural purposes, agriculture is the livelihood for a majority of the population.
7. In India Rivers treated as Deities like Ganga, Krishna, Brahmaputra, etc.
8. Use for transportation purposes
9. Rivers provide primary channels of inland waterways in the form of navigable waterways.

Major Rivers in India

Name	Length (km)	Originates From	Ends in	Places Benefited
Indus	3,180 km	in Tibet in northern slopes of Mount Kailash	Arabian sea	India and Pakistan

Ganga	2,525 km	Gangotri in Uttrakhand	Bay of Bengal	Uttar Pradesh, Uttrakhand, Bihar, West Bengal
Brahmaputra	2,900 km	Angsi glacier in Tibet	Bay of Bengal	Assam, Arunachal Pradesh
Kaveri	805 km	Brahmagiri hills in Kogadu, Karnataka	Bay of Bengal	Karnataka, Tamil Nadu
Godavari	1465 km	Triambakeshwar in Maharashtra	Bay of Bengal	South-eastern part of Andhra Pradesh
Krishna	1400 km	Mahabaleshwar in Maharashtra	Bay of Bengal	Maharashtra, Andhra Pradesh
Narmada	1312 km	Amarkantak in Madhya Pradesh	Arabian Sea	Madhya Pradesh, Maharashtra
Tapti	724 km	Betul district of Madhya Pradesh in the Satpura range	Arabian Sea	Madhya Pradesh and Maharashtra
Mahanadi	858 km	Sihava mountains of Chhattisgarh	Bay of Bengal	Jharkhand, Chhattisgarh, Orissa

9.3 WATER TRANSPORT

Water transport is the process of transport that a watercraft, such as a barge, boat, ship or sailboat, makes over a body of water, such as a sea, ocean, lake, canal or river. India has an extensive network of inland waterways in the form of rivers, canals, backwaters, and creeks. The majority of rivers use for transportation purposes. The

Inland Waterways Authority of India (IWAI) is the statutory authority in charge of the waterways in India. Its headquarters is located in Noida, UP. It does the function of building the necessary infrastructure in these waterways, surveying the economic feasibility of new projects and also administration.

Based on the data available on navigable waterways, compiled by the ministry of statistics and program implementation, a total of 106 water bodies with a minimum length of 25 km (16 mi) were declared as national waterways. In the first phase, 6 national water (NW) of category-1 that are considered most viable will be developed.

National Waterway (Nw-1)

The Ganga - Bhagirathi - Hooghly river system between Haldia (Sagar) and Allahabad was declared as National Waterway-1 (NW-1) in 1986. It is 1,620 km (1,010 mi) long, making it the longest waterway in India. It is of prime importance amongst all the national waterways considering its locational advantages. The NW-1 passes through West Bengal, Jharkhand, Bihar, and Uttar Pradesh.

National Waterway (Nw-2)

The river Brahmaputra having a length of 891 Km between Bangladesh Border and Sadiya was declared as National Waterway no. 2 (NW-2) on 1st September 1988. IWAI is carrying out various developmental works on the waterway for improving its navigability as laid down in the IWAI Act, 1985 (82 of 1985). As per IWAI, Act 1985, IWAI is responsible to develop the waterway for navigation. IWAI is maintaining a navigable depth of 2.5m in B'Border- Neamati (629 Km), 2.0 m in Neamati – Dibrugarh (139 Km) and 1.5m in Dibrugarh – Sadiya (Oriumghat) stretch. At present, the waterway is being used by vessels of Govt. of Assam

National Waterway (Nw-3)

The NW-3 is declared in February 1993. NW-3 consists of the West coast canal (Kottapuram - Kollam) -168 km Udyogmandal canal (Kochi Pathalam bridge) -23 km Champakara canal (Kochi - Ambalamugal) -14 km. the total length of national waterway 3 is 205 km.

National Waterway (Nw-4)

NW4 is declared on 25.11.2008, The Kakinada-Puducherry stretch of Canals integrated Bhadrachalam - Rajahmundry stretch of River Godavari and Wazira Vijayawada stretch of River Krishna (1078 km)

National Waterway (Nw-5)

Salient features of National Waterway No. 5 - Brahmani river & Mahanadi delta system along with East Coast Canal (NW-5). The Talcher- Dhamra stretch of river Brahmani, Geonkhali- Charbatia stretch of East Coast Canal, Charbatia- Dhamra stretch of Matai river and Mangalgadi-Paradip stretch of Mahanadi delta rivers (NW-5, 623 km), Declared as National Waterway 5 (NW 5) on 25.11.2008. Length - 588 km. River portion (371 km), Canal portion (217 km)

National Waterways 16

Barak River is the second largest river in the North Eastern Region. It originates from the south of Kohima in Nagaland near Nagaland – Manipur Border. After traversing

through Nagaland, Manipur, and Assam, it splits at Bhanga into two streams called Surma and Kushiyara. These two streams rejoin at Markuli in Bangladesh and thereafter the river is called Meghna. Barak– Meghna river system has a total length of 900 km (origin to upstream Chandpur in Bangladesh). Out of this, 524km is in India, 31 km on Indo – Bangladesh border and the rest is in Bangladesh. Out of 524 km in India, 403 km u/s of Lakhipur is in the hilly terrain and it is not navigable. The navigable portion of Barak River in India is the 121km stretch between Lakhipur and Bhanga which has been declared as NW-16 in the year 2016.

9.4 Keywords

River – A large natural stream of water flowing in a channel to the sea, another river.

Rain – The condensed moisture of the atmosphere falling visibly in separate drops.

Sea – The expanse of salt water that covers most of the earth's surface and surrounds its land masses.

Waterway -a river, canal, or other route for travel by water.

Water – acolourless, transparent, odourless liquid that forms the seas, lakes, rivers, and rain and is the basis of the fluids of living organisms.

9.5 Self-Assessment Questions

1. Explain the Significance of Rivers in the Indian Subcontinent?
2. Briefly discuss the types of Rivers in India?
3. Write a note on water transportation in India?

9.6 Further Readings

1. Land of the Seven Rivers: A Brief History of India's Geography by Sanjeev Sanyal, July 2013.
2. Michael hall (1999), Geography of Travel and Tourism, Routledge, London.
3. C. Michael Hall & Stephen J. Page (2006), the Geography of Tourism and Recreation-Environment, Place and Space, Third Edition, Routledge, London.
4. Robinson H.A. (1976), Geography of Tourism Mac Donald & Evans, ltd,
5. World Atlas.

Lesson Writer

K.Rajesh

Lesson – 10

CLIMATE, VEGETATION & FORESTS

10.0 Objectives

After studying this lesson, you should be able to:

- To provide the detailed information about the Indian Climatic conditions
- To learn the about the different types of vegetation in India
- To know the Uses of forests.

Structure:

10.1 Introduction

10.2 Classification of Climate regions in India

10.3 Factors determining the climate

10.4 Climatic Seasons of India

10.5 Vegetation

10.6 Forests

10.7 Keywords

10.8 Self-Assessment Questions

10.9 Further Readings

10.1 INTRODUCTION

Climate is the long-term average of weather, typically averaged over a period of 30 years. Some of the meteorological variables that are commonly measured are temperature, humidity, atmospheric pressure, wind, rainfall, and other meteorological elements in an area of the Earth's surface for a long time. The climate of a location is affected by its latitude, terrain, and altitude, as well as nearby water bodies and their currents. The climate of India has distinct regional variations discernible by the pattern of winds, temperature, and rainfall; further, also in the form of rhythm of seasons and the degree of wetness or dryness. Climates can be classified according to the average and the typical ranges of different variables, most commonly temperature and precipitation. India has tropical monsoon climate with large regional variations in terms of rainfall and temperature. The country stands in the tropical and subtropical belts and the climate is greatly modified by oceans and typography of several mountain ranges, as Himalayan ranges mountain ranges of Meghalaya and

Arunanchal in North east and Western Ghats with straight and Eastern Ghats in South. The climate in South and East is more typically tropical rainy, near temperate at high altitudes in the north (Kashmir), and semiarid and arid (dry hot) in the north-western part. The temperature is usually high throughout the year in most parts of the country except at high altitude in extreme north where snowfall occurs during winter and temperature goes below 0°C for short period.

10.2 CLASSIFICATION OF CLIMATIC REGIONS OF INDIA

The classifying Indian climatic regions, most geographers have given more importance to rainfall than to temperature as variations in rainfall are much more marked than those of temperature. Climatic regions of India may be classified in two categories, they are

a) Stamp's Classification of Climatic Regions of India
b) Koppen climate classification.

a. Stamp's Classification of Climatic Regions of India- Dr. L. Dudley Stamp used 18°C isotherm of mean monthly temperature for January to divide the country into two broad climatic regions such as

I. Temperate or continental zone in the North
II. Tropical zone in the South.

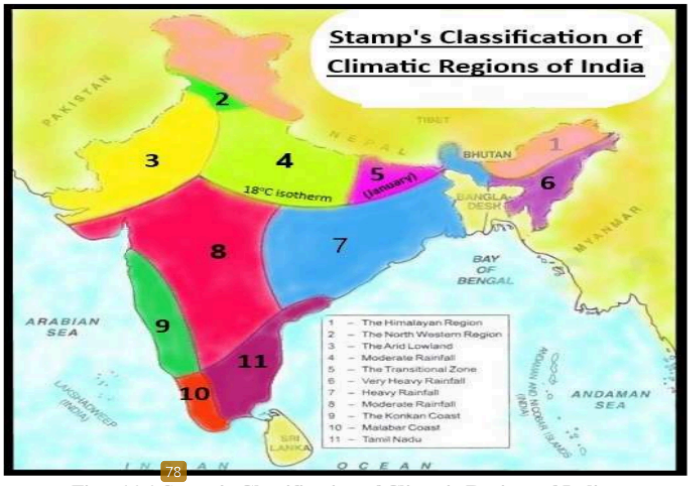

Fig – 11.1 Stamp's Classification of Climatic Regions of India

I. Temperate or continental zone in the North

- **The Himalayan region (heavy rainfall)** – This region embraces the entire Himalayan mountain area which includes from west to east, Jammu, and Kashmir, Himachal Pradesh, large parts of Uttaranchal, the north hill region of West Bengal, Sikkim and Arunachal Pradesh. The winter and summer temperatures are 4°-7°C and 13°-18°C respectively.
- **The north-western region (moderate rainfall)** - It includes the northern parts of Punjab and southern parts of Jammu and Kashmir. The winter and summer temperatures are 16°C and 24°C respectively. Amritsar is its representative city.
- **The arid low land** - This is a vast dry area that includes the Thar Desert of Rajasthan, the southwestern part of Haryana and Kuchchh of Gujarat. The average temperature in winter varies from 16° to 24°C which shoots up to 48°C in summer. Jaipur is its representative city. The average annual rainfall does not exceed 40 cm.
- **The region of moderate rainfall** - Parts of Punjab, Haryana, western Uttar Pradesh, Union Territory of Delhi, north-west Plateau area of Madhya Pradesh and eastern Rajasthan are areas of average rainfall with an annual rainfall of 40 to 80 cm. Temperatures in January and July are 15°-18°C and 33°-35°C respectively. Most of the rainfall occurs in summer. Delhi represents this region very well.
- **The transitional zone** - Eastern Uttar Pradesh and Bihar comprise the transitional zone between areas of average rainfall on the west and areas of heavy rainfall in the east. The average annual rainfall in this zone is 100-150 cm. The temperatures in January and July vary between 15°- 19°C and 30°-35°C. Patna is the representative city of this zone.

II. Tropical zone in the South.

- **Region of very heavy rainfall** - These areas receive more than 200 cm of annual rain and include large parts of Meghalaya, Assam, Tripura, Mizoram, and Nagaland. Temperatures remain around 18°C in January and rise to 32°-35°C in July. Cherrapunji and Mawsynram in Meghalaya receive 1,102 cm and 1,221 cm of annual rainfall respectively.

- **Region of heavy rainfall** - Chhattisgarh, Jharkhand, Gangetic West Bengal, Orissa, and north-eastern Andhara Pradesh receive 100-200 cm annual rainfall and are termed as areas of heavy rainfall. The rainfall is primarily brought by the monsoon winds coming from the Bay of Bengal.The cyclones originating in the Bay of Bengal also bring some rainfall. The amount of rainfall decreases as we move from east to west and from north to south. The January and July temperatures range from 18°-24°C to 29°-35°C respectively. Kolkata is the representative city of this region.
- **Region of moderate rainfall** - It includes mostly those areas between Western and Eastern Ghats which receive an annual rainfall of 50-100 cm. Rainfall is comparatively low because this region lies in the rain shadow area of the Western Ghats. The average temperature in winter is 18°-24°C which rises to 32°C in summer. This region is represented by Hyderabad.
- **The Konkan Coast** - Extending from Mumbai in the north to Goa in the south, the Konkan Coast receives over 200 cm annual rainfall brought by the Arabian Sea branch of the south-west monsoons. The temperature remains fairly high and varies from 24°-27°C. Thus the annual range of temperature is very low; to the tune of 3°C only. Mumbai is the representative city of this region.
- **The Malabar Coast** - It extends from Goa to Kanniyakumari and receives a heavy annual rainfall of over 250 cm. The rainfall is mainly brought by the south-west monsoon winds coming from the Arabian Sea and continues for about nine months in a year. The temperature remains in the vicinity of 27°C and the annual range of temperature is only 3°C. This region is represented by Thiruvananthapuram.
- **Tamil Nadu** - It includes Tamil Nadu and adjoining areas of Andhra Pradesh. The rainfall varies from 100 to 150 cm and is mainly caused by the retreating monsoons from north-east during November and December. The temperature remains somewhere around 24°C. There is not much change in summer and winter temperature and the annual range of temperature is only 3°C. Chennai is the representative city of this region.

b. Koppen climate Classifications

Wladimir Peter Koppen has crated Koppen climate classification. He was a Russian-German geographer, meteorologist, climatologist, and botanist.

The Koppen Classification of Climatic Regions of India is an empirical classification based on mean annual and mean monthly temperature and precipitation data. Koppen identified a close relationship between the distribution of vegetation and climate. Koppen selected certain values of temperature and precipitation and related them to the distribution of vegetation and used these values for classifying the climates. Koppen recognized five major climatic groups, four of them are based on temperature and one on precipitation.

- The most widely used for classifying the world's climates.
- Koppen divided the Earth's surface into climatic regions that generally coincided with world patterns of vegetation and soils.
- The Koppen system recognizes five major climate types based on the annual and monthly averages of temperature and precipitation.
- Each type is designated by a capital letter. A, B, C, D, E

Alphabet codes will help you to remember climates in Koppen Climate Classification. The A, C, D and E delineate humid climates and B dry climates.

- A: Tropical rainy climate with no cool season. Temperature of the coolest month above 18°C.
- B: Dry climate in which there is an excess of evaporation over precipitation.
- C: Middle-latitude rainy climate with mild winters. Average temperature of coldest month below 18°C but above -3°C. Average temperature of warmest month over 10°C.
- D: Middle-latitude rainy climate with severe winters. Average temperature of coldest month below -3°C and that of warmest month above 10°C.
- E: Polar climate with no warm season. Average temperature of the warmest month below 10°C.

First Letter

- A - Tropical rainy climates – Every month over 64.4 °F
- B - Dry climates – Evaporation exceeds precipitation
- C - Mild, humid climates – Coldest month below 64.4 °F but above 26.6 °F
- D - Snowy-forest climates – Coldest month below 26.6 °F but warmest month over 50 °F
- E - Polar climates – Warmest month below 50 °F
- H – high Land with heavy snow

Second Letter

Second place letters (e.g., Af, Cs, or Dw) are assigned based upon monthly or seasonal amounts of precipitation

- f - Moist, rain all year with no dry season
- w - Dry season in winter
- s - Dry season in the summer
- m- monsoon

Third Place Letters

Third-place letters are assigned according to certain monthly or seasonal temperatures. Applies to C and D climates.

- a - Hot summer. Warmest month over 72 °F
- b - Warm summer. Warmest month below 72 °F
- c - Cool, short summer. Less than four months above 50 °F
- d - Very cold winter. Coldest month below -36 °F

Koppen divided India into nine climatic regions making use of the above climatic groups

1. **Amw** (Monsoon type with short dry winter season):- This climate is found in the western coastal region, south of Mumbai. This area receives over 300 cm of annual rainfall in summer from the south-west monsoons.
2. **As** (Monsoon type with dry season in high sun period):- This is the region in which rainfall occurs in winter and summer is dry. Coromandel Coast experiences this type of climate. Coastal Tamil Nadu and adjoining areas of Andhra Pradesh are included in it. The amount of rainfall mostly in winter is 75-100 cm and is received from the retreating monsoons.
3. Aw (Tropical Savanah type):- This climate is found in most parts of the peninsular plateau barring Coromandel and Malabar coastal strips. The northern boundary of this climatic region roughly coincides with the Tropic of Cancer. The average annual rainfall is about 75 cm which is received in summer season from the south west monsoons. Winter season remains dry.
4. BShw (Semi-arid Steppe type):- Some rain shadow areas of Western Ghats, large part of Rajasthan and contiguous areas of Haryana and Gujarat have this type of climate. Rainfall varies from 12 to 25 cm and most of it occurs in summer. Winter is completely dry. Some arid steppe vegetation is found here.

5. BWhw (Hot desert type):- Most of western Rajasthan has hot desert type of climate where the amount of annual rainfall is less than 12 cm. Temperatures are very high in summer. Natural vegetation is almost absent.
6. Cwg (Monsoon type with dry winters):-This type of climate is found in most parts of the Ganga Plain, eastern Rajasthan, Assam and in Malwa Plateau. The summer temperature rises to 40°C which falls to 27°C in winter. Most of rainfall occurs in summer and winter is dry.
7. **Dfc** (Cold, Humid winters type with shorter summer):- Some of the north-eastern states such as Sikkim, Arunachal Pradesh and parts of Assam have this type of climate. Winters are cold, humid and of longer duration. The winter temperatures are about 10°C. Summers are short but humid.
8. Et (Tundra Type):- This climate is found in the mountain areas of Uttaranchal. The average temperature varies from 0 to 10°C. There is fall in temperature with altitude.
9. E (Polar Type):- The higher areas of Jammu & Kashmir and Himachal Pradesh experience polar climate in which the temperature of the warmest month varies from 0° to 10°C. These areas are covered with snow for most part of the year.

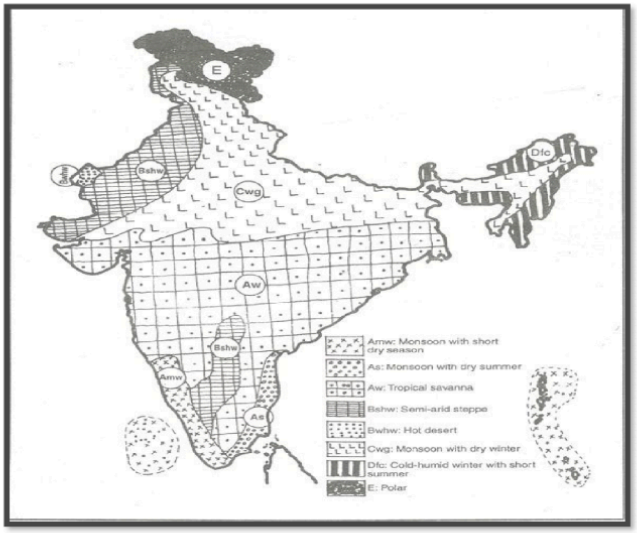

Fig11.2 - Koppen climate classification regions in India

10.3 FACTORS DETERMINING INDIA CLIMATE

The factors related to location and relief are latitudes, the Himalayan Mountains, distance from the sea, altitude, relief, distribution of land and water. These factors are related to air pressure and winds are pressure belts and movement of winds, upper air circulation and Jet streams, western disturbances and tropical depressions.

a) **The Himalayan Mountains** – Stretching along the northern borders of India and extending to the northeast the Himalayas literally block the central Asian cold wave keeping the India warm. These mountains also lessen the influence of the western disturbances and facilitate rainfall during winter in the extreme north-western parts of India which otherwise would have been cold deserts like the Ladakh.

b) **Distance from the Sea** – Water bodies of the Arabian Sea in the west, the Bay of Bengal in the east and the Indian Ocean in the south encircle. Because of these water bodies this region is neither hot in summer nor very cold in winter. This is visible as one moves from south to north. There is an extreme climatic difference in the north and this extremity becomes equable in the southern parts of the country mainly because of its proximity to the sea.

c) **Location** – India is located in the Northern hemisphere closer to the equator at 8.4° and 23 ½ Tropic of Cancer passes through the center of India. Hence, south of this latitude we find the tropical climate and towards the north, we find sub-tropical climate. Distance from the equator is one of the factors for climatic difference, even to both ends of the Tropic of Cancer there is variation. For instance, Tamil Nadu would be hotter than Punjab when we consider the average annual temperature mainly because of the distance from the effect of solar heat. Regions to the south of the Tropic of Cancer receive more solar heat than those lying north of it reducing the overall effect of the heat.

d) **Altitude** – There is a change in the weather conditions as one moves to a higher location such as a hill station. Latitude refers to this factor of the height above the average sea level. The atmosphere becomes less dense and we feel breathlessness as we go higher from the earth's surface and thus the temperature also decreases with the altitude. For instance in the mid-summer season when the temperature in Coimbatore city is 45 degrees C during the same time on the same day a little away in Kodaikanal the temperature may not fall below 16-20 degree C. This is a classic example of how altitude plays a major role in determining the climate of a

place as Kodaikanal is in the higher altitude above 1,500 meters from the mean sea level and Coimbatore is in the lesser altitude.

e) **Relief –** The relief features of India like that of the Himalayan Mountain also affect the climate of any region to a great extent. The mountains and the highlands affect the movement of winds, rainfall and air pressure as it is seen in the case of the Western Ghats and the hills in the northeast. The windward sides of these mountains block the incoming rain-bearing winds and experience a good amount of rainfall. At the same time, the region lying to the east of the Western Ghats which are in the leeward (on the side sheltered from the wind in that direction) side remains dry with very little precipitation.

f) **The direction of surface winds** – Movement of winds equally plays a major role. This system which consists of monsoon winds, land and sea breeze, and local winds determines the climate of India. In winter the winds blow from land to sea so they are cold and dry. On the other hand, in summer wind blow from sea to land bringing the moisture along with them from the sea and bring in a lot of rainfall across the country. The monsoon winds which after causing rainfall and traveling all the way to the northwest takes a U-turn and return to the south causing rainfall along the Coromandel Coast during winter.

g) **Upper-Air Circulation** – The upper air circulation also plays its part in an effective climate in certain parts of the country. These air currents are Jet streams of western disturbances. Jet streams are a narrow belt of fast blowing winds located generally at 12,000 meters above the sea level and bring western cyclonic disturbances along with them. These cyclonic winds originate near the Mediterranean Sea and move eastwards. On their way, they collect moisture from the Persian Gulf and shed it in the northwestern part of India during the winter season. They later move into central Asia.

h) **The Monsoon Mechanism** – Monsoon controls and characterizes the climate in India. It plays a central role in determining the nature of climate and its variations across the country. Monsoon refers to the seasonal movement and reversal of the wind direction during a year. It is found that during the summer season, the northern plains and low lying areas especially the states of Punjab, Haryana, Rajasthan, Delhi and western and central parts of Uttar Pradesh are very hot with the temperature reaching up to 45-50 degree C. Maximum temperature in some of the places may go beyond 45 - 50 degree. Let's have an understanding of the

differences in temperature and rainfall thorough Table given below which indicates the variance in climate at different places across the country.

10.4 SEASONS OF INDIA

India generally witnesses four types of seasons. During these seasons, strong variations in temperature takes place in the country. The different types of seasons experienced in India are as follows:

A. **Winter**: Generally the months of December and February are considered as the start of winter season in the country. However, in some parts of north-western India, the season begins from December. Generally, the average temperature during this season is about 10-15°C in northwest regions. In southeast region of mainland India, the average temperature is about 20-25°C. The western Himalayas, the extreme north-eastern parts and Kerala and Tamil Nadu, experience rains during this season.

B. **Summer Season**: The country experiences this season from March-May. In the interior peninsular regions, the mean daily temperature is recorded at 30-35°C. The maximum temperature in daytime in Central India crosses 40°C in many areas. In some regions, temperature is high during daytime while in the nights, low temperature is recorded. The coastal areas of the country have mild temperature during this season due to the influence of land and sea breezes. Thunderstorms with rains and hail influence the weather in the land areas of the country. These thunderstorms are seen in the north-eastern and eastern parts of Bihar, Assam and West Bengal. In the plains of north-west India, hot and dry winds, along with dust winds, are frequently experienced.

C. **Rainy/South-west Monsoon** (WS Monsoon): The months from June-September are the most significant. About 75% of the total rainfall of the country is supplied by the monsoon torrents during this season. The exact period of the SW monsoon in a region depends upon the onset and withdrawal time of the season. For instance, it remains in west Rajasthan for about 75 days while for 120 days in the south-western regions of the country. The SW monsoon reaches in two branches: the Arabian Sea and the Bay of Bengal branch. The Arabian Sea branch extends towards the low-pressure area over Thar Desert and is about three times stronger than the Bay of Bengal branch. The northern hemispheric temperatures, El Nino, snow cover, sea surface temperature and many other are some of the local and

global phenomenon which influences the monsoons in the country. The SW starts to weaken by 1 September in Rajasthan and from 15 September in some north-western parts of the country. The monsoons in India are very important for the economy of the country as it affects the agriculture which is the mainstay of a huge workforce of the nation.

D. **Autumn/Post Monsoon/Northeast Monsoon**: This season prevails in the country from the months of October-November. It is a transition season which is related to the establishment of the north-easterly wind regime over the subcontinent of the country. A large part of the country experiences cool, dry, and dense Central Asian air masses. Some parts of Tamil Nadu, Kerala, Karnataka and Andhra Pradesh receive about 35% of their total rainfall during this season. A decline in the mean temperature from 38°C in October to 28°C in November takes place during this season. The characteristic features of this season include decrease in humidity level and clear skies in most parts of the central and northern India

10.5 VEGETATION IN INDIA

Vegetation means plants considered collectively, especially those found in a particular area or habitat. The India subcontinent has a wide range of natural vegetation. The Vegetation in India can be classified into five types, Due to different climatic conditions; they are

1) Tropical evergreen forests
2) Tropical deciduous forests
3) Tropical thorn forests and scrubs
4) Mountain forests
5) Mangrove forests

1. Tropical Rain Forest

1) Tropical Rain Forests areas have received heavy rainfall due to monsoons.
2) These forests are so dense; that the sunlight has doesn't reach the ground.
3) In these forests, we have found the many species of trees i.e. mahogany, ebony, and rosewood, which shed their leaves at different times of the year. As a result, they always appear green.
4) Andaman and Nicobar Islands, parts of North-Eastern states and a narrow strip of the Western slope of the Western Ghats are home of these forests.

2. Tropical Deciduous Forests

1) Tropical Deciduous Forests have covered the large part of India.
2) The other name of these forests is monsoon forests.
3) These forests are very less dense areas, which shed their leaves at a particular time of the year.
4) Important trees of these forests are sal, teak, peepal, neem, and shisham.
5) Normally these forests are found in Madhya Pradesh, Uttar Pradesh, Bihar, Jharkhand, Chhattisgarh, Orissa, and in parts of Maharashtra.

3. Tropical thorn forests and scrubs

1) Tropical thorn forests and scrubs are found in only dry areas.
2) In these forest areas, the leaves are in the form of spines to reduce the loss of water.
3) Important trees of these forests are Cactus, khair, babool, keekar.
4) Generally, these forests areas are found in the states of Rajasthan, Punjab, Haryana, Eastern slopes of Western Ghats and Gujarat.

4. Mountain Vegetation

1) Mountain Vegetation's are found in the mountains, according to the variation in height.
2) In these forest areas, a height of plants between 1500 meters and 2500 meters, most of the shape of the tree is conical.
3) These trees are called coniferous trees.
4) Important trees of these forests are Chir, Pine, and Deodar.

5. Mangrove Forests

1) Mangrove Forests can only survive in saline water.
2) Mangrove Forests are found mainly in Sunderbans area in West Bengal and in the Andaman and Nicobar Islands.
3) Sundari is a well-known species of trees in mangrove forests.

10.6 FORESTS

"Forests are the natural lungs of the planet earth". Forests support biodiversity and nature conservation, they absorb carbon from the earth's atmosphere and provide the oxygen to the people. Eco- tourism has to enhance the landscapes of forests and provide opportunities for recreation to the tourists and generate employment opportunities to the local people. Forests are very essential to preserve flora & fauna. Forests which attracts the number of Eco tourists for jungle safari. Forest always plays

an important role to attract the Eco tourists for jungle safari. Wildlife is one of the most important resources provided by forest ecosystems around the world. Ecotourism focuses on socially responsible travel, personal growth, and environmental sustainability in particular.

Types of Forests in India

I. Wet Evergreen forest
II. Semi Evergreen forest
III. Moist Deciduous forest
IV. Dry Deciduous forest
V. Littoral and Swamp forest / Mangrove forest
VI. Dry Evergreen forest
VII. Thorn forest
VIII. Sub-tropical broad leaved forest
IX. Subtropical Pine forest
X. Subtropical Dry Evergreen forest
XI. Montane Wet Temperate forest
XII. Montane Moist Temperate forest
XIII. Montane Dry Temperate forest
XIV. Sub Alpine forest

Famous Forests in India

I. Nallamala forest – Andhra Pradesh
II. Kukrail Reserve Forest – Uttar Pradesh
III. Bhavnagar Amreli Forest – Gujarat
IV. Baikunthapur Forest – West Bengal
V. Annekal Reserved Forest – Western Ghats

10.7 Keywords

- **Climate –** The weather conditions prevailing in an area in general or over a long period.
- **Vegetation** – Plants considered collectively, especially those found in a particular area.
- **Forest** – A large area covered with trees.

10.8 Self-Assessment Questions

1. What is meant by climate?

2. Briefly discuss the Classification of Climatic Regions of India?
3. Write about the unique features of vegetation and its types?
4. Explain the role of Forests in India?

10.9 Further readings

1. Handbook of Climate Change and India: Development, Politics and Governance Edited by NAVROZ K DUBASH, Routledge, 2011.
2. Indian Forest And Forestry Hardcover – 2012,by Balyani Rohit Balyani (Author)
3. India a Comprehensive Geography by D. R. Khullar, January 2018
4. Geography of India, by Majid Husain | 1 September 2017

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Lesson – 11

TOURISM TRANSPORT SYSTEMS IN THE WORLD

11.0 Learning Objectives:

After reading this Lesson you should be able to understand

- To understand different transport systems around the world
- To know the advantages and dis advantages of various modes of transport
- To find the importance of transportation in tourism development

Structure:

11.1 Introduction

11.2 Tourism Transportation Systems in the world

11.3 Advantages and Disadvantages of various modes of transportation

11.4 The importance of Transportation in tourism development

11.5 Self-Assessment Questions

11.6 Further Readings

11.1 INTRODUCTION

Transportation is the main mean to carry passengers, that is, the tourists to the actual site where tourism services are performed. The development of transportation, transportation vehicles, infrastructure and using new technologies in this sector speed up the development of tourism..The transport industry has gained a vital place in the global network system and is one of the most important components of the tourism infrastructure. It now becomes easier for people to travel from one place to another because of the various modes of transportation available.

The earliest forms of transportation in the ancient times were animals on land and sails on the sea. Travel development from the need to survive, to expand and develop trade to far off countries, and the hunger to capture new lands and territories. This was followed by the use of steams and electricity in the nineteenth century followed by internal combustion engines.

11.2 TOURISM TRANSPORT SYSTEMS IN THE WORLD

Aircraft with the **jet engines were introduced in the 1950s**. With the development of technology, travel became faster and more and people could travel around the globe. Since tourism involves the movement of people from their places of residence to the places of tourist attractions, every tourist has to travel to reach the places of interest. Transport is, thus, one of the major components of the tourism industry. To develop any place of tourist attraction there have to be proper, efficient, and safe modes of transportation. Transportation is vital to tourism. Studies have shown that tourists spend almost 30 to 40 present of their total holiday expenditure on transportation and the remaining on food, accommodation, and other activities. This aspect once again highlights the importance of transportation.A tourist can travel by a variety of means. The tourism professional, as well as tourist, should be aware of the various modes of transport available to reach the destination and at the destination. The various mode of transport can be broadly **divided into** the following **three categories**:

Tourism Transportation divided in to **three Categories** i.e.

1. Air Transportation
2. Land Transportation
3. Water Transportation

Land Transportation Again divided into **two categories** i.e.,

i. Roadways
ii. Railways

1. Air Transport:

Due to the growth of air transport in recent years, long-distance travel has become much simpler and affordable. distance is now measured in hours and not in kilometres. The world has indeed shrunk and becomes a small village.

The development of air transport mostly occurred after World War I and II. Commercial airlines were created for travellers. Because of increasing air traffic, the commercial sector grows rapidly. Before the World War II, Swissair already was carrying around 14-16 passenger between Zurich to London.

The **first commercial service was introduced by KLM, the Dutch Airlines, in 1920** between Amsterdam and London. Commercial air travel grew mostly after World War II. More facilities were introduced and there was more comfort in travel.Jet flights were inaugurated by Great Britain in the year 1952. In the year **1958 Pan American introduced**

the Boeing 707 services between Paris and New York. Due to the introduction of jet flights, the year 1959 onward saw a tremendous increase in air traffic. The concept of chartered flights was also introduced during this year.Jumbo jets have revolutionized travel. A large number of people travel by air because of the speed, comfort, and economy in terms of time saved.

The modern era, thus, is the era of mass air travel. After road transport, air travel is the most popular mode of travel, particularly for international travel. For the business travellers, air transport is more convenient as it saves their precious time and offers a luxurious and hassle-free travel. Many airlines nowadays offer special facilities to the business tourist such as Internet on board.

There **two types of airlines**. These are following as:

Scheduled Airlines

Chartered Airlines

Scheduled airlines operate as regular schedules.

Chartered airlines or the non-scheduled airlines operate only when there is a demand, mainly during the tourist seasons. The chartered flights work out cheaper than the scheduled carriers as they are operated only when there is a high load factor. Chartered flights provide cheaper packages to the destination such as Portugal and Spain.

India receives more than 400 chartered flights, especially to Goa. Goa has a maximum number of chartered flights coming in during the months of December to January.

The **International Air Transport Association** (IATA) regulates international air travel. IATA has more than 105 major airlines of the world as its members. IATA regulates the price of tickets on different sectors of travel in the world. The concerned government decides the domestic fares.

The airfares are normally determined on the volume and the air travel demand in an area.

The International Civil Aviation Organization (ICAO) is an intergovernmental organization established in the year 1945. Only the government of the country can become a member. The government has to enter into a bilateral agreement for the frequency of flights for operating commercial airlines between them.

Airlines are classified into two broad categories namely

small carrier and large carrier.

The small carrier also known as **commuter airlines** have less than 30 seats**.**

The larger carriers, also known as **major airlines** fly direct routes between the major cities and seat and seat 100 to 800 passengers**.**

The recent boom in the aviation technology has certainly bought some new development to airlines industry. There has been a major change in the size of the aircraft.Every year there are a growing number of new airlines being introduced. Because of the growing number of new private airlines, there is stiff competition among them. This has resulted in a onsiderable reduction in air fairs and has boosted the growth of air traffic. To woo and attract customers, many airlines offer cheaper promotional fares such as excursion fares, group fares, and apex fares. Millions of tonnes of cargo and mail are also handled by the air transport industry.

Road ways / Land Transportation :

Humans travel place to place in search of food in the primitive era. They tamed animals such as the dog, ox, horse, camel, reindeer, elephants, etc. for carrying the load and traveling. After the discovery of the wheel, humans developed the cart, the chariot, and the carriage.

Until the seventeenth century, horses were used for traveling. Later on better roads were constructed and some of these roads developed into trade routes, which linked many countries. One of them is the Silk Route which was used for transporting silk from China to Persia and the Blue Gem road from Iran to Afghanistan and India.Today, the most popular and widely used mode of road travel is the automobile or the car. Road transport is dominated by the automobile, which provides views of the landscape and the freedom to travel. Tourist often travels with their entire family for holidays.

To promote tourism, the vehicle required are coaches and tourist cars. Tourist coaches or buses are preferred for large tourist groups traveling together on a specified tour itinerary. Many tourists prefer to travel in comfort and privacy and hire cars. Cars of various makes and standards are available on a rental basis Tourist also uses their own motorcar when holidaying. Cars and coaches carried long distance by train facility is also available in some countries.The car rental segment of the tourism industry is in a very advanced stage in foreign countries. The client can book a car, himself or through agents, and make it wait at the desired place at the destination. The client can then drive the car himself /herself on reaching the destination.

Rail ways :

The railway is the most economical, convenient, and popular mode of travel especially for long distance travel all over the world. The railroad was invented in the

seventeenth century in Germany with wooden tracks. The **first steel rail was developed in the USA during the early 1800s**. The railways revolutionized transportation and mass movement of people seen in the nineteenth and twentieth centuries.The broad gauge lines account for more than 55 present of the total network and carry 85 present of total traffic. The steam engines have been replaced by diesel and electric engines which have helped in increasing the speed. Railways have promoted tourism by introducing a special tourist train.

In Europe, the railway systems of six European countries have been clubbed to make rail travel easier for the people of Europe. A rail passenger can buy a ticket in any one country of Europe and travel through six countries. For the foreign tourists, Eurail Passes offer unlimited discounts travel in express trains for periods ranging from a week to three months. In the USA, AMTRAK operates trains.

Water Transport:

Humans have been traveling through water since time immemorial and carried good and people from one place to another. The boats progressed from the simple raft with some modifications and improvement and were first used around 6000 BC.

Travel by ship was the only means for traveling overseas until the middle of the twentieth century. The **Cunard Steamship Company** was formed in 1838 with regular steamship services operating on the North Atlantic. During the World War I, in 1914 the operations of the steamship company had to be suspended. After the World War I, the steamship luxury liners were back to business till World War II.

After the World War II, the large luxury Cruise liners again started their operations all over the world and carried passengers and holidaymakers. Some of the linear were very large accommodating up to 1000 passengers and had facilities like swimming pools, cinema halls, shops, casino, etc.

The cruise lines are the new attraction among the tourist. The cruises are booked several months in advance for trips into the tropical and sub-tropical waters of the Hawaii, Caribbean, Mediterranean, etc. Water transport today plays two main roles in travel and tourism namely **ferrying** and **cruising**.

Modern vessels such as the wave -piercing, the hydrofoil and the hovercraft are the over the water transport and used for short distance routes.

Water transportation is also used in riverboat travel. The Mississippi River has been a popular tourist river since the first settlers came to the USA. Today, tourists enjoy two or

three-day luxury trips along the river. In Europe, the Rhine, winding through the grapes growing areas of Germany, offers similar leisure tourist trips.

Motorized ferries and launches are used over rivers to transport tourists and locals, to transport vehicles, and offer facilities such as car parking, restaurants, viewing decks, etc.

11.3 ADVANTAGES AND DISADVANTAGES OF VARIOUS MODES OF TRANSPORT

Tourist has a wide variety of transport options available today. There are several advantages and disadvantages of all the model of transport. These are following as:

Air Transport

Direct root, high speed, quick service, social and political significance, luxurious travel are the advantages of air transportation.

High cost, jet lag, unsuitable for heavy bulk cargo, accidents always fatal, international rule to be observed are the disadvantages of air transportation.

Road Transport

Flexibility, reliable, door to door service, economical, supplements other modes of transport, quick transit for short distances are the advantages of road transport.

Slow speed, carrying capacity limited, accidents, none- AC coaches not so comfortable, comfort depends upon the conditions of roads are the disadvantages of road transport.

Railways

Long distance travel cheaper, carrying capacity large, dependable service, quicker than road transportation, ability to view scenery en route is the advantage of railways.

Inflexible, unfit to hilly regions, difficulties in rural areas, dining car facilities not always available are the disadvantage of railways.

Water Transport

Economical, carrying capacity enormously, develops international and coastal trades are the advantages of water transport.

Transport As An Attraction:

To attract customers as well as take them around an attraction, destination developers have used many forms of transport to move people around. These novel modes of transport ensure that major exhibits are viewed in a certain sequence and ensure that the crowd moves through at a reliable pace.

Overcrowding should be avoided at all costs to prevent untoward incidents and to maintain the beauty of the place. Tourist can cover the entire park in a shorter duration with the help of these modes of transport.

Transportation is the most crucial component of the tourism infrastructure. It is required not only for reaching the destination but also visiting the site and moving about at the destination. Variety in modes of transportation adds color to the overall tourism experience.

Unusual forms of transportation are also an attraction such as the cable cars in hilly terrain, the funicular railway, or jet boating. The choice of mode of transport is vast and tourists can choose a mode to suit their budget. They can opt for scheduled or non-scheduled transport such as the hiring of vehicles, boats, coaches or trains so that they can travel with their group.

11.4 THE IMPORTANCE OF TRANSPORTATION TO TOURISM DEVELOPMENT:

Transportation has been an integral part of the tourism industry; transportation links tourists with various tourist attractions. There is a general agreement that tourism expands more when there are better transportation systems. In many part of the world tourism had been underperforming compared to the natural heritage the country is endowed with. One of the things mentioned as the reason for under performance is poor transportation systems.

Transportation needs for tourism promotion and tourism development among others, to be maintenance of the existing roads, construction of more roads/rail track/sea and air transportation, and construction of local airports and enhancement of local flight operations. And established that the level of security and safety in transportation systems is not bad though transportation costs are considered high by tourists. Tourism development could be even bigger if more could be done in various elements of transportation systems. It is an important for all its stakeholders to take part to develop tourism in their regions. (The government, and other stakeholders of tourism).

Tourism sector is one of the main important sectors of the economy. Many countries take advantage of covering the budget deficit with the help of profits coming from tourism. That is why tourism sometimes is called a factory without chimney. But tourism has its own unique features that differentiate this sector from the others. Like in the other service industries, in tourism the customers, that is, the tourists come to the destination where the tourism services are provided. As the matter of fact it is difficult to think of tourism sector

without transportation. Transportation is the main mean to carry passengers, that is, the tourists to the actual site where tourism services are performed.

The development of transportation, transportation vehicles, infrastructure and using new technologies in this sector speed up the development of tourism. If we pay attention to the statistics of World Tourism Organization, we may see that the tourism dynamics has changed and increased rapidly between 2005 and 2015. In 2010 international tourist arrivals rose to 940 million. This in turn brought the economies $980 billion. This trend can be explained with different factors. But the main important factor here is the rapid development of transportation sector and application of technological innovations which enable the tourists to reach many destinations of the world.

Whether transportation plays important role in enriching the travel experience of a tourist depends on the mode of transportation and the frequency of use. Transportation can turn into a separate tourist attraction element; cruising, Orient Express trains, boat trips along the river and etc. are the best examples to tourist attractions.

The effective factors in choosing the transportation mode in tourism are given below (Westlake and Robbins 2005, 463):

• Time limit
• Distance
• Status
• Comfort
• Security
• Benefit
• Price
• Geographical position
• Competition

An increase in traffic due to world tourism growth puts pressure on transportation facilities, and this can have adverse effects. Those negative effects are as follows (Goeldner and Ritchie 2012, 96).

• Congestion – means delays which leads to waste of time and energy. Serious congestions may have a negative effect on transportation modes, especially on airports and roads during peak times.

• Safety and security – making sure that the transportation mode is safe and secure is a basic and important requirement for tourism.

• Environment – an increase in traffic may have disastrous effect on the environment if that

area does not have the carrying capacity for additional tourists.

• Seasonality – seasonal patterns of travel demand create overcrowding at certain times.

Air Transportation One of the most important transportation modes in tourism is air travel. Air travel has made significant changes in people's minds concerning time and distance. In order to meet the demand which increases every day, the airline companies spend billions of dollars and apply new technological innovations. Having matchless role in long distances the air travel industry develops very rapidly. The world's airline industry numbers 1,629 airlines, 27,271 aircraft, 3,733 airports, 29.6 million scheduled departures a year, and carries 2.7 billion of passengers a year. The major aircraft making companies to share the market will be Airbus and Boeing.

Automobile Transportation In short distances automobile transportation comes forward in regard to other modes of transportation. The automobile transportation makes it easy to see local culture and nations. It presents great flexibility in contrast to other modes of transportation (Oter, 2007). The importance of this mode in tourism is also very important. When compared with the prices in air transportation, this mode of transportation is frequently used by tourists because of low prices. But the main factor affecting this choice is time and distance

Railway Transportation The other mode that affects tourism is railway transportation. This type of transportation is considered the oldest one. In 19th century the railways were frequently used. Currently in many countries the railways are used for transportation of loads. The reason for this is tourist choice of air or automobile transportation. But there exists such railroads that have been included to touristic packages. For the example, we can give Orient Express railways. But nowadays application of technology and technological innovation gave birth to fast trains which compete with air and automobile transportation modes.

Sea Transportation Here we may include cruise travel, boat travel, yachting, ferry travel and etc. The cruise travel has a special place in tourism. In table 3 we can see the world and North America's growing trend for cruise travel. From the table, we can infer that cruise travel has been much more developed in North America. The cruise ships named as sailing hotels provide tourists with indispensable travel opportunity. While travelling with a cruise ship, the tourists get the opportunity to see several countries at a time. This type of transportation is one the most expensive one, because the price for a cruise ship exceeds $100 million. More than thousands of employees work in a cruise ship at a time, may see that in

cruise travel from North/south Americans to Asia, Europe and Middle East companies gained great successes.

All the stated issues prove the importance of transportation in tourism. As mentioned above the tourist's travel experience starts and ends with transportation. In this sense, if the countries want to gain sustainable development of tourism sector, they must pay attention to transportation sector, reduce monopoly in this sector; provide sound competition opportunities for the companies.

To sum up, in order to develop and increase the role of transportation in tourism the countries should pay attention to the following points:

• The transportation modes specific to the regions must be developed

• The transportation costs must always be kept competitive

• The passengers must be attracted to sea and railway modes of transportation

• New embarkation ports must be established in order to develop cruise travel

• New fast train lines must be established and new fast trains must be bought and foreign experience must be applied

• The distance from stations must be kept less

• New coaches must be brought to the country

• New technologically advanced aircraft must be put into air lines

• The personnel must be trained

• The governments should allocate financial support for the development of transportation

Key Words:

Transportation: Transport or transportation is the movement of humans, animals and goods from one location to another. In other words, the action of **transport** is defined as a particular movement of an organism or thing from a point A to a Point B. Modes of **transport** include air, land (rail and road), water, cable, etc.,

Schedules Airlines: A scheduled airlines means that tickets to this flight are sold via various sales channels around the world. Scheduled flights may have connection flights of it is regular service from time to time.

Charted Airlines: A charter flight is an unscheduled flight that is not part of a regular airline routing. With a charter flight, you rent the entire aircraft and can determine departure/arrival locations and times. There are several types of charter flights. Private Charter. Single Entity.

IATA: The International Air Transport Association (**IATA**) is the trade association for the world's airlines, representing some 290 airlines or 82% of total air traffic.

Self-Assessment Questions :

1. Define Air Transportation
2. Explain different types of airlines?
3. Define road ways/land transportation
4. Describe about the water transportation?
5. Elucidate the advantages and disadvantages of various modes of transportation?
6. Explain the importance of transportation in tourism development?
7. What are the factors influencing to choose the transportation?

11.5 Further Readings:

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Lesson – 12

AIR TRANSPORT AND MAJOR RAILWAY SYSTEMS AND NETWWORKS

12.0 Learning Objectives:

After reading this Lesson you should be able to understand

- To understand air transport and major airports in India and around the world
- To know the major railway networks around the world
- To find the importance of Indian railways

Structure:

12.1 Introduction
12.2 Air Transport
12.3 Major Airports around the world
12.4 Top 10 Airports in India
12.5 Major Railway Systems and Networks
12.6 Brief about to the Indian Railways
12.7 Self-Assessment Questions
12.8 Further Readings

12.1 INTRODUCTION

Air transport is an important enabler to achieving economic growth and development. **Air transport** facilitates integration into the global economy and provides vital connectivity on a national, regional, and international scale. It helps generate trade, promote tourism, and create employment opportunities. **Air** travel is a form of travel in vehicles such as helicopters, hot **air** balloons, blimps, gliders, hang gliding, parachuting, airplanes, jets, or anything else that can sustain flight.

12.2 AIR TRANSPORT

Due to the growth of air transport in recent years, long-distance travel has become much simpler and affordable. distance is now measured in hours and not in kilometres. The world has indeed shrunk and becomes a small village.

Air Transportation One of the most important transportation modes in tourism is air travel. Air travel has made significant changes in people's minds concerning time and distance. In order to meet the demand which increases every day, the airline companies spend billions of dollars and apply new technological innovations. Having matchless role in long distances the air travel industry develops very rapidly. The world's airline industry numbers 1,629 airlines, 27,271 aircraft, 3,733 airports, 29.6 million scheduled departures a year, and carries 2.7 billion of passengers a year. The major aircraft making companies to share the market will be Airbus and Boeing.

12.3 MAJOR AIRPORTS & ROUTES

Around the World The busiest airports by passengers traffic

ATL - **Hartsfield–Jackson Atlanta International Airport** ATLANTA (USA)

Pax.* /year 96.18 Millions

PEK- **Beijing Capital International Airport** BEIJING (CHINA)

Pax./year 86.13 Millions

LHR **London Heathrow Airport** (UK) **Pax./year73.41Millions**

HND- **Tokyo Haneda Airport** TOKYO (JAPAN)

Pax./year72.83Millions

JFK- **John F. Kennedy International Airport** NEW YORK **(USA**)

Pax./year 53.64Millions

- **Pax means Passengers**

12.4 TOP 10 AIRPORTS IN INDIA WITH HIGHEST PASSENGER TRAFFIC

Indian aviation has grown by leaps and bounds in the past few years, with India becoming one of the largest civil aviation markets in the world. More than 120 million flyers book domestic flight tickets every year. The number inflates to over 180 million when you add to it travellers flying on international routes. Catering to these flyers are world-class airports that are ranked among the best and the busiest in the world. Take a look at the busiest airports in India.

1. **Indira Gandhi International Airport (DEL) – Delhi**

Serving NCR or National Capital Region, Indira Gandhi International Airport isn't just the busiest airport in India, but also the world. In the year 2018, the aviation hub catered to more than 69 million people, besting airports in Singapore, Dallas/Fort-Worth and Guangzhou. It is

currently the 12 busiest airport in the world. This is also where you find the longest runway in the country, stretching 4430 feet. Moreover, IGI Airport is also accredited as the largest airport in India.

2. **Chhatrapati Shivaji International Airport (BOM) - Mumbai**

Serving about 50 million passengers every year, Chhatrapati Shivaji International Airport makes it to the second spot on the list of busiest airports in India. It was recently named the best airport for Customer Experience in Asia-Pacific with more than 40 million passengers by Airports Council International, edging out the likes of Shanghai Pudong International Airport and the world-famous Singapore Changi Airport

3. **Kempegowda International Airport (BLR) - Bangaluru**

The capital of Karnataka, **Bangalore** is thronged by businesspersons and tourists alike. Thus, there is no surprise that Kempegowda International, which serves the city, is among the busiest airport in India. More than 33 million people book flight tickets to or from Kempegowda International Airport in the financial year 2018-2019. The airport is also undergoing a development programme to expand its capacity.

4. **Chennai International Airport (MAA) - Chennai**

Chennai International Airport is the fourth busiest international airports in India. It is counted among the earliest airports in the country. The airport hosts flights from almost all major Indian cities, including New Delhi, Mumbai, Kolkata, Hyderabad, Guwahati, Ahmedabad and Bangalore. Colombo, Bangkok, Dubai, Kuala Lumpur, Hong Kong and Abu Dhabi are among the international cities connect to Chennai through flights.

5. **Netaji Subhas Chandra Bose International Airport (CCU) – Kolkatta**

The largest airport in India's eastern parts of the country, Netaji Subhas Chandra Bose International Airport serves the state of Kolkata. Handling about 20 million passengers in the financial year 2017-2018, it is the fifth busiest airport in India. It won the Best Improved Airport award by Airport Council International for two straight years in 2014 and 2015. Loads of people heading to Northeast India also book cheap flight tickets to Kolkata.

Read about: Hacks that will help you find the lowest hotel booking prices

6. **Rajiv Gandhi International Airport (HYD) - Hyderabad**

Rajiv Gandhi International Airport, which serves Hyderabad, is the next name on our list of busiest airports in India. The city of Hyderabad is frequented by businesspersons for its strong information technology scene and by tourists for its rich cultural heritage. A total of more than 18 million people arrived or departed from the Hyderabad airport in the FY2017-

2018. The airport is also undergoing development and will soon have a capacity of 40 million passengers per year to meet the growing demand for flight tickets to Hyderabad.

7. Cochin International Airport (COK) – Cochin

Cochin International Airport is located in Cochin or Kochi in the state of Kerala. It was the first airport in India developed as per the PPP or public-private partnership model, with funding coming from over 10000 non-resident Indians from about 30 countries. Although the state of Kerala has four international airports, Cochin International Airport continues to be in high demand and remains one of the busiest airports in India. It is the first airport in India to be completely powered by solar energy.

8. Sardar Vallabhbhai Patel International Airport (AMD) – Ahmedabad

Ahmedabad is the largest city in Gujarat. Thus, it is no surprise that Sardar Vallabhbhai Patel International Airport has found a place on this list. Almost 10 million people take their flight from or arrive at the Ahmedabad airport every year.

9. Pune Airport (PNQ) – Pune

Established by the Royal Air Force as an air base, Pune Airport is the ninth busiest airport in India, handling around 8 million people in FY2017-2018. The passenger traffic at the airport is believed to grow manifolds with the increasing significance of Pune as a centre of commerce and academics.

10. Dabolim Airport (GOI) – Goa

Goa, the land of sun, sand and sea, is the ultimate party destination in India. Thus, hordes and hordes of international and domestic tourists book cheap flights and Goa hotels.

So, these are the busiest international and domestic airports in India. With the aviation industry in India growing at a fast pace, the annual passenger traffic at these is believed to grow even further.

12.5 MAJOR RAILWAY SYSTEMS AND NETWWORKS

The railway is the most economical, convenient, and popular mode of travel especially for long distance travel all over the world. The railroad was invented in the seventeenth century in Germany with wooden tracks. The **first steel rail was developed in the USA during the early 1800s**. The railways revolutionized transportation and mass movement of people seen in the nineteenth and twentieth centuries. The broad gauge lines account for more than 55 present of the total network and carry 85 present of total traffic. The steam engines have been replaced by diesel and electric engines which have helped in increasing the speed. Railways have promoted tourism by introducing a special tourist train.

Railway Transportation The other mode that affects tourism is railway transportation. This type of transportation is considered the oldest one. In 19th century the railways were frequently used. Currently in many countries the railways are used for transportation of loads. The reason for this is tourist choice of air or automobile transportation. But there exists such railroads that have been included to touristic packages. For the example, we can give Orient Express railways. But nowadays application of technology and technological innovation gave birth to fast trains which compete with air and automobile transportation modes.

The 10 largest railway networks in the world based on total operating length.

- United States: 250,000 km. ...
- China: 100,000 km. ...
- Russia: 85,50 0km. ...
- India: 65,000 km. ...
- Canada: 48,000 km. ...
- Germany: 41,000 km. ...
- Australia: 40,000 km. ...
- Argentina: 36,000 km.
- France : 29,000 Km
- Brazil: 28000 km

In Brief about The world's 10 longest railway networks:

United States: 250,000km

The US rail network, with an operating route length over 250,000km, is the biggest in the world. Freight lines constitute about 80% of the country's total rail network, while the total passenger network spans about 35,000km.

The US freight rail network consists of 538 railroads (seven Class I railroads, 21 regional railroads, and 510 local railroads) operated by private organisations. Union Pacific Railroad and BNSF Railway are among the largest freight railroad networks in the world. The national passenger rail network Amtrak comprises of more than 30 train routes connecting 500 destinations across 46 American states.

A plan is in place to build a 27,000km national high speed rail system in four phases by 2030. Construction of the California high-speed rail, the country's first high-speed rail project, was well underway by the beginning of 2014. Three more high-speed projects including the

Midwest high-speed rail line connecting Chicago with Indianapolis or St. Louis, Texas high-speed rail, and the Northeast High-Speed Corridor are under development.

China: 100,000km

China's rail network, with a route length of over 100,000km, ranks as the second biggest rail network in the world. The extensive network, operated by state-owned China Railway Corporation, carried 2.08 billion passengers (the second highest after Indian Railways) and 3.22 billion tonnes of freight (the second highest after the US railway network) in 2013.

Rail is the principal mode of transport in China. The country's rail network consists of over 90,000km of conventional rail routes and approximately 10,000km of high-speed lines. The total rail network of the country is targeted to exceed 270,000km by 2050.

The rapid expansion of China's high-speed rail network in recent years makes it by far the largest in the world. The 2,298km Beijing – Guangzhou high speed line is the world's longest high-speed railway line. The total length of China's high-speed rail network is projected to reach 50,000km by 2020.

Russia: 85,500km

Russia's whole network, operated by state-owned monopoly Russian Railways (RZD), runs for over 85,500km. In 2013, the network carried 1.08 billion passengers and 1.2 billion tonnes of freight – the third highest freight volume after the US and China.

The Russian railway network incorporates12 main lines, many of which provide direct connections to the European and Asian national railway systems such as Finland, France, Germany, Poland, China, Mongolia and North Korea. The Trans-Siberian Railway (the Moscow-Vladivostok line), spanning a length of 9,289km, is the longest and one of the busiest railway lines in the world.

RZD introduced the Sapsan high-speed rail service between St. Petersburg and Moscow in 2009, but it has not proved successful due to sharing existing lines with low-speed train operations. A dedicated high-speed corridor between the two cities has been planned with a proposed investment of $35bn. RZD expects to have 2,500km of high-speed rail between Moscow and Kiev, Minsk and Kursk by 2015.

India: 65,000km

The Indian nationwide rail network, the fourth longest in the world, is owned and operated by state-owned Indian Railways and includes an operating route length of more than 65,000km. The network carried about eight billion passengers (the highest in the world) and 1.01 million tonnes of freight (fourth highest in the world) in 2013.

The Indian railway network is divided into 17 zones and operates more than 19,000 trains per day, including 12,000 passenger trains and 7,000 freight trains. The national railway operator plans to add 4,000km of new lines by 2017, as well as significant gauge conversion, doubling and electrification of its existing aging lines. It also plans to add 3,338km of exclusive freight network by 2017 with the implementation of Eastern & Western Dedicated Freight Corridors (DFC), two of the six identified dedicated freight corridors in India.

Six high-speed corridors have also been identified for implementation in the country. The 534km Mumbai-Ahmedabad high-speed linkis being advanced as a pilot project with an estimated investment of $9.65bn.

Canada: 48,000km

Canada's 48,000km of rail lines makes its national network the fifth longest in the world. Canadian National Railway (CN) and Canadian Pacific Railway (CPR) are the two major freight rail networks operating in the country, while Via Rail operates the 12,500km intercity passenger rail service. Algoma Central Railway and Ontario Northland Railway are among the other smaller railways providing passenger services to certain rural areas in the country.

Three Canadian cities – Montreal, Toronto and Vancouver – have extensive commuter train systems. In addition, the Rocky Mountaineer and Royal Canadian Pacific offer luxury rail tours to view the scenic beauty of certain mountainous areas in the country.

Canada, however, does not have a single high-speed line on its railway network. Many high-speed lines such as Toronto-Montreal, Calgary-Edmonton and Montreal-Boston have been proposed, but none of these have progressed beyond preliminary studies as of January 2014.

Germany: 41,000km

State-owned Deutshe Bahn dominates Germany's 41,000km railway network, accounting for about 80% of the total freight traffic and 99% of the long-distance passenger traffic.

More than 150 private railway companies apart from Deutshe Bahn operate on the network, providing regional passenger and freight services. The S-Bahn serves major suburban areas, while the Hamburg Cologne Express (HKX) is the major long-distance passenger operator after Deutshe Bahn.

The German railway network had more than 1,300km of high-speed railway track operational as of mid-2013 and more than 400km of new high-speed line under construction. Deutshe Bahn opened high-speed services, under the name InterCity Express (ICE), for the first time in 1991. The high-speed network, operated at speeds up to 320km/h, now connects major German cities and neighbouring countries such as France, Switzerland, Belgium, the Netherlands and Austria.

Australia: 40,000km

The Australian railway network is the world's seventh longest at more than 40,000km. Most of the railway network infrastructure is owned and maintained by the Australian government either at the federal or state level. The majority of the trains on the network are, however, operated by private companies.

Aurizon (formerly QR National), Genesee and Wyoming Australia, and Pacific National are among the major freight operators on the network. Great Southern Railway, NSW TrainLink and Queensland Rail are the leading long-distance passenger rail operators. Metro Trains Melbourne, Sydney Trains, V/Line and Adelaide Metro operate commuter passenger services in major suburban areas. In addition, a number of private mining railways operate in the country.

The Australian railway network does not have a high-speed line yet. A high-speed rail network connecting Brisbane, Sydney, Canberra and Melbourne is proposed to be built with an estimated capital cost of $114bn, but the first phase of the 1,748km high-speed network will not be realised before 2035.

Argentina: 36,000km

Argentina's current rail network spanning over 36,000km in length ranks the eighth largest in the world. Argentina used to have about 47,000km of rail network at the end of the Second World War, mostly operated by British and French-owned railway companies. But the decline of profits and the rise of highway construction in the subsequent decades reduced the network to the 36,000km of line that exists today. The railway companies operating on the network were nationalised in 1948 with the creation of the state railroad corporation Ferrocarriles Argentinos.

The Argentinean railway was privatised between 1992 and 1995 with the grant of concessions to different private companies for operating six divisions of the formerly state-owned rail network. Cities such as Buenos Aires, Resistencia and Mendoza offer extensive suburban passenger services, as well as the long distance passenger lines in the country.

The much talked-about Argentine high-speed railway is not a reality yet. An announcement was made in 2006 to develop a 310km high-speed line between Buenos Aires and Rosario. The project was, however, not implemented as of 2013. A second high-speed line stretching 400km between Rosario and Cordoba has also been proposed.

France: 29,000km

At 29,000km, the French railway network is the second biggest in Europe and the ninth biggest in the world. The French railway network is predominantly passenger-centric and

more than 50% of the country's lines are electrified. State-owned Société Nationale des Chemins de fer Français (SNCF) is the principal railway operator in the country.

The country's high-speed long distance passenger services are known as Train à Grande Vitesse (TGV) and the standard long-distance passenger services are branded Intercités. The short and middle distance passenger rail services are known as Transport Express Régional (TER). The network offers linkages to adjacent countries such as Belgium, Italy and the UK.

France was one of the early adopters of high-speed rail technology; SNCF brought into operation the TGV high-speed rail in 1981. The country's current high-speed network exceeds a length of 1,550km. The Tours-Bordeaux high-speed rail project, which is due for completion in 2017, will add another 302km into the network.

Brazil: 28,000km

The first railway line in Brazil became operational in 1984. The railway network was nationalised in 1957 with the creation of Rede Ferroviária Federal Sociedade Anônima (RFFSA). The country's railway network was divided into different services to be operated by a range of private and public operators by 2007.

The 28,000km network is predominantly freight-focussed and includes major iron ore rail lines. The country's passenger rail services are mostly concentrated in urban and suburban areas. Eight Brazilian cities have metro systems, São Paulo Metro being the biggest among them.

In 2012, the Brazilian government announced the construction of 10,000km of new lines comprised of freight and high-speed passenger lines by 2042. A 511km high-speed rail link between São Paulo and Rio de Janeiro has been planned for development in the country, but the project is yet to take off.

12.6 IN BRIEF ABOUT TO THE INDIAN RAILWAYS

The Indian Railways (IR) is the world's largest railway system **under single management and the largest employer in the world with approx. 1.27 million employees.**

India's as well as Asia's first train steamed off **from Mumbai (erstwhile Bombay) to Thaneon April 16th, 1853 covering a distance of 34 kms**. India's railway network grew rapidly to encompass a pan-Indian network of almost 40 000 kms. India and Japan have signed an agreement for the construction of a Shinkansen type highspeed rail corridor between Mumbai and Ahmedabad. This is one of seven corridors currently under consideration for high speed train service.

IR carried approx. 22.94 million passengers daily (total 2.87 billion) during Q1/2018-19 out of which **45 % was non-suburban passenger traffic.** IR's vast rail network (third largest in the world)

Encompassed 68 442 route kilometers of which **63 491 kms was broad gauge (**Mar 2018). The network covers **7 172 stations** and is served by over **13 300 daily passenger** (incl. 5 125 suburban EMU trains) and **7 400 freight trains**.

Total electrified route km was 30 212 in Apr '18, ie 44.9 % of the rail network. Full electrification of the whole rail network has been planned to be implemented over the next decade using renewable energy.

IR's gross revenues amounted to approx. ₹ 1.65 trillion (ca USD 23½ bn) in 2016-17.

IR's passenger reservation system (PRS) is the largest of its kind in the world. IR's plan outlay for 2017-18 is approx. ₹ 1.31 trillion (ca USD 20 bn).

Train tickets can be booked on

IR's e-ticketingservice is available eg for all Superfast, Jan Shatabdi, Rajdhani and Shatabdi, Duronto and Sampark Kranti Express trains.

IR hauled 1 223 million tons of freight in 2018/19.

The main commodities handled by IR during 2015-16 included **coal (552 million tons), iron ores (117 MT),cement (105 MT), mineral oils (43 MT), foodgrains (46 MT), fertilizers (52 mt) and iron&steel (45 MT).**

A new joint-venture plant for the manufacture of upto 5000 EMUs spanning 12 years is planned to be constructed at Kanchrapara, north of Kolkata. Bids of three consortia have been shortlisted and the contract is expected to be awarded in 2018.

KEY WORDS:

Air Transport: Air transportation is the movement of passengers and freight by any conveyance that can sustain controlled flight.

Airport: a complex of runways and buildings for the take-off, landing, and maintenance of civil aircraft, with facilities for passengers The definition of an airport is a place where airplanes take off and land that has all the services and buildings needed to take care of the airplanes, passengers, and cargo. An area with buildings, airplanes, and airstrips is an example of an airport.

Railway Networks: 1 a permanent track composed of a line of parallel metal rails fixed to sleepers, for transport of passengers and goods in trains.any track on which the wheels of a vehicle may run. a cable **railway**. 3 the entire equipment, rolling stock, buildings, property, and system of tracks used in such a transport system.

12.7Self-Assessment Questions:

1. Define Air Transpiration
2. Explain the major airports around the world?
3. Describe the top ten airports in india?
4. Explain about railway networks?
5. Brief about the top ten largest railway networks in the world?
6. Brief about Indian railways and its functions?

12.8Further Readings:

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Lesson – 13

WATER TRANSPORT

13.0 Learning Objectives:

After reading this Lesson you should be able to understand

- To understand water transport in India and the world
- To know the International waterways and Ocean transportation
- To find the importance of water transportation in India

Structure:

13.1 Introduction

13.2Water Transport

13.3 International inland waterways and Ocean transportation networks

13.4 Water transportation system in India

13.5 Self-Assessment Questions

13.6 Further Readings

13.1 INTRODUCTION:

Humans have been travelling through water since time immemorial and carried good and people from one place to another. The boats progressed from the simple raft with some modifications and improvement and were first used around 6000 BC. Travel by ship was the only means for travelling overseas until the middle of the twentieth century. The **Cunard Steamship Company** was formed in 1838 with regular steamship services operating on the North Atlantic. During the World War I, in 1914 the operations of the steamship company had to be suspended. After the World War I, the steamship luxury liners were back to business till World War II.

After the World War II, the large luxury Cruise liners again started their operations all over the world and carried passengers and holidaymakers. Some of the linear were very large accommodating up to 1000 passengers and had facilities like swimming pools, cinema halls, shops, casino, etc.

13.2 WATER TRANSPORTATION

The cruise lines are the new attraction among the tourist. The cruises are booked several months in advance for trips into the tropical and sub-tropical waters of the Hawaii,

Caribbean, Mediterranean, etc. Water transport today plays two main roles in travel and tourism namely **ferrying** and cruising. Modern vessels such as the wave -piercing, the hydrofoil and the hovercraft are the over the water transport and used for short distance routes.

Water transportation is also used in riverboat travel. The Mississippi River has been a popular tourist river since the first settlers came to the USA. Today, tourists enjoy two or three-day luxury trips along the river. In Europe, the Rhine, winding through the grapes growing areas of Germany, offers similar leisure tourist trips. Motorized ferries and launches are used over rivers to transport tourists and locals, to transport vehicles, and offer facilities such as car parking, restaurants, viewing decks, etc.

Sea Transportation Here we may include cruise travel, boat travel, yachting, ferry travel and etc. The cruise travel has a special place in tourism. In table 3 we can see the world and North America's growing trend for cruise travel. From the table, we can infer that cruise travel has been much more developed in North America. The cruise ships named as sailing hotels provide tourists with indispensable travel opportunity. While travelling with a cruise ship, the tourists get the opportunity to see several countries at a time. This type of transportation is one the most expensive one, because the price for a cruise ship exceeds $100 million. More than thousands of employees work in a cruise ship at a time, may see that in cruise travel from North/south Americans to Asia, Europe and Middle East companies gained great successes.

Inland **waterways exists in the form of rivers, canals, backwaters and creeks. ... India have an extensive *network* of *Inland* Waterways**

13.3 INTERNATIONAL INLAND WATERWAYS AND OCEAN TRANSPORT NETWORKS:

Since, prehistoric times, water transport has been used for carrying both men and goods. Water transport probably developed before the use of animals because waterway formed an easy means of travel in places where dense forests on land hindered move

The range and importance of water transport was increased when power of wind was harnessed by use of boats or some other medium. At first, boats were small and confined mainly to inland waters and sheltered coastal areas.

The gradual increase in size and complexity of sailing craft allowed trade to be established. The Phoenicians, Egyptians, Greeks and Romans as well as Arabs and Indians

had wide trading contacts. The use of steam has given a new dimension, greater power and speed to water transport to carry larger goods at long distances.

The use of diesel and other forms of power has changed the entire scenario of the water transport and today most of the world trade is water-borne. The two greatest advantages of water transport are that it uses oceans, rivers, seas and needs no special tracks, and that it is the cheapest form of transport for large and bulky loads.

Water transport can be divided into following two categories:

(i) Inland waterways, and

(ii) Ocean transport.

1. Inland Waterways:

There are three types of inland waterways, namely, rivers, rivers which have been modified or canalised, and specially constructed canals. In earlier times much, perhaps most, of the inland carriage of commodities was by water.

This was possible when vessels were small, the volume of traffic limited, and the time factor was not particularly pressing. But during the 18th century, ships began to grow in size, trade began greatly to expand, and speed of carriage came to be of greater importanc

In order to overcome the limitations of many rivers and, also, to provide many inland towns with water communications, canals began to be built. In England, a pioneer in canal construction, the building of these new man-made waterways became almost a mania. Canal building on the Continent came somewhat later, although there are some examples of early canals, e.g., the Canal du Midi in southern France was constructed in 1681.

In 19th century, there was some decline in inland water transport due to development of railways and road transport. But after sometime, water transport has tended to make a comeback, this is closely linked with the cheapness and capacity for bulk carriage of water transport – witness the recent and current developments of the Albert Canal, the canal between Zeebrugge and Ghent, the canalisation of the Moselle, the Rhone Valley Scheme, etc. Inland waterways have both advantages and disadvantages.

The chief advantages are:

(i) There is no track to lay or maintain, although dredging may be necessary in the case of natural waterways;

(ii) They may provide the only practicable routes, e.g., in very difficult, mountainous country or in areas of very dense tropical forest; and

(iii) Waterways, under favourable conditions, provide cheap transport for heavy, bulky, imperishable commodities such as coal, ore, timber, cement.

The principal disadvantages of inland waterways are:

(i) Rivers may involve devious journeys and may flow in the wrong direction from the point of view of trade;

(ii) Otherwise navigable rivers may be interrupted by falls or rapids while canals require locks if there are differences in level;

(iii) River levels may change seasonally and freezing may occur in winter causing stoppages in navigation;

(iv) Canal construction involves heavy capital outlay and canals require constant maintenance and sometimes dredging, and may also require a water supply;

(v) Transport by water is slow in comparison with most other forms of overland transport and carriage by water is generally unsuitable for perishable produce; and

(vi) Waterways are less flexible than either roads or railways which can more easily adapt themselves to changing industrial location.

Although water transport is carried on to a greater or lesser degree the world over, there are only six major navigable systems of inland waterways: the rivers of Western and Central Europe, the Volga-Don system, the North American rivers, the Amazon system, the Parana-Paraguay system, and the Chinese waterways.

Inland waterways are best developed in Europe and North America; in other continents their development is moderate.

 # The important International inland waterways:

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Europe:

In Europe, France, Germany, Belgium, Netherlands as well as Russia, have very extensive inland waterways including rivers and canals. France is having 5,600 km of navigable rivers and another 4,800 km of canals.

The major French rivers, e.g., Loire, Garonne, Seine, Rhone, Meuse and Moselle have been modified and are linked by canal systems so as to travel entirely by river and canals from Mediterranean Sea to English Channel or from Rhine to Atlantic Ocean. On the other hand, Germany is having 7,040 km of inland waterways.

1

- **The Rhine Waterway:**

The Rhine is the busiest navigable river of the world. On both sides of it have developed heavy industries which benefit from cheap water transport. The river is navigable by ocean-going steamers of small size. From the point of economic geography, the rivers prolong the great ocean routes into the interior of lands.

Of the "flowing roads" the Rhine is one of the most remarkable. It leads from the ocean into the very heart of the Continent. The Rhine is a "coal river". The lignite of the Aachen basin and the coal of the Ruhr furnish the greater part of the river freight.

The Rhine is one of the rivers most favoured by nature for navigation. The greatest difference between the Rhine from Basle to Strasbourg and the Rhine from below Strasbourg is the heavy gradient in the upstream stretch, which causes a very swift current.

The Rhine empties into a tributary sea of the North Atlantic which lies at the beginning of the largest current of world commerce. This is a privileged position as compared with most other rivers of Europe. To take advantage of this, other rivers near the Rhine have been connected to it by means of canals. The result is that there is no other river in Europe which has so many canal connections as the Rhine.

- **Waterways of the Germanic-Baltic Lowlands:**

An extensive network of waterways consisting of east-west canals joining the north-south flowing rivers crosses the northern German plain. The Mittelland Canal, also known as the Midland Canal was built in 1938, joins the three major rivers of Ems, Weser and Elbe. Kiel Canal is 96 km long, links the Elbe estuary to the Baltic Sea. The Dortmund-Ems canal runs north-south and links the Rhine with ports of Bremen and Emden.

- **Waterways of Southern Germany:**

Danube is the main river, which flows through seven countries – Germany, Austria, Czech Republic, Hungary, Yugoslavia, Romania and Bulgaria and navigable for about 2,400 km. Canals like Ludwing Canal, Rhone—Rhine Canal provide a good inland waterway.

In Belgium, total length of inland waterway is 1,535 km. Albert Canal (built in 1940) and also other canals on coastal plain serve the towns of Ghent, Bruges, Zeebrugge and Ostend. Netherlands, at the mouth of Rhine, is criss-crossed by its distributaries, and also has extensive man-made waterways.

The former Soviet Union has developed a system of navigable waterways totaling 1, 44,000 km. Most of these waterways are located in European Russia. The Baltic and White Sea Canal, the Moscow-Volga Canal and Volga-Don shipping canals are nodal.

There are several rivers like Volga, Dvina, Don, Dnieper and Dneister, which are navigable in many parts. But many Russian rivers remained blocked during winter season. In spite of such defects Russian rivers are very important for domestic and foreign trade.

- ***North America:***

In North America the rivers of most use for navigation are the Mississippi and Missouri and the most important canals are those of St. Lawrence, which unites

the Ontario and St. Lawrence; the Sault Sainte Marie canal, between Superior and Huron; the canal which links the Chesapeake to the Ohio; the New York canal; and the canals between North Allegheny and Erie.

The length of navigable waterways in United States is over 36,072 km. The Mississippi river system, largest of all, provides more than 8,000 kilometres of waterways with depths of 3 metres or more, including the main river trunkline from Minneapolis to the Gulf of Mexico — a distance of more than 12,880 kilometres. The Missouri, a tributary of Mississippi, is navigable for 1,216 km to Sioux City, Iowa.

On the recommendations of The Ralph M. Parsons Company, a private engineering and construction enterprise with headquarters in Los Angeles was set up under the project to carry out technical assessment of water and power potential of North America. The project is referred to by the company as NAWAPA – the North American Water and Power Alliance.

The basic idea behind 'NAWAPA' is to capture the surplus waters of the Fraser, Yukon, Peace, and Athabaska river systems in north-western North America and to direct, via an elaborate system of canals, reservoirs and tunnels, the surplus water to deficit areas of Canada and United States.

- **The St. Lawrence Waterway:**

The St. Lawrence, with the great lakes, forms a very important commercial route into the heart of North America. The river is, however, ice-bound for about four months every year, and has various rapids and falls which have necessitated the cutting of canals to enable sea-going vessels to reach Lake Superior.

Large ocean vessels can pass about a thousand kilometres up the river to Montreal; but here goods have to be transhipped to smaller vessels, because rapids occur, and the canals made to avoid them are not over 3-5 metres deep.

The Canadian government built a 3-5 metres deep canal around the rapids that permitted shallow draft boats to negotiate the St. Lawrence between Lake Ontario and the sea. After the Welland canal and its eight locks were completed in 1931, interest in the Great Lakes — St. Lawrence Seaway was renewed.

The St. Lawrence enters the ocean by a deep estuary due to submergence in the past, but navigation is rendered difficult by the prevalence of fogs and the rapidity of the current. The valley of the St. Lawrence is fertile, and the whole length is lined with villages and towns.

Another canal has been made to avoid the falls of Niagara, though a great deal of trade is diverted at Buffalo to the Erie Canal and Mohawk-Hudson route to New York. The Sault

Sainte Marie or 500 canals were necessitated by rapids between Lake Superior and Lake Hudson, and the traffic on these canals is enormous.

- ***Asia:***

Asia is not having elaborate system of inland waterways, but rivers in many countries are used as inland waterways.

In China, the rivers have made a significant contribution to the development of commerce. The three great rivers, the Hwang-ho, the Yang-tse-kiang and the Sikiang, cross the country from west to east. China's greatest river is the

Yang-tse-kiang, the most important waterway for navigation in the country. It is doubtful whether there is another equally extensive region of wealth in the world where the people depend as solely upon a single artery of traffic and upon one entrepot as do the inhabitants of the Yangtse basin.

About half of the populations of China live in this fertile area, utilising the river, its tributaries and its network of canals as their chief means of communication.

The Yang-tse-kiang rises in Tibet, and with its tributaries drains the heart of China. It is navigable by steamers up to the port of Hankow. The Sikiang rises in the highlands of Yunan am' has a fairly direct course eastward to its mouth. It is navigable for the greater part of its course. The Pei-ho is important for communication and can be navigated up to Tientsin

Northern India is especially endowed with three large navigable rivers. These rivers are the **Ganga, the Brahmaputra and the Jamuna.** The Ganga can be navigated by steamers as far as **Kanpur** from its mouth. This river flows through the most densely populated and fertile plain of India and naturally commands much traffic.

Before the development of railways the Ganga was of considerable importance for the movement of goods and persons. The development of railways has greatly reduced the importance of steam navigation, especially in the upper Ganga.

The Lower Ganga is even now very important, and there is traffic all the year round. The Brahmaputra flows through Assam and Bangladesh and is navigable as far as Dibrugarh. Its tributary, the Surma, has made steam navigation possible in Sylhet and Cachar. The Indus in Pakistan is navigable by steamer up to Dera Ismail Khan in the North Western Frontier Province. The river mostly handles wheat, cotton and wool. The frequent shifting of its bed and the formation of sand-bars has caused steam navigation in the Indus to be neglected.

Burma is very fortunate in having a large number of navigable rivers. The Irrawaddy, the most important and the largest, is navigable by steamers for more than 800 km from its mouth and country boats can proceed farther.

- ***Africa:***

In Africa, some rivers are navigable, that too for a very limited length. The Nile is the most important river in north-east Africa, but its great defect is the succession of cataracts. In its upper course the Nile has rapids and falls; in its middle course there are cataracts. It is navigable in the delta and in its lower course.

The rivers of South Africa are of little use for traffic. The Zambesi is navigable for only 350 km, while the Limpopo can be navigated only for a short distance. The Orange is not navigable. In tropical Africa, the Congo provides a magnificent system ot waterways. It rises in the highlands between the lakes Tanganyika and Nyasa.

But at several places navigation is interrupted by rapids and falls. The Uban the chiel tributary of the Congo can be navigated almost up to its head. In West Africa the Niger is easily navigable for 500 miles and in the wet season navigation is continued further. The Gambia is navigable for 260 km from its mouth.

- ***South America:***

South America is having some long rivers but their use as inland waterways is limited. Amazon River is the longest river of the continent. But till now the Amazon system is of relatively little use, because the region through which the river flows is densely forested, scantily populated, undeveloped and largely unexplored. The

Orinoco which flows through Venezuela is a long waterway. But the most useful in South America is the Parana system which penetrates the heart of Argentina, Paraguay, Uruguay and South Brazil. In the southern side of South America the river Rio Negro drains the sheep-rearing land of Patagonia.

- ***Australia:***

Australia is deficient in waterways. Her river-system consists of small streams flowing from the highlands to the coast, thus not suitable for navigation purpose. The two most important rivers are Murray and Darling. Darling River remains almost dry during winter and spring seasons. River Murray is partially used as a waterway.

14 Ocean Transport:

Ocean transport is the most important water transport, because it has certain advantages over land carriage. The sea offers a ready-made carriageway for ships which, unlike the roadway or railway, requires no maintenance.

Water surfaces are two-dimensional and, although sea-going vessels frequently keep to shipping lanes, ships can travel, within a limited number of constraints, in any direction.

Because of floatability and reduced friction, ocean vessels are capable of carrying far greater loads and far greater weights than can be handled even by the longest railway train, the most powerful lorry and trailer, or the largest aircraft; accordingly, ocean transport is usually the cheapest of all forms of transport.

Again, except for fog and floating ice, and occasionally stormy weather which may hinder progress, ocean-going vessels have fewer physical obstacles to surmount than those which so often handicap overland transport.

Ships have been used for transport right from early times. During Graeco-Roman times a fundamental distinction was made between longships or galleys, used for military purposes, and round-ships for trade. The Vikings had a similar distinction.

During more recent times ships have shown an even greater specialisation and several distinct types of commercial vessels gradually evolved. Today about half a dozen main types of merchant ships are recognised – passenger liners, cargo-liners, bulk-carriers, tramps and coasters, and short-sea traders.

The most spectacular development, however, has been the appearance of bulk-carriers, the most important of which are tankers, the product of the oil age. Recent years have witnessed a tremendous growth in the size of tankers, a number of which now exceed 5, 00,000 tons dead-weight.

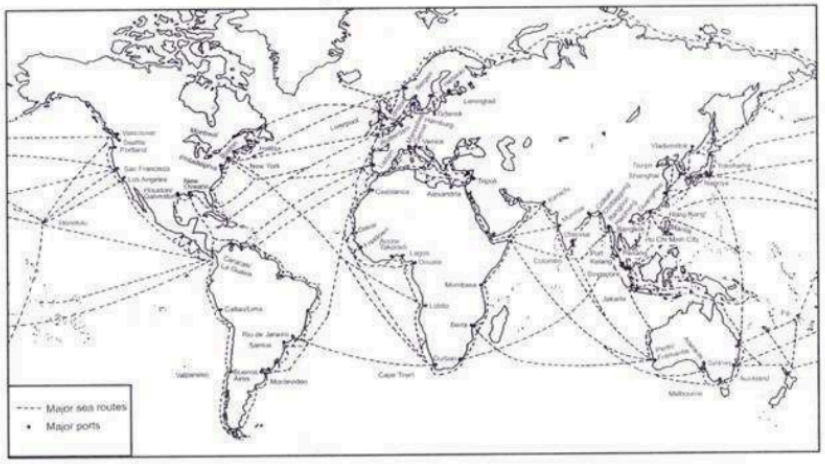
Today, more than half of the world's merchant shipping tonnage comprises tankers, a fact indicative of the great importance of oil in the modern world.

Although ships have freedom of movement and are capable of going virtually anywhere on the ocean surface, they tend to keep to certain "lanes". They do so because of: (i) physical conditions, and (ii) economic considerations.

Clearly, ships will go only where there are goods or people to be carried and the most important shipping routes are those linking the most productive and most populous regions. Certain physical conditions also help to determine the routes followed by ships, e.g., the availability of harbours and ports on coasts, weather conditions such as fog and storm occurrence, and oceanographically factors such as sea ice and icebergs, submarine banks, and shallow waters.

The principal ocean trade routes of the world are as follows:

Figure 13.6
Major Ocean Trade Routes of the World



The North Atlantic Ocean Route:

The North Atlantic Ocean Route has the greatest traffic of all ocean routes. Nearly one-fourth of the tonnage of the world's merchant vessels serves this route. In volume and variety of cargo, this route far exceeds any other.

This route connects the ports of Western Europe with those on the east coast of North America. These two regions are the most populous and highly developed regions in the world.

North America and Western Europe are the world's greatest producers of goods of quantity and diversity. Ports on the western coast of Europe are Glasgow, Liverpool Manchester, Southampton, London, Rotterdam, Bremen, Bordeaux and Lisbon. Ports on the eastern coast of the USA are Quebec, Montreal Halifax, St. John, Boston, New York, Baltimore, Charleston Galveston and New Orleans.

This oceanic route is the busiest trade route of the world. Large quantities of manufactured items: textiles, chemicals, machinery, fertilizers, steel, wine, etc., are exported from these ports across the North Atlantic to the United States and Canada.

The exports of Canada and the USA to Europe are timber, fish, wheat, raw cotton, tobacco, oil, machinery and vehicles, metals, paper and chemicals.

The Suez Canal or Mediterranean Asiatic Route:

This route is second to the North Atlantic in respect of volume of traffic. It commands the markets of eastern Africa, Iran, Arabia, India, the Far East, Australia and New Zealand. In fact, the route passes through the heart of the world and touches more lands and serves more people than any other route. Throughout its many ports of call, it reaches about three-quarters of the total population of the globe.

After crossing the Red Sea, the route follows two directions – one along the eastern coast of Africa to Durban; another to farther east – to India, Australia, etc. Ports of departure are London, Liverpool, Southampton, Hamburg, Rotterdam, Lisbon, Marseilles, Genoa and Naples. The ports of call are Aden, Mumbai, Kolkata, Rangoon, Penang, Singapore, Manila, Hong Kong, Perth, Adelaide, Melbourne, Sydney, Mombasa, Zanzibar, Mozambique and Durban.

This route is used by Asiatic countries to send raw materials and some food products to the western markets and receive in return manufactured articles – the products of the Far East are rice, tea, sugar and silk; those of India are coffee, tea, pig iron, manganese ore, jute goods, indigo, spices, cotton, teak, silk, skins, leather and oil-seeds and those of Middle East are petroleum, coffee, and dried fruits. From Australia meat, timber, wheat, flour, fruit, wool, butter and wine are sent. China, Australia, New Zealand and countries of South and South-East Asia now use this route for both export and import of commodities.

The Cape of Good Hope Route:

This route was once the subsidiary alternative to Suez Canal route, but because of its long and circuitous journey, was avoided by most of the shipping companies. During the closure of Suez Canal in 1967 all the ships had no choice but to take this route.

Even after Suez Canal reopened in 1975, much trade continues to follow this route because tankers and other vehicles nowadays are much larger. As the Suez Canal can only accommodate ships of around 20,000 tons capacity and toll charges are high, the Cape route is growing in importance.

It has several other advantages. With the greater economic development of the recently independent African nations and the exploitation of their rich natural resources such as gold, copper, diamonds, tin, chromium, manganese, cotton, oil palm, groundnuts, coffee and fruits, the volume of traffic round the Cape of Good Hope and from ports in both East and West Africa is on the increase.

The Panama Canal: West Indian Central American Route:

The construction of Panama Canal was completed in 1913. The Panama Canal is 'the gateway to the Pacific' and eliminated the long and hazardous voyage round the Cape Horn. It has benefited on both Atlantic and Pacific seaboard, facilitating trade in minerals, oil, foodstuffs, raw materials, and manufactured products. But the greatest benefits have accrued to traffic between the east and west coasts of USA.

The Panama route has also greatly facilitated trade in the West Indian islands and the Pacific states of North, Central and South America, especially the Andean states which are rich in mineral resources and have good markets in North America. The Latin American states import manufactured goods and mining equipment from the USA and the western European countries.

Much trade destined for the Far East, the Pacific islands and Australasia from North America and Western Europe also goes through the Panama Canal. With the greater economic development of East Asian countries especially China, Japan and the South-East Asian states, the Panama route is assuming a greater role in the exchange of products between the East and West. The distance saved from Auckland to New York via Panama, instead of Cape Horn, is more than 4,000 km.

The South Atlantic Route:

This route leads to West Indies, Brazil and Argentina. The chief ports of call on the route are Kingston (Jamaica), Havana, Vera Cruz, Tampico, Pernambuco, Bahia, Rio de Janeiro, Santos, Montevideo, Buenos Aires and Rosario. The exports along the route are sugar, bananas, raw cotton, mahogany, tobacco, coffee, grain, wool and meat, while the imports are manufactured goods.

This route maintains trade connections between Europe on the one hand and West Indies, Caribbean seaboard, Brazil, Uruguay and Argentina on the other.

The Trans-Pacific Route:

There are several routes in North Pacific which converge at Honolulu for refuelling and servicing. The direct route further north is a great circle which links Vancouver and Yokohama without calling the Hawaiian Island, reduces the travelling distance by half.

The North Pacific trade includes Vancouver, Seattle, Portland, San Francisco and Los Angles on the American side, dealing with wheat, timber, paper and pulp, fish, dairy products and manufactured goods. The destinations across the 7,200 km (4,500 mile) wide Pacific are usually Yokohama, Kobe, Shanghai, Guangzhou (Canton), Hong Kong, Manila and Singapore. The east-bound trade from East Asia to North America consists mainly of

manufactured goods, e.g., textiles, electrical equipment, from Japan, Hong Kong, S. Korea, and Taiwan, and tropical raw materials from South-East Asia, e.g., rubber, copra, palm oil, teak, tin and tea. In addition to international links the North Pacific is an important domestic route-way from the US mainland to the isolated states of Alaska, in the north, and Hawaii in the mid-Pacific.

In the South Pacific, the traffic consists mainly of ships travelling via the Panama Canal between either West Europe or North America and Australia, New Zealand and the scattered Pacific islands. Goods transported are mostly wheat, meat, wool, fruits, dairy products and manufactured articles.

The other important routes are eastern North American-east South American (from New York to Cape Sao Roque), North American-western South American (from New York to Punta Arenas via Panama Canal), North American-Australasian (from New York and Vancouver to Sydney and Wellington via Honolulu), etc.

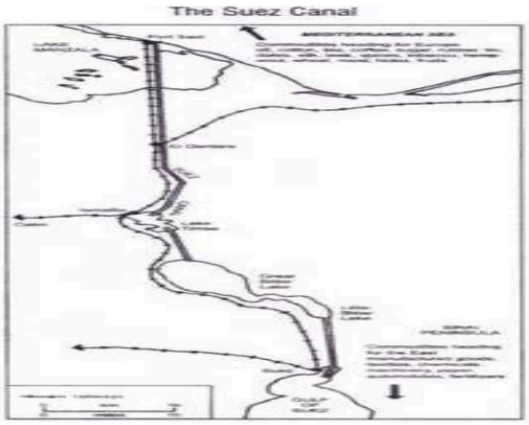
The analysis of ocean transport cannot be completed without detailed description of Suez and Panama Canals. These two canals have changed the entire pattern of oceanic trade, therefore, it is essential to know the characteristics and importance of these canals.

The Suez Canal:

The Suez Canal is one of the great international waterways of the world — cuts across the Isthmus of Suez and provides navigational facilities between the Mediterranean Sea and the Indian Ocean.

The history of a canal connecting the Mediterranean with the Red Sea dates back to 13th century B.C. when Nile-Red Sea canal is known to have been in use until the end of 8th century AD. From 16th century onward one or the other of European powers became interested in the idea of either reopening the old waterway or cutting a new one from the Mediterranean.

In 1834, Ferdinand de Lesseps, a member of the French Consular service at Alexandria was interested in the Suez Canal scheme. In 1854, he discussed the project with the Viceroy of Egypt (Khedive) and got his approval. A concession to run for 99 years from the date of the canal's opening was granted to de Lesseps, authoring him to form an International Company for the purpose of constructing a waterway.



The excavation was started in 1859 under de Lesseps, who took full ten years to construct the canal. It was opened in November, 1869. It is about 160 km long (including distance of lakes) and is 11 to 15 metres deep. The width of the floor is 40 m and varies at the surface. Suez Canal links the Mediterranean Sea with Red Sea. Port Said is located at Mediterranean Sea; while Port Suez is on the Red Sea.

As a ship enters the canal from the Mediterranean Sea, it will pass Port Said, one of the greatest ports in the world and proceeding south will enter Lake Tunisa on the bank of which is the city of Ismailia. From Lake Tunisa to Suez city, a ship will pass through Geat Bitter Lake and Little Bitter Lake.

No single human enterprise during the past century has done more to affect the destinies of nations through a physical geographical change than the Suez Canal. The opening of Suez Canal route saved approximately 5,820 kilometres on the voyage from London to Mumbai as compared to the Cape route.

The opening of Suez Canal had a tremendous affect not only on world trade and commerce but also on international politics, besides opening up to western countries a new route to Africa, Asia and Australia.

The usual trade route between the eastern coast of North America and the Far East was through the Cape of Good Hope. The Suez Canal saved a great deal of distance by diverting the traffic from the Cape of Good Hope route to itself and thus, benefited North America greatly. More than 12,000 vessels pass through the Suez Canal every year.

The Suez Canal has provided not only the fastest but also the most economical line of transit between Europe and the East. Politically the Suez route is vital because of the oilfields in the Middle East countries on whose products the economy of Western Europe is dependent.

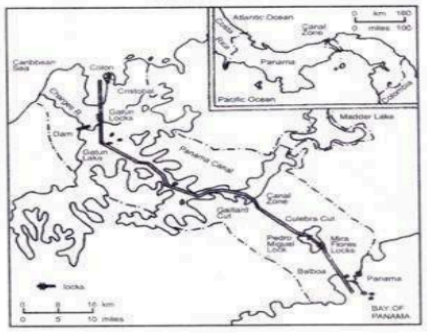
There are some problems of the Suez Canal. The canal needs improvements in regard to depth, width, diversion to avoid crossing of ships in the narrow part of canal. The deposition of silt that comes along winds blown from desert also needs regular cleaning. The second problem is the high canal dues levied on ships which pass through the canal.

It has been observed that when speed is not essential, many cargo liners follow the Cape of Good Hope route to avoid the high dues. Now many cargo vessels are so big in size that they cannot pass through the Suez Canal. Political instability in adjoining states of the canal is also a cause of concern. Although, Suez Canal according to international convention is free and open, in time of war as in time of peace, to every vessel of commerce or of war, without distinction of flag.

The Panama Canal:

The Panama Canal connects the Atlantic and the Pacific oceans by means of two bays, an artificial lake, a natural lake, and three systems of locks. It has been constructed across the narrow Isthmus of Panama where the long Continental Divide dips to one of the lowest points. The canal is 72 km long from deep water to deep water in the oceans. It was opened on 15 August, 1914 (Figure 13.8).

Figure 13.8
The Panama Canal



All the locks are double, so that ships can pass in both directions without any congestion of traffic. The depth of the channel varies from 12 to 26 metres and the width varies from 91 to 305 metres. The time taken to pass through the canal from Panama to Colon is 14 hours.

The Panama Canal passes through a rough country and the engineering difficulties have been much greater than in the case of the Suez Canal, which passes through a level country and needs no locks. The Panama Canal generates its own hydroelectric power with which not only lighting of the region is done, but also electric locomotives are supplied to pull ships through the locks.

The Panama Canal is 'the gateway to the Pacific'. It has benefited countries on both Atlantic and Pacific seaboards, facilitating the trade in minerals, oil, foodstuffs, raw materials and manufactured products. Its greatest benefits have accrued to traffic between the east and west coasts of the United States.

The canal shortens the distance between New York and San Francisco by about 12,596 km by sea, and lessens very considerably the distance between Western Europe and western America, and between the northern and middle parts of East America and East Asia.

It also slightly shortens the distance between Europe and New Zealand, but it does not lessen that between Europe and Asia or Europe and Australia. Eastern North America and north-western Europe very definitely gained as a result of the canal, for they were placed much nearer by this route to all of western North America, western South America, and New Zealand.

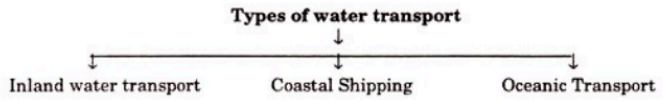
For eastern North America the canal has meant a great reduction in the distance to Japan and to all of China north of Hong Kong, a factor that has unquestionably contributed to the rapid growth of trade with East Asia.

13.4 WATER TRANSPORT SYSTEM IN INDIA

Water transport is the most easy and cheap mode of transport. Unlike rail and road transport we do not have to construct water ways because river and seas are given by nature.Water transport plays important role in case of international trade.

During natural calamities like heavy rain and flood, when rail and road transport are not workable, rescue operations are undertaken by water transpo

Before independence, there were many private shipping companies. But after independence. Eastern shipping corporation was established in 1950, in 1956 Western shipping corporation was set up. In 1961 Indian Shipping Corporation was set up merging the two corporations.



1. Inland Transport:

Generally speaking Inland water transport refers to the transport facilities available in the navigable waters, canals and back waters. It is the cheapest mode for certain kind of traffic provided the points of origin and destination are located on water bank. River and canal transport played an important role in the transport system of the country during early years but with the development of rail and road transport, this channel suffered the set back.

In Assam, West Bengal and Bihar this channel of transport is important. Half of the total traffic between Assam and Kolkata are shared by river transport and the remaining half is shared by road and rail transport. Water transport is important in Kerala where rivers and backwaters are used for ferrying goods and people. It has some importance in Orissa, Tamil Nadu and Andhra Pradesh. In 1986, Inland Waterways Authority of India was set up.

2. Coastal Transport:

India has wide coast line of nearly 4200 miles. Transport facilities available along the vast coast line of the country through ships is called coastal shipping. The shipping policy committee recommended that Indian ships should secure 100% of her coastal trade. It is the cheapest mode of transport. There has been sharp decline in coastal shipping operation. In 1961, there was 97 ships and in 1980 the number came down to 56.

3. Oceanic Transport:

Generally speaking, Oceanic Transport means the movement of ships between the countries through sea routes. India's international trade is carried on by oceanic transport. On the eve of independence, there were only 42 ships with less than 10 lakhs gross registered tonnage (GRT).Govt. appointed a shipping policy committee in 1947. The committee recommended that India should secure 100% of her coastal trade and 50% of her overseas trade. Due to this policy shipping tonnage had increased. Port Trust of India (PTI) managed 11 major and 139 minor ports in India. In 1961, Shipping Corporation of India came into existence with the merger of Eastern shipping corporation and Western Shipping Corporation.

Key Words:

Waterways: a river, canal, or other route for travel by water. a channel at the outer edge of a deck of a boat that allows water to run off.

Sea Transport: Any movement of goods and/or passengers using seagoing vessels on voyages which are undertaken wholly or partly at sea.

Inland Waterways: any of the waters (as lakes, canals, rivers, watercourses, inlets, and bays) within the territory of a state as contrasted with the open seas or marginal waters

Canal:an artificial waterway constructed to allow the passage of boats or ships inland or to convey water for irrigation

13.5 SELF-ASSESSMENT QUESTIONS:

1. Define Water transport?
2.Explain International inland waterways and ocean transport networks?
3. Describe the inland waterways
4. Explain about water transportation?
5. Elucidate the important international inland waterways systems?
6. Explain the principal ocean trade routes of the world?
7.Describe about water transport in India?
8. Water transportation is the cheapest transport- Comment ?

13.6 FURTHER READINGS

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Lesson - 14

ROAD TRNSPORTATION

14.0 Learning Objectives:

After reading this Lesson you should be able to understand

- To understand road transport systems
- To know the Classification of roads in India
- To know about the national highways in India

STRUCTURE

14.1 Introduction
14.2 Road Transportation
14.3 Classification Roads
14.4 National highways in India
14.5 Self-Assessment Questions
14.6 Further Readings

14.1 INTRODUCTION

Road transport means transportation of goods and personnel from one place to the other on roads. Road is a route between two destinations, which has been either paved or worked on to enable transportation by way of motorised and non-motorised carriages. There are many advantages of road transport in comparison to other means of transport. The investment required in road transport is very less compared to other modes of transport such as railways and air transport. The cost of construction, operating cost and maintaining roads is cheaper than that of the railways.

Delivery of goods between cities, towns and small villages is made possible only through road transport. However, in spite of various merits, road transport has some major limitations. For instance, there are more chances of accidents and breakdowns in case of road transport. So, motor transport is not as safe as other means of transport.

14.2 ROAD TRANSPORTATION

Road transport is also quite less organised in comparison with other modes. It is irregular and undependable. Rates for road transportation are also unstable and unequal,

while the speed in road transport is slow and limited, which is a major drawback. Transporting bulky goods over long distances is also unsuitable and costly. In modern days, road transport has a serious negative impact on the environment. Building roads requires melting of tar or formulation of concrete, which may harm the associated environment. Since roads have been a major enabler of motorised transport, these vehicles also emit a lot of pollution in the form of Nitrogen dioxide, volatile organic compounds, carbon monoxide and various harmful air pollutants, including benzene, which have an adverse respiratory health effects and a serious threat to global warming. While improvisation of roads is a serious topic of research, road transport of the future includes aspects like solar panel roads and cars where solar cells have replaced asphalt or tar, and there are vehicles with electric motors reducing emission. Road transport of the future aims to work on these negativities and turn them around.

Road Transportation in India

Roads are an important mode of **transport in India**. ... Adjusted for its large population, **India** has approximately 4.63 kilometres (2.88 mi) of **roads** per 1,000 people. As **of 31 March 2016, 62.5%** of **Indian roads** were paved. **India's road** network carries over 65 percent of its **freight** and about **85 present of passenger traffic.**

Roads are an important mode of transport in India. India has a network of over 5,603,293 kilometres (3,481,725 mi) of roads as of 31 March 2016.

This is the second-largest road network in the world, after the United States with 6,702,178 kilometres (4,164,540 mi).[2] At 1.70 kilometres (1.06 mi) of roads per square kilometre of land, the quantitative density of India's road network is higher than that of Japan (0.91 km, 0.57 mi) and the United States (0.99 km, 0.62 mi), and substantially higher than that of China (0.46 km, 0.29 mi), Brazil (0.18 km, 0.11 mi) and Russia (0.08 km, 0.050 mi).[2] Adjusted for its large population, India has approximately 4.63 kilometres (2.88 mi) of roads per 1,000 people.[3] As of 31 March 2016, 62.5% of Indian roads were paved.[2] India's road network carries over 65 percent of its freight and about 85 percent of passenger traffic.[4] It contributed 4.7 percent towards India's gross domestic product. This is in comparison to railways, which contributed 1 percent from 2009 to 2010.

Since the 1990s, major efforts have been underway to modernize the country's road infrastructure. The length of national highways in India has increased from 70,934 km (44,076 mi) in 2010–11 to 142,126 km (88,313 mi) in 2018–19.

As of May 2017, India had completed and placed into use over 28,900 kilometres (18,000 mi) of four- or more-lane highways connecting many of its major manufacturing, commercial and cultural centres.

According to Ministry of Road Transport and Highways, as of March 2019, India had about **142,126 kilometres (88,313 mi) of national highways and expressways,** plus another **176,166 kilometres (109,464 mi) of state highways**. Major projects are being implemented under the National Highways Development Project, a government initiative. Private builders and highway operators are also implementing major projects.

According to 2009 estimates by Goldman Sachs, India will need to invest US$1.7 trillion on infrastructure projects before 2020 to meet its economic needs, a part of which would be in upgrading India's road network. The investment in national highways increased from ₹14,095.87 crore (US$2.0 billion) in 2005–06 to ₹98,988.06 crore (US$14 billion) in 2015–16.[2] During the same period the total investment in national highways was ₹476,589.37 crore (US$67 billion).

The Government of India is attempting to promote foreign investment in road projects.[10][11][12] Foreign participation in construction of the Indian road network has attracted 45 international contractors and 40 design/engineering consultants, with Malaysia, South Korea, United Kingdom and United States being the countries with the

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14.3 CLASSIFICATION OF ROADS

Roads in India have been classified into following:

1. National Highways:

These refer to the main roads which connect the state, capitals, ports and big cities. Constructions and maintenance of these roads are the responsibility of Centre Govt.

2. State Highways:

These are the main roads of the state. These connect the capital and the cities of the state. State Govts., are responsible for their maintenance.

3. District Roads:

These roads connect district man-dies and production areas. These are maintained by District Boards.

4. Village Roads:

These roads connect the villages with district roads. Panchayats construct these roads.

5. Border Roads:

14. 4 NATIONAL HIGHWAYS IN INDIA

10

15 Longest National Highways of India by New Highway Number

Government of India has officially published new numbering system for all the national highway network of India on 28 April 2010. As per the new numbering system, All major Highways will be single digit or double digit and also based on the orientation and the geographic location of the highway.

NH 44 – 3,745 km (Old NH 7)

National Highway 44 (NH 44) is the longest National Highway in India, starts from Srinagar and terminates in anyakumari. The NH 44 highway has come into being by merging seven major national highways of old number that include NH 1A,NH 1,NH 2,NH 3, NH 75,NH 26 and NH 7. Major stretch of NH 44 are part of North South Corridor and the Golden Quadrilateral,connects several important Indian cities from Srinagar to Kanyakumari.

NH 27 – 3,507 km

National Highway 27 (NH 27) is a part of North South and East West Corridor of India,starts from Porbandar and terminates in Silchar. The 3,507 km long road is the second longest National Highway in India after National Highway 44 (old NH 7). Jhansi is the junction of North South and East West Corridors.

NH 48 – 2,807 km (Old NH 8)

National Highway 48 (NH 48) starts from Delhi and terminates at Chennai. The national highways of old NH 8, stretch from Delhi to Jaipur including Kishangarh expressway,National Expressway 1, Udaipur to Vadodara and Baroda to Bombay (NH 8 old) were merged and renumbered to NH 48. Ahmedabad Vadodara Expressway, Delhi Gurgaon Expressway, Jaipur-Kishangarh Expressway and Western Express Highway are the part of new numbered National Highway 48.

NH 52 – 2,317 km

National Highway 52 (NH 52) is a 2,317 km long highway that connects north to south India. NH 52 passes through the major cities of Hisar, Jaipur, Kota, Indore, Dhule,Aurangabad, Bijapur to Hubli.

NH 30 – 2,010 km

National Highway 30 (NH 30) was previously National Highway 221, connecting Sitarganj in Uttarakhand with Ibrahimpatnam in Andhra Pradesh. NH 30 passes through 6 major states of India covering a distance of 2,010 km through the cities of Lucknow, Allahabad,Jabalpur, Raipur and Bhadrachalam.

NH 6 – 1,873 km

National Highway 6 (NH 6) starts near Jorabat in Meghalaya and terminates at Selling in Mizoram. The 1,873 km long highway is the longest national highway in north east India and passes through the states of Meghalaya, Assam and Mizoram.

NH 53 – 1,781 km

National Highway 53 (NH 53) is a 1,781 km long highway connecting Hajira in Gujarat and Pradip port in Odisha. NH 52 runs through four states of Gujarat, Maharashtra, Chhattisgarh and Odisha.

NH 16 – 1,659 km (Old NH 5)

National Highway 16 (NH 16) is a part of the Golden Quadrilateral project, runs along east coast of West Bengal, Odisha,Tamil Nadu and Andhra Pradesh. The 1,659 km long road highway connects various cities and towns of four states and terminates at Chennai in Tamil Nadu.

NH 66 – 1,593 km (Old NH 17)

National Highway 66 (NH 66) was previously known as NH 17, that runs parallel to the Western Ghats of India. It starts at Panvel and terminates at Kanyakumari, passing through all the major cities and towns of different states of Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu. NH 66 offers the most beautiful road journey in India along the western coast of Karwar,Chiplun,Mangaon,Maravanthe and Alappuzha.

NH 19 – 1,435 km (Old NH 2)

National Highway 19 is one of the top 10 longest national highways of India, Often referred as Delhi Kolkata Road. The 1,435 km long highway is one of the busiest National Highways in India, runs through the major cities of Delhi, Agra, Varanasi, Barhi,Asansol and Kolkata. It was part of the Golden Quadrilateral and a major portion is the historical Grand Trunk Road.

NH 34 – 1,426 km

National Highway 34 (NH 34) runs from Gangotri Dham in Uttarakhand and ends at NH44 near Lakhnadon, Jabalpur . The 1,426 km long national highway route include Uttarkashi,Rishikesh,Haridwar,Ghaziabad, Bulandshahr, Aligarh,Damoh and Jabalpur.

NH 2 – 1,214 km

National Highway 2 (NH 2) starts near Dibrugarh and connect Assam, Nagaland, Manipur, Mizoram states with Sivasagar, Kohima, Imphal and Tuipang. The NH 2 1,214 km long highway is the second longest national highway in North East India.

NH 13 – 1,150 km

National Highway 13 (NH 13) was previously known as NH 229, running from Tawang in Arunachal Pradesh to Pasighat in Assam. The 1,150 km long highway passes through beautiful town of Sela Lake,Dirang, Bomdila, Ziro Town, Biru and Pasighat in Assam.

NH 47 – 1,080 km

National Highway 47 (NH 47) starts from Bamanbore in Gujarat and terminates at Nagpur in Maharashtra. The 1,080 km long highway route include Bamanbore, Limbdi,Godhra,Indore,Harda Betul and connect to NH44 at Nagpur.

NH 31 – 968 km

National Highway 31 (NH 31) starts from Uttar Pradesh and terminates at West Bengal. The 968 km long highway passes through Bihar state and crossed with West Bengal State Highway 10.

KEY WORDS:

Road Transport: *Road transport means transportation* of goods and personnel from one place to the other on *roads. Road* is a *route* between two destinations, which has been either paved or worked on to enable *transportation* by way of motorised and non-motorised carriages.

National Highway: National Highways connects various regions of one state to the other like capital of one state other state capital. National Highways are maintained by Central Govt.

State Highway: State Highways are those that connects various regions within state means main cities of a state.

14.5 SELF-ASSESSMENT QUESTIONS

1. Define Road Transportation
2. Give a brief note road transportation in India?
3. Explain about classification of roads?
4. Elucidate the important national highways in India?

14.6 Further readings:

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LESSON 15

IATA: (INTERNATIONAL AIR TRANSPORT ASSOCIATION)

OBJECTIVES

After studying this lesson, you should be able

- To know about the IATA
- To know about the priorities of IATA
- To Study the Strategic Partners Of IATA

STRUCTURE

15.1 INTRODUCTION

15.2 HISTORY

15.3 PRIORITIES

15.4 ENVIRONMENT

15.5 STRATEGIC PARTNERS

15.1 INTRODUCTION

The International Air Transport Association is a trade association of the world's airlines. Consisting of 278 airlines, primarily major carriers, representing 117 countries, the IATA's member airlines account for carrying approximately 83% of total Available Seat Kilometers airtraffic. IATA supports airline activity and helps formulate industry policy and standards. It is headquartered in Montreal, Quebec, Canada with Executive Offices in Geneva, Switzerland.

15.2 HISTORY

IATA was formed in April 1945 in Havana, Cuba. It is the successor to the International Air Traffic Association, which was formed in 1919 at The Hague, Netherlands. At its founding, IATA consisted of 57 airlines from 31 countries. Much of IATA's early work was technical and it provided input to the newly created International Civil Aviation Organization (ICAO), which was reflected in the annexes of the Chicago Convention, the international treaty that still governs the conduct of international air transport today. The Chicago Convention couldn't resolve the issue of

who flies where, however and this has resulted in the thousands of bilateral air transport agreements in existence today. The benchmark standard for the early bilateral was the 1946 United States-United Kingdom Bermuda Agreement. IATA was also charged by the governments with setting a coherent fare structure that avoided cut-throat competition but also looked after the interests of the consumer. The first Traffic Conference was held in 1947 in Rio de Janeiro and reached unanimous agreement on some 400 resolutions. Aviation grew rapidly over the following decades and IATA's work duly expanded.

15.3 PRIORITIES

Safety

This is the number one and prime priority for IATA. The main instrument for safety is the IATA Operational Safety Audit (IOSA). IOSA has also been mandated at the state level by several countries. In 2017, aviation posted its safest year ever, surpassing the previous record set in 2012. The new global Western- built jet accident rate became the equivalent of one accident every 7.36 million flights. Future improvements will be founded on data sharing with a data base fed by a multitude of sources and housed by the Global Safety Information Center. In June 2014 the IATA set up a special panel to study measures to track aircraft in flight in real time. The move was in response to the disappearance without trace of Malaysia Airlines Flight 370 on 8 March 2014.

Security

Security has become increasingly important following the September 11 attacks in2001. Following a series of uncoordinated rules by different countries, the industry has developed a Checkpoint of the Future, which is based on risk assessment and passenger differentiation.

Simplifying the Business

This was launched in 2004. This initiative has introduced a number of crucial concepts to passenger travel, including the electronic ticket and the bar coded boarding pass. Many other innovations are being established as part of the Fast Travel initiative, including a range of self- service baggage options. An innovative program, launched in 2012 is New Distribution Capability. This will replace the pre-Internet EDIFACT messaging standard that is still the basis of the global distribution system /travel agent channel and replace it with an XML standard. This will enable the same choices to be

offered to high street travel shoppers as are offered to those who book directly through airline websites.

15.4 ENVIRONMENT

IATA members and all industry stakeholders have agreed to three sequential environmental goals:

1. An average improvement in fuel efficiency of 1.5% per annum from 2009 through2020
2. A cap on net carbon emissions from aviation from 2020 (carbon-neutralgrowth)
3. A 50% reduction in net aviation carbon emissions by 2050 relative to 2005 levels.

At the 69th IATA annual general meeting in Cape Town, South Africa, members overwhelmingly endorsed a resolution on ***"Implementation of the Aviation Carbon-Neutral Growth (CNG2020) Strategy."*** The resolution provides governments with a set of principles on how governments could: Establish procedures for a single market based measure (MBM). Integrate a single MBM as part of an overall package of measures to achieve CNG2020.IATA member airlines agreed that a single mandatory carbon offsetting scheme would be the simplest and most effective option for anMBM.

Services:

- IATA provides consulting and training services in many areas crucial to aviation. _ Travel Agent accreditation is available for travel professionals. Full accreditation allows agents to sell tickets on behalf of all IATA member airlines.
- Cargo Agent accreditation is a similar program.
- IATA also runs the Billing and Settlement Plan, which is a $300 billion-plus financial system that looks after airlinemoney.
- It provides a number of business intelligence publications andservices.
- Training covers all aspects of aviation and ranges from beginner courses through to senior managementcourses.

15.5 STRATEGIC PARTNERS:

IATA's Strategic Partners are aviation solution providers who, through their work with various IATA work groups, help build and maintain relationships with key industry stakeholders and work with IATA in serving the air transport industry.

Standards: A number of standards are defined under the umbrella of IATA. One of the most important that the transport of dangerous goods.

KEYWORDS

1. Safety: the condition of being protected from or unlikely to cause danger, risk, or injury.
2. Security: Security is freedom from, or resilience against, potential harm caused by others.
3. Strategic Partnership: A strategic partnership is a relationship between two commercial enterprises, usually formalized by one or more business contracts

SELF ASSESSMENT QUESTIONS

1. When IATA was established and its Headquarters?
2. What are the priorities of IATA?

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CHAPTER 16

IATA AREAS & SUB AREAS

OBJECTIVES

After studying this lesson, you should be able

- To study about the IATA Areas
- To gain knowledge on sub areas

STRUCTURE

16.1 INTRODUCTION

16.2 Tariff Conference – 1

16.3 Tariff Conference – 2

16.4 Tariff Conference – 3

16.1 INTRODUCTION

Any **travel professional** who handles the matters related to preparations of Itineraries, reservations, Group Bookings, fare calculations and ticketing should have knowledge about the world geography and also should be able to identify the cities by the location, country, areas and sub areas defined by **IATA**.

Geography is a subject which builds on young people's own experiences, helping them to formulate questions, develop their intellectual skills and prepares into handling every type of travel client.

If a person who is related to travel field is having the knowledge about the world geography then he or she can easily plan out the best suitable itinerary for their clients.

The Eastern Hemisphere and the Western Hemisphere which are the two parts of the world as per the elementary geography is further divided by IATA into3 traffic conference areas called IATA Areas or TC1, TC2 and TC3 which comprise of further sub areas and that is different from the geographical definitions.

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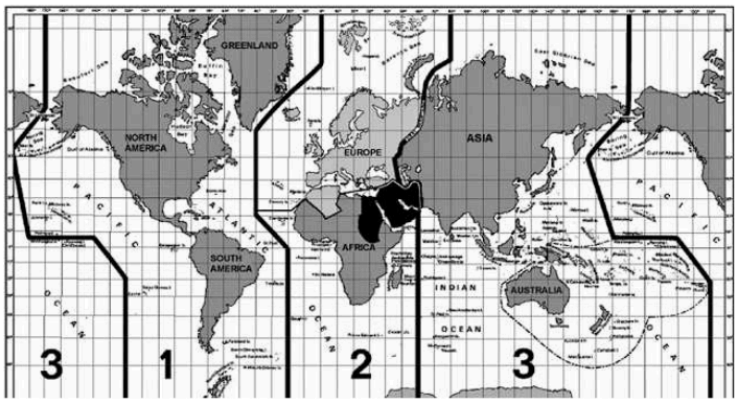
International Air Transport Association(IATA) World geography



IATA has divided world into three areas: **TC1, TC2, TC3**

- Ural Mountain of Russia and Tehran in Middle East divides TC2 with TC3.
- Tc1 is Known as Western Hemisphere.
- TC2 and TC3 are together known as Eastern Hemisphere

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AREA 1

All of the North and South American Continents and the islands adjacent , Greenland, Bermuda, the West Indies and the Islands of the Caribbean Sea, the Hawaiian Islands.

AREA 2

Europe, Africa and the islands adjacent and that part of Asia west of Ural Mountains, including Iran and the Middle East.

AREA 3

Asia and the islands adjacent thereto except the portion included in Area 2; The East Indies, Australia, New Zealand and the islands of the Pacific Ocean except those included in Area 1.

16.2 AREA-1 (TARIFF CONFERENCE - 1(TC1)

Continent	Sub-area	Counties
North America	North America	Canada, Greenland, Mexico, St. Pierre & Miquelon, USA including Alaska, Hawaii, Puerto Rico and US Virgin Islands.
	US Territories	American Samoa, Johnston Atoll, Swains Is., Baker Is., Kingman Reef, Palmyra Is., Guam, Midway Is., Wake Is., Howland Is., Northern Mariana Is., Jarvis, Saipan.
	Caribbean	Anguilla, Dominican Republic, Netherlands, Antilles, Antigua and Bermuda, Grenada, St. Kitts and Nevis, Barbados, Haiti, St. Vincent and The grenadines, Cayman Islands, Jamaica, Trinidad and Tobago, Cuba, Martinique, Turks and Caicos Is., Dominica, Montserrat, British Virgin Islands.
	Central America	Belize, El Salvador, Honduras, Costa Rica, Guatemala, Nicaragua.
South America	South America	Argentina, Ecuador, Peru, Bolivia, French Guiana, Suriname, Brazil, Guyana, Uruguay, Chile, Panama, Venezuela, Colombia, Paraguay.

16.3 AREA 2 (TARIFF CONFERENCE - 2(TC2)

Continent	Sub-area	Counties
Antarctica		Antarctica
Europe	Europe	Albania, Germany, Norway, Algeria, Gibraltar, Poland, Andorra, Greece, Portugal, Armenia, Hungary, Romania, Austria, Iceland, Russia (in Europe), Azerbaijan, Ireland, San Marino, Belarus, Italy, Serbia, Belgium, Latvia, Slovakia, Bosnia & Herzegovina, Liechtenstein, Slovenia, Bulgaria, Lithuania, Spain, Croatia, Luxembourg, Sweden, Cyprus, Macedonia, Switzerland, Czech Republic, Malta, Tunisia, Denmark, Moldova, Turkey, Estonia, Monaco, Ukraine, Finland, Montenegro, United Kingdom, France, Morocco, Georgia, Netherlands.

	Middle East	Bahrain, Jordan, Saudi Arabia, Egypt, Kuwait, Sudan, Iran, Lebanon, Syria, Iraq, Oman, United Arab Emirates, Israel, Qatar, Yemen.
Africa	Central Africa	Malawi, Zambia, Zimbabwe.
	Eastern Africa	Burundi, Djibouti, Eritrea, Ethiopia, Kenya, Rwanda, Somalia, Tanzania, Uganda.
	South Western Africa	Botswana, Lesotho, Mozambique, Namibia, South Africa, Swaziland.
Western Africa		Angola, Benin, Burkina, Faso, Cameroon, Cape Verde, Central African Republic, Chad, Congo, Brazzaville, Congo Kinshasa, Côte D'Ivoire, Equatorial Guinea, Gabon, Gambia, Ghana, Guinea, Guinea – Bissau, Liberia, Mali, Mauritania, Niger, Nigeria, Sao Tome and Principe, Senegal, Sierra Leone, Togo.
Indian Ocean Island		Comoros, Madagascar, Mauritius, Mayotte, Reunion, Seychelles, Libya.

16.4 AREA 3 (TARIFF CONFERENCE - 3(TC3))

Continent	Sub-area	Counties
Asia	South Asian	Afghanistan, India, Pakistan, Bangladesh, Maldives, Sri Lanka, Bhutan, Nepal.
	South East Asia	Brunei, Darussalam, Kyrgyzstan, Palau, Cambodia, Laos, Philippines, China (excl and Macao SAR),Macao SAR, Russia (in Asia), Chinese Taipei (Taiwan), Malaysia, Singapore, Guam, Micronesia, Thailand, Hong KongSAR, Mongolia, Turkmenistan, Indonesia, Myanmar, Uzbekistan, Kazakhstan, Northern Marian Rota).

	Japan/Korea	Japan, Korea
Oceania	South West Pacific	American Samoa, Nauru, Solomon Is, Aus Tonga, Cook Islands, New Zealand, Tuva French Polynesia, Papua New Guinea, Wallis Kiribati, Samoa.

KEYWORDS

Traffic Conference: The Eastern Hemisphere and the Western Hemisphere which are the two parts of the world as per the elementary geography is further divided by IATA into3 traffic conference areas called IATA Areas or TC1, TC2 and TC3 which comprise of further sub areas and that is different from the geographical definitions.

SELF ASSESSMENT QUESTIONS

1. Write about the traffic conference 1
2. What are the areas comes under Traffic conference 3
3. What are countries comer under Latin America

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CHAPTER-17

IATA GLOBAL INDICATORS

OBJECTIVES

After studying this lesson, you should be able

- To study about the Global Indicators
- To know about the different air routes

STRUCTURE

17.1 Western Hemisphere

17.2 Eastern Hemisphere (EH)

17.3 Atlantic (AT)

17.4 South Atlantic

17.5 Pacific (PA)

17.6 Pacific North (PN)

17.7 Trans Siberian

17.8 Russian Federation

17.9 Federation (Far East)

INTRODUCTION

A two-letter indicator used in fare construction to indicate the basic routing that the fare applies to.

There are 7 global indicator used in Airlines Industry.

The purpose of the global indicators, which will be reported on with one national aggregate per indicator, is to broadly track progress towards the Goals and targets at the global level. They are also useful for countries to communicate their current situation, both to the international community to raise awareness of challenges and needs, and to the own population to show that progress is being made.

17.1 WESTERN HEMISPHERE (WH)

- *Journey with in Area 1 or within the western hemisphere*

  Eg.1. New York to San Francisco

  2. Washington D.C to Brasilia
  3. Mexico to Buenos Aires

17.2 EASTERN HEMISPHERE (EH)

- *Travel within Ares2 (Europe)*

  1)Paris to London

  2) Liverpool to Berlin

  3) Warsaw to Lisbon

- *Travel within area3 (Asia)*

E.g. 1) Delhi to Singapore

2) Hyderabad to Kolkata

3) Sydney to Tokyo.

- ***Travel between area2 &3 (Europe and Asia)***

E.g. 1) Moscow – Kabul – Bangalore

2) Melbourne-Tokyo-Beijing

3) Bangkok-Singapore-Paris

17.3 ATLANTIC (AT)

- *Travel between area1 (America) and 2 (Europe) Via Atlantic ocean*

E.g. 1) Berlin-Miami-Rio

2) Bern-California-Buenos Aires

- *Travel between area1 (America) and area 3 (Asia) via area2(Europe)*

  1) Vancouver –Geneva-Delhi

  2) Beijing- Dubai-Ottawa

17.4 SOUTHATLANTIC

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The travel Between South Atlantic Sub-area and South East Asia via Atlantic and via point(s) in Central Africa, Southern Africa, Indian Ocean Is. only or via direct service

Singapore-Mauritius-Johannesburg-Rio

2) Bangkok-Durban-Buenos Aires.

Note: South Atlantic Sub Area

- ABCPU Countries
  - Argentina
  - Brazil
  - Chile
  - Paraguay
  - Uruguay

❖ **South East Asia Countries**

- Brunei
- Cambodia
- China
- Hong Kong
- Indonesia
- Malaysia
- Myanmar
- Philippines
- Singapore

Africa- subareas

Central Africa

- Malawi, Zambia, Zimbabwe South Africa
- Botswana ,Lesotho, Mozambique, South Africa Namibia, Swaziland Indian Ocean Is
- Comoros, Madagascar, Mauritius, Mayotte, Reunion, Seychelles

17.5 PACIFIC (PA)

3.3 The Travel between area3 (Asia) and area1 (America) Via Pacific ocean

Ex.1) Seoul-Tokyo-Ottawa

2) Vancouver-Beijing

3) Canberra-Mexico

17.6 PACIFIC NORTH (PN)

3.6 The travel Trans Pacific routing between South America and South West Pacific via North America but not via North and Central Pacific

3.7 E.g.1)Sydney – Mexico- Rio deJenario

2) Lima-Florida-Melbourne.

17.7 TRANS SIBERIAN

The Area 2 and Area 3 (Trans Siberian route) with a sector having Travel Between nonstop service between Europe and Japan, Korean countries. i.e. South Korea and North Korea. (Or) *The Travel between TC 2 and TC3 with a flight Europe and Japan /Korea*

E.g. 1) Bangkok-Tokyo-France

2) Hong Kong-Seoul-France

3) Moscow-Paris-Osaka.

17.8RUSSIANFEDERATION

The travel between Russia (in Europe) and) and Area 3 with non- stop service between Russia (in Japan, Korea not via another country (ies) in Europe. (Or) *Between Russia in Europe and TC3 with a flight coupon or nonstop service between Russia in Europe and Japan/Korea*

Ex.1) Moscow-Osaka

2) Hong Kong-Seoul-Moscow

17.9 FEDERATION (FAR EAST)

The Travel between Russia in Europe/Ukraine and TC3 other than Japan and Korea.

(Or)

The Travel between Russia (in Europe)/Ukraine and Area 3 with nonstop service between Russia (in Europe)/Ukraine and Area 3 other than Japan, Korea

Ex.1) Moscow –Delhi-Singapore

2) Kiev-Bangkok-Sydney.

KEYWORDS

- Africa sub areas: The continent of Africa is commonly divided into five regions or sub regions, four of which are in Sub-Saharan Africa
- Trans Siberian: The three termini of the Trans-Siberian are Moscow, Beijing and Vladivostok. There's also a bi-monthly connection from Moscow to Pyongyang.
- Far east: The Far East is a geographical term in English that usually refers to East Asia, the Russian Far East, and Southeast Asia

SELF ASSESSMENT QUESTIONS

1. Write about the global indicators with examples
2. Write about the Pacific North Global Indicator
3. How many global indicators are there?

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