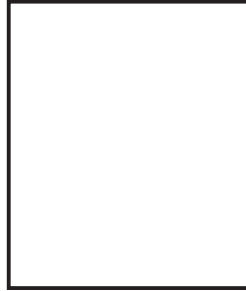


377

Senior Secondary Course

# Transportation & Warehouse Management

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**NATIONAL INSTITUTE OF OPEN SCHOOLING**

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A-24-25, Institutional Area, Sector-62, NOIDA-201309 (U.P.)

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Printed on 60 GSM NIOS Water Mark Paper

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November, 2022 (..... copies)

Published by the Secretary, National Institute of Open Schooling, A-24/25, Institutional Area, Sector-62,  
NOIDA-201309 and Printed at M/s .....

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## A Word With You

Dear Learners,

I welcome you to this course in Transportation and Warehouse Management at the Senior Secondary level. We all know the importance of Transportation and Warehouse procedures and practices in our everyday life. Transportation and Warehouse in the past are completely different from modern days. Therefore, a systematic effort is required to understand, analyze and respond to the changes that affect Transportation and Warehouse functioning in the present day society.

Transport Management is the study of the processes and systems used to safely deliver passengers and goods from one location to another. Transport Management also examines the major environmental, operational, and economic problems affecting the transport and distribution industries. Transport Management seeks to answer questions like: How to create transport systems and infrastructure that are safe and reliable for both cargo and workers? Transport and Warehouse Management learners typically work in national and international trading and commerce, in passenger transport companies on the road, rail, air or sea. Some clients prefer outsourcing logistics to experts, so transportation managers can also practice in special consultancy firms.

Through this course, you will gain a comprehensive understanding of the orchestration of logistics/transportation. The big picture of logistics and transportation keeping in mind the above, the curriculum of Transportation and Warehouse Management at Senior Secondary level has been designed. The layout of the pages has been designed to make your learning process interesting and useful. You will also find some attractive icons in the lesson symbolizing the content of different sections. Some sections like Do and Learn, Key Terms, Role Play etc.

Keeping in mind the above, the curriculum for Transportation and Warehouse Management at Senior Secondary level has been designed. The whole learning material of the subject has been published in two books for your convenience. The book has five modules and 26 chapters.

I am sure that you will find the lessons and their approach interesting and can apply your knowledge in real life situations. So read all the lessons of this course carefully and be prepared for the examination with confidence. If you face any difficulty with your studies, please write to me. Your suggestions are valuable to us.

Good luck and happy learning.

Course Coordinator



# How to use the Study Material

Congratulations! You have accepted the challenge to be a self-learner. It means, you have to organize your study, learn regularly, keep up your motivation and achieve your goal. Here it is solely you, who is responsible for your learning. NIOS is with you at every step. It has developed the material in Transportation and Warehouse Management keeping only you in mind. A format supporting independent learning has been followed. You can take the best out of this material if you follow the instructions given below.



**Title:** The title of the lesson will give a clear indication of the contents within. Do read it.

**Introduction:** This will introduce you to the lesson and also link it to the previous one.

**Objectives:** These are statements of outcomes of learning expected from you after studying the lesson. You are expected to achieve them. Do read them and check if you have achieved the same.

**Content:** Total content has been divided into sections and sub-sections. A section leads you from one content element to another and a sub-section helps you in comprehension of the concepts in the content element. The text in bold, Italics or boxes is important and must be given attention.



**Intext Questions:** Objective types self-check questions are asked after every section, the answers to which are given at the end of the lesson. These will help you to check your progress. Do solve them. Successful completion will allow you to decide whether to proceed further or go back and learn the unit again.



**Notes:** Each page carries empty space on the outer margins for you to write important points or make notes.



**What You Have Learnt:** It is the summary of the main points of the lesson. It will help in recapitulation and revision. You are welcome to add your own points to it also.



**Terminal Questions:** These are questions answered that provide you an opportunity to practice for better understanding of the whole topic.



**Answers to Intext Questions:** These will help you to know how correctly you have answered the Intext questions.



**Activity:** Activities, if done by you, will help you to understand the concept clearly.



**Key Terms:** The important terms used in the lesson are highlighted in this section. Do remember these terms.



**Do and Learn:** In this section certain activities have been suggested for better understanding of the concept.



**Role Play:** To make your learning interesting an imaginary situation is given based on any concept covered in the lesson. You are required to enact the imaginary situation through realistic behavior. You are free to choose any other concept/topic of your choice to play the role.



**QR Code:** A quick response (QR) code is given in every lesson which is a type of barcode that stores information and can be read by a digital device, such as a cell phone.



**Audio:** For understanding difficult or abstract concepts, audio programmes are available on certain content areas. You may listen to these on Mukta Vidya Vani, Community Radio FM-91.2 or on YouTube channel “niosradiovahini”.



**Video:** Video programmes on certain elements related to your subject have been made to clarify certain concepts.

You may watch these at NIOS live YouTube channel and also see live programs on PM e-vidya.

# Course Overview

## **Module 1: Transportation-1**

1. India's Road Network
2. Highways in India
3. Institutional Framework of Infrastructure Development
4. Structural Framework of NHAI -PPP Model
5. Railways in Indian Logistics
6. Features of Freight & Passenger Movement

## **Module 2: Transportation-2**

7. Inland Waterways
8. Indian Inland Waterways
9. Modes of Air Transportation
10. Trends in Logistics Industry
11. Multimodal Transportation
12. Air Transportation



## **Module 3: Introduction to Warehouse**

13. Warehouse: Meaning, Definition and Objectives
14. Need for Scientific Warehouses
15. Types of Warehouses
16. Warehouse Organisation Structure - Roles and Responsibilities

## **Module 4: Warehouse Management**

17. Warehouse Utilization Management
18. Inventory Management of a Warehouse
19. Operations and Handling of a Warehouse
20. Need for Physical Distribution in Warehouse
21. Channels of Distribution

## **Module 5: Warehouse Activities and Warehouse Documentation**

22. Warehouse Activities
23. Cross Docking Method
24. Warehouse Handling Equipment
25. Methods of various Material Handling Systems in Warehouse
26. Technology for Warehouse Management



# Contents

<b>S.No.</b>	<b>Lesson Name</b>	<b>Page#</b>
Lesson 1.	India's Road Network	1-26
Lesson 2.	Highways in India	27-52
Lesson 3.	Institutional Framework of Infrastructure Development	53-74
Lesson 4.	Structural Framework of NHAI -PPP Model	75-96
Lesson 5.	Railways in Indian Logistics	67-124
Lesson 6.	Features of Freight & Passenger Movement	125-152
Lesson 7.	Inland Waterways	153-178
Lesson 8.	Indian Inland Waterways	179-202
Lesson 9.	Modes of Air Transportation	203-224
Lesson 10.	Trends in Logistics Industry	225-252
Lesson 11.	Multimodal Transportation	253-276
Lesson 12.	Air Transportation	277-304

**Note:** The details of the different sections are on the next page.

## Bifurcation of Syllabus in Warehouse Principles & Inventory Management Secondary Level

<b>Total no. of Lessons=26</b>			
<b>MODULE (No. &amp; name)</b>	<b>TMA (40%) (A)</b>	<b>Public Examination (60%) (B)</b>	
	<b>(No. of lessons -10)</b>	<b>SUBJECTIVE 50 % (I)(No. of lessons -08)</b>	<b>OBJECTIVE 50 % (II)(No. of lessons -08)</b>
<b>Module- 1:</b> Transportation-1	<b>L-2:</b> Highways in India <b>L-4:</b> Structural Framework of NHAI -PPP Model	<b>L-1:</b> India's Road Network <b>L-5:</b> Railways in Indian Logistics	<b>L-3:</b> Institutional Framework of Infrastructure Development <b>L-6:</b> Features of Freight & Passenger Movement
<b>Module- 2:</b> Transportation-1	<b>L-8:</b> Indian Inland Waterways <b>L-9:</b> Modes of Air Transportation	<b>L-7:</b> Inland Waterways <b>L-11:</b> Multimodal Transportation	<b>L-10:</b> Trends in Logistics Industry <b>L-12:</b> Air Transportation
<b>Module -3:</b> Introduction to Warehouse	<b>L-15:</b> Types of Warehouses <b>L-16:</b> Warehouse Organisation Structure - Roles and Responsibilities	<b>L-13:</b> Warehouse: Meaning, Definition and Objectives	<b>L-14:</b> Need for Scientific Warehouses
<b>Module – 4:</b> Warehouse Management	<b>L-19:</b> Operations and Handling of a Warehouse <b>L-21:</b> Channels of Distribution	<b>L-17:</b> Warehouse Utilization Management <b>L-20:</b> Need for Physical Distribution in Warehouse	<b>L-18:</b> Inventory Management of a Warehouse
<b>Module – 5:</b> Warehouse activities and Warehouse documentation	<b>L-22:</b> Warehouse Activities <b>L-26:</b> Technology for Warehouse Management	<b>L-25:</b> Methods of various Material Handling Systems in Warehouse	<b>L-23:</b> Cross Docking Method <b>L-24:</b> Warehouse Handling Equipment

**Note:** The syllabus has been bifurcated into two sections –

- I. (i) Lessons for the Tutor Marked Assignment(TMA)
- II. (ii) Lessons for public examination question paper

Lessons in Section (ii) are further divided as-

- (A) Lessons for objective type Questions only
- (B) Lessons for subjective type of questions.

# INDIA'S ROAD NETWORK

The development of the road transport network occupies an important role in the economic development of a nation. Therefore, the kilometre-age of paved roads existing in a nation is often used as an index to assess the extent of its development. The appropriate development of the road transport network not only decreases the cost of transportation, both in terms of money and time, but also assists in the integration of various regions within the nation. It feature a better understanding of neighbouring nations on a global level. The road transport network in India has contributed to the development of the nation by bringing in direct merits from its role in the development of some segments, such as agriculture, industry as well as commerce.



## LEARNING OUTCOMES

After studying this lesson the learner:

- defines various types of roads;
- identifies the different types of roads (highways);
- assesses and classifies top expressways;
- compares expressways with National highways;
- explains how to plan and design State highways.

## 1.1 ROAD TRANSPORTATION - INTRODUCTION

Roads are an important structure of transport in India. Roads cater of approximately 85 percent of the country's passenger passage and more than 60 per cent of its freight. India's transport division is enormous and diverse, it supports the needs of 1.1 billion people. Greater physical connectivity in the urban and rural areas is important for economic development. Ever since the early 1990s, India's rising economy has proved that there



is an increase in demand for transport infrastructure and services. Usually, roads in our nation are narrow and packed with poor surface quality, and 33 per cent of India's hamlets do not have access to all-weather roads. The main enrichment in the sector is **recessions** support the nation's continuous economic development and to reduce scarcity. From the month of June 2011, The World Bank has been a major investor in the transport segment in India.

### 1.1.1 Road

Lanes are generally smoothed, paved and are prepared for ease of travel. In ancient India, several roads were simply recognizable paths without any formal structure or maintenance. In urban regions, roads within a city are known as streets.

### 1.1.2 Definition

Based on its nature, the word 'road transport' has numerous meanings. In general, road transport refers to transporting cargoes, services and personnel from one place to another destination by road. The road is a path which exists between two locations and paved to assist the transportation by the way of motorized as well as non-motorized modes of transport. In other words, helps it to transport passengers, cargoes and services from point to point.

Apart from the degree of movement of the domestic infrastructure, the nature of road transport of cargoes relies on

1. the distance the goods are shipped by road,
2. the weight and quantity of the individual shipment and
3. the sort of goods transported.

A van or pickup trailer may be used for short places in order to fetch the light and small loads. In case the goods consist of a full trailer load, for such loads, a container truck is more suitable.

### 1.1.3 Classification of Roads

The roads are classified based on several factors which are as follows:

- Materials
- Location & function
- Traffic volume
- Width

- Economy
- Traffic type
- Rigidity
- Topography



### INTEXT QUESTIONS 1.1

1. Define 'road' in your own words.
2. Write the meaning of road transport.
3. \_\_\_\_\_ are generally smoothed and paved which are outfitted to travel easily.
4. A \_\_\_\_\_ may be used for short places in order to fetch the light and small loads.

## 1.2 MERITS AND DEMERITS OF ROAD TRANSPORT

The main merit of road transport is that it can facilitate door-to-door delivery of goods and can provide a very economic means of cartage, stuffing and unloading. In the rural sectors which are not connected by the network of rail, sea or air transport, road transport is the only alternative for carrying goods as well as the general public to and fro among cities and towns. Road transport has many merits and some demerits as well. Let us discuss in detail

### A. Merits of Road Transport

#### 1. Lower Investment:

Capital required for the construction of roads will be less when compared to railways. Since lying of railway lines entails more capital, developing roadways will be cheaper and more economical.

#### 2. Door to Door Service

As road transport offers door-to-door services, it will be more valuable for manufacturing units as well as the general public. As railways cannot link each rural sector, it has a drawback.

#### 3. Service Flexibility

Road transport provides flexible service to the general public and cargoes in contrast to railways.





**Notes**

**4. Creation of Employment Opportunities**

Road transport produces employment opportunities for diverse persons, both directly and indirectly.

**5. Value for Short Distances**

Road transport is useful for short distances in the same way as railways are beneficial for long distances.

**6. Feeder to Rail Transport**

General public and cargoes are **enabled** to reach the railway station with the support of road transport as it provides the feeder services. So, based on this, road transport will be extremely helpful to rail transport.

**7. Provide Personal Service**

Road transport has both private as well as public carriers. Additionally, the general public also has their own motor vehicle. In this context, it is also considered as a type of personal service.

**8. Assists Movement of Perishable cargoes**

As road transport assists in distributing the perishable goods from the spot of cultivation to the location of utilization, it is also useful for the production and movement of perishable cargoes.

**9. Helpful to Manufacturing Units**

For manufacturing units, which are situated away from the railway links, the road transport is extremely helpful. It facilitates the movement of the general public and cargoes from these units.

**10. Speed in nature**

As compared to railways or waterways, if the goods are to be sent quickly from one area to another then road transport is more appropriate. As the nature of waterways is much slower, time is wasted in booking the goods and taking delivery of the cargoes.

**11. Price reduction in Packing**

The system of packing in road transport is less complex as compared to other modes of consignment. Goods transported by road require less packing or no packing at all in several cases.





## 12. Lower risk of damage in transport

There exists a low hazard of damage and breakage of the cargoes during the transport because of the avoidance of intermediate stuffing and handling. As a result, road transport is most appropriate for transporting fragile cargoes which are likely to be broken during stuffing and unloading.

## 13. Industry Owned Vehicles

Another advantage of road transport is that big industries have their own trucks and start their own road services in order to support their goods without causing any obstacles.

## B. Demerits of Road Transport

The following are the demerits of the road transport system:

### 1. Inadequate Roads

As per the statistics, it is understood that there exists only 34 km long road per 100 sq. km area in our nation. In the developed nations, such as Japan, they have 270 km of road per 100 sq. km. so, it is obvious that roads are insufficient and most of them are also in poor form.

### 2. High Taxes

As industries feel, they come across a lot of issues which exist because of imposing huge taxes for goods vehicles in India. For instance, the tax burden per cargo vehicle in India is more than Rs. 3000 as compared to other nations.

### 3. Poor Road maintenance

As per reliable sources, in India less than 0.1 percent of national income is spent on the maintenance of roads when compared to other nations. So, it is clear that the roads in India are not maintained properly.

### 4. Rising Cost of Petrol and Diesel

For road transport the fuel plays a vital role. As the cost of petroleum products and diesel is higher in price, it leads to increase in operational costs which make the mode of shipment more costly.

### 5. Unsuitable for bulky cargoes and long distance

Indian roads are not suitable for road transport. So carrying such goods long distances



will be uncomfortable when compared to railways. Due to this reason, it is also not appropriate for bulky cargoes.

### 6. Not reliable

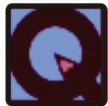
The vehicle transport is not as trustworthy when compared to rail consignment because during rainy or flood periods, the roads are in poor condition and unsafe for use transport.

### 7. Less Organized

When compared with other modes, the road consignment is less organized. Moreover, it is not regular and undependable. The prices charged for shipment are also not stable and unequal.

### 8. Frequent disaster

Due to poor maintenance of roads and other relevant issues, the road transport structure is spotted with numerous accidents which lead to a numerous number of deaths.



## INTEXT QUESTIONS 1.2

1. Road transport offers door- to- door service. True / False
2. Road transport is suitable for long distances True / False
3. The road transport provides \_\_\_\_\_ service to the general public and cargoes.
4. The system of \_\_\_\_\_ in road transport is less complex.

## 1.3 CLASSIFICATION OF ROAD TRANSPORTATION

Road transport is classified based on transportation of goods and materials and transportation of people. When an organization is planning for a product consignment, the type of road transport plays a vital role. There are several factors that exist and contribute to deciding the type of transportation, which starts from the product size and weight to the temperature-sensitivity, etc.

The main transport classification is as follows:

- a. Curtain Sided
- b. Flatbed
- c. Temperature controlled
- d. Box truck

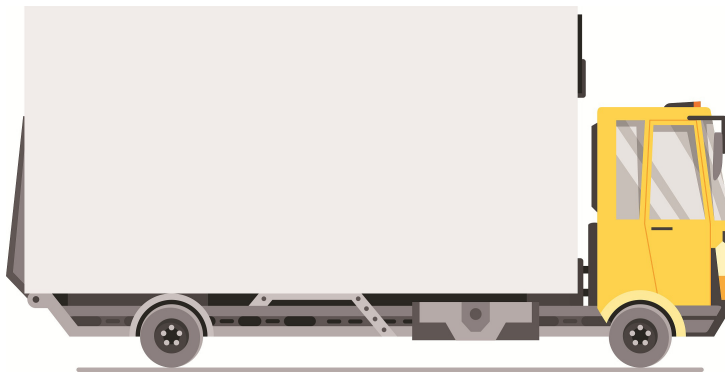


## Notes

- e. Car carrier
- f. Tanker carrier

**a. Curtain Sided shipment**

These are the most regularly used type of trucks for carrying general haulage. These types of vehicles are covered with curtain sides and have a curtain roof. The curtain sides that these trucks have help the manufacturing sectors in easy loading and unloading. Therefore, this method of trucking is very popular. Additionally, the cargo on a certain sided trunk is protected from the elements similar to a dry van while also convenience of a flat deck.



**Fig. 1.1: Curtain Sided Carrier**

**b. Flatbed shipment**

When the organization wants to send large pieces of consignments like construction equipment, building supplies and containers, this sort of road goods consignments are used.

The flatbed road goods shipment can provide various advantages which are as follows:

- Quick loading and unloading;
- Enhance cargo protection;
- Easy to use ;
- Constant space and
- Extra weight capacity.

Therefore, if the organization is in construction or general manufacturing, the flatbed vehicles are important to any goods shipment.



**Notes**



**Fig. 1.2: Flatbed Carrier**

**c. Temperature Controlled Shipment**

Temperature controlled shipment has a mounting impact on our daily lives. This category of road goods shipment requires a unique, temperature controlled vehicle. More specifically, the vehicle consignment sensitive goods have an inbuilt refrigeration structure, which helps in keeping the goods at a preferred temperature level during the overall transportation progression. In reality, for several goods temperature controlled road product consignment is not a choice, it is more of an inevitability.

The major and the most imperative advantage that temperature controlled trucks can provide is holding sensitive goods from deteriorating and losing their worth during the shipment.



**Fig. 1.3: Temperature Controlled Carrier**

**d. Box Truck Shipment**

These sort of trucks are generally large box -shaped carriers with metal structure and

can be easily recognized. This type of vehicle is suitable to move the products which are sensitive to weather. The products which are moved with the box vehicles are as follows:

- Household cargoes
- Parcel / Packages
- Fresh products
- Apparels
- Residence appliances

For the local trade routes this vehicle can be an ideal solution because of its cargo safety.



*Fig. 1.4: Box Truck Carrier*

#### **e. Car-Carrying Shipment**

Moving an individual vehicle from one location to another point will be a difficult task because of the nature of the road so, in this situation, they prefer car-carrying transportation services. Here exist two types of car shipments which are as follows

1. Open car Shipment
2. Commercial car Carrier

#### **1. Open car shipment**

It refers to the truck which transports the cars / vehicles on an open trailer and is exposed to the outdoors.

#### **2. Commercial car carrier**

These are trailers that have built-in ramps that ensure the loading and off-loading process

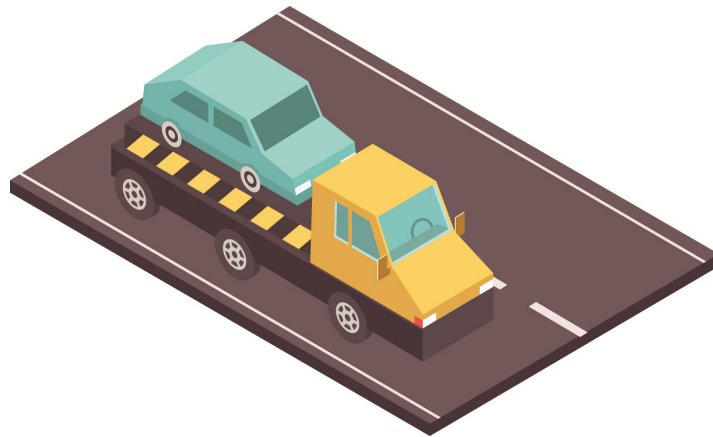


Notes



**Notes**

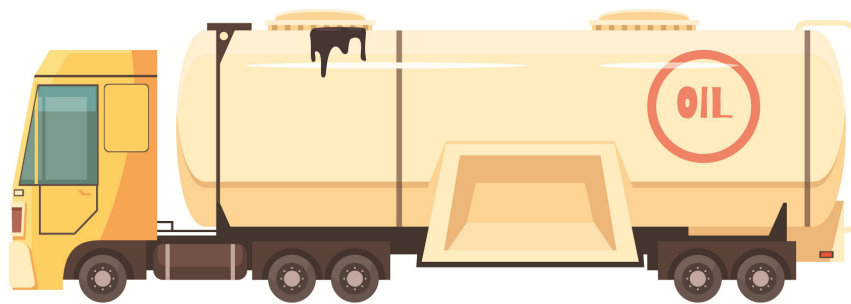
is much easier. To raise or lower the ramps, normally these trucks use power hydraulics. In India, this sort of car-carrying shipment is used widely.



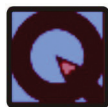
**Fig. 1.5: Car Carrier**

**f. Tanker Shipment**

This category of shipment is connected with industries which are dealing with liquids, chemicals and gases. It can also be referred to as a semi-truck and straight truck that hauls tanks. This sort of shipment can also be used for moving liquids of dangerous natural products such as pesticides and fuel.



**Fig. 1.6: Tanker Carrier**



**INTEXT QUESTIONS 1.3**

1. Define curtain-sided transport.
2. Box truck generally carries automobiles - True / False
3. \_\_\_\_\_ shipment is connected with industries which are dealing with liquids, chemicals and gases.
4. \_\_\_\_\_ vehicle is suitable to move the products which are sensitive to weather.



## 1.4 INDIA'S ROAD NETWORK BASED ON DESTINATION AND PURPOSE

At the World level, India has the second largest road network spanning a total of 5.89 million kilometres (km). This surface system transports around 64.5 per cent of all cargoes in the nation and 90 per cent of India's overall general public traffic. The road shipment has steadily improved over the years with the development in connectivity between the metropolitan cities, towns and rural segments in the nation. Indian road methods are of many types which are as follows:

- A. Expressways -1000 km
- B. National highways -79,243 km
- C. State highways and other major district and rural roads - 1, 31,899 km

According to IBEF, in April 2020, the Indian Government has set a goal of constructing roads worth Rs 15 lakh crore (US\$ 212.80 billion) in the subsequent two years. Huge reserves have been done in this segment with a total venture rising more than three times from Rs 51,914 crore (US\$ 7.43 billion) in 2014-15 compare to Rs 158,839 crore (US\$ 22.73 billion) in 2018-19. According to the statistics released by the Department for Promotion of Industry and Internal Trade Policy (DPIIT), the construction growth consisting of townships, housing, built-up infrastructure as well as construction-development projects attracted Foreign Direct Investment (FDI) which inflows worth of US\$ 25.66 billion were recorded in the structure growth sector between April 2000 and March 2020.

### 1.4.1 Based on the destination and purpose the roads are divided as follows:

- A. Express highways or Expressways
- B. National highways
- C. State highways
- D. District roads
- E. Rural roads

#### A. Expressways or Expressways

Expressways are considered as highest-class roads in India. These are the highways which have six to eight lanes with a controlled access road network. Fundamentally, expressways are of high eminence consisting of present characteristics such as ramps of access, grade separation, lane dividers and elevated segments. This expressway is also



equipped with numerous smart and intelligent characteristics which include a Highway Traffic Management System (HTMS) and Video Incident Detection System (VIDS). Generating the future highways these structures will set a yardstick and also be environment-friendly.

- i. **Overall Expressways in India (Operational)** - 21 to 25 approx
- ii. **Overall Length of Expressways in India (Operational)** - 1581,4 km
- iii. **Excellent National Expressway** - The Ahmedabad Vadodara Expressway which is 95km long is considered a renowned Expressway in India.
- iv. **Longest Expressway in India** - Agra-Lucknow Expressway which has 302 km long
- v. **The expressways** - Max limit speed is 120 km/h for cars and max limit for two-wheelers on expressways - 80 km/h

#### Expressway lane markings

- i. **Solid YELLOW line** - Marks the left edge of the road path and it must always be on the driver's left side.
- ii. **Solid WHITE line** - Spot the right frame of the road path, or entrance and exit lanes.
- iii. **Broken WHITE line** - divides lanes of traffic moving in a similar direction.
- iv. **HOV lanes** (high occupancy vehicles ) are marked with a white diamond.

#### B. National Highways

National Highways are the pillar of the road infrastructure that links every major metropolitan of India like ports, the capital of states etc. It comprises two; four or more lanes which are constructed of charcoal and cement concrete. They are generally a network of trunk roads which are owned by the Ministry of road transport and highways. It is innovated, constructed and administered by the National Highway Authority of India. At present, the longest national highway in India is "National Highway 44" at 3508 km.

#### C. State Highways

State highways are a route or portion of a state which is accepted and designated by the board as a state highway and that is maintained by that respective state. These roads link the state capitals with district towns.





### D. District Roads

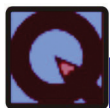
District roads exist within the cities and link between the markets and production or manufacturing areas to state and national highways. There exist two main sorts of district roads namely,

- i. Major district paths
- ii. Minor district paths

Major district roads link the headquarters of the adjacent district with core parts of the region whereas minor region paths are laid down within the region.

### E. Rural Roads

Rural roads link the nearby villages which further would lead to a nearby town or district paths. Normally, due to low traffic in the rural segment, the road construction in these areas are equipped with low-quality roads.



### INTEXT QUESTIONS 1.4

1. Define rural roads.
2. Which is the longest expressway in India?
3. \_\_\_\_\_ roads exist within the cities and links between the markets and production or manufacturing areas to state and national highways.
4. \_\_\_\_\_ Highways is the pillar of the road infrastructure that links every major metropolitan of India.

### 1.5. INDIA'S TOP SUPER EXPRESSWAYS AT A GLANCE

India is the emerging developing national has the world's third largest road network but when we discuss about these expressways, there are few examples which are as follows:

1. Ahmedabad-Vadodara
2. Mumbai-Pune
3. Jaipur-Kishangarh
4. Allahabad Bypass



**Notes**

5. Ambala - Chandigarh
6. Chennai Bypass
7. Delhi-Gurgaon
8. Noida-Greater Noida
9. Delhi Noida Direct Flyway
10. Hyderabad elevated way
11. Hosur Road elevated way

**1. Ahmedabad - Vadodara expressway**

The expressway of Ahmedabad - Vadodara is 95 km long and it links to Ahmedabad and Baroda in the state of Gujarat. This expressway was constructed under the Golden Quadrilateral Project by NHAI and came into existence in the year 2004, and was constructed under the Golden Quadrilateral Project by NHAI.

**2. Mumbai-Pune expressway**

Mumbai-Pune expressway (official name is the Yashwantrao Chavan Expressway) which was opened to the general public in April 2002, is 93 km long and is considered one of the best expressways in India. It was constructed by Maharashtra State Road Development Corporation (MSRDC) at an overwhelming cost of Rs 1,630 crores (US\$363.49 million) and is considered India's first six-lane high-speed expressway.

**3. Jaipur-Kishangarh expressway**

Jaipur-Kishangarh expressway which is 90km long, with an estimated cost of USD 154 million was constructed under the Golden Quadrilateral National Highways Development This highway which helps nearly 20,000 vehicles to pass in a day and links Jaipur with Kishangarh.

**4. Bypass of Allahabad**

Allahabad Bypass is considered one of the most outstanding achievements of the Golden Quadrilateral project, which covers a distance of 86 km. In India, it links main four metropolitans namely New Delhi, Kolkata, Mumbai and Chennai.

**5. Ambala - Chandigarh expressway**

Ambala-Chandigarh expressway which was built with a cost of Rs. 298 Crores (\$66.45



million) was opened in 2009. By covering a distance of 35 km it helped to reduce the traffic congestion to a much larger extent.

### 6. Bypass of Chennai

The Chennai Bypass with project cost of Rs 405 crores (Rs 4.05 billion) covers a distance of 32km. The speciality of this highway is around Chennai it links four main national highways such as NH45, NH4, NH205 and NH5.

### 7. Delhi-Gurgaon way

Delhi-Gurgaon way which is considered a lifesaver for commuters covers a distance of 28 km. Before the construction of this expressway, huge traffic jams were seen on the roads. Though this problem has not been solved 100% still this expressway has brought some relief to the commuters. This was opened in January 2008 with a project cost of \$223 million. This expressway ends at Manesar, which is on the outskirts of Gurgaon, the starting point is Dhaula Kuan in Delhi.

### 8. Noida-Greater Noida way

Noida-Greater Noida way was built with a total cost of Rs. 400 crores (Rs 4 billion) which covers a distance of 24.53 km. It is a six-lane highway which links Noida to Greater Noida.

### 9. Delhi -Noida Flyway (Direct)

Delhi - Noida Direct Flyway which was built by the Noida Toll Bridge Company Ltd is an eight-lane road. This road is popularly referred as the DND flyway which links Delhi to Noida with a total length of 9.2 km.

### 10. Hyderabad elevated way

In order to overcome the congestion problem in Hyderabad, two separate elevated expressways were proposed to be constructed. The foremost is P.V. Narasimha Rao Elevated Expressway was completed in the year 2009, and covers a distance of 11.6 km. It mainly links Hyderabad International Airport to Mehdipatnam. The second expressway is the Rajiv Elevated Expressway which will cover a distance of 20 km was suspended due to high projected costs. It was projected as an expansion that will cover the Secunderabad-Shamirpet stretch via Karkhana, Trimulgherry and Bollaram.

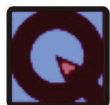
### 11. Hosur Road Elevated way

Hosur Road Elevated way was initiated in 2006 by BETL and was inaugurated on 22



## Notes

January 2010. This expressway has the feature of becoming the tallest expressway in Bangalore, Karnataka at the height of 17 meters i.e. 56 ft by covering a distance of 9.98 km which links Bangalore to Hosur. In India, there exists many expressways which are under construction or are already got sanctioned but the work is not yet started. In order to reduce the travelling time and to enhance connectivity among other major cities and states, India is in need of many more expressways.



## INTEXT QUESTIONS 1.5

1. Allahabad Bypass connects which main cities?
2. Delhi-Gurgaon way started its operation during the year?
3. Hosur Road Elevated way was initiated in \_\_\_\_\_.
4. Ahmedabad-Vadodara expressway was constructed under the \_\_\_\_ project by NHAI.

## 1.6. INDIA'S TOP TEN EXPRESSWAY PROJECTS

There are many longest expressways projects in India, these projects are currently either being implemented or on the drawing board:

1. Delhi -Mumbai Expressway
2. Purvanchal Expressway
3. Delhi -Meerut Expressway
4. Mumbai -Nagpur Super Communication Expressway
5. Bundelkhand Expressway
6. Salem - Chennai Expressway
7. Chandili - Rourkela Expressway
8. Bengaluru -Chennai Expressway
9. Brahmaputra Express Highway
10. Narmada Expressway

## 1. Delhi -Mumbai expressway

This particular expressway will pass through five states to link India's political and



## Notes

economic capitals by covering 1250 km. It is considered a signal-free access controlled corridor, which will be the nation's longest once complete. The work was positively executed in March 2019 and it is expected to be completed by March 2022. It suggested that this long expressway will cut down the travel distance between Delhi and Mumbai by 250 km. Further for cars, the cut downtime will be from 25 hours (through NH-8) to 12 hours and for trucks, it will be from 44 to 22 hours. According to reliable sources it has stated it will also help to reduce the traffic on NH-8, which is utilized by around three lakhs vehicles a day.

The National Highways Authority of India (NHAI) will acquire around 12,000 hectares for this project which will have a stretch of 80 km in Haryana, 380 km in Rajasthan, 120 km in Gujarat, 300 km in Madhya Pradesh as well as 370 km in Maharashtra. According to a news report, the construction for the Vadodara-Mumbai stretch is already underway. As per the report the required land cost alone will be around Rs 6,000 crores. Moreover, for this expressway work, it has been divided into 34 stretches. For the said project the tenders have already been floated by NHAI for multiple stretches and bids for six stretches in Haryana and Rajasthan with a sum total of 173 km have been received.

## 2. Purvanchal Expressway

This expressway is an access-controlled highway which will link eastern Uttar Pradesh, one of the least developed parts of the country, to the state capital of Lucknow. This is a 343 km long under-construction six-lane, which will offer continuous connectivity to nine districts of Barabanki, Sultanpur, Faizabad, Ambedkar Nagar, Azamgarh, Mau and Ghazipur, and will be linked to Varanasi through a unique link road. The cost for this expressway will be Rs 23,000 crores and the Uttar Pradesh Expressways Industrial Development Authority (UPEIDA) has separated these projects into eight packages. One package each was awarded to Apco and Oriental and two packages to Gayatri Projects. GR Infra and PNC Infratech have been awarded two packages each. Bharatiya Janata Party which was led by the Yogi Adityanath-led government had cancelled the earlier bids by considering them overpriced due to the cartel strategy adopted by bidders. According to UPEIDA, by breaking the cartel, the revised bids will save around Rs 600 crores, which is almost 10 per cent less.

## 3. Delhi -Meerut way

This expressway was inaugurated by Prime Minister Narendra Modi and it is developed by the National Highways Authority of India (NHAI) and Welspun Enterprises under the 'Hybrid Annuity Model'. It is considered India's first 14-lane expressway with a total length of 96 km. The initial stage of this route has been built at a cost of Rs 841 crores covering 9 km long. Further, this project will help to reduce the travel time between



Delhi and Meerut to just 45 minutes from the present 4-5 hours and is expected to price around Rs 7,500 crores. By this expressway automobiles from Punjab, Haryana, Rajasthan, Himachal Pradesh and Uttarakhand, which are not destined for Delhi, will be able to reach Uttar Pradesh.

#### 4. Mumbai - Nagpur Super Communication Expressway

This expressway is an eight-lane highway that connects Mumbai on the western edge of Maharashtra and Nagpur on the eastern end of the state. It is referred to as the Maharashtra Samruddhi Mahamarg with a length of 701 km. This route passes through 10 districts, 26 tehsils, and 390 villages in the state which is considered the longest high-speed road corridor in the nation. Further, this expressway is expected to cut the travel time between the two cities by eight hours from around 16 hours presently. For this project, a Rs 2.5 lakh crore loan is financed through a consortium of 20 banks which was led by the State Bank of India. Maharashtra State Road Development Corporation has completed the land acquisition and paid compensation to 90% of affected former. Moreover, the cleaning and levelling of groundwork have begun on numerous stretches of the road.

#### 5. Bundelkhand expressway

Approximately 289 km of this expressway will connect six districts of Uttar Pradesh's Bundelkhand province- Auraiya, Jalaun, Orai, Rath, Banda, Chitrakoot with the 300 km log Lucknow-Agra expressway. The Yogi Adityanath government has already released Rs 640 crores and land acquisition for this project has already begun. The government has recognized about 5,125 hectares of land for the progress of the defence corridor and this project will promote the Nirmala Sitharaman-led Defence Ministry's plan to bring the nation's second defence corridor to the Uttarakhand province. This route is also known as the Atal Path expressway.

#### 6. Salem - Chennai expressway

There will be proposed 277 km expressway with a six-lane Green Corridor that will cut travel time between Chennai and Salem by three hours and 68 km. The project will commence from the Chennai Outer Ring Road junction and will route through the districts of Kancheepuram, Tiruvannamalai, Krishnagiri, Dharmapuri and Salem. It is part of the Centre's strategy to advance freight movements under the 'Bharatmala Pariyojana' programme. Though the project has been met with opposition from farmers and left-leaning activists in Tamil Nadu, at the end of December 2018, nearly 90 per cent of land acquisition had been completed. Further, a petition against the land acquisition was also dismissed by The Madras High Court in September 2018.



Notes

### 7. Chandili - Rourkela expressway

This highway is projected with a cost estimation of Rs 3,600 crores and is being built in phases, some of which have already been inaugurated and completed. This corridor stretches over 656 km from Rourkela in the northern part of Odisha to Chandili in the southern part of the state. It is also referred to as the Biju Expressway. The expressway between Rourkela to Sambalpur which is a four-lane stretch 163 km long has been completed and was inaugurated by Chief Minister Naveen Patnaik in March 2018. Whereas the stretch between Berhampur and Taptapani which was 41 km has also been completed and opened to traffic. According to the now abolished Planning Advisory Commission the most backward region in the nation such as Odisha's KBK districts - Koraput, Nabarangpur, Kalahandi and Nuapada will benefit enormously from this expressway. It will link this province to the Western Odisha districts of Bargarh, Sambalpur, Jharsuguda and Sundargarh and to the manufacturing hubs of Chhattisgarh, including Jagdalpur and Raipur.

### 8. Bengaluru -Chennai way

This is a proposal with a project cost of Rs.17, 900 crores with the widening of 262 km eight-lane corridor that will stretch 262 km requiring the acquisition of 2,650 hectares of land. It will link Hoskote in Bengaluru to Sriperumbudur in Chennai by cutting down the travel time to around four hours from six to seven hours presently. It will en route through the regions of Hoskote, Malur (Karnataka), V Kota, Palamaner (Andhra Pradesh), Gudiyatam, Arakkonam and Sriperumbudur (Tamil Nadu). There are two existing paths which join Chennai and Bengaluru. The first one is via Hoskote and Andhra Pradesh and the second is through the Electronic City and Hosur. This proposed expressway would ease the traffic. It is estimated that around 9,500 passenger car units travel daily between the two cities. It is expected that this way will also cut down the distance between the two cities by around 80 km.

### 9. Brahmaputra Express Highway

This highway is considered the first sort of high-speed road corridor in Northeast India. In Assams this project will widen 890 km from Sadiya in eastern Assam to Dhubri in western Assam at a cost of approximately Rs. 40,000 crores. For this project, Assam Chief Minister Sarbananda Sonowalhas' government has sought support from the World Bank and the Asian Development Bank.

### 10. Narmada Expressway

The expressway with 1300 km long passes across the state of Madhya Pradesh. It is routed through the momentous town of Amarkantak on the eastern border of the State, where the Narmada river originates. It connects the western ends such as Dindori,





Shahpura, Jabalpur and Alirajpur. The state government will provide the land for the construction of the expressway but for its construction the Centre will be in charge.



### INTEXT QUESTIONS 1.6

1. How many states do Delhi -Mumbai expressways pass through?
2. Which expressway is the high-speed road corridor in Northeast India?
3. \_\_\_\_\_ is also referred to as Biju Expressway.
4. Bundelkhand Expressway also known as \_\_\_\_\_ expressway.

## 1.7 NATIONAL HIGHWAYS

National highways which are considered the pillar of road infrastructure that links all major cities (including ports) to the capital of the country. They are spread throughout the length and breadth of the nation. National Highways are generally at grade roads constructed with charcoal and little cement concrete. NH was established by the National Highway Authority of India Act, 1988 and this network is owned by the Ministry of Road Transport and Highways. It is built and administered by various authorities such as the National Highway Authority of India (NHAI), the National Highways and Infrastructure Development Corporation (NHIDCL) and public works departments (PWDs) of respective state governments.

*Table 1.1: National Highways*

S.No	Description	Details
1.	National Highways in India	228
2	Total length of National Highway	1,31,326 km
3	Maximum speed (Two-wheelers)	80 Km/h
4	Maximum Speed (Cars)	100 Km/h
5	Longest National Highway in India	NH 44, 3745 km long(covers North-South Corridor. It starts from Srinagar in the North and ends in Kanyakumari in the South
6	Shortest National Highway in India	NH 47A which starts from NH 47 at Kundannur

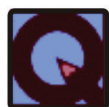




Notes

**Table 1.2: Major difference between Expressways and Highways**

S.No	Expressway	Highways
1	Roads are not multiple	Multiple roads which link important cities; towns etc
2	Six to eight lane with a controlled access road network	Usually have 4 lanes to provide high speed traffic
3	No further road merges or crosses the expressway anywhere	Roads are there which merge with the highways at many places
4	Possibility of accidents are also less	Possibility of accidents are more
5	Consists of several facilities like access ramps, lane dividers etc	Less Facilities



### INTEXT QUESTIONS 1.7

1. Which is the shortest national highway in India?
2. National Highways are multiple roads. - True / False
3. A minimum \_\_\_\_\_ road is offered for national highways.
4. \_\_\_\_\_ network is owned by the Ministry of Road Transport and Highways.

### 1.8. STATE HIGHWAYS (1,15,435 Km LENGTH) AS OF JANUARY 2020.

State highways are considered to be the second most important roads that link significant segments of the state within it. State highways eventually connect with to the national highways. These roads are numbered highways which are laid and administered by respective State governments. Generally, these highways connect major cities, towns and regional headquarters within the respective state. They link them with National Highways or State highways of adjacent states. It is constructed and managed by the State Department.



Notes

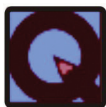
**Table 1.3: State Highways**

S.No	States	Total SH
1	Andhra Pradesh State Highways	33
2	Assam State Highways	1
3	Bihar State Highways	50
4	Chandigarh State Highways	1
5	Chhattisgarh State Highways	23
6	Dadra and Nagar Haveli	6
7	Daman and Diu State Highways	4
8	Delhi State Highways	1
9	Goa State Highways	3
10	Gujarat State Highways	210
11	Haryana State Highways	32
12	Himachal Pradesh State Highways	5
13	Jharkhand State Highways	10
14	Karnataka State Highways	126
15	Kerala State Highways	72
16	Madhya Pradesh State Highways	83
17	Maharashtra State Highways	262
18	Orissa State Highways	50
19	Puducherry State Highways	1
20	Punjab State Highways	19
21	Rajasthan State Highways	86
22	Tamilnadu State Highways	12



23	Uttar Pradesh State Highways	92
24	Uttarakhand State Highways	1
25	West Bengal State Highways	19

Andhra Pradesh has 33 State highways, for Eg SH 1, 10, 11, 122, 126, 128, 13, 132, 14, 15, 159, 16, 17, 18, 19, 19A, 2, 220, 230, 232, 234, 236, 24, 264, 275, 36, 4, 44, 5, 51, 6, 61, 7 whereas (SH7) connects Route  $\text{E}^\circ$  Bomireddipalli- Chopadandi - Karimnagar -Lakshettipet -Raipatnam



**INTEXT QUESTIONS 1.8**

1. Define State Highway.
2. State Highways are managed by the central government. - True / False
3. The state \_\_\_\_\_ has 33 State highways .
4. State highway roads are \_\_\_\_\_ highways.



**WHAT YOU HAVE LEARNT**

- Roads are an important structure of transport in India. Roads carry approximately 85 percent of the country’s passenger passage and more than 60 per cent of its freight. India’s transport division is enormous and diverse. It supplies the needs of 1.1 billion people.
- The main merit of road transport is that it can facilitate door-to-door delivery of goods and can provide a very productive means of cartage, stuffing and unloading. In rural areas that are not served by the network of rail, sea or air transport, road transport is the only alternative for carrying goods as well as carrying the general public to and fro among cities.
- Transport classification include a) Curtain Sided, b) Flatbed, c) Temperature controlled, d) Box truck e) Car carrier f) Tanker carrier and g) Curtain Sided shipment.
- Roads are divided into express highways, national highways, state highways, district roads and Rural roads according to their purpose and destination.



**Notes**

- India's top super expressways are 1) Ahmedabad -Vadodara, 2) Mumbai-Pune, 3) Jaipur-Kishangarh, 4) Allahabad Bypass, 5) Ambala- Chandigarh, 6) Chennai Bypass, 7) Delhi-Gurgaon 8) Noida-Greater Noida, 9) Delhi Noida Direct Flyway, 10) Hyderabad elevated way and 11) Hosur Road elevated way.
- India's top ten expressway projects are 1. Delhi-Mumbai Expressway, 2. Purvanchal Expressway. Delhi-Meerut Expressway, 4. Mumbai-Nagpur Super Communication Expressway, 5. Bundelkhand Expressway, 6. Salem - Chennai Expressway, 7. Chandili-Rourkela Expressway, 8. Bengaluru-Chennai Expressway, 9. Brahmaputra Express Highway and 10. Narmada Expressway.



**KEY TERMS**

Transportation	Road	Highway	Consignments
National way	Expressway	State	
District	Shipment	NHAI	
Lane	Project	Carrier	



**TERMINAL EXERCISE**

1. Explain transportation.
2. What do you mean by flatbed shipment?
3. Define Expressways.
4. What is a broken white line?
5. What is Perishable cargo?
6. Sketch the classification of roads.
7. Highlight any two merits of road transportation.
8. Differentiate between car carriers versus tanker carriers.
9. Distinguish the district roads versus the rural roads.
10. Write a note on Delhi -Mumbai expressway .



11. Road transportation is the key to a nation's economic development. Discuss.
12. Spotlight the merits and demerits of road transportation.
13. How do National highways play an imperative role in India?
14. Bring out the classification of road transportation.
15. List out the different Expressways in India.



## ANSWER TO INTEXT QUESTIONS

### 1.1

1. Road / Lanes are generally smoothed and paved which are outfitted to travel easily
2. Cargo refers to goods
3. Roads / Lanes
4. Pickup trailer

### 1.2

1. True
2. False
3. Flexible
4. Packing

### 1.3

1. This type of vehicle is covered with curtain sides and has a curtain roof
2. False
3. Tanker
4. Box Truck

### 1.4

1. Rural roads link the nearby villages which would further lead to a nearby town or district paths
2. Agra-Lucknow Expressway which is 302 km long.

**Notes**

3. District
4. National

**1.5**

1. New Delhi, Kolkata, Mumbai and Chennai
2. 2008
3. 2006
4. Golden Quadrilateral

**1.6**

1. Five States
2. Brahmaputra Express Highway
3. Chandili - Rourkela
4. Atal path

**1.7**

1. NH 47 A
2. True
3. Two-lane
4. National highways

**1.8**

1. State highways are a route or portion of a state
2. False
3. Andhra Pradesh
4. Numbered

**DO AND LEARN**

Learners can undertake their activity work in the areas of road infrastructure development organizations.

## HIGHWAYS IN INDIA

Highways play a significant role in making journeys easier and more expedient. This is of immense assistance whether travelling for work carrying cargoes. The highway system links large metropolises and rural segments across the nation. These systems have made expansion feasible, provided a suitable means to travel for more productive career opportunities, and permitted businesses to expand and develop nationwide. Further, highway transportation is particularly critical when it relates to the economy. A huge number of organisations depend on the expedience of distribution of their commodities and/or services over the road in order to compete in the fast paced trade world. Highways offer the quickest route from Point X to Point Y. Therefore those who must utilise this method of distribution will require utilising the quickest and most direct means of surface travel. This is where the highway structure becomes extremely critical.



### LEARNING OUTCOMES

After studying this lesson the learner:

- explains the grid road System;
- demonstrates highway grid and usage of numbering system;
- identifies significant National Highways Number System;
- outlines different types of corridors in Highways;
- constructs the numbering of inter Roads in Highways.

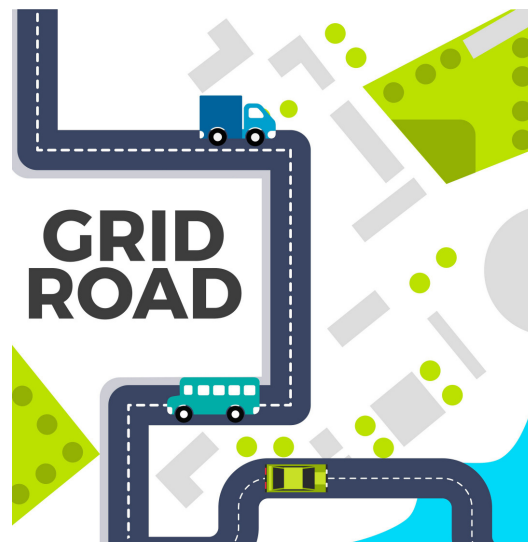
### 2.1 MEANING OF GRID ROAD

It is a road that follows a surveyed division between areas of a township, municipality, etc. It is also a municipal road which follows a grid line created by the original survey of the region. a grid is generally an interconnected system of similar lines, wheather real or



## Notes

imaginary. Most of the industrial countries' streets are laid out in a grid outline. This means that the streets interconnect at precise angles and forms a pattern of squares when viewed from above. To ensure inter linking of highways through a grid, the Indian Government has proposed to restructure a National Highways Programme. With the help of a financeable model, the National Highway Grid of desirable length and capacity will be created. Though the details of the grid have not been laid down, it is expected to unite 12 major ports, 45 out of 53 million plus cities and 26 capitals in addition to connecting tourist spots and other spiritual destinations.



**Fig. 2.1: Grid Road**

National highways (NHs) in India consist of over 1,00,000 kilometres but there is no scientific road network pattern. This meant that the drivers couldn't take a straight route from one destination to the other. In order to sort out this issue, NHAI has equipped a grid of 27 horizontal and vertical national highway corridors at a space of every 250 km. These corridors crisscross the nation. Further, these roads will be extended to at four lanes and will offer more road space for seamless shipment. The total length of these corridors as mentioned below is estimated at about 36,600 km where about 30,100 km are existing NHs. Out of these four lanes, only 18,800 km were constructed.

### 2.1.1 Different Types of Road Patterns

The following are the different types of road patterns:

1. Rectangular or Block Pattern
2. Radial Pattern
3. Radial or Star & Block Pattern



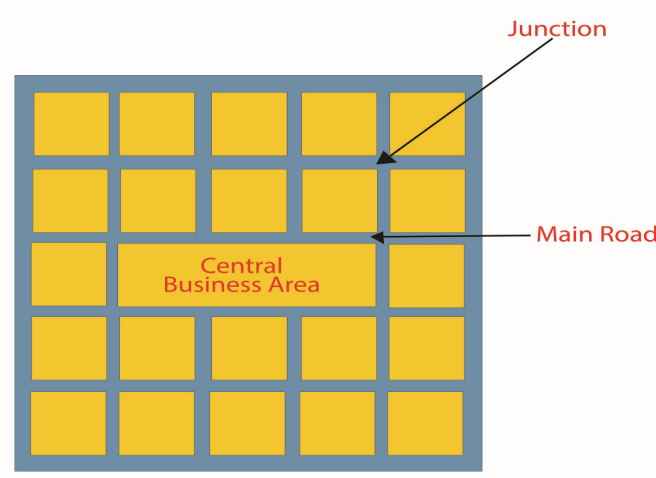


Notes

4. Radial or Star & Circular Pattern
5. Radial or Star & Grid Pattern
6. Hexagonal Pattern
7. Minimum Travel Pattern
8. Grid Pattern

### 1. Rectangular or Block Pattern

In this pattern method, the entire area is separated into rectangular blocks of plots, with streets **crossing** right angles.



**Fig. 2.2: Rectangular or Block Pattern**

The main road which runs through the centre of the location should be adequately wide and other branch roads might be moderately narrow.

#### A. Pros of Rectangular or Block Pattern

1. The rectangular plots may be further divided into small rectangular blocks for the construction of buildings placed back to back, having roads on their fronts.
2. This pattern has been adopted for city roads.
3. The construction and maintenance of roads in this pattern are comparatively easier.

#### B. Cons of Rectangular or Block Pattern

1. At intersections, these pattern are perpendicular, resulting in accidents since the vehicles face each other.



**Notes**

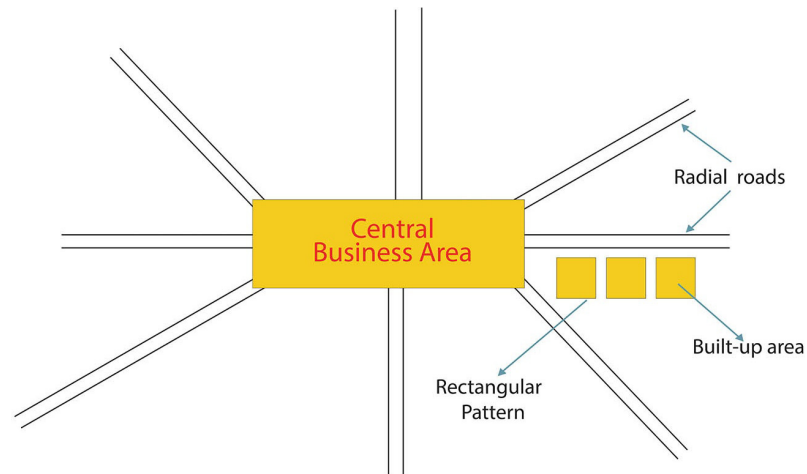
**2. Radial Road Pattern**

A straight approach to the main road is offered in this method. This pattern has been adopted on the city roads of Chandigarh. In this pattern, the roads are in the form of circles emanating from the centre of the area. This type of paradigm of a radial pattern is also being seen in our neighbourhood nation i.e. the Federal B Area of Karachi.

This pattern can also be categorised into there categories based on its layout.

**3. Radial or Star & Block Pattern**

This type of network is a mixture of radial and block patterns with a radial system of roads radiating from the center flanked by main streets the entire area is divided into radial blocks.



**Fig. 2.3: Radial or Star & Block Pattern**

**A. Pros of the Radial or Star & Block Pattern**

1. Less risky compared to a rectangular pattern.
2. It reduces the level of congestion at a primary bottleneck location.
3. If one radial road is closed another can be used as an alternative.

**B. Cons of the Radial or Star & Block Pattern**

1. Lack of safety appurtenances like rail transitions, crash attenuators and post support bases.

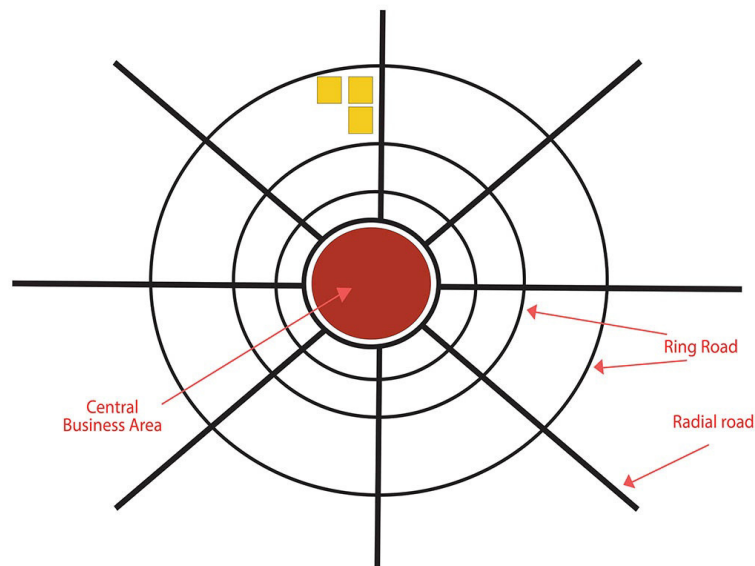


Notes

- It is only effective when two-lane ramp traffic does not have to merge at the downstream end of the ramp.

#### 4. Radial or Star & Circular Pattern

This type of network is a mixture of radial and circular pattern of roads. Here the key roads radiate from a central location and are linked along with concentric circle (ring roads).



**Fig. 2.4: Radial or Star & Circular Pattern**

##### A. Pros of the Radial or Star & Circular Pattern

- It is safer than to the above patterns because vehicles travel in the same direction.
- Roundabouts located in this pattern enhance the efficiency of traffic flow. This also reduces the fuel consumptions and emissions of the automobile.
- Reduces the possibility of rear-end crashes.

##### B. Cons of the Radial or Star & Circular Pattern

- Offering a good curve can be quite challenging.
- In most cases, it affects the ability to drive (causes a decrease in vision in old drivers).

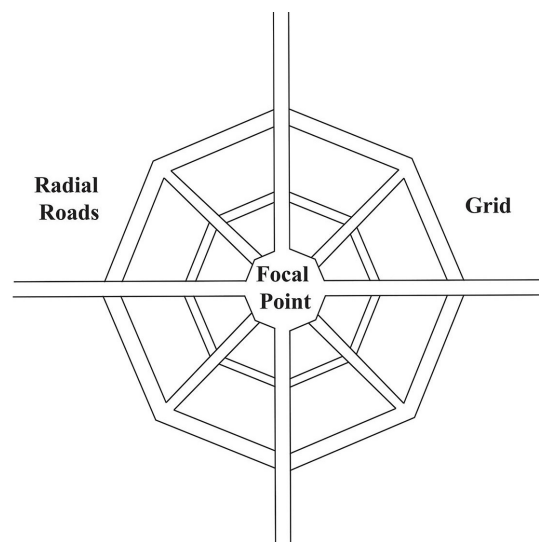


**Notes**

3. The proper provision of the traffic signals, road markings and lighting is essential to alert the drivers.
4. The Splitter islands should be extended far enough to provide a crosswalk and describe the roundabout.

**5. Radial or Star & Grid Pattern**

This type of network is a mixture of radial and grid pattern from the centres, a radial system of roads radiates outwards. The key arterial streets are interconnected by offering a grid pattern.



**Fig. 2.5: Radial (Star) and Grid Pattern**

**A. Pros of the Radial or Star & Grid Pattern**

1. It increases the efficiency of land usage and unit density.
2. It improves the traffic flow in both directions utilising Savannah's cellular structure.
3. It provides high safety to vehicular traffic with a high proportion of 3-way intersections.
4. It reduces the cut-through traffic.

**B. Cons of the Radial, Star, & Grid Pattern**

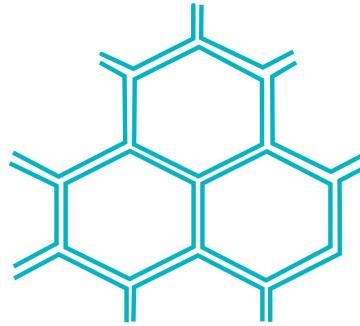
1. Splitter islands should be extended **far** enough.
2. Construction cost for extra road markings and signals.



Notes

## 6. Hexagonal Road Pattern

In this pattern method, a network of roads develops in such a manner that they form hexagons. Here the three roads meet the built-up spot boundary on the sides of the hexagons at each corner which can be further divided into appropriate sizes.



**Fig. 2.6: Hexagonal Pattern**

### A. Pros of the Hexagonal Road Pattern

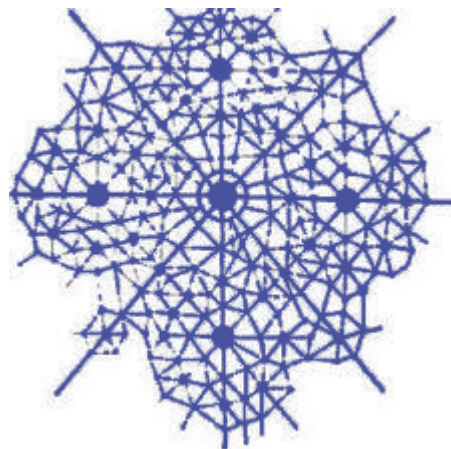
1. on the hexagonal sides three roads meet he build up - boundary.

### B. Cons of the Hexagonal Road Pattern

1. Traffic signs, pavement markings, and lighting should be adequate so that drivers are aware that they should decrease their travel speed.

## 7. Minimum Travel Pattern

In this pattern method, road pattern develops linearly in one direction feasible (straight roads) only owing to the presence of some nearby natural forces like ocean on one part of the city. These are short roads.



**Fig. 2.7: Minimum Travel Pattern**



Notes

**A. Pros of the Minimum Travel Pattern**

1. These sorts of potentially serious crashes are virtually eliminated.

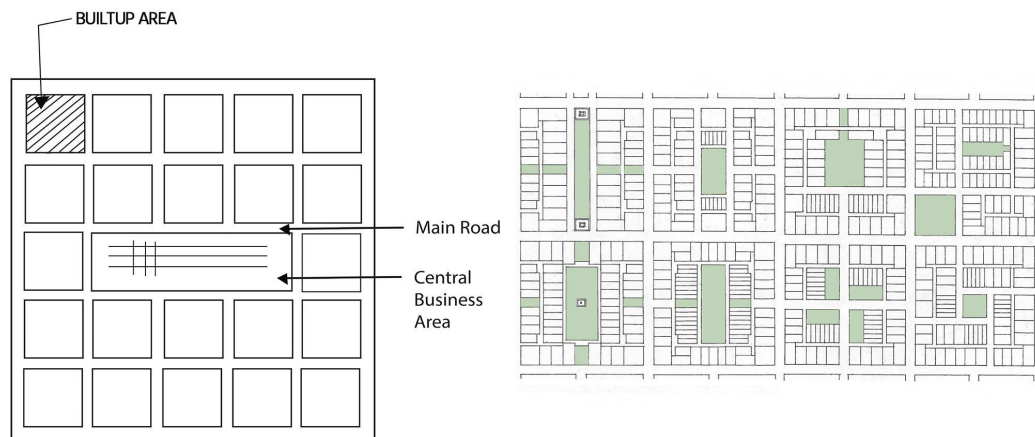
**B. Cons of the Minimum Travel Pattern**

1. The traffic signs, pavement markings and lighting must be adequate so that drivers are aware that they should decrease their travel speed.
2. Older drivers may find intersections particularly challenging.

**8. Grid Pattern**

**Grid Pattern Definition**

A **grid** is a system of interconnecting parallel lines, either actual or imaginary. Most of the developed nations streets for example America are laid out in a grid pattern. This meaning the streets interconnect at the right angles and create a pattern of squares when viewed from the above.



**Fig. 2.8: Grid Pattern**

The grid can also be referred to as a physical network of sorts, not necessarily made of straight or parallel lines. The grid plan, grid street plan, or gridiron plan is a type of city plan in which streets move at right angles to each other, creating a grid. The infrastructure price for regular grid patterns is normally higher than for patterns with discontinuous streets.

Street prices are determined primary by four variables: Street width, Street length, block width, and pavement width. Grid plans are unique because of their regular intersections and orthogonal geometry. As a result of geometry, orientation and everyday



Notes

intersections with paths to desired destination become easier and more direct.

### A. Pros of the grid Pattern

1. Grids are helpful for pedestrians because there are several different paths to travel from A to B.
2. Grids are suitable for retail stores and restaurants because they provide a lot of corner lots.
3. Navigating a grid is quite straightforward.

### B. Cons of the Grid Pattern

1. Grids are unsate for drivers and bicyclists because they have a lot of intersections and therefore several potential conflict points.
2. Grids can encourage people to use residential streets as shortcuts.
3. They lead to unnecessarily steep streets in cities with a lot of hills.
4. An inconsistent grid may result in traffic chaos.



### INTEXT QUESTIONS 2.1

1. Define grid road
2. A radial system of road radiates from the centre towards outwardly -True / False
3. A grid is a system of \_\_\_\_\_ similar lines, either real or imaginary.
4. \_\_\_\_\_ pattern, the main road is offered with a straight approach to outside the city.

### 2.2 INDIA'S TOP CORRIDORS

1. Kanyakumari to Srinagar
2. Porbandar to Kolkata
3. Surat to Paradip Port
4. Rameswaram to Dehradun
5. Mangalore Port to Chennai Port



Notes



**Fig. 2.9: National Highway Grids**

Most of the remaining 6,500 km without NH links are either single or two lane highways or major region routes. Moreover, these stretches are required to be transformed into highways by widening them into four lanes for smooth transport. In order to convert this into a four lane road, the government has to invest about Rs 25,000 crores. By preparing these kinds of maps it will be easier for the government to re-designate the National parks for easy recognition. For instance, all odd number NH grids can be identified for roads connecting north end to south as even numbers for corridors joining east to west. As the government is focusing on integrated transportation networks, these grids will be significant. Further these grids will link all the major ports in the country which will assist in fast evacuation and transport of goods from one destination to the other.





Notes

### 2.2.1 India's Top Corridors

1. Delhi-Mumbai Industrial Corridor (DMIC)
2. Chennai Bengaluru Industrial Corridor (CBIC)
3. Extension of the CBIC project to Kochi via Coimbatore.
4. Amritsar-Kolkata Industrial Corridor (AKIC)
5. Hyderabad Nagpur Industrial Corridor (HNIC)
6. Hyderabad Warangal Industrial Corridor (HWIC)
7. Hyderabad Bengaluru Industrial Corridor (HBIC)
8. Bengaluru Mumbai Industrial Corridor (BMIC)
9. Vizag Chennai Industrial Corridor (VCIC)
10. Odisha Economic Corridor (OEC)
11. Delhi Nagpur Industrial Corridor (DNIC)

#### 1. Delhi-Mumbai Industrial Corridor (DMIC)

The industrial corridor such as Delhi-Mumbai is considered as a mega infrastructure venture by the Government of India. This corridor covers a total length of 1483 km between the political capital of Delhi and the commerce capital, Mumbai. This project cost is around US\$ 90 Bn it is being funded by various stakeholders such as the Government of India, Japanese loans, ventures by Japanese corporations and via Japan depository receipts offered by Indian firms.

The National Industrial Corridor Development Corporation (NICDC) Limited, earlier known as Delhi Mumbai Industrial Corridor Corporation (DMIC) Limited, is the main integrating agency for the project. This NICDC has been registered as a firm with 49% equity of the Government of India, 26% equity of Japan Bank for International Cooperation (JBIC) and the remainder held by government financial institutions. The NICDC has been integrated to establish, support and assist the development of the DMIC project. It carries out and facilitates project improvement services, for several central government agencies as well as state governments, connecting to investment provinces / industrial segments/economic areas / industrial nodes as well as townships.

In Phase-1, there will be almost 24 investment provinces in eight industrialised cities.



**Notes**

The five cities that have been selected in Phase 1 as investment sections are:

- Manesar – Bawal (Haryana)
- Dadri – NOIDA – Ghaziabad (Uttar Pradesh)
- Ahmedabad – Dholera (Gujarat)
- Pithampur – Dhar – Mhow (Madhya Pradesh)
- Khushkhera – Bhiwadi – Neemrana (Rajasthan)

The three cities that have been selected as Industrial sectors are:

- Shendra – Bidkin (Maharashtra)
- Dighi Port (Maharashtra)
- Jodhpur – Pali – Marwar (Rajasthan)

**A. Present Status of Project:**

The DMIC venture has made considerable progress with trunk infrastructure improvement activities nearing completion in nearly four spots such as Gujarat, Maharashtra, Uttar Pradesh as well as Madhya Pradesh.

The land which is developed has been allocated to industries. Nearly 77 plots covering 536 acres of land have already been allocated. As of December 2020, this is anticipated to bring ventures worth USD 2.25 bn.

**B. The Major approved ventures under this are (Under Implementation):-**

- Dholera Special Investment Region (DSIR), Gujarat
- ShendraBidkin Industrial Area (SBIA), Maharashtra
- Integrated Industrial Township – Greater Noida (IIT-GN), Uttar Pradesh
- Incorporated Industrial Township – VikramUdyogpuri (IIT-VUL), Madhya Pradesh
- Incorporated Multi-Modal Logistics Hub – Nangal Chaudhary, Haryana

**C. The following projects has been approved on 30/12/2020**

- The Multimodal Logistics Hub as well as the Multimodal Transport Hub (MMLH & MMTH), Uttar Pradesh
- Dighi Port Industrial Area, Maharashtra



- Multimodal Logistics Park, Sanand, Gujarat
- Jodhpur PaliMarwar Industrial Area, Rajasthan
- Khushkhera BhiwadiNeemrana Industrial Area, Rajasthan

## 2. Chennai Bengaluru Industrial Corridor (CBIC)

The industrial corridor such as Chennai -Bengaluru has been proposed to facilitate accelerated development in the regional business agglomeration states of Tamil Nadu, Karnataka as much as Andhra Pradesh. The main purpose of this corridor is to help achieve the development of a well-planned and competent industrial base. This industrial corridor will attain the goal by offering smooth access to business production units, decreasing transportation and logistic cost, improving distribution time as well as reducing inventory cost. This will ensure increased private investment in manufacturing and industrial movement in the three states.

For the Comprehensive Integrated Master Plan of the CBIC, the study team of Japan International Cooperation Agency had conducted a groundwork study. They recognized 25 priority projects, across several sectors that aim to eradicate infrastructural blockages in the venture.

### A. Present Status of Project: 16

The outlook plan has been finished for the overall CBIC venture.

Totally three nodes have been recognized for further progress:

- Krishnapatnam (Andhra Pradesh)
- Tumakuru (Karnataka)
- Ponneri (Tamil Nadu)

SPVs for the implementation of the venture at Krishnapatnam node in Andhra Pradesh as well as Tumakuru node in Karnataka have correspondingly been integrated. Preliminary engineering activities have been confirmed for the main activation sector of approximately 2500 acres of Krishnapatnam and nearly 1736 acres for Tumakuru. The Cabinet had approved the industrial Corridor nodes at Krishnapatnam as far as Tumakuru under the scheme of CBIC.

### B. The two major projects under this are:-

Ventures which have been sanctioned on 30/12/2020

- Krishnapatnam Industrial Area, Andhra Pradesh



**Notes**

- Tumakuru Industrial Area, Karnataka

The venture development activities which are underway is

- Ponneri Industrial Area, Tamil Nadu

**C. Expansion of the CBIC venture to Kochi through Coimbatore**

The NICDIT has offered its sanction for the expansion of the CBIC venture to Kochi through Coimbatore.

The two main nodes have been recognized for further growth:

- Palakkad (Kerala)
- Dharmapuri (Tamil Nadu)

**D. Present Status of the venture**

- Groundwork of comprehensive master planning as well as beginning engineering has been undertaken for Palakkad (Kerala) as well as Salem (Tamil Nadu).
- The Finalization of Shareholder's Agreement (SHA) as well as the State Support Agreement (SSA) is also underway.

**3. Extension of the CBIC project to Kochi via Coimbatore (AKIC)**

This venture expands from Amritsar (Punjab) to Dankuni (West Bengal). Moreover; the AKIC will have a control area among seven Indian states such as Punjab, Haryana, Uttar Pradesh, Bihar, Jharkhand as well as West Bengal. The total length of the Amritsar-Kolkata Industrial Corridor (AKIC) is around 1839 km.

Seven additional incorporated Manufacturing Clusters (IMCs) have been recognized:

- Rajpura-Patiala (Punjab)
- Prag-Khurpia Farms (Uttarakhand)
- Bhaupur (Uttar Pradesh)
- Gamhariya (Bihar)
- Barhi (Jharkhand)
- Raghunathpur (West Bengal)
- Hisar (Haryana)



Notes

### A. Present Status of Project:

The viewpoint plan of the AKIC has been finished.

One Incorporated Manufacturing Cluster (IMC) has been confirmed for further development in seven states.

A Land recognition, agreement measuring 2935 acres, shareholder's agreement and state support agreement are being decided for the Prag-Khurpia farms in Uttarakhand.

The activities which are connected to the selection of comprehensive master planning as well as initial engineering consultant for the new spot i.e. Hisar. This is being considered as a substitute for Saha.

### B. The major ventures under this are:-

- Raghunathpur Industrial Park, West Bengal
- Hisar Integrated Manufacturing Cluster IMC, Haryana
- Prag Khurpia incorporated production Cluster IMC, Uttarakhand
- Rajpura Patiala IMC, Punjab
- Agra, Uttar Pradesh
- IMC at Gaya, Bihar

Venture improvement activities have not been commenced yet

- IMC at Jharkhand

### 4. Hyderabad Nagpur Industrial Corridor (HNIC)

Telangana and Maharashtra are affected by this corridor. By connecting rail, road and airways, we can boost an industrial enlargement.

#### A. The major venture under this:-

- Zaheerabad Phase I, Telangana

### 5. Hyderabad Warangal Industrial Corridor (HWIC)

This venture has an influential location stretching across the states of Telangana and Maharashtra. It will assist the development of a well-planned and resource competent industrial base which will bring innovation, production and job creation.



**Notes**

**A. The major venture under this:-**

- The Hyderabad segment I, Telangana project is identified under this.

**6. Hyderabad Bengaluru Industrial Corridor (HBIC)**

This corridor will have an influence on three states Telangana, Andhra Pradesh and Karnataka. It is an expansion of the Hyderabad Nagpur Industrial Corridor (HNIC) with a goal to link central parts of the nation with southern parts. The following nodes have been recognized for expansion in the preliminary phase:

- OrvakalNode

**7. Bengaluru Mumbai Industrial Corridor (BMIC)**

This corridor is aimed at assisting the growth of a well-planned as well as resource competent industrial base offered by world-class sustainable link infrastructure, bringing significant benefits merits in terms of innovation, production, job generation and resource safety. It will be stretched across Karnataka as well as Maharashtra.

**A. Present Status of Venture: 14**

The strategic plan has been executed for the total BMIC venture.

In Karnataka, the Dharwad node has been recognized as the main concern for further execution. Moreover, the Maharashtra Government has approved in principle the improvement of Sangli/Solapur.

**B. The major ventures under this are:-**

- Dharwad Node, Karnataka
- Satara Node, Maharashtra

**8. Vizag Chennai Industrial Corridor (VCIC)**

This corridor is considered the first coastal economic corridor in the nation. It is a division of the East Coast Economic Corridor (ECEC). This province has one of the largest concentrations of industrial, mineral and urban nodes. It covers an additional 800 km of Andhra Pradesh's coastline and it is associated with the Golden Quadrilateral. Further it plays an important role in the "Act East Policy" of India which focuses on raising the incorporation of the Indian economy into the economies of ASEAN. The ADB will carry out preliminary improvement activities for VCIC and will recognize the following



Notes

four nodes for progress:

- Visakhapatnam
- Chittoor
- Donakonda
- Machilipatnam

These four nodes recognized by ADB are based on the subsequent criteria:

- Present level of industrial agglomeration
- Availability of land for improvement of new industrial clusters
- Closeness to urban centres and seaports
- Connectivity (Rail and road)
- Accessibility of power and water.

#### **A. Present Status of Venture: 18**

The Asian Development Bank (ADB) sanctioned a loan of around USD 625 mn to the Andhra Pradesh government for the development of this project in phase -1 of VCIC, the National National Industrial Corridor Development and Implementation Trust has approved improvement to Visakhapatnam and Chittoor. ADB financing will be used meet seven civil works agreements provided by the Andhra Pradesh Government. The granted civil works are as specified below:

- Development of 1 MLD Common effluent treatment plant, Naidupeta
- Augmentation of Industrial area, Naidupeta
- The bulk water supply as well as summer storage tank, Naidupeta
- Samarlakota –Rajanagaram Road
- Expansion of Sub Stations in Visakhapatnam Node
- Augmentation of Sub Stations in Chittoor Node
- Water Supply distribution network improvement in GVMC area

#### **B. The major ventures under this are:-**

- Koparthy Industrial Area, Andhra Pradesh



**Notes**

- Visakhapatnam Industrial Area, Andhra Pradesh
- Chittoor Industrial Area, Andhra Pradesh

**9. Odisha Economic Corridor (OEC)**

This Corridor will be enhanced as a division of the East Coast Economic Corridor.

The subsequent 2 nodes have been recognized for development:

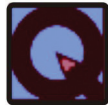
- Gopalpur-Bhubaneswar-Kalinganagar (GBK)
- Paradip-Kendrapara-Dhamra-Subarnarekha (PKDS)

**10. Delhi Nagpur Industrial Corridor (DNIC)**

This corridor will stretch among the North-South corridor of dedicated freight corridors (DFC) and on the existing NH network. These dedicated freight corridors are operated by the Ministry of Railways.

Presently, the remaining DFC's are in a sophisticated phase of completion:

- Eastern dedicated freight Corridor (Ludhiana to Dankuni)
- Western dedicated freight corridor (JNPT/Mumbai to Dadri)



**INTEXT QUESTIONS 2.2**

1. Which is considered a mega infrastructure venture by the Government of India?
2. Hisar is being considered as a substitute for which place?
3. \_\_\_\_\_ industrial corridor is regarded as the first coastal economic corridor in the nation.
4. The total length of the Amritsar-Kolkata Industrial Corridor (AKIC) is around \_\_\_\_\_ km.

**2.3 INTER ROAD NUMBERING SYSTEM**

In the month of April 28, 2010, the Ministry of Road Transport formally published the revised numbering method for the National Highway system. This was in the Gazette of the Government of India. It is a systematic numbering scheme based on the orientation and geographical location of the highway. This was implemented to ensure more flexibility





Notes

and steadiness in the numbering of existing as well as newly constructed national highways. In India the major Interstate highways are chosen by one- or two-digit numbers.

Routes with odd numbers run East and West, while even numbers run North and South. The Interstate utilise a numbering system in which the main Interstates are **allocated with one- or two-digit numbers** for the shorter paths and similarly for the longer ones they are allotted with **three-digit numbers** where the last two digits contest the parent path.

### 2.3.1 How the New Highway Numbering in India Works?

Until recently, the number system on Indian highways was in a very confusing style that didn't offer any logic besides their numbers. Moreover, the Indian Government had taken a major decision in the year 2010 towards the highway numbering system. This was in order to offer some sort of clue about the **geographical spot and the direction** of an exacting highway.

The **logic behind national highway numbering in India** is as follows:

1. It is not uncommon for the highways of **North-South** to clutch **EVEN numbers**.
2. The highways of **East-West** will carry **ODD numbers**
3. All major roads will be **single digit or double digit** in number (see the exception in point 6 below)
4. **North-South highways** will **increase their numbers from East to West**. For instance, in Central or Western India, a particular North-South highway will move towards a higher number than the one in East India. Let's assume that NH4 lies in East India and highway 44 lies in West India. Due to odd numbering 5 both runs North-South.
5. Likewise the **East-West highways** will expand as they shift **from North to South**. By this sense NH1 will be moving East-West anywhere in North India whereas NH 83 might be moving down south. Certainly, there might be minor confusion besides few roads that might be operating diagonally in stretches.
6. **THREE digit** numbered highways are **secondary routes or branches** of a main highway. For instance, the branches highway 44 will be 144, 244, and 344. Please note that since the corridor NH44 runs the length of the country from North to South a side shot say 144 may be up north while something like 944 may be down south.
7. **The A, B, C, D etc. The Suffixes** are included to the three digit sub highways to spotlight very small spin-offs or widens of sub-highways. For instance, **966A, 527B** etc.

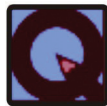


**Notes**

**2.3.2 Speed limits**

Due to the freeways, generally the Interstate Highways have the highest speed limits in a given location. Speed limits are determined by individual states. From 1975 to 1986, the maximum speed limit on any highway in developed nations such as the United States was 55 miles per hour (90 km/h). Presently, rural speed limits elsewhere usually range from 65 to 80 miles per hour (105 to 130 km/h). Several portions of various highways such as those in rural areas have a speed limit of 80 mph (130 km/h).

In certain locations, speed limits on Interstates can be considerably lower in places where they traverse extensively hazardous spots. The maximum speed limit on is 50 mph (80 km/h) in certain areas because of two sharp curves with a suggested limit of 35 mph (55 km/h) in a heavily congested area.



**INTEXT QUESTIONS 2.3**

1. North-South highways will increase their numbers from East to West - True / False
2. Three digit numbered highways are primary routes of a main highway True / False
3. Routes with \_\_\_\_\_ numbers run East and West.
4. Speed limits are determined by \_\_\_\_\_ states.

**2.4 NUMBER ALLOCATION OF NATIONAL HIGHWAYS**

The numbers assigned to National Highways in India are as follows:



**Fig. 2.10: Number Allocation of National Highways**



Notes

1. In India, for all the national highways which commence from **North to South**, the **even numbers are used**. It is allocated **from East to West in the method of ascending order**. For high longitudes lower numbers are allocated and for lower longitude, high numbers are allocated. North Eastern state are fame to NH-2 while Rajasthan is fame to NH-68. NH-8 Delhi to Mumbai, Maharashtra (via Jaipur, Ahmedabad and Vadodara)
2. Odd numbers are assigned to al highways in india, especially from East to West. In this incident, the highways are named in ascending numbers from East to West. It is assigned in such a way that, for high latitudes lower numbers are allocated and for lower latitudes higher numbers are allocated. For example, NH-87 is located in southern India and NH-8 is located in Jammu and Kashmir.

**For example**, NH-11 Agra, Jaipur, Bikaner



**Fig. 2.11: NH-11 Agra, Jaipur, Bikaner**

3. One or two digit numbers are used for all the major highways.
4. In India if we start moving from the East to the West, the number of highways in the North to South direction will be increased. For instance, if the number four is utilized for a highway positioned on North to South but in an Eastern State, then the number for a highway situated on North to South but in a Western State or Central State will always be indicated by more than four.



Notes



**Fig. 2.12: National Highway numbers**

5. A subsidiary highways a highway that is denoted by three digit numbers in India. 244, 144, and 344 are the branches of the National Highway number of 44. Where us in the auxiliary highway number, if the first numeral is odd, then the highway is positioned from East to West. If the first numeral is even, it is situated from North to South.
6. The sections of the auxiliary highways are denoted by a letter, A, B, C or D in the three digit number.



### INTEXT QUESTIONS 2.4

1. NH-2 is situated in the North Eastern States - True / False.
2. NH-87 is located in Jammu and Kashmir True / False.
3. The numbers such as 244, 144, 344 are the branches of the National Highway number of \_\_\_\_\_.
4. NH-68 is positioned in \_\_\_\_\_.



### WHAT YOU HAVE LEARNT

- A grid road that follows a surveyed division between areas of a township, municipality, etc. It is also a municipal road which follows with a grid line created by the original survey of the region. Generally a grids referred to as a system of connecting similar lines, whether they are real or imaginary.
- The types of road patterns are Rectangular or Block Pattern, Radial Pattern (Radial or Star & Block Pattern, Radial or Star & Circular Pattern, Radial or Star & Grid Pattern), Hexagonal Pattern, Minimum Travel Pattern and Grid Pattern.
- India's top corridors are 1. Kanyakumari to Srinagar, 2. Porbandar to Kolkata, 3. Surat to Paradip Port, 4. Rameswaram to Dehradun and 5. Mangalore Port to Chennai Port
- The main industrial corridors are Delhi-Mumbai Industrial Corridor (DMIC), Chennai Bengaluru Industrial Corridor (CBIC), Extension of the CBIC project to Kochi via Coimbatore., Amritsar-Kolkata Industrial Corridor (AKIC), Hyderabad Nagpur Industrial Corridor (HNIC), Hyderabad Warangal Industrial Corridor (HWIC), Hyderabad Bengaluru Industrial Corridor (HBIC), Bengaluru Mumbai Industrial Corridor (BMIC), Vizag Chennai Industrial Corridor (VCIC), Odisha Economic Corridor (OEC) and Delhi Nagpur Industrial Corridor (DNIC)
- Routes with odd numbers run East and West, while even numbered run North and South. The Interstate utilise a numbering system in which main Interstates are allocated with one- or two-digit numbers for the shorter paths and similarly



Notes



**Notes**

for the longer ones they are allotted with three-digit numbers where the last two digits contest the parent path.

- In India, for all the national highways which commence from North to South, the even numbers are used. It is allocated from East to West in the method of ascending order. All the highways especially from East to West, the odd numbers are allocated.



**KEY TERMS**

Grid	Corridor	Highways
Inter road	Pattern	Number
National	Project	Township
Location	Speed	Length



**TERMINAL EXERCISE**

1. Define Grid system.
2. Explain Block Pattern.
3. Explain Delhi -Mumbai Corridor.
4. What is the Inter-road number?
5. Explain NH -68.
6. Outline the Pros and cons of the Radial Pattern.
7. Write a note on minimum travel patterns.
8. Brief the Chennai -Bangalore Industrial corridor.





Notes

9. List out India's top corridors.
10. What do you understand about highways Three Digit Number.
11. Sketch the inter road numbering system
12. Spotlight the different types of road pattern
13. Which industrial corridors is significant - Justify your answer
14. How does the New Highway Numbering system work in India?
15. In what way Asian Development Bank connected with the industrial corridor?



## ANSWERS TO INTEXT QUESTIONS

### 2.1

1. It is a road that follows a surveyed division between areas of a township, municipality, etc.
2. True
3. Interconnect
4. Radial Road

### 2.2

1. Delhi-Mumbai Industrial corridor
2. Saha.
3. Vizag Chennai
4. 1839

### 2.3

1. True/False
2. False

**Notes**

3. Odd
4. Individual

**2.4**

1. True
2. False
3. 44
4. Rajasthan

**DO AND LEARN**

Learners can undertake their activity work in the areas of Road infrastructure highway development organisations.



# INSTITUTIONAL FRAMEWORK OF INFRASTRUCTURE DEVELOPMENT

Infrastructure is the pillar of industrial and agricultural output, as well as global and domestic business. It is the basic organizational and physical structure needed to run a successful firm or nation. Communication, transportation, monetary systems, education, health, safe drinking water, and sewage, are all examples of fundamental infrastructure in an organization or for a nation. The infrastructure of a nation has a direct impact on its economic and social development. Because of the enormous expansion of economic and social infrastructures, several developed nations have made significant developments. Infrastructure consists of the following components power and the objects used to construct it, such as coal and oil, roads and rail transportation, telecommunications, sea ports and airports Irrigation is a significant element of agriculture's infrastructure. As a result of a good infrastructure, the work process is more efficient, resulting in greater productivity.



## LEARNING OUTCOMES

After studying this lesson the learner:

- summarizes the application of road infrastructure by various authorities
- explains the coordination of road infrastructure develop between various authorities;
- identifies the Importance of National Highway Numbers;
- lists the Allocation of National Highway Numbers;
- identifies the operation structure of NHAI;
- defines the functions of NHIDCL and State PWD.



**Notes**

## **3.1 SIGNIFICANCE OF NATIONAL HIGHWAY NUMBERS**

### **3.1.1 National Highways**

The National Highways are the backbone of the road infrastructure that links all metropolitan city of India such as ports, capitals of states etc. There one two, four or more lanes constructed with charcoal and cement concrete. The Ministry of Road Transport and Highways is mainly responsible for the development and maintenance of National Highways (NHs). The Ministry receives several proposals from diverse State Governments and Union Territories (UTs) for the declaration of State roads as new National Highways (NHs). However, the Ministry from time to time has consider the declaration of only few State roads as new NHs based on the need for connectivity, inter-se priority as much as availability of funds.

The declaration of these State roads as new NHs is taken into account based on well established principles such as the condition for State roads for declaration as new NHs adding the roads based on following

- Roads moving through length
- The breadth of the nation
- Linking towards adjacent nations
- National Capitals along with State Capitals
- Mutually the State Capitals
- Major and non-major ports
- Large industrial centers or tourist centers
- Roads connecting very significant strategic necessity in hilly and isolated location
- Arterial roads which facilitate sizeable decline in travel distance and attain substantial economic development thereby
- Roads which assist by opening up huge tracts of backward location and
- Regions in hilly (other than strategically significant ones), attain a National Highways grid of 100 km, etc.

#### **1. Indian National Highway structure**

The National Highways in India are a network of trunk roads managed by the Ministry



of Road Transport and Highways. It is built and administered by several organizations such as

- The National Highway Authority of India
- The National Highways and Infrastructure Development Corporation Limited, and
- The Public Works Departments of State Governments.

## 2. National Highway Numbers

Till the year 2010, the National Highways continued to be numbered in the same way they were numbered. In addition, the National Highways are listed every National Highway according to the National Highways Act of 1956. In order to rationalize the numbering system, during the year 2010, the government had sent notification stating that "The number of National Highway which is currently existing does not offer any indication of its spot and direction". As a result, the new system is framed so that all roads east-west will have odd numbers, and all roads north-south will have even numbers, and all the highways of north-south will have even numbers. In the north-south direction of odd numbered highways the number increases. In such a case a highway from the spot Jodhpur to Kanpur will have a smaller number of lanes than a highway from Mumbai to Chennai. For highways which start with even-numbers the numbers rise from east to west. Similarly a highway which connects from Kolkata to Chennai will increase have fewer roads than a highway starting from Delhi to Mumbai.

The digits of each number will educate anyone whether an interstate links multiple metro areas, or exists exclusively within a single metro location. The Interstates with multiple regions usually have one-digit and two-digit span, while interstates with three-digit spans are more likely to be domestic. The rest of the structure flows from this most fundamental starting point.

## 3. The system of one/two-digit

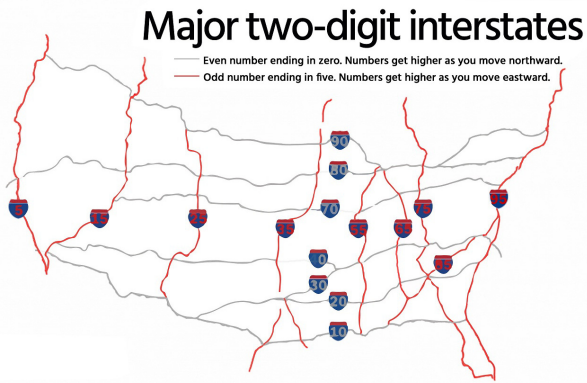
There exist three factors that move towards determining the number for a two-digit interstate:

1. The East-west roads receive even numbers, whereas north-south roads will obtain odd numbers.
2. The lowest numbers start in the south and west, and rise from north and east.
3. The most significant cross-nation interstates receive numbers which are divisible by five, meaning they generally end with zero or five.



**Notes**

Thus, for instance, the name I-95 was given to the farthest east main national cross-country interstate that traverses towards a north-south path. Similarly, the name I-10 was assigned to the farthest south main interstate traversing towards an east-west path.



**Fig. 3.1: (a) Major Two-Digit Interstates**

The interstates with smaller two-digit numbers are those ending in digits either zero or five and do follow the same similar geographic rule of east-west or north-south, but in a much lesser form. The Diagonal highways generally do not always fit the structure. While few interstates were added to the network after it was initially constructed, moving in the exact order wasn't feasible forever. Until 1998, I-99 not designated, and move into Central Pennsylvania well to the west of I-95.



**Fig. 3.1: (b) Major Two-Digit Interstates**

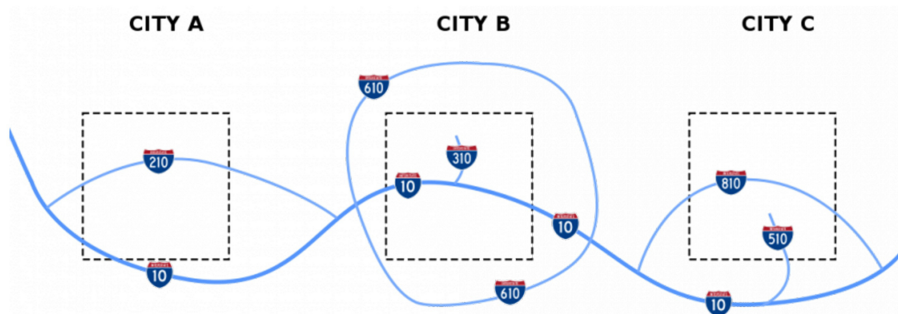
The major interstates with two-digit (fives and zeros) will have unique numbers; there exists only one highway which is named I-95, only one I-70, etcetera. While numbers could repeat as long as they are distant apart from one another. For instance, there exist separate I-76s in Pennsylvania as well as in Colorado as well as separate I-87s in the city such as New York as well as North Carolina .

There are a very few short two-digit interstates that perhaps should have received three-digit numbers instead. The North Carolina's highway I-87 is only 13 miles long, where as Maryland's I-97, which links Baltimore to Annapolis, which is less than 18.

#### 4. The system of three-digit

The interstates with Three-digits are shorter paths that serve individual metro locations, as opposed to the two-digit intercity paths. They link towards the longer two-digit paths, and they act as beltways, spurs, or even connectors. There are two factors that move into three-digit numbering:

- A. The second two digits reflect whatever two-digit interstate the path connects to. For instance, I-395 links to I-95, and I-270 links to I-70.
- B. The first digit always reflects the intention of the road. Loops and by passes that connect with their chief two-digit interstate in two locations generally have even first digits. Spurs and connectors that only intersect once typically have odd first digits.



**Fig. 3.2: The system of three-digit**

The interstates with three-digits numbers can repeat as often as necessary as long as it does not repeat inside the same state. For example, there one seven diverse I-395s and four diverse I-270s. Observe that in developed nations like the United States both Baltimore and Washington have their own spur I-395, whereas Baltimore does not have an I-495 because Washington's Beltway penetrates into Maryland.

Certainly, there exist several exceptions. For example in USA say the city number Maryland's I-270 is a real troublemaker: The question is why should a spur link to I-70 at the same location obtain an even first digit in spite of an odd? I-370 is the spur off of a spur in Gaithersburg, so why does I-270 in Bethesda also get it own number maybe I-570?



Notes



The main exception perhaps falls to I-238 in the vicinity of San Francisco Bay. There is no I-38 and therefore there should be a number I-238. I-238 links I-580 and I-880, which are each spurs off of I-80. As a general rule I-238 could have received an I-x80 number, but since California was in California, all the available options one through nine were in advance for other such highways. While I-238 which used to be California route 238 was transformed into an interstate.

**a. Hawaii, Alaska, and Puerto Rico**

In spite of having no direct land links to the rest of the United States, Hawaii, Alaska, as well as Puerto Rico all have their interstate highways. These are generally given in lettered prefixes such as H for Hawaii, A for Alaska and similarly PR for Puerto Rico. Moreover, they also have an easy numbering structure, with highways numbered consecutively starting with 1. Hawaii's first interstate is H1, Alaska's A1, and Puerto Rico's PR1.

**5. Merits of Highway numbers**

The Highway numbers which is placed can benefit the commuters in the following ways:

- Low risk / High Speed Travel
- Identification of type of road
- Cross Traffic Eliminated
- Median between opposing lanes
- No pedestrians, bikes, slow moving vehicles
- Wide shoulders make good escape paths
- Signs well posted, in advance to warn drivers
- Can hold large volumes of traffic
- Straighter roads, no traffic signals
- Higher speed limits
- Minimizes distance between major cities
- Evacuation routes
- Military usage



**INTEXT QUESTIONS 3.1**

1. Define National highways
2. The major interstates with two-digit numbers will have a unique numbers -True / False
3. The National highways in India which has a network of \_\_\_\_\_ roads maraged by the Ministry of Road Transport and Highways.
4. The interstates with smaller two-digit numbers are those end with zero or \_\_\_\_\_.



Notes

**3.2 NATIONAL HIGHWAYS NUMBERS WITH ITS STATE CONNECTIVITY**



*Fig. 3.3: National Highways Numbers*

*Table 3.1: Significant National Highway Numbers in India*

S. No.	National Highway Number	States through which it moves
1	No 1	<b>Jammu and Kashmir</b> (URI, Baramulla, Kargil, Srinagar and Leh)
2	No 2	<b>Assam, Nagaland, Manipur, Mizoram:</b> (Dibrugarh, Sivnagar, Wokha, Imphal, Kohima, Mokokchung)





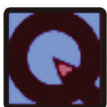
3	No 3	<b>Punjab, Himachal Pradesh, Jammu &amp; Kashmir</b> (Atari, Amritsar, Jalandhar, Hoshiarpur, Hamirpur, Mandi, Kullu, Manali)
4	No 4	<b>Andaman &amp; Nicobar Island</b> (Mayabunder, Port Blair, Chidiatapu)
5	No 5	<b>Punjab, Chandigarh, Haryana, Himachal Pradesh</b> (Ferozepur, Moga, Jagraon, Ludhiana, Chandigarh, Kalka, Solan, Shimla, Thiyog, Narkanda, Rampur)
6	No 6	Meghalaya, Assam, Mizoram (Zorabat, Shillong, Badarpur, Kolasib, Aizawl, Badarpur, Panchgram)
7	No 7	<b>Punjab, Chandigarh, Haryana, Himachal Pradesh, Uttrakhand</b> (Fazilka, Abohar, Bhatinda, Barnala, Sangrur, Patiala, Panchkula, Raipur Rani, Dehradun, Rishikesh, Devprayag, Rudraprayag, Karnaprayag, Chamoli, Badrinath)
8	No 8	Assam, Tripura (Karimganj, Agartala, Udaipur)
9	No 9	<b>Punjab, Haryana, Delhi, Uttar Pradesh, Uttrakhand</b> (Dabwali, Sirsa, Fatehabad, Hisar, Hansi, Rohtak, Bahadurgarh, Delhi, Gaziabad, Moradabad, Rampur, Bilaspur, Rudrapur, Tanakpur, Pithoragarh)
10	No 10	<b>Sikkim, West Bengal</b> (Siliguri, Kalimpong, Gangtok)
11	No 11	<b>Rajasthan</b> (Jaisalmer, Pokhran, Bikaner, Ratangarh, Fatehpur)
12	No 12	<b>West Bengal</b> (Raiganj, Malda, Farakhha, Barhampur, Krishnanagar, Ranaghat, Baarasaat, Kolkata)
13	No 19	<b>Delhi, Haryana, Uttar Pradesh, Bihar, Jharkhand, West Bengal</b> (Delhi, Mathura, Agra, Kanpur, Allahabad, Varanasi, Mohania, Aurangabad, Asansol, Kolkata)
14	No 20	<b>Bihar, Jharkhand, Odisha</b> (Bakhtiyarpur, Bihar Sharif, Nevada, Hazaribagh, Ranchi, Khooti, Chakradharpur, Chaibasa)





Notes

15	No 21	<b>Rajasthan, Uttar Pradesh</b> ( Jaipur, Dausa, Bharatpur, Agra)
16	No 24	<b>Gujarat, Rajasthan, Madhya Pradesh, Uttar Pradesh, Bihar, West Bengal, Assam</b> (3507 Kms); (Porbandar, Udaipur, Chittorgarh, Kota, Shivpuri, Jhansi, Kanpur, Lucknow, Faizabad, Gorakhpur, Gopalganj, Muzaffarpur, Darbhanga, Araria, Purnia, Siliguri, Guwahati, Dispur, Silcher)
17	No 44 (longest NH in India)	<b>Jammu &amp; Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttar Pradesh, Madhya Pradesh, Maharashtra, Telangana, Andhra Pradesh, Karnataka, Tamil Nadu</b> (3,745 Kms); (Srinagar, Jammu, Pathankot, Ludhiana, Ambala, Karnal, Panipat, Delhi, Faridabad, Mathura, Agra, Gwalior, Jhansi, Nagpur, Adilabad, Nizamabad, Hyderabad, Kurnool, Bengaluroo, Dharmapuri, Selam, Madurai, <b>Kanyakumari</b> .)
18	No 48	<b>Delhi, Haryana, Rajasthan, Gujarat, Maharashtra, Karnataka, Tamil Nadu</b> (2807 Kms); (Delhi, Jaipur, Kishangarh, Chittorgarh, Udaipur, Ahmedabad, Vadodara, Ankaleshwar, Mumbai, Thane, Pune, Satara, Kolhapur, Bengaluru, Krishnagiri, Vellore, Chennai)
19	No 53	<b>Gujarat, Maharashtra, Chhattisgarh, Odisha</b> ( 1781 Kms); (Surat, Jalgaon, Bhusawal, Akola, Amaravati, Nagpur, Bhandara, Devri, Rajanandgaon, Durg, Raipur, Saraipalli, Baargarh, Sambalpur, haridaspur, Paradeep Port



**INTEXT QUESTIONS 3.2**

1. National highway No. 4 passes through Gujarat, Maharashtra, Chhattisgarh, Odisha -True / False.
2. National highway No. 12 passes through West Bengal -True / False
3. National highway No. 48 ends at \_\_\_\_\_.
4. National highway No. 53 starts at \_\_\_\_\_.



### 3.3 PURPOSE AND ACTIVITIES OF NHAI

The NHAI was formed through the promulgation of the National Highways Authority of India Act, 1988. According to the Section 16(1) of the NHAI Act the key purpose of NHAI is to develop, sustain as well as manage the national highways and other highways which is entrusted or connected to it by the Indian Government.



**Fig. 3.4: Purpose and Activities of NHAI**

Moreover it has been delegated with the project of National Highways Development in addition to other small business enterprises which have been vested by National Highways for development, maintenance and administration of 50329 kms. The total length of NH (comprising expressways) in the country at present is around 1,32,499 kms. While the Highways /Expressways comprise merely about 1.7% of the length of all roads, they cover about 40% of the road passageway. One of the main purposes of NHAI is to implement the National Highways Development Project (NHDP), which is considered to be as India's largest highway project undertaking in a phased scheme.

There are three tier of NHAI :

- The Headquarters (HQ),
- The Regional Offices (ROs) and
- The Project Implementation Units (PIUs).

The National Highways Authority of India's Headquarters is located in New Delhi.

#### 3.3.1 Main Functions of NHAI are as follows

- To develop, maintain and manage the National Highways which are vested in it by the respective Government.
- For appropriate management of National highways, it should collect fees, regulate and control the plying of vehicles.



- To develop and provide construction and consultancy services in India and abroad, as well as to carry out research and development work in connection with the development, maintenance and supervision of highways or any other amenities there at.
- Advising the Central Government on matters related to highways.
- To facilitate the respective State Government in the formulation and implementation of schemes for highway development and mutually agreed upon such terms and conditions
- Construct the offices, workshops and create and sustain hotels, motels, restaurants and other rest-rooms which are close to the highways
- Construct houses and townships for its Employees
- Legalize and control the plying of vehicles on the highways
- Provide amenities for the users of the highways which is necessary for the smooth stream of passage on such highways.

### 3.3.2 PROJECTS AWARDED BY NHAI

The projects awarded by NHAI are as follows:



Fig. 3.5: Project awards by NHAI



Notes



### INTEXT QUESTIONS 3.3

1. NHAI was formed in the year \_\_\_\_.
2. NHAI has three-tier structure -True / False
3. The key purpose of NHAI is to develop \_\_\_\_ and manage national highways and other highways.
4. One of the main purposes of NHAI is to implement the National Highways \_\_\_\_\_ Project.

### 3.4 RESPONSIBILITIES OF NHIDCL

The National Highways and Infrastructure Development Corporation Limited (NHIDCL) is a fully owned organization which is formed under the Ministry of Road Transport & Highways, Government of India. It is responsible for managing a system of over 5,500 km of National Highways out of 1, 15,000 km in India. According to the Government, the Cabinet Secretariat is currently in place. (Allotment of Business) Rules, 1961 were framed and the subjects were assigned to the Ministry of Road Transport & Highways.



**Fig. 3.6: Building Infrastructure**

This Ministry is responsible for

- The development and maintenance of National Highways

- The Central Road Fund Administration and
- Formation and execution of policies relating to road transport.

Furthermore this Organization plays several roles which are as follows

- Upgrading
- Carry out surveys
- Establishes
- Designs
- Builds
- Operates
- Administers and
- Promotes the National Highways and Strategic Roads

Comprising interrelating the roads in divisions of the country which assign global boundaries with neighboring nations. The improved provincial linkage would enhance the cross border trade and assist in safeguarding the nation's worldwide borders. This would lead to the development of a more integrated and economically consolidated North America and South East Asia. In addition to the above, there are general economic benefits for the general public and benefits by integrating the peripheral divisions with the conventional in a more energetic manner. In order to build the road, through the assistance of this Organization, an estimated cumulative length of 10,000 kms has been recognized. The company aims to create customized as well as specialized skills. In terms of dealing with the issues like complications of environmental regions and spotlighting the broad harmonization basics with defense bureaus, the Organization would also take effort to start infrastructure ventures comprising metropolitan infrastructure and consignment and execute as a bureau for the development of all types of Infrastructure. A cross-allocation of technical know how has been visualized as part of business development with other nations and their bureaus, such as multilateral organizations and other institutions.

To assist competent and safe consignment regionally with other member nations in South Asia Subregional economic Cooperation (SASEC), the company also recommended to develop the road linkage and efficiency of the global business passage, by extending about 500 Kms of pathways in the nation of North Bengal towards Northeastern





region. Furthermore, for the above business ventures the fund was allocated by the ADB (Asian Development Bank).

### 3.4.1 Functions

- A first, step will be use of electronic tools like e-Office, e-Tendering, e-Monitoring, e-Access.
- Second, in order to ease infrastructure business the company is revisiting different measures and processes.
- Third, to keep pace with the latest developments, NHIDCL is engaged itself in stable capability building of staff and stakeholders comprising contractors. In order to become energetic partners in building of Highways and other infrastructure, the capability growth of domestic contractors and engineers in the North Eastern Region and Strategic divisions will facilitate them and thereby take ahead towards the comprehensive development of these divisions.
- The endeavor of the firm, as a fourth strategy, is to promote the use of the latest but suitable technology in materials, design and work. This will enable improvement in quality, durability, execution speed, cost reduction, security values and to emphasize ecological concerns.
- In order to become a leader in the trade, NHIDCL will create a platform to exchange ideas by linking experts and leading research centers.
- The sixth approach is in order to avoid needless litigations; the NHIDCL has dedicated to offer a speedy Dispute Resolution Mechanism.
- Finally, in order to create one vision, one mission as seventh planned progress, it involves constant communication with stakeholders.



### INTEXT QUESTIONS 3.4

1. NHIDCL stands for \_\_\_\_\_.
2. The Govt. of India (Allotment of Business) Rules, 1961 were framed in the year \_\_\_\_\_.
3. One of the final plans of NHDCL is to create one \_\_\_\_\_ one mission.
4. NHIDCL \_\_\_\_\_ plan is in order to develop into a leader in the trade.

### 3.5 FUNCTIONS OF STATE PWD



*Fig. 3.7: State PWD*

In the production and conservation of Government Buildings, the Public Works Department is measured as one of the oldest service sectors of the Government. This Department has been rendering its eminent services for the past 153 years. It is divided into the Water Resources Department as well as the Buildings Organisation. Numerous buildings and monuments position as demonstrate to the engineering skills of PWD. By implementing the current trend of e-government, this organization will deliver superior service offering to the general public. The department with its long term vision is striving to deliver excellent service. By implementing sophisticated technology and following the requirements of the Indian Standard Code, the Organization provides structural security to all public buildings. Moreover this department safeguards all the Monuments and Heritage buildings, by protecting their Architectural, Aesthetic, Historic, archeological as well as famous symbolic values. (Keeping in mind that, it was under) the control of the Government. By executing best evolved practice and sophisticated modern technologies, this department has long term visualization for superiority service for secure and secure public buildings at (an affordable) price.

#### 3.5.1 Functions

PWD is one of the oldest departments in charge of works. The functions of PWD comprises the following -

1. Planning
2. Construction
3. Maintenance
4. Repairs



Notes





PWD executes those projects which are financed by the state government and are considered civil works.

This organization builds and preserves those buildings of different Government Departments such as

- School Education
- Health and Family Welfare
- Home (Judicial, Transport, Prison, Fire and Rescue)
- Revenue
- Agriculture
- Animal Husbandry
- Dairying and Fisheries
- Tourism and Art Culture Department
- Labor and Employment and
- Social Welfare Department.

Moreover, this department also provides excellence services for Secure Government buildings at reasonable prices by utilizing fashionable technologies and knowledge acquired through years of practice.

### **3.5.2 Organization Structure of Public Works Department**

The Public Works Department Organization Structure consists of following:

1. Secretary (P.W.D.)
2. Dy. Secretary (P.W.D)
3. Chief Engineer (P.W.D.)
4. Executive Engineer (P.W.D.)
5. Assistant Engineer (P.W.D.)
6. Junior Engineer (P.W.D.)

### **3.5.3 Central Public Works Department**

While, the Central Public Works Department is under the Central Government, each





state has its own PWD department, which is controlled by the state government. Therefore, the Central Public Works Department (CPWD) assists all the civil works relating to such a project.

The CPWD has the main responsibilities such as

- constructing roads
- bridges
- buildings
- auditoriums
- laboratories
- flyovers
- border roads etc.

At present, this CPWD has become a construction administration department, and it offers services such as completion and maintenance of projects.

In addition to leading the Central Public Works Department, Director General (DG) acts as the principal technical advisor to the Government of India. There exist special DGs and they are heading of those regions. In addition to these regions a DG is also head the sub-regions, and the chief engineers administer the zones in any part of state. At present, a Chief Project Manager (CPM) is also setup to administer the major projects of the CPWD. The CPWD can undertake most challenging tasks, such as building and maintaining complex projects.

#### 3.5.4 Functions of CPWD

- Projects of the Central Government other than railways, communications, atomic energy, defense services. These normally consist of non-residential buildings, designs, construction and maintenance of the same.
- Construction of accommodation for employees of the Central Government Services.
- Construction projects for Central Armed Police employees. These consist of projects connected to the CRPF, CISF, BSF, etc. Additionally, maintenance of the assets of the CRPF.
- Proper maintenance of developments under the Cabinet Secretariat such as the SSB.



- Projects related to construction for Public Sector Undertakings. The Construction of engineering firms and other organizations either government or private. PWD also works on projects related to the deposit work. The CPWD undertakes the Deposit Works and outlay is provided wholly or in part shape
- The Public funds which are not added in financial estimates as well as the accounts of the Union of India.
- Contributions of the public
- Contributes a major role by offering consultancy in civil engineering projects. These are related to the planning, designing, and construction of government and autonomous buildings.
- Abroad construction ventures after obtaining permission from the Ministry of External Affairs.
- Border fencing and other border security projects assigned by the government.
- Construction of roads under diverse government programs such as PMGSY and RSVY.



### **INTEXT QUESTIONS 3.5**

1. The Public Works Department has been providing outstanding services for a number of \_\_\_\_\_ years.
2. Every state has a separate PWD department - True / False
3. The \_\_\_\_\_ is in charge of the Central Public Works Department.
4. The Public Works Department is measured as one of the \_\_\_\_\_ service sectors of the Government.

### **3.6 MAJOR ACTIVITIES OF PUBLIC WORKS DEPARTMENT**

1. It plans, designs, constructs and maintains the Government Buildings which are considered as the capital assets of the respective State.
2. It Constructs and maintains monuments and memorials under the authority of the government.



3. It executes the Local Area Development Scheme which normally uses MLAs' and MPs' funds as deposit works.
4. It executes any reconstruction works which are related to calamity such as Emergency Tsunami Reconstruction projects.
5. Renovating and restoring of heritage monuments.
6. In addition to its deposit work, it constructs buildings for Central government undertakings and state universities etc.
7. Conducting research and development in the areas related to construction materials and practices.
8. Upon request from Vigilance, Anti-Corruption Department and Judiciary the organization performs building valuation.
9. Assesses the structural stability of private buildings in order to provide rent reasonableness certificates.

### 3.6.1 Role of PWD in Irrigation

**The Public Works Department** has been serving in the construction and maintenance of irrigation structures for the past 153 years. Several dams serve as a testimony to their engineering skill. In order to derive greatest benefit from artificial recharge, improved water management, restoration of water bodies, and water users contribution to this endeavour, it is well understood that water users should contribute. The department is working diligently hard to gain a thorough understanding of irrigation competence. In order to supply adequate water for irrigation, drinking and other purposes, Intra-linking of rivers is necessary for diversion of flood water. With a long-term vision the department is taking all efforts to improve service delivery.



#### INTEXT QUESTIONS 3.6

1. The Public Works Department undertakes building valuations on the request of \_\_\_\_\_.
2. PWD conducts Research and Development in the areas related to agriculture products - True / False.
3. The PWD is working extremely diligently to gain a clear understanding of \_\_\_\_\_ complence.
4. The PWD is taking all efforts for better service \_\_\_\_\_ with long term vision.



Notes



**WHAT YOU HAVE LEARNT**

- The National Highways are the backbone of the road infrastructure that links all metropolitan city of India such as ports, capitals of states etc. A charcoal or cement concrete lane is composed of two, four or more lanes. The Ministry of Road Transport and Highways is mainly responsible for the development and maintenance of National Highways (NHs).
- The National Highway Numbers in India starts from No 1 Jammu and Kashmir and the No 44 (longest NH in India) Jammu & Kashmir, Himachal Pradesh, Punjab, Haryana, Delhi, Uttar Pradesh, Madhya Pradesh, Maharashtra, Telangana, Andhra Pradesh, Karnataka, and Tamil Nadu.
- The NHAI was formed through the promulgation of the National Highways Authority of India Act, 1988. According to the Section 16(1) the NHAI Act the key purpose of NHAI is to develop, sustain as well as manage the national highways and other highways which is entrusted or connected to it by the Indian Government.
- The National Highways and Infrastructure Development Corporation Limited (NHIDCL) is a fully owned organisations which is formed under the Ministry of Road Transport & Highways, Government of India. It is responsible for managing a system of over 5,500 km of National Highways out of 1, 15,000 km in India.
- PWD is one of the oldest departments in charge of public works. The functions of the PWD include 1. Planning, 2. Construction, 3. Maintenance and 4. Repairs.
- The CPWD has the main responsibilities such as constructing roads, bridges, buildings, auditoriums, laboratories, flyovers and border roads etc. At present, this CPWD has become a construction administration department, and it offers services such as completion and maintenance of projects.



**KEY TERMS**

Highway	Transport	Road	Ministry
Number system	Highways	Route	Department
State	Expressway	Organization	Public



### TERMINAL EXERCISE

1. What do you mean by Union Territories?
2. Define National Highway Numbers.
3. Define the system of two digit numbers.
4. Explain the route map for NH No 5.
5. Explain the formation of NHAI.
6. Sketch the structure of the Indian national highway.
7. Explain the role of PWD in irrigation.
8. Bring out the organization structure of PWD.
9. List out of the Responsibilities of NHIDCL.
10. Write a note on NH 44.
11. Outline any five significant national highway numbers with their state connectivity.
12. Sketch the responsibilities of NHIDCL.
13. List out the activities of NHAI.
14. Highlight the main functions of CPWD.
15. Bring out the major activities of PWD.



### ANSWERS TO INTEXT QUESTIONS

#### 3.1

1. The National Highways are the backbone of the road infrastructure that links every metropolitan cities of India such as ports, capital of states etc.
2. True
3. Trunk
4. Five

#### 3.2

1. False



Notes

**Notes**

2. True
3. Tamil Nadu
4. Gujarat

**3.3**

- |            |                |
|------------|----------------|
| 1. 1988    | 2. True        |
| 3. Sustain | 4. Development |

**3.4**

1. National Highways and Infrastructure Development Corporation Limited.
2. 1961
3. Vision
4. Fifth

**3.5**

1. 153
2. True
3. Director General
4. Oldest

**3.6**

1. Vigilance, Anti-Corruption Department and Judiciary
2. False
3. Irrigation
4. Delivery

**DO AND LEARN**

Learners can undertake their activity work in the areas of Road infrastructure highway development organizations.

## STRUCTURAL FRAMEWORK OF NHAI-PPP MODEL

The National Highways Authority of India is an independent agency constituted by an Act of Parliament, the National Highways Authority of India Act, in 1988. It is accountable for managing the network of national highways in India and comes under the Ministry of Road Transport and Highways. NHAI Act ensures the development, maintenance, and management of National highways and has a three-tier structure such as the headquarters, the Regional Offices, and the Project Implementation Units. The Headquarters of NHAI is situated in New Delhi. The National highway authority of India role consists of a) Planning, development and maintenance of National Highways in the country b) widen technical and monetary assistance to State Governments for the growth of state roads and the roads of inter-state linkage and economic importance c) develop a standard pattern for roads and bridges in the nation, and d) act as a repository of technical knowledge on roads as well as bridges.



### LEARNING OUTCOMES

After studying this lesson the learner:

- explains the current road projects by Governments;
- identifies design innovative models for highways;
- categorizes the Bharatmala Project;
- outlines the structure of NHDP;
- classifies various phases of ventures.



**Notes**

## 4.1 NHAI-PPP MODEL

According to the Public Private Partnership Appraisal Committee (PPPAC), as of December 2019, 824 projects have been recommended by the National Highways Authority of India (NHAI). Some PPP models generally which are being used are Built Operate Transfer (BOT) Toll, BOT Annuity, and Hybrid Annuity. Additionally NHAI executes road ventures NHAI finance the construction of road projects under the Engineering Procurement Construction (EPC) system. Several significant PPP road projects were implemented such as Delhi-Gurgaon (Gurugram), Ahmedabad-Vadodara, Chenani-Naseri tunnel projects etc. For the selection of implementation methods the waterfall mechanism is used. First the projects would be appraise under BOT toll and the equity return would remain at 15 per cent. If these ventures were not appropriate under BOT toll i.e. if the EIRR would be identified as less than 15 %, then the project would fall under BOT Annuity and only after failing in the attempt to take up under these two, it could be opted for EPC. However, in the wake of the 2008 recession, there was less appetite for BOT projects. The hybrid annuity mode or HAM, was introduced in December 2016 as a new format PPP. The first example of successful HAM is Delhi-Meerut Expressway Package I. This venture would commence from Sarai Kale Khan and end at the Delhi-UP boundary.

The highest ever award of 51,073 km of National Highway projects and highest ever construction of 28,531 km over a four year period from 2014-5 to 2017-18 was achieved by the Ministry of Road Transport and Highways. Construction of National Highways has more than doubled from 12 km/day in 2014-15 to 27 km/day in 2017-18 and the total investments in the sector has increased by 2.5 times when compared to 2014-15. Through the multiple strategy initiatives taken by the Ministry, this significant leap in highways award and construction was achieved. These growth efforts have been facilitate augmented threshold for project appraisal, delegation of power and approval and superior inter-ministerial coordination on procedure streamline been facilitate. The ventures of Languishing were revived – under which 73 projects of length approximately 8,310 kms were revived through this strategy interferences by permitting 100% equity for developers two years after the start of operations, premium deferment in stressed projects which would permit rescheduling of quality dedicated by concessionaires during the bid phase, streamlined reward to concessionaires for languishing NH projects in BOT form for delays will not be attributable to concessionaires and One-time fund infusion.





## INTEXT QUESTIONS 4.1

1. PPPAC stands for \_\_\_\_\_.
2. BOT stands for \_\_\_\_\_.
3. NHAI is one of the leading players in the world in implementing the \_\_\_\_\_ model in the highway sector.
4. Through the \_\_\_\_\_ strategy initiatives taken by the Ministry, this significant leap in highways award and construction was achieved.

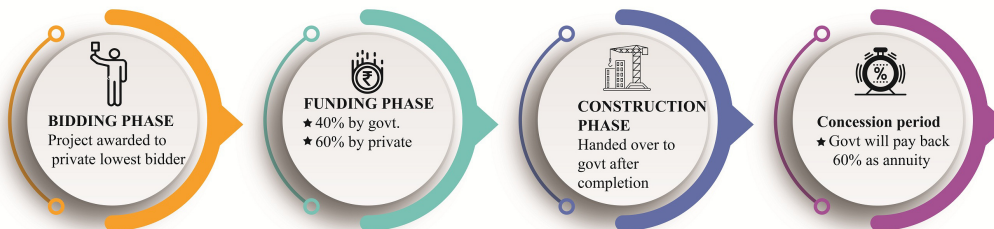


Notes

## 4.2 INNOVATIVE PROJECT IMPLEMENTATION MODELS

### 4.2.1 Hybrid Annuity Model (HAM)

In the model, 40% of project cost is provided by the Government as 'Construction Support' and the remaining 60% as annuity payments during operations period with interest (Bank Rate +3.00%). Separate stipulation for O&M compensations for the concessionaire. The private party does not have to abide by the traffic and risks involved due to inflation. The model has been widely accepted by the market.



**Fig. 4.1: Hybrid Annuity Model**

#### A. The Hybrid Annuity Model (HAM)

- In our nation, the present day HAM is a mixture of BOT Annuity and EPC models.
- According to the design, the respective government will contribute towards 40% of the venture cost in the initial five years via annual payments (annuity).
- The balance payment will be made on the basis of the assets generated as well as on the performance of the developer.

**Notes**

- Here, hybrid annuity means the first 40% payment is made as a fixed amount in five equal instalments. The remaining 60% is paid as variable annuity amount depending upon the value of assets which is created only after the completion of the project.
- During the construction stage, the government will only cover 40% of the cost, so the developer should find an alternative for the balance amount. At this stage, he has to raise the remaining 60% in the form of equity or loans.
- Over a period of 15 years, the private sector developers will recover their investment from the government by obtaining annuity payments.
- For developers who undertake these sorts of projects, the government will provide 80 per cent of prior land possession as well as forest clearance.
- For the project developers there is no toll right.
- The collection of revenue will be the responsibility of the National Highways Authority of India under the HAM.

**B. Advantage of HAM**

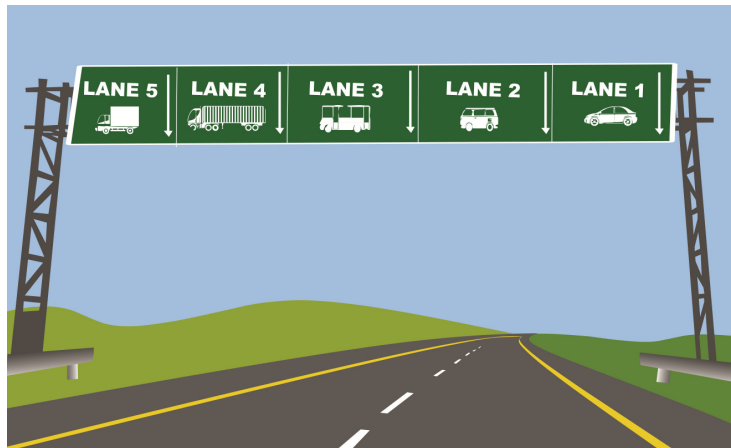
- It provides adequate liquidity to the project developers and the financial burden is shared by the respective governments.
- Whereas the private partnership prolongs to bear the construction and maintenance hazards as in the model of BOT. Further the developer is obligated to partially bear the finance risk.
- Where other models are not applicable the HAM will be used in stalled projects according to the Governments strategy.

**4.2.2 Toll – Operate – Transfer (TOT) Model**

As per this model the right to collect toll fees for public funds is allocated to concessionaire for a 30-year concession period against on upfront payment. During the concession period, the O&M obligations are with the concessionaire. For TOT projects, the initial round of bids were completed at NHAI with a bundle of 9 project stretches (length 680 km) bid out. The H1 bidder estimated a concession fee of Rs 9,681.5 crores (against NHAI estimated Rs 6,258 Cr). DPR groundwork is under development for TOT bundles 2,3 and 4 at NHAI.



Notes



**Fig. 4.2: Toll – Operate – Transfer (TOT) Model**

### A. Benefits

The TOT Model allows NHAI to:

- Ensure competent management of constructed and operational NH projects through appropriate Operation and Maintenance (O&M).
- Additional funds one necessary for the achievement of targets under the Bharatmala Programme and other such NH development projects.
- This model would aid in realisation of competent tolls through the private sector.

### B. Highlights of TOT Model

- A concession period of around 30 years may be extended (e.g. increased or decreased) depending on certain circumstances that may arise when the project begins.
- Once the project concession is granted, the concessionaire is required to pay a lump sum upfront as the concession charge to the Authority. This is done prior to the date of appointment. Moreover, the escrow account is essential only if the concessionaire obtains loans or advances from the respective banks/ FIs.
- While the government anticipates any foreign players showing interest in TOT ventures, they must obtain approval from the relevant Authority both from a national security and public interest stand point. For all such acquisitions, ownership or control should not be less than 25% of the concessionaires; earnout, or any control aur the concessionaire board.

**Notes**

- In nations like India, competing road projects are a serious and recurring point of dispute. Therefore in such cases the Authority is restrained from constructing competing roads under the TOT model, subject to certain stipulations. Furthermore, this model also lays down penalties in case the Authority breaches its responsibility.
- The Concessionaires are allowed by the Authority to secure refinancing in full or in part of the Debt which is Due subject to the condition being such funds are utilised only for the project purpose.
- Under the TOT model, with the intent to motivate the concessionaire, the Authority will allow one-half of the payment, price and expenses of the Independent Engineer.
- This model also offers flexibility to concessionaires to promote an ‘intelligent tolling system’ or comparable mechanism, upon the similar being introduced in the future. This is coupled with the advantage of settlement of income collection with the Authority in case of substantial disparity.
- NHAI recommends implementing a tolling structure, which will work on a mixture of mobile telecommunications technology (GSM) as well as satellite-related GPS, and would be capable of deducting the funds from a vehicle account, crediting to concessionaire within one day and opening a toll gate. During a failed transaction it would be capable of alerting the toll operator to receive the payment manually and not release the gate.
- As a protection measures to the lenders, besides obtaining permission from the Authority, the concessionaire is also required to obtain permission from its lenders for alteration in order of payment mentioned under the TOT model.
- This TOT model intends to decrease the argument for expansion of the period of concession by offering expansion upon material default or breach dedicated by the Authority, directing to suspension of or decrease (*i.e. less than 90% of ‘Average Daily Fee’*) in collection of charge, as described in the TOT model.

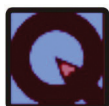
It is also offered that:

- (i) Owing to default by concessionaire and upon the termination of such agreement, the Authority shall forfeit the performance protection, but have to pay 70% of unexpired cash flow to concessionaire and
- (ii) Owing to default by Authority and upon the termination, the concessionaire shall be paid an sum equal to 105% of the unexpired cash stream, subject to



lenders (*if any*) offering NOC, failing to such fee shall be done by Authority straightly to such lenders.

- The model of TOT offers flexibility to Parties to neutralise the consequence of any:
  - (i) Augmentation in costs or
  - (ii) A decrease in net after-tax return or
  - (iii) Other monetary burden suffered by each of the Parties owing to ‘Change of Law’.
- To decrease the allegation of biases in arrangement of disputes, which erupts among the Parties, the model of TOT offers for reference thereof to Society for Affordable Redressal of Disputes (SAROD) for mediation, which was integrated in 2013, by NHAI, and the National Highways Builders Federation (NHBF) which is an apex firm of all the contractors or builders of NHs, State highways as well as bridges in India.



#### INTEXT QUESTIONS 4.2

1. Advantages of HAM.
2. In the hybrid annuity the first 40% payment is made as a fixed amount in five equal instalments -True / False
3. TOT stands for Toll, Operate and \_\_\_\_\_.
4. The TOT model facilitates competent toll realisation through the \_\_\_\_\_ sector.

### 4.3 IT INITIATIVES

#### 4.3.1 Project Monitoring and Information System (PMIS)

To ensure timely delivery of projects, a state-of-the-art Project Monitoring Information System (PMIS) has been developed in-house. A series of Executive Dashboards have been designed to provide updated progress on all these data fields, at various levels, such as national, Regional Office (RO) level, Project Implementation Unit (PIU) and venture level. Focused ventures with key pending issues can be indentified during these reviews by on in-built algorithm. Apart from the dashboard data views, the PMIS is also facilitated with the Geographical Information System (GIS), which offers a geographical visualisation of all NHAI projects on an India map.



**Notes**

**4.3.2 Integrated Technology Solution (ERP):**

To digitally integrate all systems and processes across MoRTH, NHAI and NHIDCL (including all the regional offices) it has initiated an ERP solution. With the execution of ERP solution, MoRTH plans to combine more than 60 softwares and tools on a single platform along with digitization of over 30 lakh documents. Further, this project is expected to be completed within two years and will improve competence and transparency.



**Fig. 4.3: Enterprises Resource Planning Model**

**4.3.3 Infracon:**

“INFRACON” has been developed by NHIDCL as a comprehensive National Portal for infrastructure consultancy firms as key personnel, to make the assessment procedure during procurement of consultancy firms more objective, user friendly and transparent. Moreover this portal has the capability to host companies and personnel CVs as well as credentials online and has connections to Aadhaar and Digilocker for statistics validation and clarity.

**4.3.4 Inam-pro:**

INAM-Pro is a web based application which offers for Infrastructure and materials providers and would perform as a general platform for Infrastructure material provider’s viz. Cement Companies, Steel Companies Infrastructure providers, Ministry of Road Transport and Highways and other stakeholders.

**4.3.5 Electronic Toll Collection:**

MoRTH (Ministry of Road transport & Highways) has fast-tracked the execution of





Notes

Electronic Toll Collection through Fastags in order to reduce the congestion at toll plazas. It has now been decided to equip all the Toll Plaza lanes with gantry mounted ETC Infrastructure and installation of Weigh-in-Motion (WIMs) systems in about 50% of the lanes. The NHAI has been energetically pursuing the stipulation of ETC infrastructure on all the lanes. Nearly, 25.99 lakhs fastags have been issued as on 26th July, 2018 and more than 20 percent of the collections are being received through the ETC.

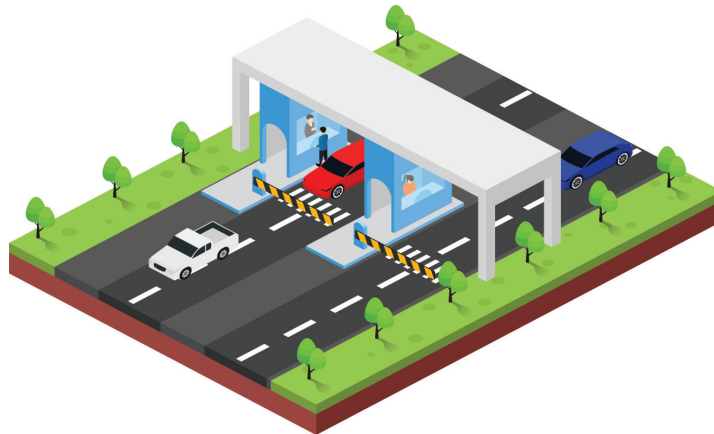


Fig. 4.4: Electronic Toll Collection

**4.3.6 Sukhad Yatra:**

It is an interactive mobile application designed to empower the National Highways user with pertinent information. Key modules include receiving real-time toll plaza waiting time, reporting any highway related incident or providing feedback on highway quality, exploring highway details and related amenities and purchasing FASTag.



Fig. 4.5: Sukhad Yatra

**4.3.7 Bidder Information Management System (BIMS):**

This system is developed by MoRTH to modernise the procedure of pre-qualification of bidders for EPC/HAM/BOT form of agreements for all National Highway and other similar works which is a centrally sponsored work with enhanced transparency and objectivity. For invitation of bids for civil works of EPC form and considerably lessen

**Notes**

time for appraisal of pre-qualification, the BIMS will be functioned in combination with the CPPP portal.

**4.3.8 Bhoomi-Rashi:**

Once the alignment and land acquisition plan is approved, the land acquisition is critical for the beginning and completion of construction. Bhoomi Rashi is presently being extensively implemented for issuing the notifications. By using the portal, so far, more than 900 notifications have been issued. Pertaining to land acquisition, the Bhoomi Rashi portal has been instrumental in reducing the time taken for approval and publication of notifications. Currently, the users of MoRTH have the substitute of making payments to the beneficiaries directly through the portal when Bhoomi Rashi and PFMS were integrated.

**INTEXT QUESTIONS 4.3**

1. “INFRACON” has been developed by NHIDCL - True / False.
2. Define - Sukhad Yatra.
3. \_\_\_\_\_ is a web based application which offers for Infrastructure and materials providers.
4. The PMIS is also facilitated with the \_\_\_\_\_ System, which offers a geographical visualisation of all NHAI projects on an India map.

**4.4 OVERVIEW OF BHARATMALA PROJECT****4.4.1 Bharatmala Project:**

The Bharatmala Pariyojana/India Garland Project is a centrally-sponsored and funded Road and Highways project of the Government of India. The total venture of 83,677 km has committed towards the new highways which is estimated at Rs. 5.35 lakh crore, making it the single largest outlay for a government road construction scheme.

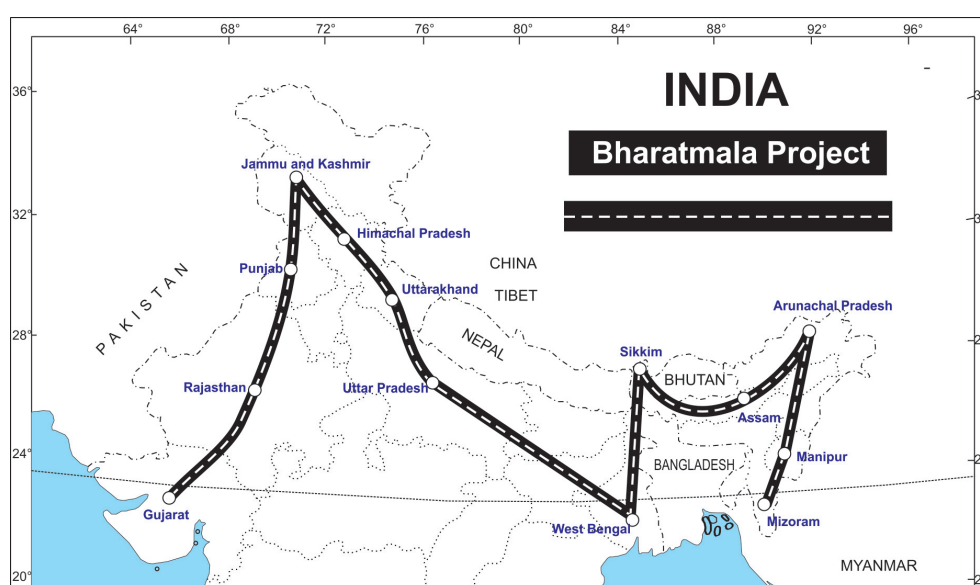
The progress of any country purely depends on the shipping systems and the paths on which they are being preserved. For the development of an enormous and populous country like India it reflects fact. For linking the segments and sustaining the smooth stream of passage, the construction of innovative and developed paths is a necessity. By implementing the Bharatmala project it can be achieved and under this format, a mass of new paths will be laid down in the country. For the highways division that targets on optimising competence of freight and passenger movement across the nation by connecting





the significant infrastructure gaps through efficient interferences like enhancement of Economic Corridors, Inter Corridors and Feeder paths, National Corridor competence Improvement, Border and International connectivity roads, Coastal and Port connectivity roads and Green-field expressways are concerned of Bharatmala Pariyojanas new umbrella program. Under Bharatmala Pariyojana, a total of 65,000 kms of roads and highways are to be constructed.

The mammoth scheme announcement was done by Shri Nitin Gadkari, in the presence of Prime Minister Shri Narendra Modi and the idea behind the execution of a pan-nation proposal is to enhance the road network. The Road Transport and Highways Ministry of the nation will manage all key aspects of the plan.



**Fig. 4.6: Bharatmala Project**

### 1. Scheme Highlights

- Through the development of Multimodal Logistics Parks and the abolition of choke points, has developed the competence of existing corridors.
- To leverage synergies with Inland Waterways as well as enhance by focusing on improving the North East.
- For project preparation and asset monitoring, emphasis on use of sophisticated technology & scientific planning.
- To assign of supremacy in order to expedite venture delivery - Phase I which to be completed by 2022
- To improve connectivity in the North East region.



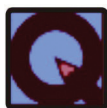
## Notes

## 2. Budget Allocation

According to Phase I of Bharatmala project, a total of around 24,800 kms are being considered and in addition to phase -I under NHDP, it also includes 10,000 kms of balance roadworks rising the total to 34,800 kms at an approximate price of Rs.5, 35,000 crores. Moreover, over a five year tenure i.e. 2017-18 to 2021-22 the Bharatmala Phase I - is to be implemented.

## 3. Key Characteristics of the Scheme

- **Improving the roads quality** - Under this venture, the construction of roads, in all segments of the country will be undertaken. The main purpose of this scheme is to bring a new wave of development in the country in the structure of well-maintained and developed roads.
- **Entire road construction** - According to the draft of the method, the government and the ministry will attempt to finish new roads, which will include to a whopping 34, 800 kms.
- **Integrated scheme** - The name which denotes as “Bharatmala” is given to the road development and it will comprise of many other associated proposals as well. With the achievement of all the methods, the overall triumph of the design will be guaranteed.
- **Tenure of the program** - The central government has planned to complete the proposal within a span of five years and it is suggested that the first phase to be completed before the end of 2022.
- **Division in phases** - It is alienated into seven distinct phases due to the sheer magnitude and spread of the scheme. At present, the first phase is under construction.
- **Daily basis construction**- To complete the first phase on time, the respective section has taken efforts to construct at least 18 km of path on a daily basis. Further, to beat the clock, continuous attempts are being made to elevate it to 30 km/day.
- **Road construction categories** - In the official draft of the scheme, it has been clearly highlighted to offer enhanced the connectivity. In order to construct the road various categories of measures will be undertaken.
- **Finding Multi-source** - For funding a mammoth project, one source will not be sufficient. Therefore, the government has to depend on other sources for generating sufficient funds to meet the required expenses.



### INTEXT QUESTIONS 4.4

1. The name which denotes “ Bharatmala” is given to the \_\_\_\_\_.
2. Under Phase I of Bharatmala project, a total of around 54,800 kms are being considered -True / False.
3. The \_\_\_\_\_ scheme announcement was made by Shri Nitin Gadkari, in the presence of Prime Minister Shri Narendra Modi .
4. Under Bharatmala Pariyojana, a total of \_\_\_\_\_ kms of roads and highways are to be constructed.



Notes

## 4.5 CATEGORY OF BHARATMALA PROJECT

### 4.5.1 Economic Corridor :

The corridors of economic are incorporated networks of infrastructure surrounded by a geographical location which is designed to motivate economic development. They link diverse economic agents in exacting geographical locations. These corridors could be created inside a nation or flanked by countries and prevail in continents of Asia, Africa, and other areas. The corridors of economic are an incorporated system of roads, rails as well as ports that link GMS with nations. They connect mainly with centres of production, manufacturing hubs, industrial clusters, special economic zones, and centres of demand which are the capitals and metropolitan cities. They act as gateways to the sub region for regional and international trade. The construction of 9000 kms of Economic Corridors will be undertaken by the central government as per the guidelines of the road construction project.

1. **Inter Corridor** - Approximately, the overall length of the roads which fall under the Feeder Route is 6000kms.
2. **National Corridor** - In the category of National Corridor for the better connection between roads around 5000kms was constructed under the scheme.
3. **International Connectivity** - For integrating the cities and rural sector, which are located in the border areas, the venture has kept stipulation for constructing around 2000kms roads which fall in the border road which connects the International.
4. **Port and Coastal Connectivity** - The central government has ordered the construction of 2000km of roads to connect the areas that are dotted along the coastlines and significant ports.



**Notes**

5. **Green Field Expressway:** For better administration of traffic and freight, the foremost priority will be given to the construction and development of Green Field Expressway.

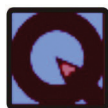


**Fig. 4.7: Green Field Expressway**

6. **Balance Works of NHDP -** These ventures, under the final segment will outlook the construction and maintenance of around 10,000kms of new roads.

**A. VENTURES WHICH ARE NOT A PART OF BHARATMALA**

If any of the projects which is proposed by the concerned State or otherwise measured as essential and expedient to build including the Ring Road or Bypass which is not considered as a Bharatmala shelf of ventures, such new ventures will be taken into account by the MoRTH with a stipulation, if the respective State or Agency is equipped to agree to at least 50% value of land acquisition. Further MoRTH will also conduct a due discussion with the Ministry of Finance and other respective Departments/Ministries. For similar offers from more than one state /Agency the Grand Challenge mechanism would still apply.



**INTEXT QUESTIONS 4.5**

1. Define the Economic Corridor.
2. The construction of 9000kms of Economic Corridors will be undertaken by the central government -True / False.
3. The overall length of inter corridor roads which fall under the \_\_\_\_\_ route is 6000kms.
4. The construction of 9000kms of Economic Corridors will be undertaken by the \_\_\_\_\_ government as per the guidelines of the road construction project.

## 4.6 OVERVIEW OF NATIONAL HIGHWAYS DEVELOPMENT PROJECT (NHDP)



Notes

The **National Highways Development Project (NHDP)** is a venture to promote, regenerate and extend the chief highways in India to a elevated standard. The venture was commenced in 1998 under the guidance of Prime Minister Atal Bihari Vajpayee. National Highways which account for only about 2% of the total length of paths, but move about 40% of the total traffic across the length and breadth of the nation. This venture is administered by the National Highways Authority of India (NHAI) below the Ministry of Road Transport and Highways. The NHDP symbolises 49,260 kms of roads and highways work and structure in order to enhance the economic development of the nation. The government has sketched to end the NHDP program in early 2018 and consume the ongoing ventures under a well-built Bharatmala project.

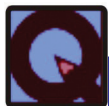
### 1. NHDP Functions

The National Highways Development Project (NHDP) is a project to upgrade, rehabilitate and widen major highways in India to a higher standard.

### 2. Features of NHDP

The stages I & II of the NHDP were visualised towards a laning of 4/6 for about 14,330 kilometres of the national highways, at a complete estimated price worth of Rs. 65,000 crores (at 2004 prices). The stages of these two comprise of

1. The Golden Quadrilateral (GQ), the North-South & East-West corridors, Port Connectivity and
2. Other projects.



### INTEXT QUESTIONS 4.6

1. NHDP stands for \_\_\_\_\_.
2. NHDP was started in the year \_\_\_\_\_.
3. NHDP is a project to upgrade \_\_\_\_\_ and widen major highways in India.
4. The NHDP symbolises 49,260 kms of roads and highways work and structure in order to enhance \_\_\_\_\_ development of the nation.



Notes

## 4.7 PHASES OF VENTURES

4.7.1 The venture is comprises of the subsequent phases:

- a) Phase I
- b) Phase II
- c) Phase III
- d) Phase IV
- e) Phase V
- f) Phase VI
- g) Phase VII

1. **Phase I:** It is referred as The Golden Quadrilateral with 5,846 kms, links the four major cities such as Delhi, Mumbai, Chennai and Kolkata. The total price of the venture is Rs.300 billion (US\$6.8 billion) which is funded mainly by the government's special petroleum product tax revenues and government borrowing.



Fig 4.8: Golden Quadrilateral

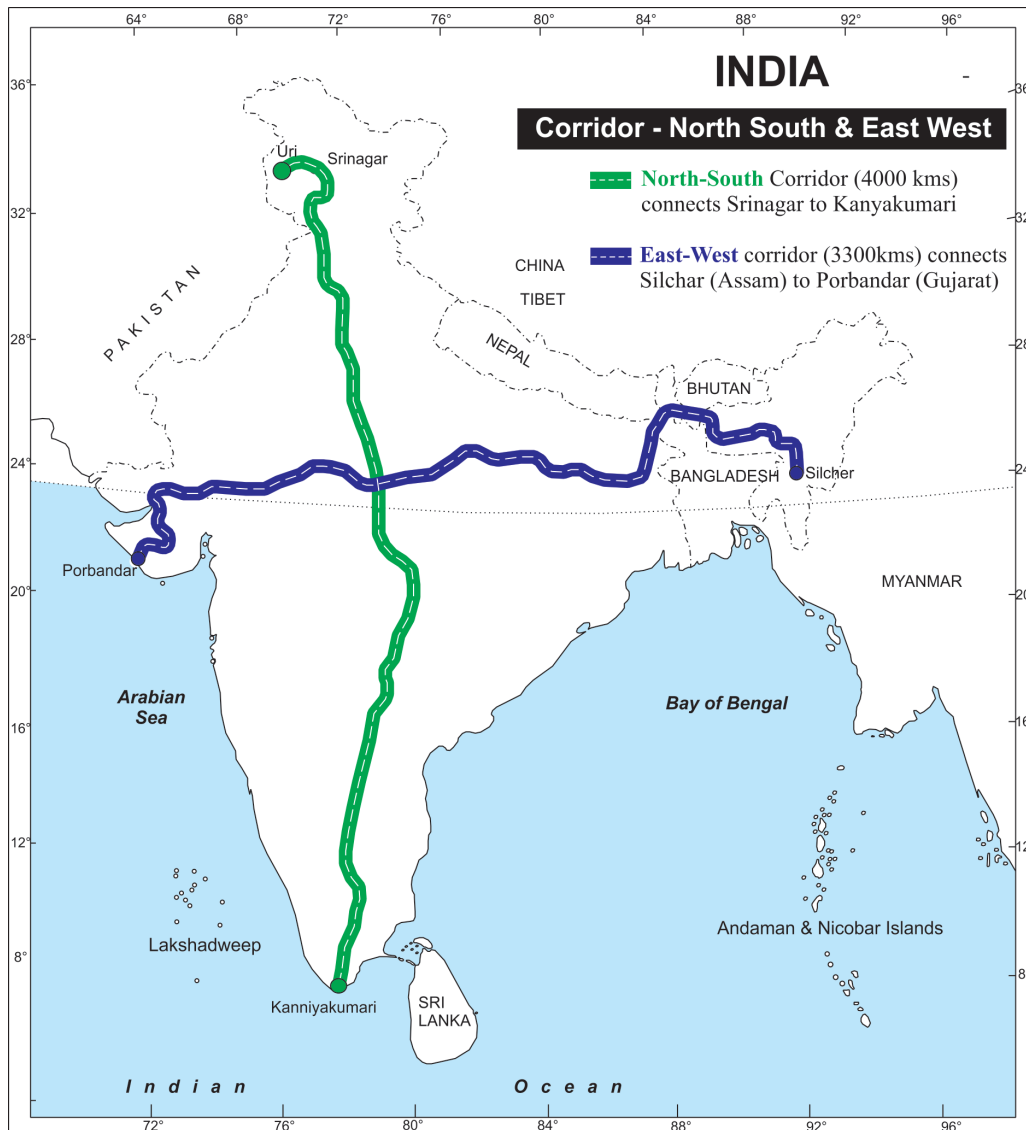




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**2. Phase II:** It connects four tremendous points of the nation such as the North-South and East-West corridors comprising the national highways. The North-South and East-West corridor (NS-EW; 7,142 km) links Srinagar in the north to Kanyakumari in the south, by including a spur from Salem to Kanyakumari (through Coimbatore and Kochi) and Silchar in the east to Porbandar in the west. Total length of the network is 7,142 km (4,438 mi). It also includes Port connectivity and other ventures with 435 km (270 mi).

**Corridor - North-South and East-West**



**Fig. 4.9: Corridor - North South & East West**

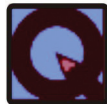
**3. Phase III:** The government on 12 April 2007 approved NHDP-III to upgrade



**Notes**

12,109 km (7,524 mi) of national highways on a Build, Operate and Transfer (BOT) basis, which takes into account the high-density traffic, which connects the state capitals via NHDP Phase I and II, and links to the centres of economic significance.

4. **Phase IV:** On 18th June 2008, the government has approved to widen nearly 20,000 kms (12,000 mi) of highways, which is not a part of Phase I, II, or III. Phase IV will further renovate the existing single-lane highways into two lanes with paved shoulders.
5. **Phase V:** A number of four-lane highways are in need to be upgraded/expanded to six lanes because of road traffic congestion over time. So on 5th October 2006 in order to upgrade of about 5,000 kms (3,100 mi) of four-lane roads the government has given approval for the same.
6. **Phase VI:** The Indian government is working towards constructing 1,000 kms (620 mi) expressways which would link major commercial and industrial townships. It has also recognized 400 kms (250 mi) of Vadodara -Mumbai division that would join the existing Vadodara (earlier Baroda)-Ahmedabad division. This venture was under the observation of the World Bank and this project will be funded on Build Operate and Transfer basis. The 334 km (208 mi) Expressway which lies between Chennai -Bangalore and 277 km (172 mi) Expressway which lies between Kolkata -Dhanbad has already been acknowledged and practicability study and DPR agreement has also been honoured by NHAI.
7. **Phase VII:** In order to facilitate easier connectivity with national highways to significant cities, this phase calls for the enhancements to city road networks by adding ring roads. Moreover, in addition to it, the improvements will also be done to widen national highways that need additional flyovers and bypasses which has given population and housing growth along with the highways and increasing the traffic. So, the government has intended to invest Rs. 16,680 Cr for this phase. The Chennai port - Maduravoyal Elevated Expressway which is 19 kms (12 mi) long is executed under this phase.



**INTEXT QUESTIONS 4.7**

1. \_\_\_\_\_ major cities are connected by the first phase after Golden Quadrilateral.
2. The Chennai Port - Maduravoyal Elevated Expressway is executed under \_\_\_\_\_ phase.



3. Phase I, II, or III. Phase IV will further renovate the existing single-lane highways into \_\_\_\_\_ lanes with paved shoulders.
4. Phase II connects four tremendous points of the nation such as the \_\_\_\_\_ and \_\_\_\_\_ corridors.

**WHAT YOU HAVE LEARNT**

- The National Highways Authority of India (NHAI) is one of the leading players in the world in implementing PPP model in the highway sector. For the development by the Public Private Partnership Appraisal Committee (PPPAC), as on December 2019, 824 projects were recommended. Some PPP models generally which are being used are Built Operate Transfer (BOT) Toll, BOT Annuity, and Hybrid Annuity.
- The innovative project implementation models are the Hybrid Annuity Model (HAM) and toll operating and transfer models.
- The Bharatmala Pariyojana / India Garland Project is a centrally-sponsored and funded Road and Highways project of the Government of India. The total venture of 83,677 km has committed towards the new highways which is estimated at Rs. 5.35 lakh crore, making it the single largest outlay for a government road construction scheme.
- The corridors of economic are incorporated networks of infrastructure surrounded by a geographical location which is designed to motivate economic development. They link diverse economic agents in exacting geographical locations. These corridors could be created inside a nation or flanked by countries and prevail on the continents of Asia, Africa, and other areas.
- The National Highways Development Project (NHDP) is a venture to promote, regenerate and extend chief highways in India to an elevated standard. The venture was commenced in 1998 under the guidance of Prime Minister Atal Bihari Vajpayee. National Highways which account for only about 2% of the total length of paths, but move about 40% of the total traffic across the length and breadth of the nation.
- The venture comprises the subsequent phases such as a) Phase I, b) Phase II, c) Phase III, d) Phase IV, e) Phase V, f) Phase VI and g) Phase VII.





**Notes**



**KEY TERMS**

Bharatmala	PPP	Highways
Model	Project	Phase
Corridor	Transport	Road
Government	NHDP	Lane



**TERMINAL EXERCISE**

1. What are PPP models?
2. Define the benefits of the TOT Model.
3. Explain the infracon.
4. Explain the Bharatmala project in your own words.
5. What do you mean by Phase III?
6. Write a note on the TOT Model
7. What do you understand about Electronic Toll Collection?
8. Bring out the scheme for Bharatmala project
9. Sketch the guidelines of the road construction project
10. Point out the features of NHDP
11. Explain the **Hybrid Annuity Model**
12. List out any three important IT Initiatives.
13. Bring out the category of Bharatmala project.
14. Outline the overview of NHDP
15. Explain the five phases of ventures.



**ANSWER TO INTEXT QUESTIONS**



**Notes**

**4.1**

1. Public Private Partnership Appraisal Committee.
2. Build Operate Transfer.
3. PPP
4. Multiple

**4.2**

1. It provides adequate liquidity to the project developers and the financial burden is shared by the respective government.
2. True
3. Transfer
4. Private

**4.3**

1. True
2. It is an interactive mobile application designed to empower the National Highways user with pertinent information.
3. INAM-Pro
4. Geographical Information

**4.4**

1. Road development.
2. False
3. Mammoth
4. 65,000



### Notes

#### 4.5

1. The corridors of Economic are **incorporated** networks of infrastructure surrounded by a geographical location which is designed to motivate economic development.
2. True
3. Feeder
4. Central

#### 4.6

1. National Highways Authority of India.
2. 1998
3. Rehabilitate
4. Economic

#### 4.7

1. Four
2. VII
3. Two
4. North-South and East-West



### DO AND LEARN

Learners can undertake their activity work in the areas of NHAI / NHDP and other Road infrastructure highway development organisations

## RAILWAYS IN INDIAN LOGISTICS

Railways are the main form of transportation of passengers and freight in India. A network of connections connects the entire country. Apart from being an imperative mode of transport, IR has been a driving force for more than 150 years. The Indian Railways started its function on 16 April 1853 and it plays a main role in transportation. Trains are the most preferred mode of transportation for people, and commodities can be easily transported by them. Railways also make it feasible to conduct several activities like business, pilgrimage, sightseeing along with transportation of cargoes over long distances. It has the capability to carry enormous consignments and bulky commodities for long distances. It also provides employment opportunities for a significant number of people. Railways play a significant role in developing nations. In India, railways link the economic life of the nation and accelerate the progress of agriculture and industry.



### LEARNING OUTCOMES

After studying this lesson the learner:

- identifies different types of railways;
- differentiates modes of rail transport;
- explains railways in Indian economy;
- explains innovative railway methods in logistics;
- finds the significance of railways in the logistics value chain.

### 5.1 INTRODUCTION TO INDIAN RAILWAYS

Indian Railways refers to a Department of the Government of India, under the Ministry of Railways, tasked with operating the rail network in India. The Indian Railways, being a state monopoly on rail transport, constitutes one of the leading and busiest rail systems



in the world it transporting around six billion passengers a year. Indian Railways operates both long distance as well as suburban rail structures. In view of the rapid growth in the industrial as a whole the port sector, the State Government is glancing for strategic alternatives to enhance transport amenities. In this sector the State Government is looking for private sector collaboration as much as also foreign direct investments. It carries the largest number of passengers around 6.7 billion in a year and the leading volumes of goods (794 million tonnes in the year 2007-08) between the world's major rail structures. The Government of India has concentrated on investing in railway infrastructure by creating investor-friendly policies. To enhance freight infrastructure as well as high-trains, it has moved quickly to facilitate Foreign Direct Investment (FDI). Currently, numerous domestic and foreign firms are also looking to invest in Indian rail projects.

### 5.1.1 Major investments and developments in India's railways sector:

- Anticipated to commence 102 semi-high-speed Vande Bharat Expresses.
- Prepared to begin 500 multi-modal goods terminals under the 'PM GatiShakti' programme.
- Modernization of infrastructure.
- Received bids from the private and public sectors to operate trains.
- Re-improvement of railway stations throughout the nation.
- Undertake electrification of Broad Gauge (BG) rail lines.
- Commissioned Wi-Fi at 6,000 railway stations.
- Signed a finance contract with European Investment Bank (EIB).
- Aimed to reduce carbon footprint.
- NHSRCL signed a contract with L&T to design and construct.
- All Non-AC sleeper coaches will be replaced by AC coaches (based on speed).

### 5.1.2 Government initiatives

- Some of the recent initiatives taken up by the Government are:
- India and Nepal signed an MOU for a proposed US\$ 3.15 billion railway line project.



- Government sanctioned the implementation of a 235 km semi-high-speed rail corridor.
- Planned to use 4G technology to modernise communication networks in railway stations.
- Enhance the safety and security of train journeys.
- Electrification of 6,015 Route Kilometres (RKM).
- Arch closure of the Chenab bridge the world's highest railway bridge is completed.
- Identified 56 new projects in various railway zones.
- Minister of Railways dedicated 88 railway projects to the nation.
- For the redeveloping of the New Delhi railway station in competition with a public-private joint venture a 'request for qualification (RFQ)' being sent.
- Establishment of a National Rail Plan.
- A 'New Online Vendor Registration System' has been launched by the Research Designs & Standards Organisation (RDSO).

### 5.1.3 The Road Ahead

- The Indian Railway system is developing at a healthy rate. It is anticipated that in the next few years, the Indian railway market will be the third largest, accounting for 10% of the global market.
- The Indian Railways, one of the nation's biggest employers, can create one million jobs.
- With the potential of bringing an investment of over US\$ 7.5 billion, the government has announced two key initiatives for seeking private investments-running passenger trains by private operators across the railway network and redevelopment of railway stations across the nation.
- 'Adarsh' Station Scheme has been launched to enhance railway stations. Under this scheme, 1253 stations have been identified for improvement, of which 1201 have been developed so far.
- It is also evaluating other revenue generation avenues, including: a) Modifying the composition of coaches to drive more profitable coaches, b) revenues from its digital booking IRCTC; and c) disinvesting in it.



- IR Launched the National Rail Plan, Vision 2024, to accelerate execution of significant projects, such as multitask congested paths, attain 100% electrification, enhance the speed to 160 kmph on Delhi-Howrah and Delhi-Mumbai paths, promote the pace to 130 kmph on all other golden quadrilateral-golden diagonal (GQ/GD) paths and eradicate all level crossings on the GQ/GD path, by 2024.



### INTEXT QUESTIONS 5.1

1. During the year 1853, the British initially introduced railways to India \_\_\_\_\_.
2. RFQ refers to \_\_\_\_\_ .
3. The Indian Railways, being a state \_\_\_\_\_ on rail transport, constitute one of the leading and busiest rail systems in the world.
4. \_\_\_\_\_ Station Scheme has been started to enhance the railway stations.

## 5.2 MERITS AND DEMERITS OF RAILWAYS

### 5.2.1 Merits

#### 1. Dependable:

The utmost merit of the railway transport is it that is considered as the most reliable mode of transport as it is the least affected by weather conditions such as rains, fog etc. In contrast to other modes of transport.

#### 2. Better Organised:

Rail transport is more organised than any other form of transport. It has fixed paths and schedules. Its service is more definitive, uniform and regular as compared to other modes of transport.

#### 3. High speed over Long Distances:

When it comes to long distances, its speed is more than any other mode of transport. As a result, it is the best option for long distance traffic.

#### 4. Appropriate for Bulky and Heavy Cargoes:

Railway transport is reasonable, fast and best suitable for carrying heavy as well as bulky cargoes over long distances.





### 5. Economical Transport:

It is a reasonable mode of transport because most of the working and operating costs of railways are in the nature of fixed costs. Every boost in railway traffic is followed by a decline in the average cost. Moreover, in the use of labour, it seems reasonable because in a train, one driver and one guard are adequate to carry much more consignments.

### 6. Safety:

Railway is the safest structure of transport. The possibility of accidents and breakdowns of railways are least as compared to other modes of transport. Furthermore, the traffic can be sheltered from the exposure to sun, rains, snow etc.

### 7. Better Capacity:

The carrying capability of the railways is immense large. In addition, its capacity is elastic which can simply be improved by adding more wagons.

### 8. Public Welfare:

IR is considered one of the leading public undertakings in the nation. They provide out several public utility services. They charge what the traffic can bear, helping the poor. In reality, it is a national necessity.

### 9. Administrative Facilities of the Government:

Railways offer administrative services to the Government. The defence forces as well as the public servants derive their mobility mainly from the railways.

### 10. Employment Opportunities:

The railways offer greater employment opportunities for both skilled and unskilled labour. Nearly 16 lakh people rely on the railways for their livelihood.

## 5.2.2 Demerits

Even though railway transport has several merits, it suffers from certain serious limitations:

### 1. Huge Capital Outlay:

The railway is in need of large capital investment. Construction, maintenance and overhead costs are very high as compared to other modes of transport. Investments are also precise and immobile. In case the traffic is not adequate, the investments might mean a large amount of money is wasted.



**Notes**

**2. Lack of Flexibility:**

The inflexibility of rail transport is another form of demerit. The reason is, its paths and timings cannot be tuned to individual requirements.

**3. Lack of Door to Door Service:**

Rail transport cannot offer door to door service as it is attached to a particular track. Intermediate stuffing or destuffing involves a huge cost, more wear, tear and waste of time. The cost and time of terminal operations are a huge drawback of rail transport.

**4. Monopoly:**

As railways need massive capital outlay, they might provide rise to monopolies and work against public interest. Despite government control and administration lack of competition might lead to inefficiency and high costs.

**5. Not suitable for Short Distance and Small Loads:**

For short distance and small cargoes traffic the railway transport is unsuitable and uneconomical.

**6. Booking Formalities:**

It takes more time and labour to book and deliver of cargoes through railways when compared to motor transport.

**7. No Rural Service:**

Railways cannot function economically in rural sectors because of enormous capital requirements and traffic; therefore, large rural sectors have no railway service even today. This creates much inconvenience for the public living in remote areas.

**8. Under-utilised Capacity:**

For its perfect and economic operation, the railway should have full load. As it has a very large carrying capability, when it is under-utilised, in such cases, most of the regions lead to significant financial issues and loss to the economy.

**9. Centralised Administration:**

Railways, being the public utility service, have a dominant position and as such there exists a centralised administration. Local authorities fail to meet the personal necessities of the people as compared to roadways.



## INTEXT QUESTIONS 5.2

1. Railway transport is best suitable for short distance - True / False.
2. Define the economical transport.
3. Railways cannot function economically in rural areas because of huge \_\_\_\_\_ requirements and traffic.
4. IR is considered one of the leading \_\_\_\_\_ undertakings in the nation.



Notes

## 5.3 DIFFERENT TYPES OF RAIL TRANSPORTATION

### 5.3.1 Rail transport:

Rail transport has been around since the 6th Century BC during ancient Greek times. Rail transport is ever-evolving, and accounts for a huge percentage of surface transportation. It refers to any form of transferring passengers and goods on or in wheeled vehicles running on rails, which are positioned on tracks. Rail vehicles are directed by the tracks on which they operate.

### 5.3.2 Types of rail transport

There are several types of rail transport, summarised below.

#### 1. Urban rail transport

One of the overarching forms of rail transport is urban rail– transport; it can be divided into several other types of rail transport, which are all laid out in terms of specifics. The term ‘Urban Rail’ is utilised for various types of local rail structures which offer a passenger service in and around urban or suburban regions. This transport consists of trams, fast transport trains, light rail, monorails, cable cars, funiculars as well as commuter rail.

#### 2. Rapid transit

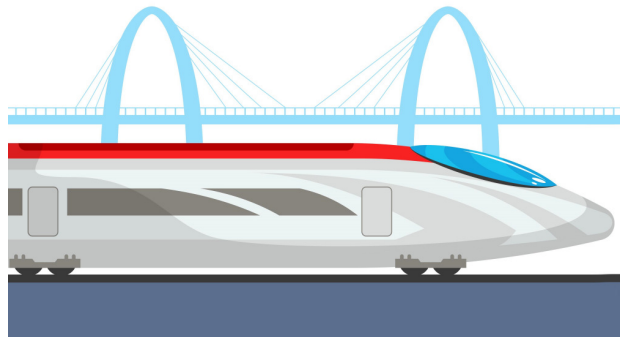
The most-capable public transport trains are referred to as rapid transit. In general it is known as the subway, the metro, the tube, the underground or similar. They are electric railways which operate in and through regions which cannot be accessed by pedestrians. The London Metropolitan Railway, a conventional railway which commenced in 1863 is considered as the first rapid transit structure in the World. At present, China has the majority of rapid transit systems in the world. These are typically utilised by commuters and those travelling to cities for either leisure, education or shopping purposes. They are also used by tourists.



**Notes**

**3. High-speed railways**

When compared to other types of rail transport, high-speed railways run at significantly faster speeds. They use system of rolling stock as well as designated tracks. Furthermore there is no single pace standard that exists internationally but if a train is capable of travelling quicker than 160 mph it is considered to be an HSR. Tokaido Shinkansen Japan’s ‘bullet train’, is very popular in the world. It began its operations in 1964. At present several nations have high-speed rail infrastructures: to name a few Russia, Italy, Denmark, UK, Italy, South Korea ,Germany and the US.



**Fig. 5.1: High-speed railways**

**4. Commuter rail**



**Fig. 5.2: Commuter rail**

Commuter rail is a similar structure to rapid transit trains. Commuter rail refers to rail services surrounded by metropolitan areas connecting commuters between suburbs, towns and cities As heavy rails, they run on electric or diesel. Most of the British commuter rail services share their tracks with other passenger and freight trains too.

## 5. Monorail



**Fig. 5.3: Monorail**

A monorail is a type of railway where the track has a singular beam. While the name spotlight refers to the type of track, the colloquially term ‘monorail’ is used to refer to elevated rail vehicles. These rails can be seen in zoos and theme parks such as Granby Zoo, Canada and Flamingo Land, UK. This facilitates transport inside the zoo or park, without the requirement to take up additional ground space. Even though the first monorail prototype was created in the 1820s, they didn’t arrive at their intended use until the 1900s.

## 6. Elevated railways

The elevated railways are a form of rail transport that moves above ground level more than at or below ground level. Mostly they are used in urban areas to evade congestion and the requirement for level crossings. The first elevated railway was built in London and Greenwich between 1836 and 1838, which was on a brick viaduct with 878 arches.



**Fig. 5.4: Elevated railways**



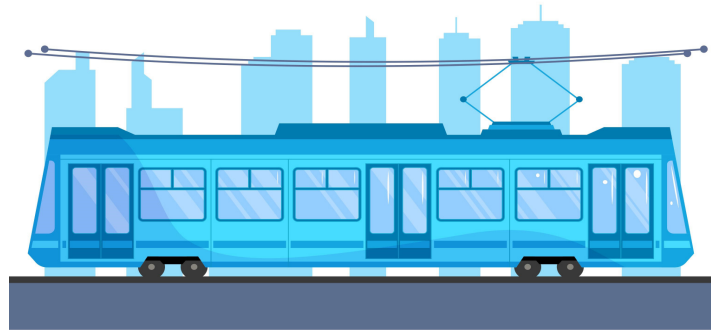
Notes



## Notes

### 7. Trams and streetcars

Trams operate on tramway tracks beside the public streets on tramways. In the past, they were referred to in the past as 'electric street railways', or light rail. When compared to the main line or rapid transit, these trams are short and light. Furthermore, they mostly operate through electric power from the overhead lines, which indicates that they are not as environmentally friendly for the environment when compared to cars or buses which are frequently operated in similar road areas. In certain European cities, trams play an important role in transporting people around the main areas such as Prague, Vienna etc. In areas like San Francisco, the cable car structure which is a tram network is popular among tourists.



*Fig. 5.5: Trams and streetcars*

### 8. Funiculars

The most interesting sort of rail transport is a funicular. They are powered by cable traction, and designed exclusively for steep inclines. There exist two counterbalanced



*Fig. 5.6: Funicular*

passenger cars which travel in concert such that one rises up and the other comes back down. At present, the funiculars are mostly tourist attractions and they provide a fun way to see at new scenery when visiting a particular location. Some are used for commuting as well as for general transport also. "The Flying Dutchman" is one of the world's best funiculars in Cape point, south Africa. Besides this, there are immense funiculars to visit in nations like Switzerland, Scotland and Italy.



Notes

### 9. The Fell mountain railway system

The first third-rail system to be introduced was Fell Mountain. It was for railways that were too steep to utilise just two running rails. This is because a third, elevated centre rail flanked by the two running rails offers extra traction and simplicity of braking. It refers to these types of trains only that one suitable for use on the fell system, since they have extra brake shoes. This system was designed and developed in the 1860s by a British engineer named John Barrowclough Fell. They initially operated this train at Cromford railway and in the High Peak Railway in Whaley Bridge, Derbyshire.



**Fig. 5.7: The fell mountain railway system**

### 10. Mountain railway

As the name suggests, a mountain railway is a railway which operates in a mountainous location. Whether offering transport to and from the summit or sightseeing, these mountain trains tend to utilise narrow gauge tracks owing to the tight curves created by the contours





**Notes**

of the mountain. They frequently use steep grade railway technology which offers an immense opportunity to glance at mountain scenery without hiking. The following nations are the home to most of the mountain railways:

- Germany
- Romania
- Switzerland
- The UK
- The US



**Fig. 5.8: Mountain railway**

**11. Heritage railways**



**Fig. 5.9: (a) Heritage railway**

One of the loveliest forms of rail transport is heritage railways and they are pieces of living history. Visitors learn about rail history by recreating or conserving historical railway





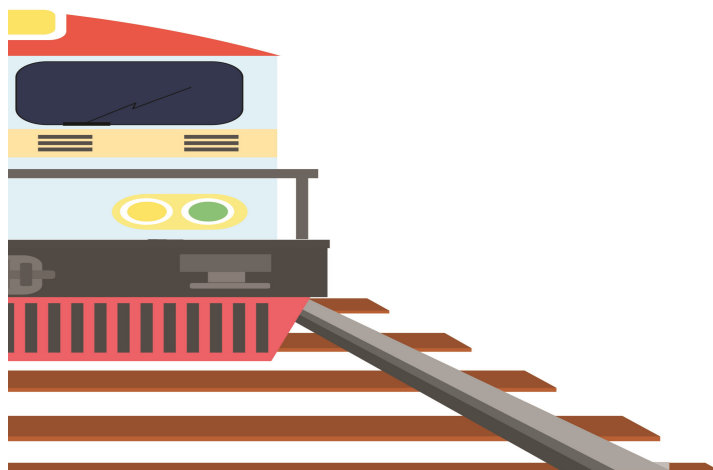
scenes. They are often also referred to as ‘tourist railroads’ and can be seen across the world. A nation like the UK is home to several beautiful heritage railways. Among the more the West Somerset Railway, Severn Valley Railway as well as the North Yorkshire Moors Railway. Countries like Canada, Slovakia, Argentina, the US and India also have several fantastic heritage railways and tourist railroads.



**Fig. 5.9: (b) Heritage railway**

As one of the first forms of rail transport in the UK,. Plate ways were introduced by John Curr. These rails were constructed with the help of cast iron, and they were utilised for around 50 years between 1780 and 1830. Plate ways one generally L-shaped rails that used to be horse-drawn. Plateways were fashionable in locations like South Wales, Gloucestershire, Surrey, Derby as well as Cornwall at the time.

**12. Rack railways**



**Fig. 5.10: Rack railway**



**Notes**

A rack railway, also referred to as a cog railway, is a sort of steep grade railway. It normally has a toothed rack rail, and these trains are fitted with a cog that meshes with this rack rail. These mountain railways are regularly rack railways, as are a few transmit railways and tramways operated in steep urban regions. The Middleton Railway which is located in West Yorkshire, England was considered the first rack railway. It was invented, designed and patented by John Blenkinsop in 1811. The Mount Washington Cog Railway, presently operating in the US, is the first mountain rack railway which commenced its operation in 1868.

**13. Wagon ways**

The earliest of all forms of rail transport are the wagon ways . It is the combined term for the horses, tracks and equipment used for hauling wagons prior to introduction of the railways.

It is noteworthy that the first track structure was built on the narrow land bridge called the Isthmus of Corinth. The peloponnese was divided from mainland Greece by this inancient times. In the past, hait were transported across the Isthmus by a trakway that was 6 to 8.5 km long. The tracks were constructed by wheeled vehicles with grooves carved into limestone. This helped to prevent the wagons from getting off track as they followed a some route. Moreover, evidence of wooden rail tracks can be seen as far back as 1556, in Germany.

**14. Container Train**



**Fig. 5.11: Container Train**

Containerization is a structure of intermodal freight transport utilising standard shipping containers (also referred to as 'ISO containers' or 'isotainers') that can be stuffed with cargo, sealed and placed onto container trains, vessels, and trailers.



Notes



### INTEXT QUESTIONS 5.3

1. The first third-rail system to be introduced is the \_\_\_\_\_.
2. The plate way was introduced by \_\_\_\_\_.
3. The high-capacity public transport trains are referred to as \_\_\_\_\_ transit.
4. The earliest of rail mode are the \_\_\_\_\_ ways.

## 5.4 ROLE OF RAILWAYS IN INDIAN LOGISTICS

The backbone of the nation's logistics system is the Indian Railways. A network of 68000 kms carried more than 1.2 billion tonnes of freight every years. This network touches nearly every nook and corner of the nation. Moreover they play an essential role in assisting the balanced and comprehensive socio economic growth of the nation. They used to carry all the cargoes comprising bulk commodities like Iron, Steel, Iron ore, Food grains, Fertilisers, Cement, Petroleum products and other goods carried in containers. Land transportation structures like these are considered the most eco friendly. They are dedicated to competitive charges and timely delivery of goods.

- Daily Rake Loadings - 1325
- Intents per day - 3356
- Wagons -3052531
- Locomotives -14276
- Commodities -662
- E-payment customers - 1417

This rail service focuses on competently moving bulk material between long distances over the railroads of the vast network of tracks which is running throughout India. While the rail service has to stay on the tracks, they can easily move among the rail-served buildings or yards to handle bulk freight. Their service is much different and as a result it will not be suitable for everyone, but while it is for bulk material, there will be fabulous



**Notes**

cost savings. In addition operating tracks off the main line to a rail-sided building is costly and time-consuming. Therefore, these circumstances can be overcome by aligning with any number of logistics firms which can offer cross docking services. This involves shifting the freight from a trailer into rail equipment. Basically, any firm that requires shifting heavy, bulk material constantly utilises the railroad network for its logistics requirements. In addition several firms also use these services for special bulk project requirements.

These projects which are special in nature can save firms around tens of thousands of dollars. However, while a firm does not play in the rail service space, they never consider the opportunity or know where to turn to obtain help.

**5.4.1 Types of Equipment Used for Rail Logistics Service**

There are several types of equipment the railroads use on their lines to move freight. Everyone has their own specific use, so let us glance over the types and identify what they're used for:

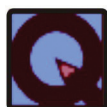
**Table 5.1: Types of Equipment Used for Rail Logistics Service**

S.No	Types of Equipment Used	Features
1	Automotive Racks	Designed to move automobiles, trucks, SUVs and minivans
2	Boxcars	The most common type of rail service. Designed to transport created, palletized or large bulk items, such as paper stock rolls
3	Centerbeams	Used to transport bundled building supplies. It has a centre partition that secures the product in place
4	Covered Hoppers	Designed to handle free-flowing dry bulk commodities that are loaded from the top and product is dispersed from the bottom
5	Coil Cars	Designed for coiled steel and steel plate, along with other high-grade ores



Notes

6	Flatcars	Interesting piece of equipment, in that, these are designed in a variety of lengths, tonnage capacities for various commodities that are not subject to damage from the outdoor elements
7	Gondolas	Used to transport heavy bulk materials like scrap metal, aggregates, coal, lumber and many of other similar commodities that cannot be damaged from the elements
8	Refrigerated Boxcar	Similar to boxcars, but with adjustable temp, refrigerated units can ship fresh fruits and vegetables, frozen foods and other perishable products that need to be temp controlled
9	Open Top Hoppers	These are used to ship heavy, dry bulk commodities that are not affected by the outdoor elements. The product is loaded on the top and discharged through bottom gates that dump into storage pits below
10	Tank Cars	Designed to ship liquid or compressed commodities. Think of chemical and petroleum-based products. Non-railroad companies own most of these tank cars
11	Specialised Rail Equipment	There are many specially designed rail equipment used on the railroad to move specific commodities for a particular company



**INTEXT QUESTIONS 5.4**

1. Define boxcars.
2. Explain the Gondolas.
3. The backbone of the nation's \_\_\_\_\_ division is Indian Railways
4. \_\_\_\_\_ cars are designed to transport liquid or compressed commodities.



## 5.5 ROLE OF RAILWAYS IN INDIAN ECONOMY

By integrating the markets and increasing trade, the railways play a major role in Indian economic development. They are indeed a climate-smart and competent way to transport people and freight. Railways support economic growth and also reduce greenhouse gas emissions. They are a very clean and compact way to move millions of passengers and millions of tons of cargo across nations and continents. Additionally, Indian Railways play a pivotal role in the lower and upper middle class sectors. Among the prevailing travel modes in India, IR serves as the most economical mode of transport. With a modest creation in India from 1853, the Indian Railways has come out as the main vehicle for socio-economic development of the nation. By having a workforce of over 13.6 lakhs employees, Indian railway has become a labour intensive business. Furthermore it is one of the largest employment service providers in India. In India, IR contributes extensively to employment generation as one of the imperative objectives of development planning. Rail transportation has a number of constructive characteristics as compared to other modes of transportation. It is four times more economical and six times more energy efficient than the road. The social charges in connection with environmental damage or degradation are significantly lower in rail. Rail construction costs are around six times lower than roads at comparable levels of traffic. It is the only transport form capable of using any form.

### 5.5.1 Indian Railway Organisation Structure

Indian Railways is an Indian state-owned railway firm headquartered in New Delhi, India. It is operated and owned by the Government of India through the Ministry of Railways. Indian Railways has a total track of 114,500 kilometres (71,147 mi) with a route of 65,000 kilometres (40,389 mi) covering 7,500 stations. In the world railway sector, next to the United States, Russia and China, India has the world's fourth largest railway network.

### 5.5.2 Role of Indian Railway Contributing towards Nation's Economic Development

- Service segment plays an crucial role in the development of the Indian economy. Railway being a vital part of the service division also contributes to the nation's economic development directly and indirectly.
- Indian railways, through their forward and backward linkages, are not only generating formal employment but also creating a huge scale of informal employment.



- Competence building on existing paths will assist in carrying more and more freight, as well as increasing the passenger traffic too.
- Ratio development will be emphasized which will assist in better financing of projects in the future.
- E-Catering services in India are assisting in fueling the development of Indian Railways and in turn creating superior employment opportunities. This has appeared as a major boon for employment generation and in turn facilitates the development of the Indian economy.
- The widespread network expansion through the “*Diamond Quadrilateral Scheme*” will assist in movement of cargoes and decrease the lead time for trade. This huge project is aimed at generating high speed rail network in India which would link four metro cities in India i.e. Delhi, Mumbai, Kolkata as well as in Chennai. In the initial phase, separating rail corridors will be improved by using conventional technology to train speeds of 160 to 200 km/h. In the second stage, main intercity corridors will be recognized and state of the art high speed corridors will be developed up to 350 km/h by using the state ownership and public-private partnership. The main intention is to enhance at least 4 corridors of 2000 km and have at least 8 other corridors in diverse stages of advancement. the present development is focused on creating six corridors:

**Table 5.2: Seven different corridors and its route**

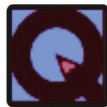
S. No.	Corridor	Route
1	Delhi -Kolkata	New Delhi – Aligarh – Agra – Kanpur – Lucknow – Sultanpur – Varanasi – Buxar – Gaya – Patna – Dhanbad – Asansol – Burdwan – Kolkata
2	Delhi-Mumbai	New Delhi – Gurugram – Rewari – Jaipur – Ajmer – Bhilwara – Udaipur – Himmatnagar – Ahmedabad – Anand – Vadodara – Surat – Vapi – Boisar – Virar – Thane – Mumbai
3	Mumbai -Chennai	Thane – Navi Mumbai – Lonavala – Pune – Kolhapur – Belgaum – Hubli – Davangere – Tumkur – Bangaluru – Banagarpet – Chennai



4	Kolkata -Chennai	Kolkata – Haldia – Cutttack – Bhubaneswar – Vizianagaram – Visakhapatnam – Rajahmundry – Nellore – Chennai
5	Delhi -Chennai	New Delhi – Agra – Gwalior – Guna – Bhopal – Itarsi – Betul – Nagpur – Nizamabad – Hyderabad – Vijayawada – Ongole – Chennai
6	Mumbai -Kolkata	Thane – Nashik – Aurangabad – Akola – Nagpur – Durg – Raipur – Bilaspur – Rourkela – Kharagpur – Kolkata

- The social costs in terms of environmental damage are significantly lower in rail.
- Rail construction cost are roughly six times lower than road construction changer for comparable stages of traffic.

Thus we see that Indian Railway contributes significantly to GDP through employment creation, freight collection, catering services etc. Further more the move towards e-tendering will assist in evaluatin the profitability and contribution to growth on an overall basis.



**INTEXT QUESTIONS 5.5**

1. Corridor of Mumbai –Kolkata.
2. Environment damage is significantly reduced in rail transport -True / false.
3. Railways support economic growth and also reduce greenhouse gas emissions.
4. The \_\_\_\_\_ scheme will facilitate the movement of cargoes and decrease the lead time for trade.





## 5.6 ROLE OF RAILWAYS IN LOGISTICS VALUE CHAIN

### A. Logistics Value Chain

The concept of the value chain originates from a business management perspective. In every company, value chain managers look for opportunities to add value to their business. They may look for ways to cut back on shortages, prepare product strategies, and work with other related intermediaries in the chain to add value to their customers.

In the value chain process there are five steps. They offer a firm the ability to generate value beyond the cost of offering its cargoes or services to customers. In any of the five steps, a competitive edge over its competitors. The steps and activities are as follows:

**Table 5.3: Logistics Value Chain**

S. No.	Steps	Activities
1	Inbound Logistics	Receiving, warehousing, and inventory control
2	Operations	Value-creating activities that transform inputs into products, such as assembly and manufacturing
3	Outbound Logistics	Activities required to get a finished product to a customer. These include warehousing, inventory management, order fulfilment, and shipping
4	Marketing and Sales	Activities associated with getting a buyer to purchase a product
5	Service	Activities that maintain and enhance a product's value, such as customer support and warranty service

In order to facilitate and streamline the five important steps, Porter had mentioned the value chain also is in need of a series of support activities. These consist of procurement,



**Notes**

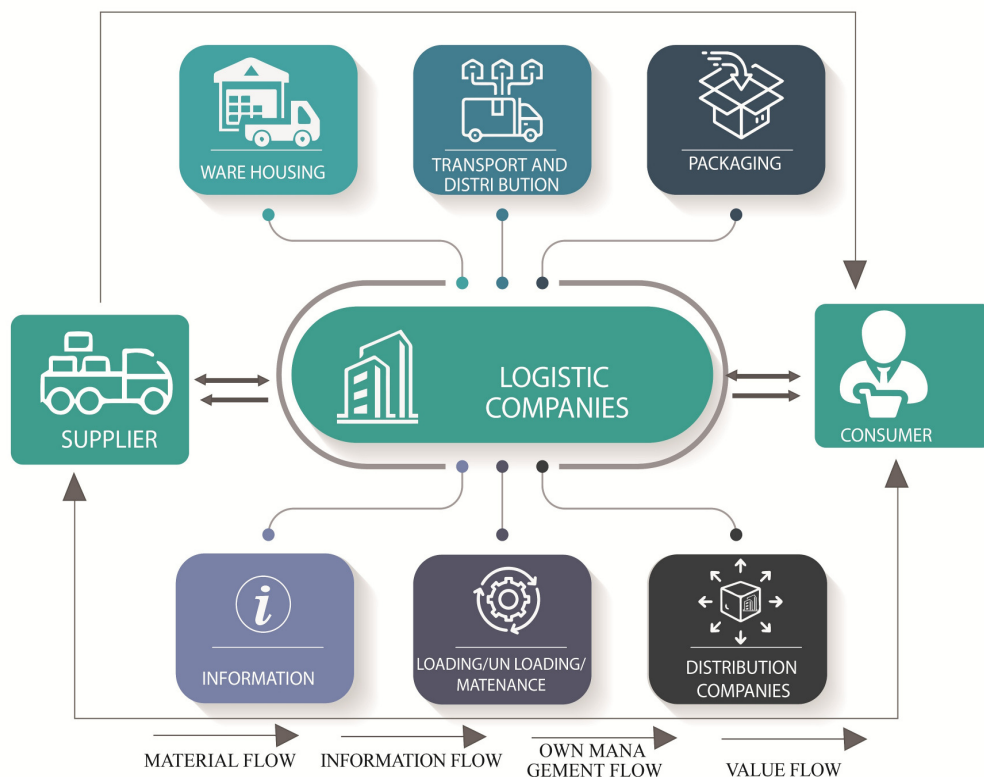
technology development, human resource management as well as infrastructure.

**B. Supply Chain**

The supply chain involves the coordination of how and when goods are manufactured and how they are transported. The main concerns of supply chain management are the handling of materials and efficient distribution. Proper distribution chain management can decrease consumer charges and increase revenues for the manufacturer.

**C. Value Chain Model**

A business model that describes the complete range of activities required to generate a product or service is referred to as a value chain. To distribute maximum value for the least possible cost, a value-chain analysis aims to develop production competence. The significance of the Indian railway structure, a centuries-old form of transportation that's still chugging and remains at the heart of the distribution chain. It is a nail of the 19th century that leads to 21st century logistics via the utilisation of sophisticated systems and digital technologies.



**Fig. 5.12: Value Chain Model**



Moving cargoes by rail is often much cheaper, more efficient and less environmentally damaging than sending cargoes by road. As a result, several firms will continue to utilise the train mode to move cargoes for many years to come. Rail is transferring a significantly amount of freight each year, and sophisticated technologies are empowering the distribution chain to fully embrace the new precision railroading model.

Through the optimization of data-driven, superior automation, and increased acceptance of intermodal freight, consumers can continue to rely on trains to meet supply and demand. More significantly, utilising technology such as this can develop and build up production in order to assist the overcome of the following confronts and make sure that the Indian railway structure is working as smoothly as possible and add value to the consumers in the following ways:

- a. Visibility
- b. Capacity
- c. Payables
- d. Technology
- e. Standardisation
- f. Efficiency:

#### **a. Visibility:**

At present, consumers demand end-to-end consignment visibility among all transportation forms, reports of real-time status updates and evidence of delivery.

#### **b. Capacity:**

To meet the ever-increasing capacity requirements, maintaining and growing capability with carrier partners is an absolute must.

#### **c. Payables:**

Complex payables procedures with extensive cycle times among time of service to being paid by numerous shippers can take as long as 60 to 90 days.

#### **d. Technology:**

The legacy IT structures have become a resource strain on internal teams and the manual procedures have become labour intensive.



Notes

**e. Standardisation:**

Working along with frequent carrier partners who have their own technology remedies and stages of maturity, necessitate a streamlined and standardised process.

**f. Efficiency:**

The models such as decentralised and fragmented which are used for account management and manual carrier scorecard procedures are tiring and demand better.



**INTEXT QUESTIONS 5.6**

1. Supply chain
2. In the value chain process there exist \_\_\_\_\_ steps
3. A business model which describes the complete range of activities required to generate a product or service is referred to as a \_\_\_\_\_.
4. At present, consumers demand \_\_\_\_\_ consignment visibility among in all transportation modes.



**WHAT YOU HAVE LEARNT**

- Indian Railways refers to a Department of the Government of India, under the Ministry of Railways, tasked with operating the rail network in India. While the Railway Board manages the department, a cabinet Minister Railways directs the Ministry. The Indian Railways, being a state monopoly on rail transport, constitutes one of the leading and busiest rail systems in the world. It transporting around six billion passengers a year. The railways pass through the length and breadth of the nation.
- The merits of railways are 1. Dependable, 2. Better organised, 3. High pace over long distances, 4. Appropriate for Bulky and heavy cargoes, 5. Economical transport 6. Safety, 7. Better capacity 8. Public welfare 9. Administrative facilities of Government and 10. Employment opportunities.



Notes

- Rail transport has been around since the 6th Century BC during ancient Greek times. Rail transport is ever-evolving, and accounts for a huge percentage of surface transportation. It refers to any form of transferring passengers and goods on or in wheeled vehicles running on rails, which are positioned on tracks. Rail vehicles are directed by the tracks on which they operate and there are several types of rail transport.
- This rail service focuses on competently moving bulk material between great distances over the railroads of the vast network of tracks which is running throughout India. While the rail service has to stay on the tracks, they can easily move among the rail-served buildings or yards to handle bulk freight. Unlike the intermodal, the rail service is not a direct competitor to trailer load on transit or price.
- Railways play a major role in Indian economic development by integrating the markets and increasing trade. They are indeed a climate-smart and competent way to transfer people and freight. Railways support economic growth and also reduce the greenhouse gas emissions. They are a very clean and compact path to move millions of passengers and million of tons of cargoes across nations and continents
- The concept of the value chain originates from a business management outlook. In every firm the value chain managers look for opportunities to add value to their business. They may glance for paths to cut back on shortages, prepare product strategies, and work with other related intermediaries in the chain to add value to their customers.



KEY TERMS

Railways	Transit	Equipments	Value chain
Freight	Passengers	Wagons	Customer
Commodity	Logistics	Carrier	Traffic



**Notes**



**TERMINAL EXERCISE**

1. Write a note on Indian Railways
2. What do you understand by Rapid transit
3. Mention any two type of equipments used in Indian railways
4. Define Funiculars
5. Briefly explain the urban rail transport
6. Highlight the investments and developments in India's railways sector
7. Point out any two demerits of railways
8. Bring out the organisation structure of Indian railways
9. Outline the concept of logistics value chain
10. Distinguish between the mountain and heritage railways
11. Explain the different types of rail transportation
12. List out the merits of railways
13. Discuss the Role played by Railways towards Nation's Economic Development
14. Sketch the value chain model with suitable examples
15. Explain the role of Indian railways in logistics sector



**ANSWER TO INTEXT QUESTIONS**

**5.1**

1. 1853.
2. Request for Qualification.
3. Monopoly
4. Adarsh



### 5.2

1. True.
2. Reasonable mode of transport
3. Capital
4. Public

### 5.3

1. The most common type of rail service which is designed to transport crated, palletized or large bulk items, such as paper stock rolls
2. Used to transport heavy bulk materials like scrap metal, aggregates, coal, lumber and many of other similar commodities that cannot be damaged from the elements
3. Rapid
4. Wagon

### 5.4

1. The most common type of rail service. Designed to transport crated, palletized or large bulk items, such as paper stock rolls.
2. Used to transport heavy bulk materials like scrap metal, aggregates, coal, lumber and many other similar commodities that cannot be damaged from the elements.
3. Logistics
4. Tank

### 5.5

- 1 Thane – Nashik – Aurangabad – Akola – Nagpur – Durg – Raipur – Bilaspur – Rourkela – Kharagpur – Kolkata
2. True
3. Greenhouse gas
4. Diamond Quadrilateral

**Notes****5.6**

1. The supply chain engages with the coordination of how and when the goods are manufactured and how they are transported
2. Five
3. Value chain
4. End-to-end

**DO AND LEARN**

Learners can undertake their activity work in the areas of Railways / CONCOR / CFS / Railway Intermediary organisations.



## FEATURES OF FREIGHT & PASSENGER MOVEMENT

Commodities are transported on a widespread and complex transportation network. The benefits of freight transportation to the economy are massive. It increases the value of cargoes by shifting them to destinations where they are worth more. It motivates competition and manufacturing by widening the spatial territory of cargoes and labour markets. It also stimulates demand for commodities and services and creates employment opportunities for millions of people. Moreover, freight transportation infrastructure is a vital element of our country's wealth and constructive capacity. The mobility of passengers and freight has very diverse spatial dynamics. While the purpose of passenger transportation mainly concerns short distances, and most of the mobility of passengers is connected to commuting, shopping, and recreation. These mobilities is mainly bound by time restrictions. Only when passenger movements are less bound to time constraints, such as for business and tourism their geographical range can be extended. In a worldwide economy, the majority of passenger movements are still bound by a distance/time ratio, whereas freight movements are more a function of comparative benefits in production.



### LEARNING OUTCOMES

After studying this lesson the learner:

- defines fundamentals of freight and passenger transportation;
- categorizes various forms of freight movement;
- constructs freight policy for transportation mode;
- differentiates between freight and passenger in order to promote economic growth;
- assesses innovative, cost-effective freight transport systems.



## 6.1 INDIA'S FREIGHT TRANSPORT - INTRODUCTION



**Fig. 6.1: North-South corridor**

Countries like India taking part in such an international path are great success. In reality, this refers to the fact that it can utilise a path that mostly uses rail for rapid access to Russia and the European continent. This is the skipping the Suez Canal. Indeed, the first train journey from Europe and particularly from Finland to India through the INSTC is in progress. The train started from Helsinki on June 21 and before reaching India it had crossed the borders between Azerbaijan and Iran. The transit time between Finland and India is around 22 days by making this path even more aggressive.

### 6.1.2 Curiosity in regional neighbours

India appears to be leading the way in up improvement in Central Asia nations. For example, in December 2020, Iran and Afghanistan had obtained their first rail freight link. Finally link between Khaf (Iran) -Herat (Afghanistan) which has been in construction since 2007 has began. Rail links can develop towards has been in Turkmenistan in the north and open the path to the Caspian Ocean where nations like Russia, Kazakhstan and Azerbaijan can be accessed.

India played an active role in the launch of the Khaf-Herat railway line. It got involved and contributed to the incorporation of this venture. This venture aims to improve its links with Afghanistan further and offer the nation other very significant destinations, for example, Russia. The nation has tried the effort to seize opportunities popping up in the adjacent countries when it comes to rail freight developments. The reason is, it acknowledges their prospective regarding additional links with significant destinations and economic centres. It may not be the simplest thing to do because of the China



Road Initiative belt which covers most of Asia’s transport and economic interest. India is still on the right track, exploring lesser but significant opportunities to reach Russia and Europe. It is considered a significant transport means to carry cargoes and general public. there is a complete track size 1, 26,366 kms and a double track of 25034 kms with nearly 45881 kms that are electrified, making it the 4th largest system. The Rail path length is approximately 67956 kms with 13169 Passenger trains and 8479 Freight trains. Almost 23million travels on a normal basis and it covers the regular freight of 3 million tonnes from over 7349 stations.

### 6.1.3 Freight Transportation

**Table 6.1: Freight Transportation**

Daily Trains	9200
Tonnes carrying	1,110million
Network	68000 kms
Revenue	501 billion per year
Freight Wagons	2,77,987
Wagon Number system	11 digit
Locomotive	Diesel & Electric
Freight train length	Length : 1.5km Width: 3660mm Height: 7.1m
Locomotive class	WAG-9 -(Powerful freight locomotive)
Locomotive class	WAG 12-New Electric freight locomotive
Power output	12000GP

The Freight Transport Service is accountable for moving the commodities and making sure they reach all parts of India. It terms of length, vembanand Rail Bridge is 4062 km long and is solely dedicated to freight traffic. The Golden Quadrilateral freight corridors normally carry 55 % of India’s Rail freight traffic with an IR Double stack normal shaped containers and transport almost 400 container capacity in the world. The nations freight service house has 800 Electric locomotives with 12000 HP capacities which are considered a the biggest in the world.

Moreover, the Konkan Railway also supports the Ro-Ro services beside Skybus & Anti collision devices. The Freight Corridor Corp of India which is run and operated by the



Ministry of Railways is responsible for Construction, maintenance, operation and freight corridors. With the completion of Golden the quadrilateral, the Freight train can reach a speed of 100 km/hr by using Advance technology and Renewable energy. Generally carry nearly 650 Commodities including coal, iron ore, iron & steel, cement, petroleum, fertiliser, food grains, sugar, spices, salt, oils, granite, stone, bamboo chips and container services. The Freight Transportation during the year (20-21) touched around 1232.64 million tonnes with a Freight revenue of 1, 17,386 crores. The company also operates 450 Kisan railway services which transport around 1.45 lakh tonnes mainly Agriculture & perishables.



**INTEXT QUESTIONS 6.1**

1. INSTC is a 7,200 kilometre-long freight path - True / False.
2. In terms of length \_\_\_\_\_ bridge is as the longest rail bridge in world.
3. The ministry of Railways runs and operates the \_\_\_\_\_ Corp of India.
4. Railway services in Kisan transport the primarily \_\_\_\_\_ & \_\_\_\_\_.

**6.2 INDIA’S PASSENGER MOVEMENT-INTRODUCTION**

**Indian Railways (IR)** which manages the nation’s railway system is a statutory organization falls under the ownership of the Ministry of Railways, Government of India. As of 31 December 2021, it administers the fourth largest national railway network in the world by its size, with an entire route length of 126,511 km (78,610 mi) or 75% of all broad-gauge paths electrified with a capacity of 25 kV 50 Hz AC electric traction as of 1 April 2021.

In the fiscal year ending March 2020, the Indian Railways carried around 808.6 crore (8.086 billion) passengers. Further it operates 1 lakh (100,000) passenger trains daily both on long-distance and suburban paths by covering 7,325 stations across India. The mail or express trains, which are the most general types of trains, run at an average speed of 50.6 km/h (31.4 mph). Similarly the suburban EMUs travel at an average speed of 37.5 km/h (23.3 mph). General passenger trains (incl. mixed) travel at of 33.5 km/h (20.8 mph). Based on the type of train it operates, the passenger trains maximum speed also varies. The passenger train such as Gatimaan Express runs at a peak speed of 160 km/h (99 mph). As of March 2020 India Railways had 1.254 million employees, making it the world’s eighth largest employer. The government has committed towards electrifying the nation’s complete network by 2023–24 by leading towards a net zero (carbon emissions) railway by 2030.



Notes

### 6.2.1 Passenger service

Based on its commercial significance, the IR categorises its railway stations into three diverse categories namely 1. Non Suburban Group (NSG), 2. Suburban Group (SG) and 3. Halt Group (HG). These are in addition subdivided based on their business importance specifically from NSG 1 to NSG 6, SG 1 to SG 3 and from HG 1 to HG 3. The trading importance of a station is determined by considering the passenger footfall, earnings and its strategic importance. These types are used by IR to offer the minimum necessary facilities required by every station. Prior in December 2017, the commercial significance of a station was considered merely on the basis of its earnings. As such stations were classified into seven categories such as A1, A, B, C, D, E, and F.

### 6.2.2 IR Travel classes

With or without air-conditioning, IR has numerous travel classes. Generally a train may have one or several classes. Slow passenger trains have only unreserved seating, and a few trains have air-conditioned classes. unreserved seating in the least expensive of all these classes.

**Table 6.2: IR Travel classes**

S. No.	Class Type
1	Saloon
2	AC First Tier (1A)
3	AC Two Tier (2A)
4	AC Three Tier (3A)
5	AC Three Economy (3E)
6	Sleeper Class (SL)
7	Second Class (2S)
8	General Class (II)
9	Vistadome Class
10	Anubhuti Class (EA)
11	Executive Chair Car (EC)
12	AC Chair Car (CC)
13	AC Chair Car Economy (GC)
14	FC



Notes



## INTEXT QUESTIONS 6.2

1. NSG stands for \_\_\_\_\_.
2. Define Indian railways.
3. As of 31 December 2021, Indian railways administer as the \_\_\_\_\_ largest national railway network in the world.
4. \_\_\_\_\_ Express runs 160 km/h (99 mph).

## 6.3 TYPES OF FREIGHT TRANSPORTATION

The goods or freight wagons or freight cars also referred to as goods carriages, goods trucks, freight carriages or freight truck. These are unpowered railway vehicles used for the transportation of commodities.

### 6.3.1 The types of rail freight transportation are as follows

#### 1. Wagons:

##### A. Open wagons

Code allotted is from 10 to 29

*Table 6.3: Open wagons*

S. No.	Code Allotted	Type of Wagon
1	10	BOXN
2	11	BOXNHA
3	12	BOXNHS
4	13	BOXNCR
5	14	BOXNLW
6	15	BOXNB
7	16	BOXNF
8	17	BOXNG
9	18	BOY



10	19	BOST
11	20	BOXNAL
12	21	BOSTHS
13	22	BOXNHL
14.	24	BOXNS

### B. Covered wagons

Code allotted is from 30 to 39

*Table 6.4: Covered wagons*

S. No.	Code Allotted	Type of Wagon
1	30	BCNA
2	31	BCNAHS
3	32	BCCNR

### C. Flat wagons

Code allotted is from 53 to 69

*Table 6.5: Flat wagons*

S. No.	Code Allotted	Type of Wagon
1	53	BLCSA
2	54	BLCSB
3	55	BRNA

### D. Tank wagons

Code allotted is from 40 to 54

*Table 6.6: Tank wagons*

S. No.	Code Allotted	Type of Wagon
1	40	BTPN
2	41	BTPNHS
3	42	BTPGLN



**Notes**

**E. Hopper wagons**

Code allotted is from 70 to 79

**Table 6.7: Hopper wagons**

S. No.	Code Allotted	Type of Wagon
1	70	BOBYN
2	71	BOBYNHS
3	72	BOBRN

**F. Well wagon**

Code allotted is from 80 to 84

**Table 6.8: Well wagon**

S. No.	Code Allotted	Type of Wagon
1	80	BWTB
2	81	MBWT
3	82	DBKM

**G. Brake Van**

Code allotted is from 85 to 89

**Table 6.9: Brake Van**

S. No.	Code Allotted	Type of Wagon
1	85	BVZC
2	86	BVZI
3	87	BVCM





Notes

### 6.3.2 Other Types of wagons

- A. Container Wagons:** Container wagons are flats especially fitted with secured equipment for transporting ISO containers.
- B. Spine cars:** Spine cars fetch intermodal containers or trailers in a single stack configuration. The intermodal container is supported by side seats and lateral arms with a centre.
- C. Mineral wagons:** A mineral wagon or coal trailer is a small open-topped railway cargo wagon utilised in certain countries to carry coal, ores and other mine products.
- D. Refrigerated vans:** A refrigerated van is a railway commodities wagon attached cooling equipment designed to transport cooled stuff goods.
- E. Special wagons:** The railways design special wagons for shifting automobiles and they charge freight as per number of wagons instead of weight of vehicles.

### 6.3.3 Based on services

- A. Shunting trains:** These trains normally carry inward loaded wagon, as well as empty container, from those stations.
- B. Pilots:** Wagons are loaded in a large number at sliding / load terminals / Transshipment / Industrial areas etc. The Outward/inward takes place among the above places and the Marshalling yards. It is cleared by the running of pilots.
- C. Through goods trains:** It operates from one Marshalling Yard to another Yard without shunting the enrooted. The Resorting is completed in the next marshalling yard.
- D. Point Loads:** All wagons are unloaded at a one point.
- E. Unit Trains:** It is an Integrated movement of cargoes which fetchs a single commodity and move farward. It has a regular schedule and moves under a special tariff.
- F. Merry Go Round (MGR) Trains:** It is created with bottom discharge Hopper wagons and manually loaded in the overhead bunkers. In collieries, these trains operate with loaded wagons and move towards the thermal power station at normal speed. At this juncture, the Unloading line doors are opened through mechanical devices and the coal is discharged from the bottom into underground bunkers. In the unloaded line the doors will be closed at the exit end. The Entire process of Unloading / Loading Time completes in 45 minutes with 30 Hopper wagons. Additionally, crew changes, electronic weighine, billing, documentatin is done while the train is in



Notes

motion. Moreover the Crew changing, Electronic weighing Billing, documentation is done when the train is in slow motion.

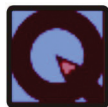
**G. Freight Liners:** These are fully containerized traffic which operates between container terminals. The loading / Unloading are mechanised. As of March 2021 it had reaches the highest freight loading with 27.33% higher them last year.

### 6.3.4 Wagon Numbering System:

In 2003, IR adopted an updated wagon numbering system and these wagons are allocated 11 digits, making it simple for identification and computerization of a wagon's information. The first two digits point out the Type of Wagon, the third and fourth digits spotlight the owning Railway, the fifth and sixth digits highlights the Year of Manufacture, the seventh to tenth digits specify the Individual Wagon Number, and the final digit is a Check digit.

### 6.3.5 Investment /Development of IR

- As FDI the IR received US\$ 1.2 billion (2020)
- It has Commissioned Wifi at nearly 6000 railway stations
- The train with above 130kmph, replaced from non -ac coach to an air-conditioned coach
- Electrification of routes is done for around 6015kms
- The Chenab Bridge has been upgraded to become the world's
- 50 upcoming projects were completed in 2021



### INTEXT QUESTIONS 6.3

1. Define the spine of cars.
2. Define container wagons
3. \_\_\_\_\_ train is an integral movement of cargoes which fetch one particular commodity and move away from a single origin & destination.
4. \_\_\_\_\_ trains normally carry loaded wagons and empty containers from those stations.



## 6.4 CONTRIBUTION OF FREIGHT MOVEMENT TOWARDS ECONOMIC GROWTH

Indian Railways is considered the world's largest rail network with a route length network stretches over 67,956 kms. It has with 8,479 freight trains, carrying 3 million tonnes (MT) of freight daily from 7,349 stations. One of the world's largest railway system, India's railway network is under single management. Apart from being an energy efficient and economical mode of conveyance and transport, this railway network is also suitable for bulk commodities movement. Indian Railways is the best carrier of automobiles in the nation. The Government of India has focused on investing in railway infrastructure by creating investor-friendly policies. It has moved rapidly to facilitate Foreign Direct Investment (FDI) in railways to enhance freight and high-speed trains infrastructure. At present, numerous domestic and foreign firms are also looking to invest in Indian rail projects.

### 6.4.1 Advantages of Freight Transportation

- 1. High level of security:** Statistics show that thefts from containers shipped by rail freight are relatively rare, as it is difficult for criminals to get close to a train and unload a container on a rail wagon. In comparison, theft from trucks parked at rest areas is more common as access is easier.
- 2. Multimodal compatibility:** The containers and trailers utilised are compatible with both road and rail freight sometimes referred to the multimodal transport. This highlights that there is no requirement to unload and load at shipment points i.e. the container or truck is simply lifted from rail wagon to truck as required.
- 3. Economical and less subject to fuel surcharges:** Rail freight transport is particularly suitable for long distances, as one driver can move more containers with comparatively few rest stops. Rail freight transport is primarily electrically powered, avoids the fuel surcharges and oil price fluctuations.
- 4. More environmentally sustainable:** As rail freight transport is often electrically powered, and handles high volumes it is considered a much greener form of transport by emitting much lower volumes of CO<sub>2</sub>.
- 5. Punctual:** Unlike road freight, trains generally do not get stuck in traffic jams, and there may occasionally be delays. Rail freight transport is much more punctual since authorities control capacity.



**Notes**

### 6.4.2 Market Size

In October 2021, freight revenues stood at Rs. 12,312.76 crore (US\$ 1.63 billion) and freight loading was 117.35 million tonnes. Freight remains the key income earning division for the Indian Railways, accounting for 79.1% of the entire revenue in FY22 (until August 2021), followed by the passenger division. The Freight remains the major income earning segment for Railways, accounting for 65% of its total revenue in FY20, followed by the passenger segment. Indian Railways carried 1,232.64 million tonnes of freight in FY21. With this, Indian Railways freight income also increased to Rs. 1,17,386 crore (approx.) which is around (US\$ 16.04 billion) for the year 2020-21, as against Rs. 113,488 crore (US\$ 16.10 billion) during fiscal 2019-20. During August 2021, freight income were at US\$ 1.43 billion and freight stuffing at 110.43 million tonnes. In June 2021, the freight incomes stood at US\$ 1.50 billion, which is 26.0% higher than last year's revenues of US\$ 1.19 billion. Freight stuffing reached 112.65 million tonnes, which is 11.19% higher than last year's stuffing of 101.31 million tonnes. In November 2020, the India Railways had announced that 40% of the dedicated freight corridor (DFC) will be operated for traffic by end-FY21 and the entire 2,800 km path will be completed by June 2022. Railways exports in 2019 stood at US\$ 635 million.

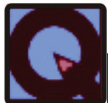
### 6.4.3 Investments/ Developments

Foreign Direct Investment (FDI) Inflows in railway connected components stood at US\$ 1.23 billion from April 2000 to June 2021.

Following are few of the major ventures and developments in India's railways segment:

- In October 2021, the Indian Railways announced a strategy to establish ~500 multi-modal goods terminals under the 'PM GatiShakti' programme, with an estimated expenditure of Rs. 50,000 crore (US\$ 6.68 billion) in a four to five years period. Through this strategy, the government plans to incorporate various forms of transportation for efficient movement of parcels and bulk goods (e.g., coal and steel).
- Since the initiation of first 'Kisan Rail' service on August 7, 2020, the Indian Railways have executed a total of 1,040 Kisan Rail services by moving 3.38 lakh tonnes of shipment across 72 routes in the nation until July 30, 2021.
- In July 2021, the Ministry of Railways had received bids from the private and public segments to operate 29 pairs of trains with about 40 sophisticated rakes, entailing a venture of ~Rs. 7,200 crore (US\$ 966.74 million).

- As of May 2021, the Indian Railways stuffing stood at 73.45 million tonnes (MT) including 35.62 MT (coal), 9.77 MT (iron ore), 3.38 MT (food grains), 2.22 MT (fertilisers) and 3.15 MT (cement, excluding clinker).
- As of May 5, 2021, the Indian Railways had commissioned Wi-Fi at 6,000 railway stations.
- In January 2021, Prime Minister Mr. Narendra Modi flagged off the world's first double-stack, long-haul container train from New Ateli in Haryana to New Kishanganj in Rajasthan.
- In January 2021, Hyundai Motor India Ltd. (HMIL) has announced that it has exported 125 cars to Nepal through the Indian Railways. The export is claimed to be eco-friendly and the firm's first. This year, the firm aims to decrease its carbon footprint by 20,260 tonnes.
- The Indian Railways had finished eight major capability enhancement projects by taking advantage of the Coronavirus lockdown. These ventures consist of three super critical projects with a joint length of 68km, three critical ventures with a combined length of 45km, upgradation of the whole 389km railway line from Jhajha in Bihar towards Pandit Deen Dayal Upadhyaya Junction in Uttar Pradesh and a new 82km port linking line to Paradip.



### INTEXT QUESTIONS 6.4

1. Indian Railways is the world's largest rail network - True / False
2. DFC stands for \_\_\_\_\_.
3. Rail freight transport is particularly competent for \_\_\_\_\_ distances
4. Prime Minister Mr. Narendra Modi flagged off the world's first \_\_\_\_\_, long-haul container train from New Ateli in Haryana to New Kishanganj in Rajasthan.

### 6.5 IMPORTANCE OF PASSENGER MOVEMENT TOWARDS ECONOMIC GROWTH

A passenger train is used to transport people along a railroad line. These trains might consist of unpowered passenger railroad cars hauled by one or more locomotives. They also might be self-propelled passenger trains called multiple units or railcars. The Passenger





**Notes**

rail facilitates economic growth, connect rural communities with the country, and also reduce congestion in major metropolitan areas.

Indian Railways path length stretches over 67,956 kms, with 13,169 passenger trains plying 23 million travellers daily from 7,349 stations. Moreover India's railway system is renowned as one of the largest railway networks in the world that too under single management. The railway system is also suitable for long-distance journeys and is an energy efficient and economical form of conveyance and transport. India Government has focused on investing in railway infrastructure by creating investor-friendly strategies. It has moved rapidly to facilitate Foreign Direct Investment (FDI) in railways to enhance infrastructure and high-speed trains. Currently, numerous domestic and foreign companies are looking at investing national rail projects.

### **6.5.1 Market Size**

Income growth has been very strong over the years. Indian Railways' gross income was Rs. 174,660.52 crore (US\$ 24.78 billion) in FY20. The passengers incomes for Indian Railways was Rs. 50,669.09 crore (US\$ 7.25 billion) in FY20. The entire passenger income between April 2020 and February 2021 stood at Rs. 12,409.49 crore (US\$ 1.70 billion) against Rs. 48,809.40 crore (US\$ 6.7 billion) in the corresponding phase. The gross income stood at Rs. 85,588.96 crore (US\$ 11.44 billion) in FY22 (until September 2021). In FY22 (until September 2021) the passenger income stood at Rs. 15,434.18 crore (US\$ 2.05 billion). In FY20-21 Indian Railways operated at 1,526.75 million passengers.

### **6.5.2 Investments/ Developments in Passenger movement**

The Foreign Direct Investment (FDI) inwards in railway-connected components stood at US\$ 1.23 billion from April 2000 to June 2021. Following are a number of major investments and developments in India's passenger railways division:

- In the month of November 2021, the Indian Railways had announced that 102 semi-high-speed Vande Bharat Expresses are anticipated to begin its operations by 2024, with at least 10 new rails scheduled to commence by August 2022 that will link 40 cities.
- In the month of July 2021, the South Central Railway division announced infrastructure development by doubling the maximum permissible speed to 100 km per hour on the Godavari Bridge. The proposal gave a major boost to the Indian Railways in infrastructure development.

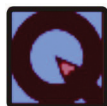


- In July 2021, the Indian Railways initiated the remodelling of Gangapur City Yard to enhance the speed of railways along the routes between Delhi and Mumbai.
- The Indian Railways is expected to distribute 58 super vital and 68 critical ventures worth more than Rs.1,15,000 crore (US\$ 15.44 billion) in the next few years. The 27 upcoming super strategic ventures will be completed by December 2021, and the two new projects will be handed over by March 2022. The 29 most strategic projects spanning 1,044 kms at a cost of total of 11,588 crore (US\$ 1.5 billion) have been commissioned. Four projects worth Rs. 1,408 crore (US\$ 189.05 million) have been finished and the remaining ventures are targeted for completion by the month of March 2024.
- In the month of July 25, 2021, the Indian Railways Station Development Corporation (IRSDC), which is the nodal agency of the Ministry of Railways leading the redevelopment of railway stations in the country, had claimed that the two railway stations will be enriched at a price of Rs. 1,285 crore (US\$ 172.54 million) in the next four years.
- The Indian Railways has determined to undertake the electrification of Broad Gauge (BG) rail lines through a mission form and complete the practice by 2023-24. Among the 64,689 kms of broad gauge path, 45,881 kms have been electrified remaining 18,808 kms still need. About Rs. 21,000 crore (US\$ 2.8 billion) is anticipated to be spent on electrification of the remaining BG routes.
- Indian Railways commissioned Wi-Fi at 6,000 stations on May 5, 2021.
- During May 2021, the Government of India along with European Investment Bank (EIB) signed a finance agreement for the second tranche of US\$ 182.30 million for the Pune Metro Rail venture.
- In the month of November 26, 2020, National High-Speed Rail Corporation Limited (NHSRCL) signed a contract with L&T to design and build 47% alignment works for the Mumbai-Ahmedabad bullet train venture.
- As a part of the Railways' strategy to enhance its network, the Ministry announced that trains which run >130 kmph, all non-AC sleeper coaches will be replaced by AC sleeper coaches. This shift has been taken as a technical requirement for high-speed trains with the bonus of improving passenger experience.





Notes



### INTEXT QUESTIONS 6.5

1. A passenger train is used to transport people alongside a \_\_\_\_\_.
2. The Government of India has focused on investing in railway infrastructure by creating \_\_\_\_\_ strategy.
3. A passenger train is used to transport people alongside a \_\_\_\_\_ line.
4. The Indian Railways initiated the remodelling of \_\_\_\_\_ City Yard to enhance railway speed along Delhi and Mumbai path.

## 6.6 FUTURE OF FREIGHT TRANSPORTATION

Transport demand is mounting rapidly in Global and as per the current trends, passenger and freight activity is expected to double by 2050. Such development is an indication of social and economic development, but it also carries with it superior energy demand and increased CO<sub>2</sub> emissions and atmospheric pollutants. Greater trust in rail could reduce that development. When the world becomes ever more urbanised, rail travel is well harmonised with urban requirements. High-speed rail can replace short-distance air travel, and conventional transportation. Freight rail can also harmonise with other transport forms by offering efficient mobility. The transport sector accounts for more than half of worldwide oil demand and approximately a quarter of global CO<sub>2</sub> emissions from fuel ignition. Therefore, modifying transportation is essential to achieve energy transitions worldwide. Yet whereas rail is among the most energy efficient forms of transport for the segment of freight and passengers. The rail division can offer substantial benefits in the energy sector as well as for the environment. By expanding energy sources and offering more competent mobility, rail can reduce carbon dioxide and domestic pollutant.

### 6.6.1 Road head (Next 5 years)

1. Generate 1 million jobs
2. Modernized stations
3. Eliminate all level crossing
4. Achieve 100% electrification
5. Upgrade speed 160 kmph
6. Development of double tracks





7. Reforestation along tracks
8. Solar power trains
9. Wind powered trains
10. LED lightings at all stations
11. Automatic block signalling and
12. Private Railways participation.

Trains are considered the most eco-friendly form of transportation. taking cargoes and passengers from one location to another in an incredibly fast manner allows them to take advantage of the incredibly fast time between their destinations. Here are some technologies that could play a major role in the future of rail transport.

- 1. Superfast maglev trains:** At present, Maglev trains are considered the fastest mode of rail travel. They normally use magnets to float their carriages above the ground without wheels. In China, the Shanghai maglev train which links Pudong Airport to a main metro terminal outside the city is one of the fastest in the world. The 19-mile trip takes around 7 minutes to finish at 268 MPH. The next evolution in maglev trains will look at the Chuo Shinkansen line which is anticipated to open in 2027. The upcoming maglev bullet train is expected to reach a maximum speed of 314 mph. The will finishing the 178-mile journey between Tokyo and Nagoya in 40 minutes. It is also the fact that China is testing a 1000 km /h advanced super maglev train. Desbite being very much in the research stage, it's a sign as to the speed that the technology may eventually permit passenger trains to accomplish.



**Fig. 6.2: Superfast maglev trains**

- 2. Incredibly efficient autonomous rail:** Throughout the World, autonomous trains



have been in operation for years. Some examples include Shanghai, Dubai, and Sao Paulo. And still, the technology is still tacted as a game-changer for rail potential. As structures are constantly developing, they canbe used for longer trips globally. Automation has a great potential for optimising the competence of public transport structures such as underground trains by accounting for peak times and preventing delays.

**3. High-speed biometric and microchip ticketing systems:**



**Fig. 6.3: High-speed biometric and microchip ticketing systems**

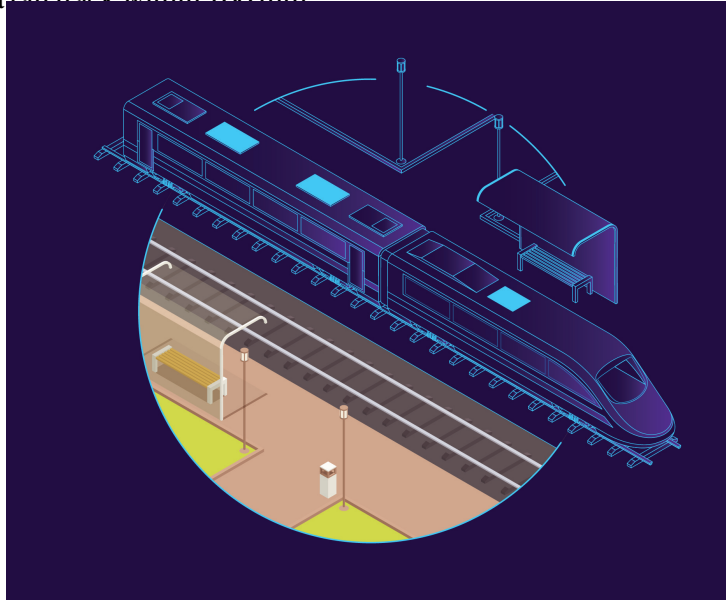
Facial recognition technology has the potentiality to simplify our morning commute. Thus by adding a smile to an individuals face they can simply walk through a ticketing face sensor location. A firm called Cubic Transportation Systems has presented a gateless entry device that uses a mixture of Bluetooth and facial identification software to allow passengers to quickly for their journey and board onto their train. In Sweden, on a Swedish train the operators of SJ Railways had already began using microchips to rapidly authenticate rail passengers.

- 4. Cabin space optimization:** Train cabins are in need of an overhaul. Whether it's offering enough space for train overcrowding or optimising trains for the current traveller, there is quite a lot that can be done to alter the way that people experience during rail travel. Priestman Goode british rail concept is the Mercury high-speed train, explains how a sophisticated train interior could look in the future.
- 5. Smart sensors for automated track and train inspection:** An imperative feature in automating railways is the sensing and consumption of enormous amounts of data

that arrives from railways, trains and passengers. Companies like Siemens and Thales had developed sensors that could help keep trains and passengers safe. An example is Siemens Broken Rail Detection. With GPS positioning this system can detect a break in a rail track within 100 mm.



Notes



**Fig. 6.4: Smart sensors for automated track and train inspection**

6. **Drones: an extra eye on the tracks:** Pierre-Antoine Benatar, Marketing Manager for Thales' Transportation Activities pointed out that they are currently working on rail bots, the rail drones of the future. Moreover, they will move on the track ahead of the train and will be programmed to operate autonomously. The firm is already a major player in railway sensors and security across the world. It is accountable for



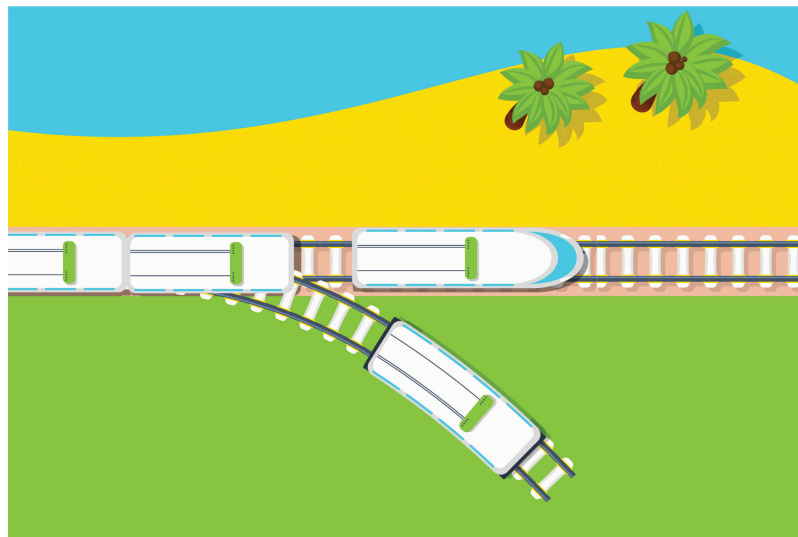
**Fig. 6.5: Drones**



Notes

the sensors in a few of the world's most futuristic and competent underground systems, including the Singapore MRT. These Drones could be used to add security to rail travel. With automated sensing structures, aerial vehicles could inspect the track ahead of a travelling train and scrutinise for any issues that might arise.

- 7. Modular trains that don't need to stop to allow passengers to get off :** A big issue with rail transport is that it, as anticipated, can't stop at each location. The tradeoff for adding spots to a journey is that the trip speed is greatly reduced. That's why the high-speed trains normally arrive at major cities. Priestman Goode has recently innovated a concept where metro cars move on a loop from the city to a high-speed rail on the outskirts. Further such metro cars would connect up to high-speed trains, allowcups the passengers to board and exit the train without slowing down. Even though this concept looks some what dangerous, it has the potential to dramatically enhance the accessibility of high-speed rail travel for large populations.



**Fig. 6.6: Modular Train**

- 8. The hyperloop:** Basically the hyper loop is not technically a rail, the technology is a continuation of sorts of railway. Though it is still undergoing such tests, the speed at which it could link cities would revolutionise travel. A complete operational Hyperloop, as envisioned by Elon Musk, would hit speeds of more than 700mph, making the travel between Los Angeles and San Francisco only 30 minutes long. The Hyper loop also utilises the passive maglev technology, which is quite similar to that used by today's greatest trains.

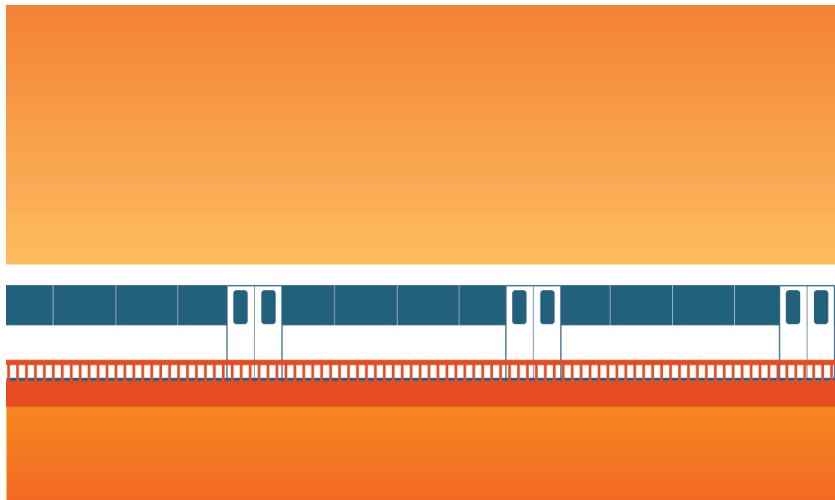


Notes



**Fig. 6.7: The Hyperloop**

- 9. Solar rail:** Several firms are using photovoltaic panels on the roofs of electric cars to help to maximise their range. Similar can be done with trains to make them even more eco-friendly as a type of transport. The world's first solar-powered rail is already operational in Byron Bay, Australia and has been operational since 2017. The use of solar and hydrogen power will make train journeys even more sustainable than they are already.



**Fig. 6.8: Solar Rail**

- 10. The Straddling Bus:** Though of China's Straddling Bus looks like it could not be an extensively used of transportation, the notion method shows how metropolitan spaces can be optimised for efficient transport. Trams have long co-existed with cars and pedestrians in cities around the world. A system that allows cars to freely shift underneath carriages would definitely enhance commuting experience.



Notes



**Fig. 6.9: The Straddling Bus**

- 11. Startram: a train to... space?** While this is not likely to be a part of our day to day commute, it is considered an exciting indication of how rail and space technology could interconnect in the distant future. The concept of Startram would catapult a craft into space by using a maglev rail formation that expanded into low Earth orbit. This would significantly decrease the trust the space industry has in fuel.



**Fig. 6.10: Startram**

Let's be honest, this will probably never become a thing. However but it illustrates how railway technologies can be utilised for transportation structures that are for beyond our wildest dreams.

- 12. Hydrogen-powered trains:** The technology powering hydrogen-fuelled trains is fairly simple. The fuel cell is composed of an anode, a cathode, and an electrolyte membrane. Hydrogen is passed through the anode, where it is divided into electrons



and protons. Further, the electrons are then pushed via a circuit that creates an electric charge that is stored in lithium batteries or directly utilised by the train's electric motor. The merely waste created occurs as hydrogen molecules react with oxygen at the cathode and become water. The world's first passenger train the Corara iLint is powered by a hydrogen fuel cell.



Notes



**Fig. 6.11: Hydrogen-powered trains**

- 13. Rail hotels:** The innovative cars on the Shiki-Shima train move towards a more relaxing and luxurious rail journey. The trains comprise a glass wall observatory; a dining car with a menu assembled by a Michelin-starred chef, and a passenger lounge with live music. Travelling on this Shiki-Shima line generally costs up to \$12k.



**Fig. 6.12: Rail hotels**

- 14. Space tech for trains:** Space technology can make train journeys safer. Special sensor technology that is used to ensure the safe reentry of spacecraft into Earth's



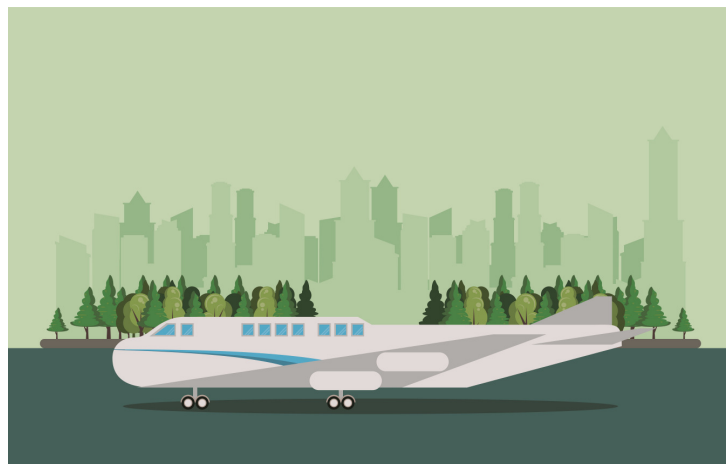
**Notes**

atmosphere is now being utilised to keep rails more secure. The satellite technology also has the potential to offer a scalable solution for railway positioning that can enhance the security of rail transport and also offer better internet linkage on high-speed trains.



**Fig. 6.13: Space tech for trains**

**15. The plane train hybrid:** With the current growth rate of air traffic, worldwide airports are expected to reach a saturation point by 2030.” Akka Technologies has commenced testing a concept for a multimodal aircraft called “Link & Fly”. It is a hybrid plane/train that would be capable of simply affixing and detaching a wagon that also has the potential to connect with railways. The firm has successfull tested an advanced version of the aircraft. If the potential of transport is modular, railways will certainly be a central part of the innovation practice. With their less carbon footprint and flexibility, trustworthy train won’t fall behind other high-profile forms of transport any time soon.



**Fig. 6.14: The Plane train hybrid**





### INTEXT QUESTIONS 6.1

1. High-speed rail can replace short-distance \_\_\_\_\_.
2. \_\_\_\_\_ are considered the fastest rail travel mode.
3. The world's first solar-powered rail is operational in Byron Bay, \_\_\_\_\_.
4. The innovative cars on the Shiki-Shima train location provide a more relaxing type of \_\_\_\_\_ rail journey.



### WHAT YOU HAVE LEARNT

- Freight transportation plays an crucial role in supporting economic development of a country. It also boosts its logistics and industrial competitiveness and it is able to meet the needs of its citizens.
- The Indian Railways (IR) which operates the nation's railway system is a statutory body that falls under the ownership of the Ministry of Railways, Government of India. As of 31 December 2021, it administers the fourth largest national railway network in the world by its size, with an entire route length of 126,511 km (78,610 mi) or 75% of all the broad-gauge paths electrified with a capacity of 25 kV 50 Hz AC electric traction as of 1 April 2021.
- The goods or freight wagons or freight cars also referred to as goods carriages, goods trucks, freight carriages or freight trucks are unpowered railway vehicles that are utilised for transportation commodities. India has are different types of freight wagons.
- India's railway network is recognized as one of the largest railway systems in the world. Apart from being an energy-efficient and economical mode of conveyance and transport, this railway network is also suitable for bulk commodities. The government of India has the spotlight on investing in railway infrastructure by creating investor-friendly policies.
- A passenger train is used to transport people alongside a railroad line. These trains might consist of unpowered passenger railroad cars hauled by one or



Notes



**Notes**

more locomotives or might be self-propelled passenger trains called multiple units or railcars. The passenger rail service facilitates economic development, links rural communities to the country, and also decreases road path congestion in major metropolitan areas.

- The demand for transport is mounting rapidly in Global and as per the current trends, passenger and freight activity is expected to double by 2050. Such development is an indication of social and economic development, but it also carries with it superior energy demand and increased CO2 emissions and atmospheric pollutants.



**KEY TERMS**

Transportation	Freight	Passengers
Wagons	Trains	Corridors
Carrier	Commodity	Goods
Economic	Container	Express



**TERMINAL EXERCISE**

1. Describe how freight & transport.
2. What do you mean by wagons?
3. Define unit trains.
4. Explain drones.
5. Define space technology.
6. Outline the International North-South Transport Corridor.
7. Provide a description of the passenger services with their.
8. Bring out different types of rail freight transportation.



9. Sketch the Indian freight market size.
10. Discuss the importance of passenger movement in economic development
11. Freight transport plays concial role in India – Discuss.
12. Sketch the various types of wagons based on their services.
13. Discuss freight movement's contnibution towards economic development.
14. Highlight Investments/ Developments in the passenger movement segment.
15. Outline the innovations in rail transport.



## ANSWER TO INTEXT QUESTIONS

### 6.1

1. True
2. Vembanad Rail Bridge
3. Freight Corridor
4. Agriculture & perishables

### 6.2

1. Non Suburban Group
2. Indian Railways (IR) which operates the nation's railway system is a statutory body that falls under the ownership of the Ministry of Railways, Government of India.
3. Fourth
4. Gatimaan

### 6.3

1. Spine cars fetch intermodal containers or trailers in a single stack configuration. It is a car with a centre with side sills and lateral arms to support the intermodal containers.
2. Container wagons are flats especially fitted with securing equipment for transporting ISO containers.



### Notes

3. Unit
4. Shunting

#### 6.4

1. True
2. Dedicated freight corridor
3. Long
4. Double-stack

#### 6.5

1. Railroad line
2. Investor-friendly
3. Railroad
4. Gangapur

#### 6.6

1. Air journey
2. Maglev trains
3. Australia
4. Luxurious



### DO AND LEARN

Learners can undertake their activity work in the areas of Railways / CONCOR / CFS / Railway Intermediary organisations.

## INLAND WATERWAYS

Ever since the beginning, India has been one of the seafaring nations. Its seamen navigated far and near, transporting and widening Indian business and culture. India has a widespread network of inland waterways in the form of rivers, canals, backwaters and creeks. Freight shipping by waterways is extremely underutilised in the country as compared to developed nations. India's hinterland linkage is primarily based to surface and rail with national waterways together with coastal shipping and inland waterways playing a limited role. Waterways are cost efficient and environmentally friendly modes of shipping freight. In India, Inland Water Transport has the potential to alleviate the burden placed on railways and congested surface ways. In addition to commodities movement, IWT division also offers a convenient function in associated activities such as automobiles carriage (Ro-Ro), cross ferries and tourism.



### LEARNING OUTCOMES

After studying this lesson the learner:

- defines basic concept of inland waterways;
- identifies various types of Inland waterways;
- lists the port planning and operation of inland waterways;
- identifies the sources of inland waterways;
- predicts opportunities for inland waterways in India..

## 7.1 INTRODUCTION TO INLAND WATERWAYS

### 7.1.1 Transportation Management

The beating spirit of almost all businesses is transportation. People, finished goods,



components and raw materials are continuously on the move across towns and cities around the world. These are typically moved by container vessels, cargo planes, cargo trains, trailers of a variety of sizes, and pipelines. Transport generally deals with a) how manufacturers obtain the resources they require to construct their goods b) how merchants obtain the cargoes they require to reserve their shelves in warehouses, and c) how traditional and current internet businesses satisfy their consumers' orders. A Company's ability to manage the practice of constantly transporting cargoes competently and at a reasonable price which can easily make the difference between revenue and peril.

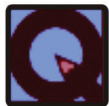
### 7.1.2 Transport Management in distribution chain management

Many people confuse transportation management with distribution chain management or logistics management. Others fail to recognize how it connects to enterprise resource management. However, transportation administration is neither identical nor entirely separate from these other sophisticated business processes. Transport is the movement of people, cargoes, and related goods from one location to another. Methods of transport comprise air, rail, surface, ocean, cable, pipeline and space. Transport management is important because it enables business among people and industries, which in turn create civilizations. Logistics and distribution chain can be defined to be the art and science of getting and delivering objects and cargo in the appropriate place and correct quantities. This definition comprises inbound as well as outbound progress. One of the most important factors, in both import and export trade, is a reliable logistics firm. When a firm needs to shift their cargoes to a regional or worldwide destination, these logistics firms are competent in offering the finest and the quickest method. They make sure that a firm reaches its final point on time without any damage.

### 7.1.3 Waterways

A waterway is a navigable body of water and an essential part of human activity. The reason is that during the times of prehistoric times and navigability it has permitted watercraft and canals to pass through every body of water. Having wide variety of waterways characteristics on Europe makes this category valuable for respectively the various classes of waterways. There is also a remarkable diversity of waterway characteristics in several countries of Asia, but there has not been any equivalent international drive for uniformity. Water transport in India has played a significant role in the nation's overall economy and is indispensable to foreign trade. India is endowed with a considerable network of waterways in the form of rivers, canals, backwaters, creeks and a long coastline accessible through the seas and oceans. It has the largest carrying capacity of any form of transport and is the most suitable method for carrying heavy

cargoes over long distances. It is one of the most economical modes of transport in India, as it takes advantage of natural tracks and does not require a huge capital investment in construction and maintenance except for canals. Its fuel effectiveness lowers operating costs and reducing the environmental impact due to carbon. India is surrounded by nearly 14500 km of inland waterways. Out of which only 5685 km are navigable by embattled vessels. Its vision is to increase the current cargo handling capacity from 55 MT in 2017-18 and 72 MT in 2018–19 to 100 MT by 2021–22 of India's 111 national waterways.

**Notes****INTEXT QUESTIONS 7.1**

1. \_\_\_\_\_ is referred to as the movement of people, cargo, and related goods from one location to another.
2. A \_\_\_\_\_ is referred as a navigable of water and an essential part of human activity.
3. Transport methods comprise air, rail, surface, ocean, cable, pipeline as well as \_\_\_\_\_.
4. India is surrounded by nearly \_\_\_\_\_ km of inland waterways.

**7.2 MEANING OF INLAND WATER**

The term “inland waterway” was introduced to navigable rivers and canals and was intended for inland waterway vessels, which were implied to have much smaller dimensions than seagoing ships. An inland waterway is a system in the form of rivers, canals, backwaters and creeks. It can be used for transportation instead of or in addition to roads and rails. Through the ages, rivers have served as adequate waterways, carrying people and goods over long distances. All of those waters such as lakes, canals, rivers, watercourses, inlets, and bays which are situated within the province of a state are contrasted with the open oceans or marginal waters bordering other states are subject to several sovereign rights of the bordering state. The interior of the water does not border upon the marginal or high oceans or is above the tide rise and fall. India has an extensive structure of inland waterways in the form of rivers, canals, backwaters and creeks. There are 14,500 km (9,000 mi) of navigable structure, out of which about 5,200 km (3,200 mi) of river and 4,000 km (2,500 mi) of canal.

About 44 million tonnes (49,000,000 short tons) of cargo are moved annually through these waterways using embattled vessels and country boats. Further, these cargoes are



transported in a systematic manner confined to a few waterways in Goa, West Bengal, Assam and Kerala. Inland waterways comprise of the Ganges – Bhagirathi – Hooghly Rivers, the Brahmaputra, the Barak River, the rivers in Goa, the backwaters in Kerala, indian waters in Mumbai and the deltaic part of the Godavari – Krishna rivers.

Inland waterways have played a central role in maritime development in India. Moreover, according to The National Waterways Act 2016, it has declared 111 river stretches, creeks, estuaries in India as National Waterways. Navigation in rivers, lakes and other water bodies by small vessels connecting places not far from each other has been around for centuries. It has been the backbone of our inland waterways. In a few cases, especially near ports and coastal areas, this has also become large-scale, commercial shipping.



### INTEXT QUESTIONS 7.2

1. An inland waterway is a system in the form of \_\_\_\_\_.
2. The National Waterways Act \_\_\_\_\_, it has declared 111 rivers, creeks, estuaries in India as National Waterways.
3. Through the ages, \_\_\_\_\_ have served as adequate waterways, carrying people and goods over long distances.
4. India has an extensive structure of inland waterways in the form of rivers, canals, backwaters and \_\_\_\_\_.

### 7.3 TYPES OF INLAND WATERWAYS

There are three types of inland waterways, namely rivers, rivers altered or canalised, and specially constructed canals.

- A. Rivers:** The rivers of our nation play a significant role in the lives of the Indian people and industries. The river systems provide irrigation, potable water, economical transportation, electricity, and offer livelihoods for a large number of groups all over the nation. This explains why the major is located the river banks. In Hindu myth rivers, the rivers play a significant role and are considered holy in the nation.
- B. Seven Major Rivers:** The major rivers such as Indus, Brahmaputra, Narmada, Tapi, Godavari, Krishna and Mahanadi) along with their numerous tributaries





make up the river system of India. Further, most of these rivers flow towards the Bay of Bengal. Few of the rivers move towards the western part of the nation and lead east of the state and become empty in and empty. The Ladakh parts situated in northern areas of the Aravalli range and the arid sectors of the Thar Desert, have inland drainage. All these eminent rivers of India generally originate from any of the three main watersheds. India's rivers can be classified by their origin and basin type.

**Table 7.1: Rivers of India**

Code	Basin Name
1	Indus (Up to border)
2a	Ganga
2b	Brahmaputra
2b	Barak and others
3	Godavari
4	Krishna
5	Cauvery
6	Subernarekha
7	Brahmani and Baitarni
8	Mahanadi
9	Pennar
10	Mahi
11	Sabarmati
12	Narmada
13	Tapi
14	West flowing rivers South of Tapi
15	East flowing rivers between Mahanadi and Godavari
16	East flowing rivers between Godavari and Krishna



Notes

17	East flowing rivers between Krishna and Pennar
18	East flowing rivers between Pennar and Cauvery
19	East flowing rivers South of Cauvery
20	West flowing rivers of Kutch and Saurashtra including Luni
21	Minor rivers draining into Bangladesh
22	Minor rivers draining into Myanmar
23	Area of North Ladakh not draining into Indus
24	Drainage Area of Andaman & Nicobar Islands
25	Drainage Area of Lakshadweep Islands

In earlier times, most of the inland transportation of commodities took place by water. This was because the vessels were small, the volume traffic limited, and the time factor was not particularly demanding. But during the 18th century, ships began to grow in size, trade developed and expanded, and the speed of carriage also became to be of greater importance. In general, canals were built to overcome river restrictions and also to provide many inland cities with water communications. In countries like England, which is familiar with canal construction, the structures of these innovative man-made waterways have become almost a mania. Though the concept of building the canal in the Continent arrived somewhat later, there are few examples of canals built early, e.g., in development 1681, the Canal du Midi was constructed in southern France.

Due to railways and road transport, there was a downfall in inland sea transport during the 19th century. However after a few decades, the ocean transport has tended to make a comeback, because it is connected with the economical and capacity of carrying bulk goods. In addition, the ocean transport industry had witnessed the developments of the canal Albert, the connecting between Zeebrugge and Ghent, and the canalisation of the Moselle, the Rhone Valley scheme, as well as other developments.

**C. Inland waterways in Asia**

Asia's inland waterways are as follows:

- a. **Asia:** Generally, Asia does not have a stretched structure of inland waterways, but in several nations, rivers are utilized as inland waterways.



## Notes

- b. China:** The Rivers have constructed an irreplaceable dedication to the development of business. The three eminent rivers, the Hwang-ho, the Yangtse-kiang and the Sikiang, move the nation from west to east. The river Yangtse-kiang is China's supreme river, the most important waterway for navigation in the nation. In China, nearly half of the populations lives in this fertile location and use this river. It has a network of canals which are the main mode of communication in Tibet, and with its tributaries finally drains the heart of China. Moreover, steamers route it upto Hankow. The river Sikiang which rises in the highlands is quite direct towards its mouth. It is stretched towards the crider area and Pei-ho is significant for communication and can be moved up to Tientsin.

### D. Northern India

The northern part of India is well endowed with three major navigable rivers.

- a. Ganga:** It is navigated by steamers till Kanpur from its origin. In addition , it flows towards the nation's most fertile and densely populated plain. Earlier, it was used ato transport cargoes and move people. Later on the growth of Indian railways has greatly reduceds the significance of steam navigation, particularly in the upper tier. Moreover, there is traffic all the time on the Lower Ganga and it is still seen as very imperative.
- b. The Brahmaputra:** The Brahmaputra flows towards the state of Assam and our neighbour nation Bangladesh. It is routed till Dibrugarh and its tributaries the Surma, which has made steam navigation possible in Sylhet and Cachar.
- c. The Indus:** The Indus flows from Pakistan and is navigable by steamer towards the Dera Ismail Khan in the area of North Western Frontier. This river is primarily used to trasport commodities such as wheat, cotton and wool. The regular movement of its bed and the structure of sand-bars has created steam navigation in the Indus river, which has been ignored.
- d. Burma:** This nation is very lucky in having a huge number of navigable rivers. The river Irrawaddy, which is the most significant and the biggest, is navigable by steamer agents for more than 800 km from its origin. Nation boats can move further.

### E. Development of National Waterways

With over 111 waterways (mean 5 existing waterways and 106 new waterways) declared



as National Waterways (NWs) under the National Waterways Act of 2016, which came into force in the year 2016, 12th April 2016 the nation & trying to develop its inland water transportations.

**Table 7.2: Operational National Waterways in the Country**

S. No.	National Waterway Number	Location	Length(Km)
1	<b>NW-1:</b> Ganga-Bhagirathi-Hooghly River System (Haldia - Allahabad)	Uttar Pradesh, Bihar, Jharkhand, West Bengal	1620
2	<b>NW-2:</b> Brahmaputra River (Dhubri - Sadiya)	Assam	891
3	<b>NW-3:</b> West Coast Canal (Kottapuram- Kollam), Champakara and Udyogamandal, Canals	Kerala	205
4	<b>NW-4:</b> Phase-1 development of the stretch Muktiyala to Vijyawada of river Krishna	Andhra Pradesh	82
5	<b>NW-10</b> (Amba River) <b>NW-83</b> (Rajpuri Creek) <b>NW-85</b> (Revdanda Creek - Kundalika River System) <b>NW-91</b> (Shastri river–Jaigad creek system)	Maharashtra	45 31 31 52
6	<b>NW-68 – Mandovi –</b> Usgaon Bridge to Arabian Sea <b>NW-111 – Zuari–</b> Sanvordem Bridge to Mormugao Port	Goa	41 50
7	<b>NW-73- Narmada river</b> <b>NW-100- Tapi river</b>	Gujarat & Maharashtra	226 436
8	<b>(NW-97):</b> Namkhana to AtharaBankiKhal	West Bengal	172



### INTEXT QUESTIONS 7.3

1. There are \_\_\_\_\_ types of inland waterways.
2. The Brahmaputra flows towards the state of \_\_\_\_\_ and our neighbour nation Bangladesh.
3. The \_\_\_\_\_ flows from Pakistan are navigable by steamer towards the Dera Ismail Khan in the area of North Western Frontier.
4. In general, \_\_\_\_\_ were begun to be built in order to overcome the restrictions of several rivers.



Notes

## 7.4 BENEFITS OF INLAND WATERWAYS

### A. The chief merits are:

- There is no need for any track to lay or to maintain such routes, though dredging may be essential in the instance of natural waterways;
- They may offer the only practicable routing system;
- Waterways, under constructive conditions, offer economical transport for commodities such as coal, ore, and timber, cement which is heavy, bulky and imperishable in nature.

### B. Other Merits

- Saving of Costs
- It is fuel and energy effective when compared to the other forms of transport.
- The cost of developing waterways is lower.
- Decreases the transportation and transition losses.
- Eco-Friendly.
- Low fuel utilisation per tonnekm.
- For trucks the emission of Carbon dioxide emission is 50%.
- No need of land required.
- Supplementary form of transport.



## Notes

- Reduces pressure on road and rail
- Reduces congestion and accidents on road
- It will offer optimal modal combinations covering ocean transport with modes.
- Superior connectivity: It creates seamless interconnectivity linking hinterlands besides navigable river coasts and coastal paths.
- Inland waterways holds tremendous potential for domestic goods transport, cruise services, tourism and passenger traffic.
- Growth of inland waterways will help create of employment opportunities.
- It symbolises a built in infrastructure network, which can be implemented without any additional capital investment.
- Congestion is reduced, there by reducing congestion on highways shifting goods away.
- Waterways do not involve land acquisition challenges.
- Waterways are an economical form of transportation vis-à-vis the available options, significantly decreasing cargo transportation prices.

#### 7.4.1 Demerits of Inland Waterways

- Rivers may entail devious routes and may stream in the wrong direction from the point of view of business;
- The navigable rivers may be interrupted by falls while canals need locks if there is variation in stages;
- River phase may vary seasonally and glacial might take place in winter creating closure in navigation;
- Canal construction comprises of heavy capital expenditure and canals need regular maintenance and at times to be dredged, and also need a water supply;
- Shipping by water is slow in recognition with most other methods of overland movement and carriage by water is normally unsuitable for fragile produce; and
- As being less adjustable in nature, it cannot simply adapt them to altering industrial areas.



Even though water transport is moved on to a greater or lesser grade the world over, there are only six main navigable structures of inland waterways

1. The rivers of western and Central Europe 2. The Volga-Don system 3. The North American rivers 4. The Amazon system 5. The Parana-Paraguay system, and 6. The Chinese waterways. In Europe and North America these inland waterways are the most developed whereas on other continents their progress is moderate.



### INTEXT QUESTIONS 7.4

1. Growth of inland waterways will create \_\_\_\_\_ opportunities.
2. The best way to improve inland waterways in Europe and \_\_\_\_\_.
3. Navigable rivers may be interrupted by falls while canals need locks if stages vary.
4. River phase may vary seasonally and glacial activity may occur in the winter creating closure in navigation

## 7.5 SCOPE OF INLAND WATERWAYS

India is gifted with several Inland Water Transport (IWT) alternatives that consist of rivers, canals, backwaters, creeks, and tidal inlets. India's share of cargo moved on inland waterways has the potential to increase when compared to other modes. It is important to increase the share of the nation's inland waterways as they are a cost-effective and environmentally friendly form of transport. Over the last five years our nation has increased the modal share of goods from 0.5 per cent to 2 per cent and has observed 19 per cent continuous year growth in goods volumes. Our nation is developing of nearly 5,000 kms of navigable inland waterways. These not only form a competitive choice form of transportation with 30 % less operating charges by railways and 60 % lower than road transport but it is also a sustainable method in cargo logistics as well as passenger transport. To develop and regulate inland waterways, in 1986, the Inland Waterways Authority of India (IWAI) was established.

The Indian government had notified 106 as added waterways as National Waterways by the Act of National Waterways but among all only five waterways acknowledged as National Waterways (NWs). Out of these 111 NWs spotlighted under the Act, several ways are operational for activities such as shipping, navigation of goods and passenger vessels and functions on those routes.

**A. National Waterway-1** (Ganga-Bhagirathi-Hooghly river structure from Allahabad to Haldia),



## Notes

**B. National Waterway-2** (River Brahmaputra from Dhubri towards Sadiya),

**C. National Waterway-3** (West Coast Canal from Kottapuram towards Kollam besides Udyogmandal and Champakara Canals) which has already been developed and equipped with fairways, navigational aids, jetties and terminals with automated equipment and handling amenities for stuffing and de-stuffing of cargo. In addition to NWs notification, the government has also taken steps to accelerate infrastructure growth.

**These comprises are:**

- Jal Marg Vikas Project (JMVP) for NW-1.
- Arth Ganga and Arth Brahmaputra for holistic and sustainable growth leveraging NW-1 and NW-2 for goods and passenger movement.
- Inland Vessels invoice.
- Utilisation of land guidelines for Inland Waterways (IWs).
- Dredging strategy for IWs.
- Encouraging private involvement in terminal execution and maintenance.

As a result, the total goods volume shipped through inland waterways in India attained 73.6 million tons per annum (MTPA) in 2019-20 and grew at a CAGR of 19 per cent over the past five years. Key factors contributing to this sector's growth are the availability of limited infrastructure, lack of inland vessels and non-availability of return goods. Further move governance problems due to overlapping authorities also drastically showed sector progress. Once seamlessly incorporated with other modes of transport, together with the coastal infrastructure, IWT can offer significant relief to congestion on the surface infrastructure. At present it not only functions as a supplementing method of transportation, but has influential perspectives in river and canal tourism; however, it should be tapped and identified its real potential. In order to deal with the above problems and further to move the goods and passenger through IWs, four sectors have been recognized.

**1. Enhancement and growth of infrastructure at 23 major NWs**

A stage wise strategy to enhance terminal and associated infrastructure among 10 functional NWs by 2025 has been created. Additionally 6 NWs that will be functional under the authority of state maritime boards have also been shortlisted for infrastructure





enhancement. Seven upcoming NWs which have the potential to unlock 13-15 MTPA of goods capacities have also been recognized for growth on priority basis. The preliminary works towards development are expected to be finished by 2024. In order to facilitate the goods movement among NWs various demand activation deals are also proposed.

## 2. Provincial linkage with Bangladesh, Nepal, Myanmar and Bhutan

Besides the NWs under development, NW-1 and NW-2 hold enormous importance as they link the neighbouring nations with India's hinterland. EXIM with nations like as Bangladesh, Bhutan, Myanmar and Nepal could benefit from these waterways.

- A. Bangladesh:** Currently movement between India & Bangladesh takes place under the Indo-Bangladesh Protocol on Inland Water in Transit and Trade agreement which associates NW-1, NW-2, NW-16 and NW-97. Under this Protocol, inland vessels of both countries can play on the appropriate protocol route and dock at Ports of Call in each country, advised for loading/ unloading of cargo. There has been significant improvement in the movement of cargo vessels in a coordinated manner on the protocol route carrying both transit cargo to northeast region and vice-versa and export-cargo to Bangladesh.
- B. Nepal:** The development of NW-1 from Varanasi to Halide/Sager under the Jal Marg Vikas Project (JMVP) has also opened up opportunities for transportation of Nepalese cargo to/from third countries via Kolkata Port using NW-1. Considering the availability and understanding of IWT mode for hinterland transportation, India and Nepal have defined Inland Waterways mode in the Treaty of Trade and Transit between the two countries.
- C. Myanmar:** The Kaladan Multimodal Transit Transport Project has been conceptualised by the ministry of external affairs (MEA) to provide alternative connectivity to the northeast region of India with the Kolkata port and the rest part of the country. The venture envisages a link between Haldia/Kolkata in West Bengal via an ocean route till Sittwe (539 km) in Myanmar. Further, via Inland Water shipping till Paletwa (158 km) and by surface from Paletwa towards the Indo-Myanmar Border till Mizoram (110 km). Phase-1 of the similar work has been already been accomplished under the growth rules.
- D. Bhutan:** The Inland Waterways connectivity through the Indo-Bangladesh Protocol (IBP) is of significant significance for Bhutan. As per the contract on business and journey between India and Bhutan, Dhubri on NW-2 is declared as an approved exit/ entry position in India for EXIM goods movement of Bhutan.



## Notes

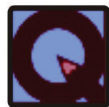
### 3. Development of terminal infrastructure for Ro-Ro and ferry services

The ability to move people and cargo seamlessly and cost effectively from originating point to destination is a key driver for growth and jobs. IWs could play a significant role in lowering the burden of transportation, making India's logistics more competitive. Currently, 145 million passengers are ferried between the nine states and the highest share is West Bengal accounts first, followed by Kerala and Maharashtra. The main success feature in the uptake of ferry services is structure mixture with other modes of transport and ensuring first and last mile connectivity. Globally, several countries like Australia, Norway, and Hong Kong have undertaken measures to integrate their ferry systems with other modes of transport. In Kochi, a single smart card has been used to connect ferry boat services to the Kochi Metro.

### 4. Policy interventions to incentivize development of the IWT sector

In order to encourage the uptake of IWT, the government needs to provide fiscal benefits to the operators and users. Reduction in taxes, removal of tax deviation, and flexibility in operations could act as an incentive to shift traffic from road/rail to IWT. Related measures have been undertaken in Europe to encourage the use of IWs.

**A. The way ahead:** India has prioritised development of 23 NWs in the next 10 years, which are expected to increase goods traffic. A set of globally benchmarked targets have been defined as part of MV 2030, to increase inland waterway traffic and improve the performance of the sector. In this lesson specific initiatives and a lesson by lesson road map will further and in achieving the set Key Performance Indicators (KPIs). With the suggested measures, share IWT can increase from 2 per cent at present to 5 per cent by 2030.



### INTEXT QUESTIONS 7.5

1. The Inland Waterways Authority of India (IWAI) was established in the year\_\_\_\_\_.
2. MTPA stands for \_\_\_\_\_.
3. Globally, several countries like Australia, Norway, and Hong Kong have undertaken measures to integrate their \_\_\_\_\_ systems with other modes of transport.
4. Reduction in \_\_\_\_\_ removal of tax deviations and operations flexibility could act as an incentive to shift traffic from road/rail to IWT.



Notes

## 7.6 SOURCES OF INLAND WATERWAYS

Inland waters are distributed among polar ice and glaciers, cordially exchanged groundwater, freshwater lakes, and human-made impoundments (farm ponds and reservoirs), saline lakes, soil water, marshes/wetlands, and rivers and streams, in decreasing volume. 1. Polar ice and glaciers 2. actively exchanged groundwater 3. freshwater lakes 4. human-made impoundments (farm ponds and reservoirs) 5. saline lakes 6. soil water 7. marshes/wetlands 8. rivers and streams

**1. Polar ice and glaciers:** The Himalayan region of India is home to some of the most evident glaciers in the world including Siachen Glacier, the second largest glacier on earth and largest in the Himalayas. The following list of the most significant glaciers in India. Most glaciers are situated in the province of Ladakh, surrounded by the states of Sikkim, Himachal Pradesh and Uttarakhand. Some glaciers one also found in Arunachal Pradesh.

### 7.6.1 SOURCES OF INLAND WATERWAYS (basis of origin)

The main sources of water in India on the basis of origin are as follows

**A. Himalayan Rivers:** The main Himalayan river systems are the Ganga. The Indus and the Brahmaputra rivers system. The Himalayan Rivers form large basins. Many rivers pass through the Himalayas. These in-depth valleys with vertical rock sides were created by the down cutting of the stream during the time of the Himalayan uplift. They carry out intense erosion movement up the streams and hold massive loads of sand and silt towards the plains, river cliffs as well as levees. These rivers are constant as they receive water from the rainfall and by melting of ice. Almost all of them construct massive plains and are navigable over the long distance. Moreover, these rivers are also connected with their upstream catchment location to produce hydroelectricity.

**B. Peninsular Rivers:** The major peninsular river structures comprising are 1. The Narmada 2. The Tapi 3. The Godavari 4. The Krishna, and 5. The Mahanadi Rivers. The rivers such as the Peninsular Rivers move towards the shallow valleys. A huge number of them are seasonal in nature as their stream is mostly dependent on rainfall. The purpose of erosion movement is also relatively less because of the general slope. The rock bed which is hard and a short of silt and sand which does not permit any important meandering. Many rivers therefore have straight and linear cause. These rivers provide huge opportunities for hydroelectric power.

**C. The Indus River System:** The origin of Indus lies in the northern slopes of the



## Notes

Kailash series in Tibet adjacent to Lake Manasarovar. It follows a north westerly course through Tibet. It penetrates towards the Indian border in Jammu and Kashmir and it creates a pleasing gorge in this location. Quite a number of tributaries such as the Zaskar, the Shyok, the Nubra as well as the Hunza unite it in the Kashmir province. It comes via the areas of Ladakh, Baltistan and Gilgit and crosses the Ladakh Range as well as the range of Zaskar. It passes through the Himalayas with a 5181 m in depth gorge adjacent to Attock. Iying north of the Nanga Parbat after that it takes a curve to the south west route before moving towards Pakistan. Both India and Pakistan are surrounded with a huge number of tributaries with an entire length of around 2897 km from the origin to the location of near Karachi where it finally enters into the Arabian Sea. The Jhelum, Chenab, Ravi, Beas and Sutlej are the foremost tributaries of the Indus in India.

- D. Jhelum:** From the south – eastern area of Kashmir ,the Jhelum originates, and. it moves towards the Wular Lake, which located in the north, and next towards Baramulla. Further, it moves towards an in depth gorge cut by the river Pir Panjal which located among Baramulla and Muzaffarabad. The right bank stream, the Kishanganga unites at Muzaffarabad. It moves towards the Indo – Pakistan territory and flows towards the plains such as Punjan, and at the end connect the Chenab at Trimmu.
- E. Chenab:** The River Chenab takes its birth from both rivers, such as the Chandra as well as the Bhaga, which these two originate from the BaraLacha Pass located in Lahaul. In Himachal Pradesh, it is also referred as the Chandranhaga. It moves parallel towards the Pir Panjal area in the north westerly route and bends via the location adjacent to Kishtwar. It penetrates the plains of Punjab adjacent to Akhnoor and after that it unites the Jhelum. Further it is connected by the Ravi as well as the Sutlej in Pakistan.
- F. Ravi:** The River Ravi commence adjacent to the Rotangand moves in the Kangra Himalayas and go after a north westerly course. It then bends to the south west, adjacent to Dalhousie, and then turns a gorge in the Dhauladhar area penetrating the plains in Punjab plain which is close to Madhopur. It moves as a division of the Indo – Pakistan territory for quite a distance before penetrating the Pakistan and uniting the river Chenab. The entire length of the river stretches around 710 km.
- G. Beas:** The River Beas begins from Beas Kund, located adjacent to the Rohtang pass. It moves past Manali as well as Kulu, where the gorgeous valley is referred to as the Kulu. It initially moves a North West route from the town of Mandi and next it moves towards a westerly path, before penetrating the plains of Punjab which is



## Notes

close to Mirthal. It unites the river Sutlej adjacent to Harika, after which it unites with few tributaries. The entire length of the river is approximately 615 km.

- H. Sutlej:** The Sutlej originates from the Rakas Lake, which is connected to the Manasarovar Lake by a stream, in Tibet. It moves on a north wester ndiration and enters. Himachal Pradesh at the Shipki Pass, where it is joined by the river Spiti. It cuts deep gorges in the range of the Himalayas, and finally enters the Punjab plain after cutting a gorge in a hill range, the Naina Devi Dhar. This where the dam Bhakra Dam which has a huge water reservoir called Gobind Sagar, has been built. It bends west below the river Rupar and is later joined by the Beas. In this way, Pakistan moves adjacent to Sulemanki and is further connected by the Chenab. It has an entire length of approximately 1500 km.
- I. The Structure of Brahmaputra River:** The Brahmaputra takes birth in the lake Mansarovar which is also the main source of the Indus and the Satluj. It is longer than the Indus, but the majority of its course is located outside India. It streams eastward, similar to the Himalayas and it reaches the area of Namcha Barwa (7757 m) and takes a cut around it and penetrates India in the state of Arunachal Pradesh and is called dihang. The u-turn made by this particular river is around 5500 metres. In India, it moves towards states such as Arunachal Pradesh, Assam, and is united by many tributaries. This river is called the Tsangpo in Tibet where it obtains less water and silt. As it of day a province with heavy rainfall the river carries a huge amount rainfall. The Brahmaputra is surrounded by a braided canal most of its length in the state of Assam. It has a few huge islands surrounded by the channel. The shifting of river direction is also extremely common. The river flow during of Assam and our adjacent nation Bangladesh.
- J. The Structure of Narmada River:** The River Narmada is located in the central part of India. It creates the customary boundary between North and South India, and is surrounded by 1289 km (801 mi) long. Out of the foremost peninsular rivers in India, Narmada, Tapti and Mahi function from east towards the west. It grows on the top of Amarkantak Hill which is located in the state of Madhya Pradesh for the first 320 kilometres (200 miles) of its route winds between the Mandla Hills, which creates the chief of the Satpura area: Jabalpur, which moves towards the 'Marble Rocks'. Further it penetrates the Narmada Valley linking the Vindhya and Satpura areas, and follows a straight westerly route towards the Gulf of Cambay with a length of 1312 kilometres (815 miles). It moves through three states such as Madhya Pradesh, Maharashtra and Gujarat, and it unites into the Arabian Sea towards the Bharuch district of Gujarat.



**K. The Tapi River System:** The River Tapi is located in central India. It is considered as one of the familiar rivers of peninsular with the total length of approximately 724 km, which passes through east to west. It begins in the eastern part of Satpura area of southern part of Madhya Pradesh, and arrives slowly in westward, draining towards the historic Nimar region Madhya Pradesh's, historic Khandesh of Maharashtra's and east Vidarbha locations in the northwest curve of the Deccan flat terrain and moves to South Gujarat before joining into the Gulf of Cambay, Arabian Sea, of Gujarat. The Western Ghats route begins from south of the river Tapti adjacent towards the border of states of Gujarat and Maharashtra.

The Basin Tapi River located mainly in the state of Maharashtra's northern and eastern districts through Amravati, Akola, Buldhana, Washim, Jalgaon, Dhule, Nandurbar, Malegaon, and district of Nashik and further moves towards Betul, Burhanpur districts of Madhya Pradesh and later enters Surat district in Gujarat as well. The principal stream of rivers of Tapi are Purna River, Girna River, Panzara River, Waghur River, Bori River and Aner River.

**L. The Structure of Godavari River:** The Godavari is often referred as the Vriddh or the Dakshine and it is the second largest river route in India. As the river moves towards the route of Ganga's tragedy, the name might be apt in several ways. The river's total length is around 1,450 km (900 miles) and it starts at Trimbakeshwar, close to Nasik and Mumbai in Maharashtra which is approximately 380 km distance from the Arabian Sea, but stream towards the southeast towards south part of central India through different states such as Madhya Pradesh, Karnataka, Orissa, Andhra Pradesh and at end unites into the Bay of Bengal. The river divides into two streams thus creating an extremely fertile delta at the place called Rajahmundry, which is 80 km from the coast. The banks of this river also have several pilgrimage sites similar to other major rivers in India, for example, Nasik, Triyambak and Bhadrachalam, which are considered as the major ones. Being brownish in nature, this river is seasonal in nature because it stretches during the monsoons and becomes dry at the time of summers. Few of its tributaries consists of Indravati River, Pranahita (mixture of Penuganga and Warde), Manjira, Bindusara as well as Sabari. Few significant urban centres on its banks comprises Nasik, Bhadrachalam, Rajahmundry as well as Narsapur. Asia's biggest rail cum surface bridge on the river Godavari connecting Kovvur and Rajahmundry is referred to as an engineering feat.

**M. The Structure of Krishna River:** The River Krishna is considered as one of the longest rivers of India with approximately 1300 km in length. It originates in Maharashtra at the palace Mahabaleshwar and moves via Sangli and gathers the sea at Hamsaladeevi, Andhra Pradesh in the Bay of Bengal. This moves via the





## Notes

states of Maharashtra, Karnataka as well as Andhra Pradesh. The customary source of the river comes from the mouth of a sculpture of a cow in the ancient holy place of Mahadev in Mahabaleshwar. Its most significant stream is the river Tungabhadra, which itself is created by the rivers Tunga and Bhadra which originate in the Western Ghats. Other streams are the Ghataprabha, Kouna, Musi, Bhima, Mallaprabha, Yerla, Warna, Dindi, and Dudhganga .

- N. The Structure of Kaveri River:** The Kaveri which is spelled Cauvery or Kavery is considered as one of the huge rivers of India and. This is also referred to as Dakshin Ganga. The main headwaters are situated in the Western Ghats series of the state of Karnataka State and it moves towards Tamil Nadu, It finally joins hands with the Bay of Bengal. This water has been supporting irrigated agriculture for centuries, and it has been the livelihood of the prehistoric kingdoms and current towns of South India. The main source of the river is at Talakaveri, situated in the Western Ghats which is approximately 5000 feet (1500 m) above sea point. Talakaveri is a renowned pilgrimage and tourist location set in the Brahmagiri Hills close to Madikeri in Kodagu locality of Karnataka. Thousands of devotees march towards the temple at the source of the river particularly on the particular day referred as Tula sankramana when the river has been viewed to flood out like a spring at a determined time. It streams normally south and east for approximately 765 km, and joins hands with the Bay of Bengal via two major mouths. Its basin is anticipated to be 27,700 square miles (71,700 km), and it has several streams comprising rivers such as Bhavani, Shimsha, Hemavati, Lakshmana Tirtha, Arkavathy, Kapila, Honnuhole, Kabini, Lokapavani, Noyyal and eminent Amaravati.
- O. The Structure of Mahanadi River:** The river Mahanadi is a part of eastern India. The Mahanadi originates in the Satpura series of central India, and moves towards the east of Bay of Bengal. Further this river drains most of Chhattisgarh and Orissa and also passes towards Jharkhand and Maharashtra. It consists of a length which is approximately 860 km.



## INTEXT QUESTIONS 7.6

1. The main Himalayan river systems are the \_\_\_\_\_.
2. The origin of the Indus lies in the northern slopes of the \_\_\_\_\_.
3. The rivers such as the Peninsular Rivers move towards the \_\_\_\_\_ valleys.
4. The river Mahanadi is a part of \_\_\_\_\_ India.



## 7.7 ISSUES, CHALLENGES AND WAY FORWARD OF INLANDS WATERWAYS

### 1. Issues and Challenges

- A. Estimation charges:** In connection of operating charges per ton-km, IWT has lower charges than cargo train and road modes. This is however, a Nevertheless, in the charges. There exist two features which evaluate how freight moves on surface versus on ocean: i) A surface journey is straight while oceans bend and curve; hence the change among freight charges for IWT and surface / railways is not much ii) Charges of freight related to stuffing and de-stuffing
- B. Insufficient depth:** To be considered a navigable inland route it, needs adequate depth the year. Nevertheless, in their normal state, several Indian river lack the level of water which requires widespread dredging. Besides, Indian rivers (particularly rivers located in the northern plains) face severe issues siltation through the year
- C. Force on other activities:** Comprising dams and farming, water in rivers has a forceful demands. It may be necessary to restrict the use of water for such other activities in order to maintain the water levels on the said rivers so that they will operate as inland waterways.
- D. Insufficient Air Draft:** Numerous bridges with less vertical clearance might hinder the passage of superior inland water transport ships on several inland waterways such as NW 3.
- E. Lack of night navigation:** Night navigational services and markings are also a major problem.
- F. Lack of IWT ships:** Ship building is extremely capital intensive and faces difficulties in obtaining venture finance from banks and other financial Organisations.
- G. Scarcity of MRO amenities:** There is a severe scarcity of Maintenance, Repair and Revision (MRO) amenities for IWT ships.
- H. Insufficient industries:** Insufficient number of manufacturing units on the riverside, particularly not all along the Brahmaputra is a main discouragement holding back inland waterways growth. At the National Strategy Dialogue on trans-boundary collaboration connected to the rivers of Ganga and the Brahmaputra, it was highlighted that due to insufficient manufacturing capacity, there is no commitment by private agents.





## Notes

**I. Insufficient funds:** The process of dredging and infrastructure for IWT need enormous investments. The funding for this sector from the public and private source appears to be very low.

**J. Ecological Impact:**

- a. The operations of dredging will harm river beds, and can direct and alter habitats for diverse aquatic flora and fauna.
- b. Further this dredging might also force aquifers along the river, there by reducing the ability of water to percolate underground.
- c. During capital dredging, the removal of river bed substance can cause surplus saline water to enter rivers or estuaries. This is one of the reasons why the Kerala government opposed several of its proposed waterways.
- d. The building of jetties and river ports will lead to removal of trees/ mangrove forests in the location. For instance, at the port Dharamtar which is in NW10, for building a jetty, the mangrove forest area on the bank has been removed.
- e. Other ecological matters include pollution owing to oil and diesel from ships, leakage and spilling of goods.

**Note:** Dredging is an activity of digging underwater which removes rock, mud, silt, sediments etc. Dredging is used to create a canal in the river bed of the required depth.

**K. Social impact:**

- a. Ecological forces can end the livelihoods of people or industries who rely on the rivers and streams. For instance: impact on fishing groups of people, mainly relying on riverbeds cultivation.
- b. Dislocation is another major concern as land is required for amenities like ports, jetties, and other related infrastructure.
- c. Collaborating with public-private joint ventures has the main role to play in the growth of the inland waterways division. Private sectors can initiate terminal development, goods and passenger handling, and less-draft ships and related repair amenities.
- d. Certain measures should be taken for the development of basic infrastructure,



which address sophisticated technological blockage and preservation of rivers to ensure year-round navigability.

- e. To create the availability of flawless, multimodal last-mile links to and from the surrounding area to decrease trans-shipment charges and make inland water transport cost-effective.
- f. Consignment transport via inland waterways should also be incentivized. For this reason, the following measures can be taken into consideration :
- g. To utilise this form for a portion of their consignments, the respective Government can mandate or incentivize these units in the vicinity of national waterways.
- h. The government can support manufacturing corridors besides the riverbanks and promote waterways-related industrialization.
- i. High road taxes can be imposed on shipping of coal and inflammable substances over long distances.
- j. The government should focus on the development of passenger terminals, provide financial assistance to ferry operators to enhance the safety, and assist insurance coverage in order to improve passenger transport.
- k. In states such as Assam and Kerala certain measures should be taken to encourage river tourism.
- l. Bearing in mind the concerns, it is imperative to assess the ecological and social impact of growth of inland waterways and related infrastructure to negate possible damage.

#### L. Other Implementation Challenges

- a. The canal draft of the national waterways is not at standard level at 2 metres throughout the year, as is needed. Few of these streams are seasonal in nature and do not provide navigability throughout the year. Approximately 20 out of the 111 reliable national waterways have apparently been found not feasible.
- b. In addition, all the recognized waterways rely upon rigorous capital and maintenance dredging, which could be opposed by the domestic community on ecological grounds, comprising dislocation fears, thereby creating execution challenges. Moreover, these water resources have significant competing uses,



## Notes

viz. required for living, irrigation, and power creation etc. It would not be feasible for the state government/others to overlook these requirements.

- c. The exclusive authority of the Central Government is merely in connection to transportation and navigation on inland waterways which was acknowledged to be 'national waterways' by an act of Indian Parliament. In other waterways that are surrounded by the parallel list or under the authority of state governments, ships can be used or sailed.
- d. As each revering structure is unique and provides varied challenges, separate studies related to a complete micro-level scrutiny to evaluate viability must be done for each, before taking up execution. An efficient waterways system would require drawing up a healthy coordinated approach on harmonising line flanked by the national system and other waterways. The said plan should closely glance into the several undercurrents, comprising competing requirements, feasible domestic resistance and also work intimately and in harmonisation with respective state governments. This will enable fast and successful execution of this significant national venture.



## INTEXT QUESTIONS 7.7

1. \_\_\_\_\_ building is extremely capital intensive.
2. Collaborating with \_\_\_\_\_ has the main role to play in the growth of inland waterways division
3. The building of jetties and river ports will lead to removal of \_\_\_\_\_ forests in the location.
4. There is a severe stortege of Maintenance, Repair and Overhaul) amenities for \_\_\_\_\_ ships.



## WHAT YOU HAVE LEARNT

- Transport is the movement of people, cargoes, and related goods from one location to another. Methods of transport include air, rail, surface, ocean, cable, pipeline as well as space. Transport management is important because it enables business among people and industries, which in turn create civilizations.



Notes

- A waterway is a navigable of water and an essential part of human activity. The reason is the during the times of prehistoric times and navigability it has permitted watercraft and canals to pass through every body of water. Europe is a continent with a huge variety of waterway characteristics, which makes this category valuable to respect the different classes in waterway.
- An inland waterway is a system in the form of rivers, canals, backwaters and creeks that can be used for transportation in place of or in addition to roads and rails. Through the ages, rivers have served as adequate waterways, carrying people and goods over long distances.
- India is gifted with several Inland Water Transport (IWT) alternatives that consist of rivers, canals, backwaters, creeks, and tidal inlets. India's share of cargo moved on inland waterways has the ability to enhance when compared to other modes. It is significant to boost the share of the nation's inland waterways as they are extremely reasonable and an eco-friendly form of transport.
- The major peninsular river structures comprising 1. The Narmada 2. The Tapi 3. The Godavari 4. The Krishna, and 5. The Mahanadi rivers.
- Issues and Challenges of Inland waterways are 1. Estimation charges 2. Insufficient depth 3. Force on other activities 4. Insufficient air draft 5. Lack of night navigation 6. Lack of IWT ships 7. Scarcity of MRO amenities 8. Insufficient industries 9. Insufficient funds and 10. Ecological impact.



KEY TERMS

Transportation	Waterway	Goods
River	Glacier	Navigable
Sea	Peninsular	Polar ice
Stream	Lake	Ponds



TERMINAL EXERCISE

1. Sketch the different types of Inland waterways
2. Discuss the development of National Waterways



3. Highlight the navigable structures of inland waterways
4. Write a note on the Tapi river system
5. Bring out the social impact of inland waterways
6. List out the merits of inland waterways
7. Highlight the scope of inland waterways
8. Bring out the sources of inland waterways
9. Explain the Peninsular Rivers in detail
10. Spotlight the issues and challenges of inland waterways



**ANSWER TO INTEXT QUESTIONS**

**7.1**

1. Transportation
2. Waterway
3. Space
4. 14500

**7.2**

1. Rivers
2. 2016
3. Rivers
4. Creeks.

**7.3**

1. Three
2. Assam
3. Indus
4. Canals

**Notes****7.4**

1. Employment
2. North America
3. Locks
4. Navigation

**7.5**

1. 1986
2. Million tons per annum
3. Ferry
4. Taxes

**7.6**

1. Ganga
2. Kailash
3. Shallow
4. Eastern

**7.7**

1. Ship
2. Public-private joint venture
3. Trees/mangrove
4. IWT

**DO AND LEARN**

Learners can undertake their activity work in the areas of inland transportation / warehouse / distribution organisations .

## INDIAN INLAND WATERWAYS

Inland waterways have played a central role in maritime growth in India. The National Waterways Act 2016 has declared nearly 111 waterways or river extensions, creeks and estuaries in India national waterways. Navigation in lakes, rivers, and other water bodies by small ships linking positions not far apart has been around for centuries. This has been the foundation of our inland waterways. In some cases, particularly near ports and coastal locations, this has also progressed to large-scale business shipping. The national waterways venture intends to commercial shipping and navigation structures on all these waterways. These are anticipated to recognize the potential of commodity and passenger traffic, comprising tourism and cruise. They will provide seamless linkage at a lower per-unit price and construct transportation more competently. The scheme, in its whole execution and operation stage, would create a sequence of forward and backward connectivity with prospects to reach deep into the economy.



### LEARNING OUTCOMES

After studying this lesson the learner:

- explains structure and location of inland waterways;
- assesses the ocean and their effects on coast, port and waterways infrastructure;
- discuss the NOC's for structures on inland waterways;
- examines climate change and its effect on the coast;
- explains the coastal structures and shore protection.

### 8.1 STRUCTURE OF INDIAN WATERWAYS

As per The National Waterways Act, 2016, specified that nearly 111 inland waterways (NWs). 106 were during 2016. Further, the NEW system covers approximately



**Notes**

20,275.5 km. NW-1, 2 & 3 are already operational. On these waterways, cargo, passenger and cruise ships operated. For development of NW-4 & 5 a detailed scheme report was completed in 2010 and in 2014, the NW 5 was updated. Moreover, techno-economic possibility studies have been commenced for the newly confirmed 106 NWs. The National waterways in India has handled nearly 55 million tonnes (MT) of cargoes in 2017-18 and 72 MT in 2018-19 respectively, and anticipated to attain nearly 100 MT during 2021-22.

The Inland ways can be recognized based on their relevant water flows which are as follows the major rivers of India are:

- Rivers which are flow towards the Arabian Sea: Narmada, Tapi, Sindhu, Sabarmati, Mahi, and Purna.
- Rivers flowing into the Bay of Bengal: Brahmaputra, Yamuna, Ganga, Meghan, Mahanadi, Godavari, Krishna, Kaveri.

**8.1.1 Rivers flowing into the Bay of Bengal**

*Table 8.1: Rivers flowing into the Bay of Bengal*

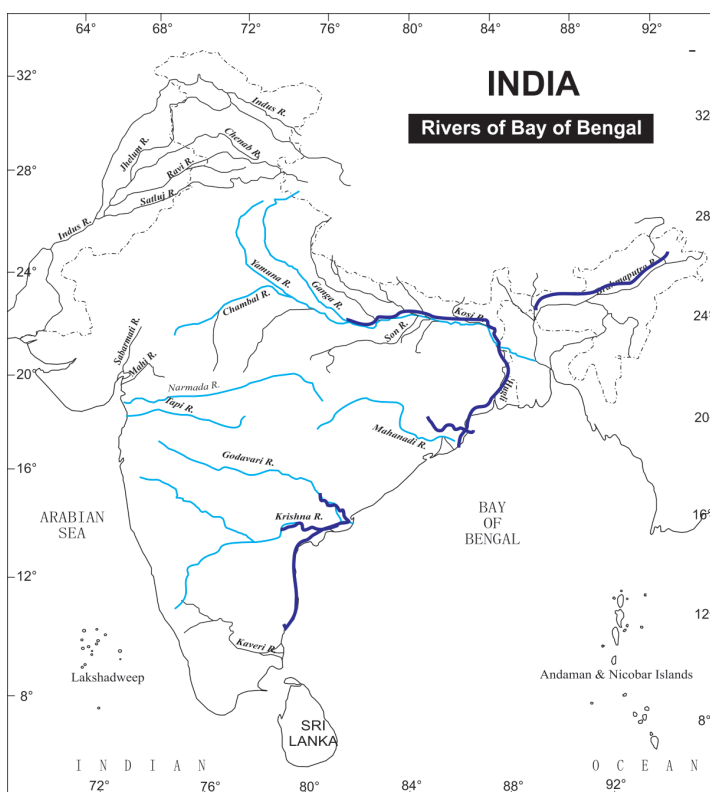
S. No.	Rivers flowing into the Bay of Bengal
1	Meghna River Basin (To name a few Padma, Dhaleshwari, Gumti, Surma etc.
2	Ganges River Basin (To name a few Ganga, Hooghly, Damodar, Jalangi etc.
3	Brahmaputra River Basin (To name a Beki, Bhogdoi, Dhansiri, Kolong etc.
4	West Bengal Coastal (To name a few Subarnarekha, Kangsabati, Hughli, etc.
5	Odisha Coastal (To name a few Baitarani, Bhargavi, Brahmani, Daya etc.
6	Godavari River Basin (To name a few Purna, Bandiya, Wardha, Taliperu etc.
7	Krishna River Basin (To name a few Koyna, Venna, Bhima, Varada etc.
8	Pennar River Basin ( Pennar river )
9	Kaveri River Basin (To name a few Kaveri, Kollidam, Amaravathi, Bhavani etc.
10	Tamilnadu Coastal Rivers (To name a few Thamirabarani, Palar, Vaigai, Vaippar etc.

Data Source: Computed





Notes



**Fig. 8.1: Rivers of Bay Bengal**

**8.1.2 Rivers flowing into the Arabian Sea**

**Table 8.2: Rivers flowing into the Arabian Sea**

S. No.	Rivers flowing into the Arabian Sea
1	Indus Basin (To name a few Indus, Panjnad, Chenab, Suru etc..)
2	Narmada River Basin (To name a few Kharmer, Silgi, Temur, Hiran etc..)
3	Mahi River Basin (To name a Mahi, Som, Gomati etc..)
4	Sabarmati River Basin (To name a few Sabarmati, Wakal, Hamav etc..)
5	Tapi River Basin (To name a few Tapi, Gomai, Girna, Purna etc..)
6	Maharashtra Coastal rivers (To name a few Shastri, Savitri, Ulhas, Surya etc..)
7	Coastal rivers of Goa (To name a few Mandovi, Baga, Mapusa, Chapora etc.)
8	Karnataka Coastal Rivers (Kali, Netravati, Sharavathi, Gangavalli etc..)
9	Kerala Coastal Rivers (To name a few Periyar, Pamba, Chaliyar, Karyangod etc.)

Data Source: Computed



Notes



## INTEXT QUESTIONS 8.1

1. The National Waterways Act came into force during \_\_\_\_\_.
2. The Yamuna Rivers flows into \_\_\_\_\_.
3. Goa's costal rivers are \_\_\_\_\_, Baga, Mapusa, and Chapora
4. The river Narmada flows towards the \_\_\_\_\_ Sea.

## 8.2 MAJOR INLAND WATERWAYS OF INDIA

Inland waterways crucial role in maritime development in India. The network consists of natural rivers as well as artificial constructed canals as links as well as important ports as nodes. The major inland waterways in India are as follows:

### 8.2.1 NATIONAL WATERWAY (NW-1)

In the year 1986 the Ganga - Bhagirathi - Hooghly river structure which is operated between Haldia (Sagar) and Allahabad (1620 km) was announced as National Waterway-1 (NW-1). Ever since then IWAI has been performing several developmental works on the waterway for the development of its navigability and also for the growth and preservation of other infrastructure related to navigation aids and terminal amenities as spotted according to the 82 of 1985 ,IWAI Act. During the financial year 2017-18, the significant works executed for the maintenance and improvement of fairways, navigational substances and terminal amenities on NW-1 are as follows:

#### A. Development of Fairway:

With the intention of smooth and safe navigation, a fairway of targeted depth and width has been created or maintained on NW-1. Tribeni-Chunar (1226 Kilometers) falls under NW-1, and they have undertaken River Conservancy services such as bandaling and dredging. In addition the length between Haldia (Sagar) – Tribeni (196 km) which is tidal and considered to be the Least Available Depth (LAD) with a depth than 3.0 meters. IWAI was not undertaking any works related to River Conservancy ahead of Chunar to Allahabad stretch. This is excluding the day canal marking as the dredgers owned by IWAI are being utilised in lower stretched areas of NW-1 owing to better traffic demand. Moreover, the day navigational aids were also offered towards the complete stretch of NW-1 from Haldia (Sagar) towards Allahabad (1620 km).



Notes

During the year 2017-18, the works of Bandalling of 3,900 m in the location of Tribeni - Rajmahal (399 km) extension and 18,300 m in the area of Rajmahal-Chunar (827 km) extension were implemented for the growth and maintaining the navigation canal (fairway), besides few canals were stabilised. Moreover, the 1.46 lakh m<sup>3</sup> dredging in the connecting canals of Tribeni – Rajmahal and 7.24 lakh m<sup>3</sup> dredging in the canal Rajmahal - Varanasi /Chunar extensions were executed by appointing the IWAI’s dredgers.

**B. Dredging in development through pipeline on National Waterway-1**

The particular of Least Available Depth (LAD), which was administered for several stretches of NW-1 is spotlighted below:

**Table 8.3: Dredging in development through pipeline on National Waterway-1**

S.No	Stretch	Kms	Metres
1	Haldia – Farakka stretch	560	2.6 m to 3.0 m
2	Farakka – Badh stretch	400	2.1 m to 2.5 m
3	Barh – Ghazipur stretch	290	1.6 m to 2.0 m
4	Ghazipur – Chunar/Allahabad	370	1.1 m to 1.5 m

Data Source: Computed

**C. Goods Movements:**

The shipping of coal for the power plant, NTPC, has been undertaken since November, 2013 from sand heads (Bay of Bengal) towards Farakka via the National Waterway–1. During the financial year 2017-18 approximately 1.60 lakh tonnes of Coal which is imported up to July, 2017 has been effectively shipped by the eminent organisation M/s Jindal ITF Ltd. Further for such movements, barges capacity of 1500 – 2000 tons were utilised. Furthermore, around 30 lakh tons of goods cargo including of food grains fly ash, & general commodities are moved among India and Bangladesh via the National Waterway - 1 and Indo-Bangladesh regulation path under the Inland Water Transmit & Business Moreover, as trial shipment, bagged cement of 240 tons shipped from Kolaghat situated on the river Rupnarayan (NW-87) towards the Bhagalpur on Ganga river (NW-1) as well as bagged fly ash with 300 tons from the Kahalgaon (NW-1) towards Kolaghat of eminent organisation M/s Dalmia Bharat Cements has been made by IWAI’s low draft cargo ship namely MV VV Giri based on consultancy services for better strategy and execution assistance for commercialization of NW-1.



**Notes**

**8.2.2 NATIONAL WATERWAY 2**

On 1st September, 1988, the famous Brahmaputra River which has a length of 891 Km flows along the Bangladesh Border and towards the Sadiya was announced as National Waterway no. 2 (NW-2). IWAI is performing several expansion works on the waterway to enhance navigabilities under the Act 82 of 1985. Further, IWAI is trying to maintain a navigable waterdepth of around 2.5m in the Border of Bangladesh-Neamati (629 Km), 2.0 m in the canal between Neamati to Dibrugarh (139 Km) and 1.5m in the area of Dibrugarh – Sadiya (Uriamghat) extension. Currently, this waterway is being utilised by ships by both government and private sectors such as Govt. Of Assam, Army Border Security Forces, Tourism firms and other private service providers. Tourist vessels such as Long cruise generate voyages among Pandu and Majuli Island adjacent to Neamah regular only. During certain months say October to May, over dimensional goods are also shipped via this waterway

**A. Navigation services**

In order to offer the safe navigation for several goods vessels, tourist ships with overseas tourists, local standard service by private service providers and mechanised nation boats, day navigation spots with bamboos along with navigational lights are attached on nation boats have been offered from Border of Bangladesh towards Dibrugarh as spotlighted below:

*Table: 8.4: Navigation services*

S. No.	Stretch and Distance in KM
1	Bangladesh Border - Pandu (255 km)
2	Pandu- Neamati (374 Km)
3	Neamati-Dibrugarh(139 km)
4	Dibrugarh- Sadiya (123 Km)

**8.2.3 NATIONAL WATERWAY 3**

**A. Brief explanation:**

For a successful navigation on Inland Waterways, there are mostly three needs. These are as follows:

- i) Navigable fairway towards inland ships movement,



Notes

- ii) Aids to ensure safe navigation and
- iii) Terminals for stuffing / de-stuffing of goods at several locations along the waterway.

The current amenities on NW-3 are listed below:

### **B. Navigable Fairway:**

For navigation in NW-3, a navigational route of 38m width and 32m in narrow with 2 m depth is to be created. It was predicted that 40 lakh cu. m of investment dredging would be necessary to develop to navigation route of this size over a length of approximately 87km. As of 2014, July the IWAI has performed around 36 lakh cu.m dredging for around 80 km shoal length. By this, while the targeted depth of two metres has been offered to the NW-3, the stretching of the navigation route to the needed width of 32 metres is still to be completed in a length of 2 km in the location of

- a) Alappuzha (Karuvatta and Mullackal villages).
- b) 1.50 km in Kayamkulam Kayal, and
- c) 2.75 km from to Chavara.

The remaining shoals of approximately 6 km are at

- a) Alappuzha/Kuttanad (2 km) at Kayamkulam Kayal location
- b) (1.5km) in Alappuzha District and at
- c) Chavara (3.5km) in the Kollam District, for which the work is under progress.

### **C. Aids to Navigation:**

The complete path length of NW-3 has been equipped with aids to assist 24 hours per day.

### **D. Terminals:**

Out of the entire 11 terminal locations eight have already created at the locations of Kottapuram, Thrikkunnapuzha, Aluva, Maradu (Kochi), Cherthala (Thanneermukkom), Vaikom, Kayamkulam (Ayiram Thengu) and Kollam. Further, the building of one terminal at Alappuzha, kerala is under progress at a price of Rs.9.04 crores and as of July 2014, 88% of the jobs have been completed. Terminals at outstanding two spots specifically Kakkanad as well as Chavara are projected to be built in the next stage after firming up the supply of goods. For efficient and supported private division participation, execution



and maintenance of IWT terminals at Aluva, as well as Vaikom have been hired from the KSINC (A Govt. of Kerala Undertaking).

Further, to decongest the city of Kochi and to offer a substitute transport path for the container terminal, Vallarpadam, IWAI has set up a couple of Ro-Ro terminals at Willingdon Island and in Bolgatty in association with the Cochin Port Trust. In the year 2011, a route was successfully executed in order to ship the containers in this path.

#### **8.2.4 NATIONAL WATERWAY 4**

**National Waterway 4 (NW 4) was announced during the year 2008, 25th November.**

The canals of Kakinada-Puducherry stretch which combines the Bhadrachalam - Rajahmundry extension of River Godavari as well as Wazira Vijayawada widening of River Krishna with 1078 km)

##### **A. Development in phases**

**Phase 1:** Stretches between Muktyala towards Vijayawada (Krishna River) (82 Km)

**Phase 2:** Widening between Vijayawada towards Kakinada and Rajahmundry to Polavaram with 233 Km.

##### **B. Subsequent Phases:**

- The extending between Commamur & Buckingham Canals and the remaining segment of the Rivers Krishna as well as Godavari
- Improvement works in Phase-1 widens from Muktyala towards Vijayawada of river Krishna River are under progress.
- For the development of NW-4 on 14th April'2016, an MOU was signed with the government of Andhra Pradesh.

**C. NW-4 stretched by National Waterway act on 2016:** Amended length 2890Km

##### **Added Reaches:**

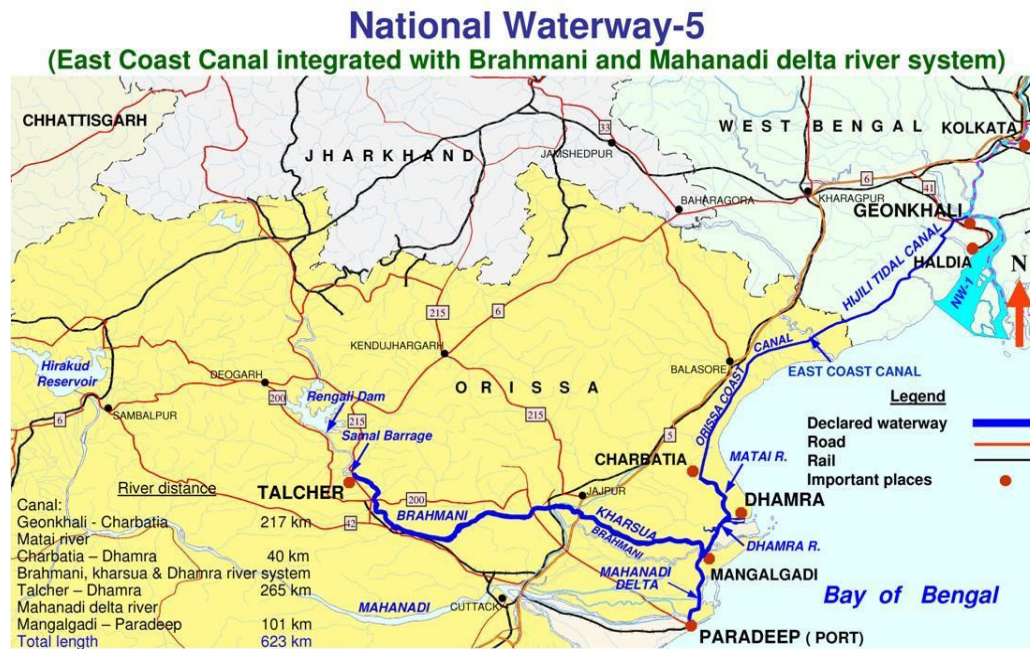
- Widened of Krishna river from Wazirabad towards Galagali with 628 KM
- Stretched Godavari river from Bhadrachalam towards Nasik with 1184 Km
- Feasibility studies on Techno-economic are under progress for this widened area of NW-4





### 8.2.6 NATIONAL WATERWAY 5

Salient characteristics of National Waterway No. 5 - Brahmani River as well as Mahanadi delta structure besides with East Coast Canal (NW-5). The Talcher- Dhamra which widens stretch Brahmani river, Geonkhali- Charbatia widen of East Coast channel, between Charbatia and Dhamra expansion of river Matai and Mangal Ghadi-Paradip broaden of rivers Mahanadi Delta of NW-5 with 623 km.



**Fig. 8.2: National Waterway 5**

- National Waterway 5 (NW 5) was announced on 25.11.2008
- Comprehensive venture report was done by M/s. WAPCOS

**Total Length** – 588 km.      **River area** (371 km)      **Canal area** (217 km)

**Estimated price (atv2009 prices)**

- Charges for improvement of River area Rs.2230 Cr (Barrages – 1843 Cr)
- Charges of development of channel Portion Rs.1979 Cr (Dredging – 1273 Cr)
- Total Charges Rs.4209 Crore.
  - Time period of Completion – maximum 7 years
  - Land acquirement: in West Bengal – 846 Ha essential
  - Anticipated charge of land acquisition – Rs.176 crore



**Notes**

**A. Dredging details**

River area – 10.07 million cum

Channel Portion – 44.77 million cum

**B. Barrages**

To preserve LAD of 2 m in the river Brahmani throughout the year, nearly 5 barrages with equal heights to the maximum flood level are planned to be built at each 26 km among Talcher as well as Jokadia. Moreover, every barrage will have a navigational security device or locking system to permit the passage of two 500 tone ships at a time.

**C. Potential of cargo**

The most significant potential cargo which is carried in this waterway is coal and makes its journey from Talcher towards Dhamra as well as Paradip port. Instantly after the enhancement of the waterway, it is anticipated in the DPR that approximately 11 million tonnes of goods can be shipped per year which can move up to 23 million tonnes in subsequent 15 years or so.

**D. EIRR**

River area 31.77%

Channel Portion 12.75%

River and Channel together 23.75

**a. The activities of Phase – I are as follows:-**

- The Phase-II of detailed Hydrographic Survey from Talcher towards Pankapal with 120 Km length was completed in the month of October, 2020.
- The Phase-I monthly Thalweg Survey from Pankapal towards Dharma and Paradip through Mangalgadi with 230 km per month.
- Consultancy for generation of DPR comprising FEED for creation of
  - 4 Weirs cum Barrages with 3 Navigation locks
  - 2 Check Dams and
  - 1 Rubber Dam with Nav. Lock (Phase-I)



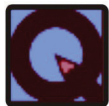


- Consultancy for creation of DER comprising DEDD for amendment or Reconstruction of Bridges on NW-5 (Phase-I) which is already existing.
- The studies related to Phase-I, EIA / EMP flanked by Paradip, Dhamra as well as Pankapal (Fairway development).
- Phase-I NW-5 by Shifting or repositioning of HT / LT Power lines. This work was assigned to Govt. of Odisha under the deposit basis.

### E. NATIONAL WATERWAY 6

In the North Eastern Region, the Barak River is considered as the second largest river. It begins from the south part of Kohima which is situated near the border of Nagaland – Manipur. After moving towards Nagaland, Manipur as well as Assam, it divides at the place Bhanga into two canals referred as Surma and Kushiya. These two canals reunite at Markuli in Bangladesh and after that the river is referred as Meghna. The river Barak – Meghan structure has a full length of 900 km (beginning upstream at Chandpur in Bangladesh). Out of 524km total in India, it lies nearly 31 km on the border between Indo – Bangladesh and the further is in Bangladesh. Out of the total 524 km which is surrounded in India, 403 km passes through the hilly terrain, Lakhimpur which is not navigable in nature. The navigable area of river Barak in India is the stretch of 121km among the Lakhimpur and Bhanga which was announced as NW-16 during the year 2016.

For the development of infrastructure on NW-16, execution of several ventures has already been commenced. In order to widen the area between Silchar – Bhanga, the dredging work is under progress and approximately 65% works have been finished. DPRs for enhancing the floating terminals between the Karimganj and Badarpur besides with automatic handling and storage amenities for goods have been prepared. For the enhancement of IWT, a multimodal terminal at the prime area of Silchar is also designed.



### INTEXT QUESTIONS 8.2

1. Inland waterways have played a crucial role in the \_\_\_\_\_ development in India.
2. In the \_\_\_\_\_, the Barak River is considered the second largest river.
3. On 1st September, \_\_\_\_\_, national waterways 2 was announced.
4. For the development of NW-4 on 14th April' 2016, on MOU was signed with Govt. of \_\_\_\_\_.



**Notes**

### **8.3 ROLE OF INLAND WATERWAYS AUTHORITY OF INDIA**

For the development and regulation of inland waterways for shipping and navigation, the Inland Waterways Authority of India (IWAI), with its headquarters in Noida, came into existence on 27th October 1986. Further, the Authority mainly undertakes ventures for enhancement and maintenance of IWT infrastructure on the national waterways via grants obtained from the Ministry of Shipping. Its regional and sub offices are located at in Patna, Kolkata, Guwahati and Kochi. It has sub-offices at Kollam, Allahabad, Swroopganj, Varanasi, Silchar, Farakka, Sahibganj, Haldia, Hemnagar, Dibrugarh, Dhubri, Bhubaneswar and Vijayawada.

India is equipped with 14,500 km of navigable waterways including rivers, channels, backwaters, streams, etc. Annually, with the assistance of Inland Water Transport (IWT) nearly 55 million tonnes of goods are being moved. It is also viewed as a fuel-efficient and environmentally friendly form. Its functions are restricted to a few widening areas in the

1. The river Ganga-Bhagirathi-Hooghly
2. The river Brahmaputra
3. The river Barak
4. The rivers in Goa
5. The backwaters in Kerala
6. The inland waters in Mumbai and
7. The deltaic provinces of the rivers Godavari - Krishna Rivers.

Further these organisations are executed by automatic ships; nation boats of several capacities also function in several rivers and channels. A substantial amount of goods and passengers are shipped in this unorganised division as well.

#### **8.3.1 Functions of IWAI**

##### **A. National Waterways**

- Survey
- Navigation, Infrastructure and Regulations
- Fairway Development
- Pilotage
- Coordination of IWT with other modes



Notes

**B. General**

- Advise Central Govt.
- Carry out hydrographic surveys
- Assist State Governments
- Develop consultancy services
- Research & Development
- Classification of waterways
- Standards & safety

**8.3.2 Consideration for declaration as National Waterways**

For the declaration of a national waterway, the committee on National Transport Policy suggested the following principles:

- It should acquire navigation competence by automatically propelled ships of a reasonable size.
- It must have an approximately 45 m wide canal and a minimum 1.5m depth.
- There should be continuous stretch of nearly 50 kilometers. There is some exception in waterway length in conglomerations as well as intra-port traffic.
- It should move and serve two States (or).
- It should link an enormous and wealthy hinterland and Major Ports (or).
- It should enter via a strategic province where enhancement of navigation is considered essential to provide logistic assistance for national security (or).
- It should link locations not served by other forms of transport.

The Committee of National Transport Policy had considered the following waterways as having the potential for confirming as national waterways:

- The Sunderbans
- The Mahanadi
- The Narmada
- The Mandovi, Zuari rivers and Cumberjua Canal in Goa
- The Tapi,



To establish the prospects and viability of the waterway, feasibility studies to hydrographic surveys and techno economics are conducted. Widespread surveys and investigations have been executed on all the above-mentioned waterways on the basis which was announced as national waterways, specifically the rivers Ganga, the Brahmaputra and the West Coast Canal. During the current period, several new waterways are being converted into national waterways.



**INTEXT QUESTIONS 8.3**

1. India has a total of \_\_\_\_\_ kilometers navigable waterways.
2. IWAI was formed on \_\_\_\_\_.
3. For the declaration of a national waterway, it must have an approximately 45 m wide canal and a minimum depth of \_\_\_\_\_.
4. The Inland Waterways Authority of India is situated in \_\_\_\_\_.

**8.4 NOC'S FOR STRUCTURES**

Under the National waterway 1, there exists 36 structures which are announced as National Further waterway 2 there are nearly 3 structures and under the National waterway 3 it has a total of 25 structures, where as in National waterway 4 there exists a total of 9 structures, in National waterway 5 it consists of only one and in National waterway 3 the extension is total of 5. For the sake of reference maximum three structures were mentioned.

**Table 8.5: NOC's For Structures**

S. No.	Waterways	Name of Structure	Location
1	National waterway 1	Construction of Road Bridge of NHAI at Nakhwa (Varanasi)	at Ch: 1302 Km near Nakhwa across river Ganga in Ghazipur-Varanasi stretch of NW1
2	National waterway 1	Construction of 6 lanes Cable Stayed Road Bridge at Bansberia, Kalyani (WB).	at Ch: 191.30 Km D/s of existing Iswar Gupta Setu in Haldia-Farakka stretch of NW-1, Bansberia, Kalyani



Notes

<b>3</b>	<b>National waterway 1</b>	Construction of tower foundation of 400 KV D/C Rajarhat-Purnea overhead transmission lines under ERSS-V by Power Grid Corporation of India, Kolkata.	Across river Bhagirathi between Rasulpur Char and Sunderpur Char near Behula Rly station under Nadia and Hooghly (W.B.) at Ch. 226 km in Tribeni-Swaroopganj stretch of NW-1
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*Table 8.6: National waterway 2*

S.No	Waterways	Name of Structure	Location
<b>1</b>	<b>National waterway 2</b>	Construction of Intake well for South East Guwahati Water Supply Project.	At Ch: 265 Km near IOCL Gate, Sector-1, Guwahati
<b>2</b>		Laying of transmission line upstream of Naranarayan Setu,	U/s of Jogighopa Bridge, (NW2, Class-VII ); Ch. 108km Jogighopa
<b>3</b>		Construction of passenger ropeway between Guwahati and North Guwahati	U/s of Umananda, Guwahati (NW2, Class-VII ); Ch:260 km

*Table 8.7: National waterway 3*

S. No.	Waterways	Name of Structure	Location
<b>1</b>	<b>National waterway 3</b>	Construction of Thottappally - Naluchi Bridge across Pamba River in Alappuzha	chainage- 124 km



**Notes**

<b>2</b>	<b>National waterway 3</b>	Construction of foot Over bridge across NW-3(TS Canal) for MS unit of KMML at Chavara	Chainage- 166.0 km
<b>3</b>		Laying of power cable across TS canal through Horizontal Directional Drilling Method	Chainage- 166.0 km

**Table 8.8: National waterway 4**

<b>S. No.</b>	<b>Waterways</b>	<b>Name of Structure</b>	<b>Location</b>
<b>1</b>	<b>National waterway 4</b>	Construction of Bridge	Krishnapatnam, Nellore (Dt.), A.P. Buckingham Canal (Under Class-II)
<b>2</b>		Construction of Pipeline Bridge	Km 14 R&B milestone near sugar factory Samalkot A.P., Samalkot canal (Under Class-I)
<b>3</b>		Construction of Bridge	Thamminapatnam (vill), Nellore (Dt.) A.P., Buckingham Canal (Under Class-II)

**Table 8.9: National waterway 5**

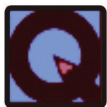
<b>S. No.</b>	<b>Waterways</b>	<b>Name of Structure</b>	<b>Location</b>
<b>1</b>	<b>National waterway 5</b>	Construction of Railway Bridge	Near Barachira High School (near Ghoshpukur), Hijli Tidal Canal (Under Class-II)



Notes

Table 8.10: National waterway Extension 3

S.No	Waterways	Name of Structure	Location
1	National waterway Extension 3	LAC -ADS-Koothu Mukkal-Chirakkal- Cherupuzha Thodu project Augmentation scheme in painoor Kayal lift irrigation project in Edathiruthy Panchayat of Kaipamangalam Constituency- Sanction for pipeline crossing through PC Canal	Chainage- 22.5 km in extended stretch of (Kottapuram to NW-3 Kozhikode)
2		Underground cable crossing Canoli Canal to Kerala state Electricity Board Ltd. Thrissur	Chainage - 5.0 km in extended of NHW-3 (Kottapuram to Kozhikode)
3		Construction of Bader Palli Bridge across Canoli Canal in Malappuram District	Tanur in Malappuram District



### INTEXT QUESTIONS 8.4

- National waterway 1 contains \_\_\_\_\_ structures.
- There are \_\_\_\_\_ structures in the National waterway 4
- Construction of Bandra pali bridge across Canoli canal in malappuram district is a National waterway extension of \_\_\_\_\_.
- Construction of Railway Bridge near barachira high school, hijli tdal canal is a national waterway extension \_\_\_\_\_.

## 8.5 NEW WATERWAYS OF INDIA

### I. 106 NEW WATERWAYS

India has a widespread network of inland waterways in the form of rivers, channels,



backwaters and streams. Of the entire canal's navigable length of 20,236 km, nearly 17,980 km and rivers and around 2,256 km of channels can be utilised by automatic crafts. Cargo transportation by waterways is extremely under-used in the nation as compared to nations and economically developed provinces like the United States, China as well as the European Union. Our national waterways are healthy and will become lifeline of the nation. In addition to fulfilling our country shipping obligations but they can also act, as recreational hubs.

During the development of this phase, the ministry of shipping, Govt., has been involved. Govt. Of India has directed the IWAI to recognize possible waterways in India. Consequently, nearly 106 newly discovered waterways were recognized by the IWAI and reported to the MoS. In respect to this, as per the 2016, National Waterways Act was circulated in the Extraordinary, Part II, Section I, Gazette of India, as an Act No.17 of 2016.

### 8.5.1 Status of 106 new National Waterways

As part of the preliminary work enhance of 106 newly established National Waterways, IWAI has assembled them under 7 of 3 classifications as follows:

- A. Group – I:** Under group I, nearly 8 waterways which are measured to be the most feasible and can be picked up for enhancement in Phase-I. Consequently, consultancy. Projects for preparing EPC tender manuscripts agreement and ecological studies for these waterways are also being undertaken.
- B. Group – II:** These waterways are located in the coastal provinces and have few tidal widening works considered for the development in this group. This group includes 60 coastal rivers and (nearly 14 rivers in Sunderbans have been applied as a waterway and the expansion of West Coast channel has been identified in NW-3, creative 46 new waterways of the region). Moreover, these 60 rivers based on their geographical locations have been separated into 8 clusters.
  - (i) Rivers related to DPR stages, stage-1 feasibility study based on feasibility stage II DPR studies were awarded. In relation to Stage-1 viability reports, preparation of stage II Detailed Venture Report for nearly 24 National Waterways has already been awarded.
- C. Category – III:** Waterways located in isolated, inaccessible & hilly provinces are included into this class. Further, these 54 rivers/channels (rivers such as Krishna and Godavari have been integrated as on expansion of NW4, resulting 52 existing waterways which is in the catalogue of 106 waterways) have further been subdivided





into several clusters and originally only viability studies related towards these waterways have been awarded.

- a, Viability reports are being finalised and the proper strategy is developed based on the result of these reports.

State-wise details of the National Waterways are as follows:-

**Table 8.11: State-wise details of new National Waterways**

S. No.	State	Name of the River / Canal	No of Rivers /Canals
1	Andhra Pradesh	Pennar and Tungabhadra	2
2	Arunachal Pradesh	Lohit	1
3	Assam	Aai, Barak, Beki, Dhansiri / Chathe, Dehing, Dikhu, Doyans, Gangadhar, Jinjiram, Kopili, Lohit, Puthimari, Subansiri and Twang (Dhaleswari)	14
4	Bihar	Gandak, Ghagra, Karamnasa, Kosi, Punpun and Son	6
5	Delhi	Yamuna	1
6	Goa	Chapora, Cumberjua, Mandovi, Mapusa, Sal and Zuari	6
7	Gujarat	Jawai-Luni - Rann of Kutch, Mahi, Narmada, Sabarmati and Tapi	5
8	Haryana	Indira Gandhi Canal and Yamuna	2
9	Himachal Pradesh	Beas, Ravi and Sutlej	3
10	Jammu & Kashmir	Chenab, Indus, Jhelum and Ravi	4
11	Jharkhand	Kharkai and Subarnarekha	2

## MODULE - 2

### Transportation-2



#### Notes

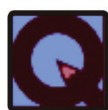
### Indian Inland Waterways

12	Karnataka	Bheema, Ghataprabha, Gurupur, Kabini, Kali, Malaprabha, Netravathi, Panchagangavali (Panchagangoli), Sharavati, Tungabhadra and Udayavara	11
13	Kerala	AVM Canal, Alappuzha-Changanassery Canal, Alappuzha-Kottayam – Athirampuzha Canal and Kottayam-Vaikom Canal	4
14	Maharashtra	mba, Arunawati - Aran, Dabhol Creek - Vashishti River, Kalyan-Thane-Mumbai Waterway - Vasai Creek - Ulhas River, Manjara, Nag, Narmada, Penganga - Wardha, Rajpuri Creek, Revdanda Creek - Kundalika River, Savitri (Bankot Creek), Shastri River - Jaigad Creek, Tapi and Wainganga – Pranahita	14
15	Meghalaya	Ganol, Jinjiram, Kynshi, Simsang and Umngot (Dawki)	5
16	Mizoram	Tl Wang (Dhaleswari)	1
17	Nagaland	Tizu – Zungki	1
18	Odisha	Baitarani, Birupa - Badi Genguti - Brahmani, BudhaBalanga, Mahanadi and Subarnarekha	5
19	Punjab	Beas, Indira Gandhi Canal and Sutlej	3
20	Rajasthan	Indira Gandhi Canal, Jawai-Luni - Rann of Kutch and Luni	3



Notes

21	Tamilnadu	VM Canal, Bhavani, Kaveri - Kollidam, Manimutharu, Palar, Pazhyar, Ponniyar, Tamiraparani and Vaigai	9
22	Telangana	Bheema, Manjara, Penganga - Wardha, Tungabhadra and Wainganga – Pranahita	5
23	Uttarpradesh	Asi, Betwa, Chambal, Gandak, Ghagra , Gomti, Karamnasa, Tons, Varuna and Yamuna	10



**INTEXT QUESTIONS 8.5**

1. India has a widespread network of inland waterways in the form of \_\_\_\_\_, channels, backwaters and streams.
2. Nearly \_\_\_\_\_ newly created waterways were recognized by the IWAI
3. The canal Yamuna is located in \_\_\_\_\_.
4. No rivers / Canals in Assam are \_\_\_\_\_.



**WHAT YOU HAVE LEARNT**

- The National Waterways Act, 2016, for the determination of inland water transport 111 officially designated Inland National Waterways (NWs) and 106 were created during 2016. Further, this updated system covers approximately 20,275.5 km. and namely NW-1, 2, & 3 are already in operational. On these waterways, cargo, passenger and cruise ships are operate.
- Inland waterways have played a crucial role in maritime development in India. It comprises of natural rivers as well as artificial constructed canals as links and corresponding significant ports as nodes



**Notes**

- For the development and regulation of inland waterways for shipping and navigation, the Inland Waterways Authority of India (IWAI), with its headquarters in Noida, came into existence on 27th October 1986. Further, the Authority mainly undertakes ventures for enhancement and maintenance of IWT infrastructure on the national waterways via grants obtained from the Ministry of Shipping.
- India is stetched with 14,500 km of navigable waterways including rivers, channels, backwaters, streams, etc. Annually, with the assistance of Inland Water Transport (IWT) nearly 55 million tonnes of goods are being moved. It is also considered to be a fuel - effectiveness and enviromentally-friendly.
- Under the National waterway 1, there exist 36 structures which are announced as National Further in National waterway 2 there are nearly 3 structures and under the National waterway 3 it has a total of 25 structures, where as in National waterway 4 there exists a total of 9 structures, in National waterway 5 it consists of only one and in National waterway 3 the extension is total of 5.
- India has a widespread network of inland waterways in the structure of rivers, channels, backwaters as well as streams. Of the entire canal’s navigable length of 20,236 km, nearly 17,980 km are rivers and around 2,256 km of channels can be utilised by automatic crafts. Cargo transportation by waterways is extremely under-used in the nation as compared to nations and economically developed provinces like the United States, China as well as the European Union.



**KEY TERMS**

Transportation	Waterways	Navigation
River	Goods	Cargo
Inland	National	Coastal
Canal	Channel	Backwater



**TERMINAL EXERCISE**

1. What is navigation?



Notes

2. Explain the need for national waterways.
3. Define “The Barak River”.
4. What is the full form of IWAI?
5. Explain National Waterway 5.
6. Sketch the rivers flowing into the Arabian Sea.
7. Explain the National Waterways 1.
8. Mention the functions of the inland waterway authority of India.
9. Discuss the NOC structures of the national waterway 4.
10. Outline the development phases of national waterways 4.
11. Spotlight on the rivers flowing into the Bay of Bengal Sea.
12. Discuss national waterways 3 in detail.
13. Point out the main factors to consider when delaring them as National Waterways.
14. Describe the role of IWAI in developing Indian waterways.
15. Highlight the status of new National Waterways.



ANSWER TO INTEXT QUESTIONS

8.1

1. 2016
2. Bay of Bengal
3. Mandovi
4. Arabian

8.2

1. Maritime
2. North Eastern Region
3. 1988.
4. Andhra Pradesh

**Notes****8.3**

1. 14,500
2. 27th October 1986
3. 1.5m
4. Noida

**8.4**

1. 36
2. Nine
3. 3
4. 5

**8.5**

1. Rivers
2. 106
3. Delhi
4. 14

**DO AND LEARN**

Learners can undertake their activity work in the areas of different inland transportation /warehouse /distribution organisations.

## MODES OF AIR TRANSPORTATION

Air transport is one of the quickest means of public transport across worldwide boundaries. Air transport allows people and businesses from different nations to cross global boundaries and travel to other nations for personal, trade, medical, and tourism purposes. Despite the fact that air transport offers the fastest means by saving voyage time, another feature of air transportation is that it enhances the comfort level of the passengers and business. There are several air transportation in India. Besides the airline sector there are different types of air transport available in India including commercial aircraft, helicopters, private planes, blimps, glider, rocket, zeppelin, parachute and competitive environment. Every company offers a variety of amenities to attract passengers and business. Few years ago, it was difficult to recognize the requirements and desires of passengers and business. But with the rise of social media, passengers and organisations are sharing their opinions on social media platforms about different modes of airline amenities. This is when they travel or send their commodities through such airlines. As a result, sharing these sorts of information plays an enormous role in increasing the competitiveness between the airline industries. Travelers and traders will also be able to benefit from these services and amenities.



### LEARNING OUTCOMES

After studying this lesson the learner:

- defines the air transportation;
- classifies various air transportation systems;
- identifies the importance of air transport;
- identifies top airlines in India;
- describes valuable solutions for airlines.



**Notes**

## 9.1 AIR TRANSPORTATION – INTRODUCTION

Air transport is a significant enabler of economic growth and development. It facilitates the integration into the world economy and offers very significant connectivity on a national, regional, and international scale.



**Fig. 9.1: Air Transportation**

It generates trade, promoting tourism, and sector employment opportunities. This transport is considered one of the most modern approaches to transport. Further, it is the gift of the 20th century to the globe. The World has given tremendous force to air transport development in almost all nations. Air transport does not require a specific location track for operations. Further more political borders are also irrelevant, despite observing the requirements of international law. The most significant benefit of air travel is its speed. It is one of the fastest forms of transport but the price of its operation is extremely high. Therefore, it is appropriate for only wealthy passengers, mail, light and expensive cargo. However, in sophisticated nations like the U.S.A., Germany, etc. It provides a tough opposition to the railways.

### 9.1.1 Characteristics of air transport

**1. Air transport has the following characteristics:**

- A. Unbroken Journey:** An unbroken journey over land and sea. It is considered the fastest and quickest mode of transport.
- B. Speed:** All modes of transportation, air transport has the highest speed.
- C. Expensive:** Air transport is the most costly mode of transport and it requires huge investment in procuring air planes and constructing airports.





Notes

**D. Special Preparations:** Air transport needs special grounding like

- a) motor links,
- b) meteorological stations,
- c) flood lights, and
- d) searchlights etc.



**Fig. 9.2: Characteristics of Air transport**

**9.1.2 Development of Air Transport**

Air transport is the modest means of transport; this refers to the fact that this transport was introduced in 1903 but converted into full modes of transporting the passengers and freights in the 1930s. The use of air transportation began after the Second World War (WW11) and was used by both national and international flights.

Of all the trasport developments which took place during the 20<sup>th</sup> century, air transport has been the main striking ones. Who would have imagined that?

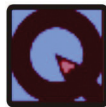
- When did the Wright brothers make their historic aeroplane in 1903?
- The aeroplane would become one of the most imperative modes of passenger transport within merely three generations?

Moreover these improvements have been rapid : jet engines with recovered propellers, introduction of radar systems, the size of aeroplane which has been



converted to jumbo proportions; supersonic speeds have been attained and vertical take-off is now feasible.

At present, across the world, air transport is heavily used by both passengers and freight. Generally, there are two types of services: those which operate for particular considerations on an ad hoc basis and those which operate on regular programs. During the summer it will be used for tourists and mineral deposits in inaccessible mines and manufacturing areas. However, the latter category would include services operated by top world airlines. The route of both kinds would also radiate from developed provinces and especially from the world's largest capital and manufacturing centres. As much as possible, they mark the shortest distance among places and thus utilise the large Circle routes to economise both time and fuel. Several cities, including London, New York, Cairo and Bangkok have acquired major international airports and numerous others are developing their own global airport facilities. In low locations, where there is complex terrain, air transport makes communication feasible and has a correspondingly significant. Offers very pronounced connectivity on a national, regional, and international scale.



### **INTEXT QUESTIONS 9.1**

1. On a national, regional and international scale \_\_\_\_\_ Provides a very important level.
2. Air transport is the \_\_\_\_\_ means of transport.
3. Air transport is the smallest means of transport; this refers to the fact that it was introduced in the year \_\_\_\_\_.
4. Air transport is the most costly mode of transport and requires huge \_\_\_\_\_.

### **9.2 DEFINITION**

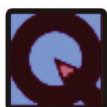
Air transport is one of the greatest modes which help to transport passengers as well as freight through the air using aeroplanes, jets, rockets, helicopters, and drones. Each of these kinds of air transport has a specific way of achieving speed and the sustainability of its voyage. However there are other categories of air transport which may or may not be utilised for conveying goods, but could be used for recreational considers, they comprises of, hot air balloons, hang gliding, blimps, gliders, parachuting etc.



Notes

**Table 9.1: Air transportation definition**

S. No.	DEFINITION
1.	Air transportation means the trade of transporting natural persons, property, goods and mail by aircraft.
2.	Air transportation refers to the carriage by aircraft of passengers, baggage, goods, and mail, separately or in mixture, held out to the public for payment or hire, which, shall comprise of both scheduled and non-scheduled services.
3.	Air transportation means the carriage of persons, property, cargo, express, or mail by aircraft.
4.	Air transportation means domestic or international air transportation or the transportation of mail by aircraft.
5.	Air transportation means inter- state or foreign air transportation
6.	Air transportation means “foreign air transportation, interstate air transportation, or the transportation of mail by aircraft.
7.	Air transportation means the operation of a transportation system by aircraft for the carriage of persons, property and mail, including activities reasonably necessary to such operation.
8.	Air transportation means inter- state air transportation, foreign air transportation, or the transportation of mail by aircraft



**INTEXT QUESTIONS 9.2**

1. Air transportation means the carriage of persons, property, \_\_\_\_\_, express, or mail by aircraft.
2. Air transportation means \_\_\_\_\_ air transportation.
3. Air transport is used extensively across the world by both passengers and \_\_\_\_\_.
4. Air transportation means the trade of transporting natural persons, property, goods and mail by \_\_\_\_\_.



Notes

### 9.3 TYPES OF AIR TRANSPORTATION

The types of air transport are as follows

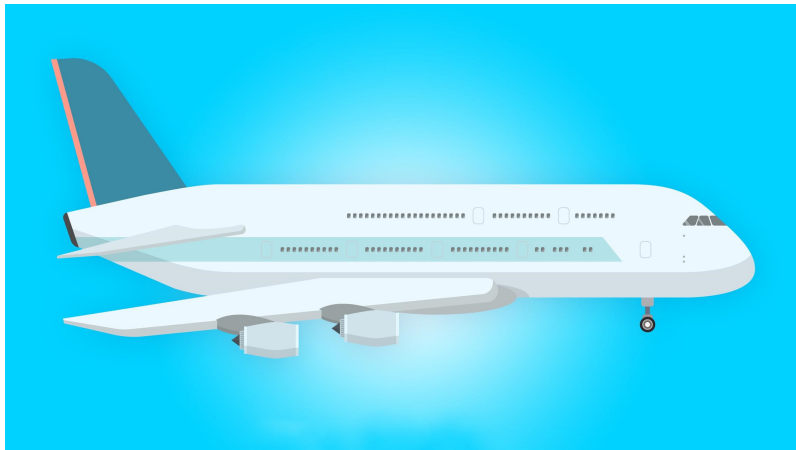
**A. Commercial aeroplanes :** These are the common routes passengers take through the air. Commercial planes offer a fast means of transportation compared to other forms of transport such as road, rail and ocean transport. Aeroplanes can carry hundreds of people from one spot to another at a time; the seating can sometimes be divided into two or four classes. For instance, most national flights usually have two categories First Class and Economy Class. Global flights may have up to four classes such as First Class, Club Class, Business Class, Premium Economy and Economy Class. There are separate cargo planes operated by leading airlines.



**Fig. 9.3: Types of air transport**

**B. Helicopters:** Helicopters are another quicker means of air transport; they shift people and cargo through the air. When compared with other commercial aircraft, helicopters are much more limited in nature. When it comes to passenger divisions it can only transport a few people at a time, whereas some economic aeroplanes can carry hundreds of people at a time.

**C. Private planes:** Private planes are designed to offer transportation service for a single person or at most a maximum of five (5) people at a time. Private planes range from the smallest Cessna to comfort jets such as the Citation CJ1, which can carry around five people in leather-seated comfort. These planes provide comfort and privacy during the journey from one location to another for business or pleasure.



**Fig. 9.4: Private planes**



### Notes

- D. Blimps:** Blimps and hot air balloons are utilized to transport people for recreational purposes. They cover a limited area which prepares tourists to glance at a location on a larger scope. This is than if they tried to see the area from the ground. Blimps used to be a form of commercial transport but they are no longer used.
- E. Glider:** A glider, is a type of glider aircraft utilised in the sport of gliding or for recreational purposes. Sailplanes by nature are aerodynamically streamlined and one competent at gaining altitude when flown in rising air. Some gliders are made of the aluminium, alloy or composite frame covered with synthetic sailcloth which forms the wings.
- F. Rocket:** A rocket is any type of vehicle that utilises a rocket engine. It comprises a missile, spacecraft or air crafter. Rockets have been used since the 13th century for small-scale armed applications and recreational displays. Rockets perform more in space than in the atmosphere; the engines perform by action and reaction of pushing the rockets upward by expelling their exhaust in the opposite direction, and can therefore work in the vacuum of space.
- G. Zeppelin:** A Zeppelin was a form of rigid airship named after the German Count Ferdinand von Zeppelin. It comprises a cigar-shaped, trussed, and covered structure supported by internal gas cells. Count Ferdinand von Zeppelin designed the Zeppelin in the early 20th century. Zeppelins resemble blimps, but they differ in two ways: Zeppelins consist of a metal skeleton with a rigid covering, and they utilize hydrogen gas to float. These two ingredients make zeppelins taller than blimps.
- H. Parachute:** This is a fabric canopy that is filled with air and permits a person, package or heavy object affixed to it to descend slowly when dropped from an aeroplane, or which is freed from the rear of an aeroplane on landing to act as a



brake. Back then, the military had developed parachuting technology as a way of saving aircrews from the emergencies aboard balloons and aircraft in flight, and later as a means of delivering soldiers to the battlefield. Currently, parachuting is one of the most successful activities and as a spirited sport in various locations.



### **INTEXT QUESTIONS 9.3**

1. \_\_\_\_\_ planes are designed to offer transportation service for a single person or at most a maximum of five (5) people at a time.
2. A Zeppelin was a form of rigid airship named after the German Count \_\_\_\_\_.
3. A \_\_\_\_\_, which is also called a sailplane.
4. \_\_\_\_\_ and hot air balloons transport people recreationally.

### **9.4. IMPLICATION OF AIR TRANSPORTATION**

Organisations in the aviation industry are looking for employees with a diverse range of professional qualifications. Beyond this, air transportation also secures employment and value generation in developed nations as a business location. This is because air transport links people and markets worldwide.

Aviation is of great importance to developed nations as a trade location. Aviation organisations provide employment for hundreds of thousands of workers with wide diversity of professional qualifications. However, the real importance of air transport moves far beyond jobs in aviation. Air transport contributes significantly people's individual mobility and thus enhances international understanding and cultural exchange. Moreover, aviation links developed nation companies with key vendors and sales markets all over the globe. Air cargo plays a crucial role in trade with almost all countries in the world.

**A. Economic growth:** Air travel, the world's fastest transport network, are critical for trade, tourism and economic growth. Every day, around 128,000 aeroplanes take off, carrying 12.5 million passengers and \$18 billion in trade.

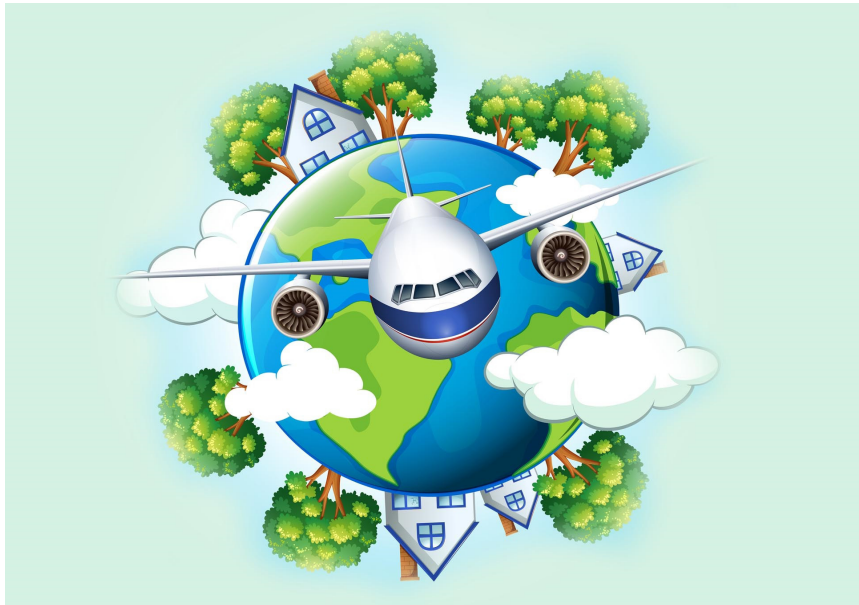
**B. Social development:** From the USA to Fiji, aviation connects people together which permits all to visit friends and family, experience the Globe's cultures and offers access to better healthcare and education. Employment in the air shipment sector ranges from technical and engineering positions to customer service work, and requires a variety of diverse skills. Several roles in the aviation industry are need of highly qualified employees with significant training.



- C. Environmental efficiency:** Around 2% of human-generated CO<sub>2</sub> emissions arrive from aviation. The entire sector is dedicated to combating climate change, by investing in sophisticated technology and infrastructure, improving effectiveness, and improving sustainable aviation fuels. Aviation is directing the way with efforts to enhance its environmental performance. It was considered as one of the first businesses to have ambitious worldwide goals and a strategy for decreasing its impact on climate change.



Notes



**Fig. 9.5: Environmental efficiency**

The aviation industry has made significant progress in term of fuel and CO<sub>2</sub> efficiency, halving the amount of fuel utilised per flight compared to 1990. In other words, an airplane today would create just 50% CO<sub>2</sub> compared to a same flight back in 1990. This has been achieved through technological development and executions and infrastructure improvements. Even though, aviation emission have increased, as the quantity of air traffic (both passenger and goods) has increased. Most development has occurred in emerging economies, as they began to reap the benefits of air travel.

Trade and tourism are imperative drivers of global economic growth. As more people become wealthy, their appetite for the journey in the world would increase. The organisation's climate action structure is designed to help find the balance among the two goals - economic development through connectivity, and decrease of climate impact.

- D. Employment:** For hundreds of thousands of men and women, airlines, airports and air traffic control are attractive employers. They offer secure employment throughout



the globe is far beyond our own industry. Aviation generates a diverse working environment for several professions. Both fresh entrants to the job market as well as people changing their careers from other divisions find an expanded range of job opportunities in the sectors of airlines, airports and air traffic control. A multitude of aviation experts regularly rank among the most admired professions in surveys of young people about their career ambition. Many already dreamed of careers as pilots or air traffic controllers. The aviation industry supports 87.7 million jobs around the globe. Some of these functions are within the business itself, at airports, for airlines, and in civil aerospace and air navigation services. Other jobs are supported by air travel's economic movement.

**E. Tourism**



**Fig. 9.6: Tourism**

Developed nations travel to other nations by plane, and large numbers of overseas tourists also come to India by air. This generates employment both here in India and in the tourist destination nations. Air transport makes a decisive contribution to people's individual mobility. Even long journeys can be covered fast and safely with air travel, which is why aeroplanes are indispensable in private and business travel. Air transport equips millions of people to connect in cultural exchange. It also improves the tourism industry, which is a major economic feature both in India and in tourist destination nations.

**F. Foreign Trade:** Air transport links India with international markets. Air freight transport connects the Indian economy to global cargoes flows, and trade travel in order to prepare companies to maintain contacts with consumers and vendors. Aviation's economic inference moves far beyond employment in several companies,



because air cargo links India to global manufacturing and distribution chains around the clock organisations can transport time-sensitive and fragile cargoes quickly and safely anywhere.

- G. Humanitarian Aid:** Over extensive distances, there is no faster method than air transportation. For this reason, relief cargoes are shipped by air to conflict and disaster locations. Rapid action is generally in normal disasters, armed conflicts and comparable circumstances. Aid related cargoes such as food, medicines, drinking water and tents must reach those affected as soon as feasible. As transport to several areas cannot be carried out by trucks and ships fast enough, air transport is critical for humanitarian aid in crisis regions.



### INTEXT QUESTIONS 9.4

1. The Aviation industry has made significant progress in fuel efficiency and \_\_\_\_\_ competence.
2. Air transport links India as a \_\_\_\_\_ spot with international markets.
3. Over long distances, there is no quicker shipment method than the airplane
4. For hundreds of thousands of men and women, airlines, airports and air traffic control are as attractive employers.

## 9.5 MERITS AND DEMERITS OF AIR TRANSPORTATION

### 9.5.1 The merits of Air Transport are as follows:

1. **High Speed:** Air transport is ultimate merits is its high speed. It is the fastest mode of transport and thus the most appropriate means where time is a critical factor.
2. **Comfortable and Quick Services:** It offers a regular, comfortable, sufficient and quick service.
3. **No Investment in Construction of Track:** It does not need huge capital investment in the construction and preservation of the track in the area.
4. **No Physical Barriers:** It moves via the shortest and direct path and seas, mountains or forests do not arrive in air transport path.
5. **Easy Access:** Air transport can be used to carry goods and people to locations not accessible by other modes of transport.



### Notes



6. **Emergency Services:** It can be executed even when all other means of transport cannot be managed owing to floods or other related natural calamities. Thus, at that time, it is the only mode of transport which can be used to do relief work and deliver the essential goods of life.
7. **Quick Clearance:** In air transport, custom formalities can be completed very quickly preventing delay in receiving clearance.
8. **Mainly appropriate for carrying Light Cargoes of High Value:** It is most appropriate mode for carrying cargoes of a perishable nature which need quick delivery and light cargoes of high value such as diamonds, bullion etc., towards long distances.
9. **National Defence:** Air transport plays a significant role nation defence. Approaching wars are fought mostly by aeroplanes. It in destroys the enemy in a short period of time. It further supports a nations defence wings.
10. **Space Exploration:** Air transport has facilitated the world in exploration.

#### **Other merits**

- i. Air transport is a quick and adequate system which is generally suited to passenger traffic, providing comfort and high quality service
- ii. Air transport comprises the use of direct routes.
- iii. It is suitable to high quality, luxurious and perishable goods for which speed is essential
- iv. It can perhaps reach the areas inaccessible to other modes of transport.
- v. It provide complete freedom of movement and this offers potentially flexible routes and services

#### **9.5.2 Demerits of Air Transport**

**In spite of several advantages, air transport has the subsequent limitations:**

1. **Extremely Costly:** It is the costliest method of transport. The charges of air transport are so high that it is further than the reach of the common man and small companies.
2. **Small Carrying capability:** Its carrying capability is very small and therefore it is not appropriate to carry cheap and bulky cargoes.
3. **Uncertain and untrustworthy:** Air transport is unsure and unreliable as it is controlled to an immense extent by weather conditions. Adverse weather conditions such as

fog, snow or heavy rainfall etc. may cause cancellation of certain scheduled flights and suspension of air service.

4. **Breakdowns and Accidents:** There is a possibility of breakdowns and accidents that seem to be more as compared to other forms of transport. Consequently, it comprises comparatively greater risk.
5. **Large Investment:** It needs a large amount of capital venture in the construction as well as maintenance of aero planes. Further, they expect trained and skilled persons to operate the air service.
6. **Specialised Skill:** Air transport needs a specialised skill and high degree of training for its functions.
7. **Unsuitable for Cheap and Bulky Goods:** Air transport is not suitable to carry cheap, bulky and heavy cargoes because of its limited capacity and high price.
8. **Legal Restrictions:** There are several legal restrictions imposed by various nations in the interest of their own national harmony and peace.

### Other demerits

- Aircraft are costly to build and operate;
- As aircraft become bigger, the number of airports competent to be used is declining. It reflects in reducing the flexibility.
- Few airports are far away from city centres and this offsets the merits of speed and convenience.
- It provides no access among termini and therefore minimum possible for intervening opportunity.
- Airports use up precious land and aircraft create a lot of noise as well as air pollution.



### INTEXT QUESTIONS 9.5

1. The ultimate merit of air travel is its \_\_\_\_\_.
2. Air transport is carrying capacity \_\_\_\_\_.
3. Air transport is not suitable for carrying cheap, bulky and \_\_\_\_\_ cargoes.
4. In air transport, custom formalities can be completed very \_\_\_\_\_.





**Notes**

## 9.6 TOP TRUSTABLE ON TIME AIRLINE COMPANY IN INDIA

The airlines in India are mainly fuelled by the fast developing Civil aviation in industry India. As per the data of 2018 November, India's domestic airline market is positioned as the third biggest in the world. It is expected to reach the top in next 10 to 15 years. This can be attributed to the competition among domestic carriers in India. For the past couple of years, the country's air carriers have consistently provided low prices for air travel while maintaining and enhancing their services. The outcome is the influx of consumers who opt for air travel which is gradually rising with every successive year. Domestic airlines are also aggressively trying to push out airline schedules, more package agreements and convenient booking structures to keep their consumer base happy. But due to heavy competition and choices, which one should a firm or individual choose for the best flying experience? To assist ease of making decisions, below is a comprehensive record of some of the most excellent airlines in India which a firm can consider for their next air transport.

Airlines of the highest quality in India 2022

### 1. Air India

Despite its current struggles, Air India continues to be one of the most sought-after airlines by India's cargo and people for local as well as worldwide journeys. It provides some of the cheapest charges while also offering the most luggage capacity (25 kg for the economy class) among all airlines, which of greatly appreciated by flyers with its mascot, 'The Maharajah' Airlines is regarded as one of the first airlines in India because of its cononitment to providing the warmest of hospitality in India.

**Headquarters - Delhi**

**Type - Full Service**

**IATA - AI**

**ICAO – AIC**



**Fig. 9.7: Air India**



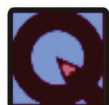
Notes

**Table 9.2: Cargo Airlines of India**

S. No.	Cargo Airlines
1	Air India Cargo
2	Blue Dart Aviation
3	Deccan 360
4	Quikjet Airlines
5	VRL Group

**Table 9.3: Top Cargo Airlines in the World**

S.No	Cargo Airlines
1	Federal Express
2	Qatar Airways
3	United Parcel Service
4	Emirates
5	Cathay Pacific Airways
6	Korean Air
7	Lufthansa
8	Cargolux
9	Turkish Airlines
10	China Southern Airlines



**INTEXT QUESTIONS 9.6**

1. \_\_\_\_\_ is ranked as first in the directory of greatest airlines in India.
2. Air India Express headquarters are located in \_\_\_\_\_.
3. Deccan 360 is a \_\_\_\_\_ airline in India
4. \_\_\_\_\_ Air is a subsidiary of Air India.



## 9.7 CURRENT CHALLENGES IN THE AIRLINE INDUSTRY

The aviation industry is a world encompassing a massive work force and contributing an important percentage to the global economy. This division was set for major development, challenges notwithstanding, till the pandemic hit, post which it plummeted to a significant extent. Yet, it is reasonable to state that in spite of the economic impact of COVID-19 on airline business, it has been on the path to recovery, and may very well be back to normal in a couple of years. During the year 2018, the Air Transport Action Group (ATAG) had released a research report stating that the global aviation market viewpoint had been quite optimistic over a couple of years earlier. The report mentioned that at the time, the global air transport division supported more than 65.5 million jobs and was accountable for a mammoth USD 2.7 trillion in economic activity. Additionally, the statement claimed that a free-trade approach will assist further the growth in air shipping, and it will come to record USD 5.7 trillion in financial activities by 2036, while supporting approximately 97.8 million jobs.

The airline segment does, therefore, play a basic role in today's society, but it is also imperative to spotlight that it has its own fair share of conflicts. From battling downturn to government guidelines and terrorism to labour scarcity, there are countless issues this division has been facing.

The paragraphs underneath enlist some of the challenges of the aviation business previous to the pandemic:

- 1. Fuel Efficiency:** For nearly three decades, the availability of aviation Fuel as well as costs has stayed as one of the major economic features affecting the airline industry. High prices of jet fuel have a straight impact on the airline's monetary portfolio. With the number of airline organisations rising year-on-year, fuel charges were on an all-time high, generating a vicious circle. Substitutes for fuels haven't actually been that impactful, thereby, maintaining fuel effectiveness falls among a battery of main challenges of the aviation business.
- 2. Global Economies:** The state of the global economy is one of the main challenges of the airline division. The economic recession which took place in 2008 had a disastrous force on the aviation business size. As the world economy collapses, the travel and fuel charges also increase and lead to decrease in passenger numbers. The effect of the recession on the tourism segment is also one of the main economic features affecting the airline business. As air transport companies seek development across several nations and explore new paths, they must bear in mind the market scenarios and volatility in the provincial zones. Also, various countries have different economic



## Notes

conditions for development, a factor which airline organisations must remember when they look for global expansion.

- 3. Passenger Comfort and Experience:** The aviation business is service-driven; and its success is purely dependent enormously on the satisfaction of passengers and clients. The cause of the passenger comfort creates the crux of challenges faced by the airline segment is that no passenger is alike and at some point; a division of customers might always be dissatisfied. Yet, this is what has pushed airline firms to ensure seamlessness all through the actual air travel, tremendous security, less/no difficulties in airport lines, handy baggage claim, consumer care and more. To attain these in a flawless way is a consistent tussle of methods. The client surveys and feedback always describe that not all the passengers or clients have immense travel experiences. For example, during 2017, the Global Passenger Survey of IATA portrayed that only approximately 56% of North American consumers were pleased with their previous travel experience. To that end, there's forever space for bettering the client's comfort, which airline firms will carry on to battle with.
- 4. Airline Infrastructures:** Airports must constantly upgrade their infrastructure, especially the runways, terminals, public spaces, hotels, shopping malls, lounges, and more. There is foremost competition in this sector; to maintain the status of the airline and stay ahead of competition, onsite facilities such as aircraft ground handling structures will require to be periodically renovated. While doing so periodically is advantageous no doubt, heading towards the increasing passenger numbers, repeating the promotion every now and then will have an important impact on the airline firm's finances. Aircrafts required to be periodically upgraded and administered as well and this in fact, is even more vital, as passenger safety is dependent on the same. Having damaged aircraft doors or aircraft seating is accountable to obtain the airline sued. Airline infrastructure is one of the most imperative challenges of the aviation segment, as carriers require maintaining their current fleet and also making sure to purchase new, approaching ones, while making sure of fuel effectiveness and lowered charges.
- 5. Global Congestion:** A few years back, air travel had been considered as a luxurious affair; playthings of the wealthy, especially in the developing nations. This situation has changed drastically, and most of the airports operating around the world are so congested that it has led to pointless flight delays. Most flights seem to be full, terminals are always crowded, and more significantly, the skies are overcrowded with an extreme number of aircraft. Air transport and airport congestion are main challenges faced by the airline business, which seem to have no realistic solution, at least in the instant future. Carriers carry on to make seamless trips for flyers and cargoes, yet, this will continue to stay a practical challenge.





- 6. Technological Advancements:** The sophisticated technological developments are also considered as one of the challenges of the airline industry may come as a surprise. Technology, though, is a double-edged sword, and in spite of the revolution it has brought about, increasing dependence on the same can create the whole industry vulnerable. For example, in case of a software problem, the operations of the airline might remain crippled till it is resolved. In case of inadequate funding, upgrading vital infrastructure such as aircraft communication structure may be impossible, creating the whole system to collapse.
- 7. Terrorism:** Tragic events which took place in the past have generated ripples of fear not only amongst the masses, but also airport employees. Even though terrorist activities have decreased down in recent times, but still it is very much considered as a threat, as airline firms must remain every time vigilant. Rising fear of terrorism directs to stringent check-ins and as a result longer lines and delays. It also forces airline firms to come up with extremely secure state-of-the-art screening processes and equipment. On a connected note, even political scuffles among two nations can pose as one of the main challenges of the aviation segment. After all, airlines are the linkage between two nations, and unreasonable government guidelines due to strife among two nations can make it very complicated for carriers to conveniently ship passengers and cargo in and out of worldwide borders.
- 8. Climate Change:** Without a shred of doubt, climate change and environmental issues have remained among the key challenges faced by the airline market for a very long time. Since commercial aviation is responsible for a considerable percentage of carbon emissions, the airline industry is under tremendous pressure to undertake measures that will reduce the environmental impact of air travel. As part of a response to this challenge, the IATA had suggested a multi-faceted, four-pillar strategy, including enhanced technology, adequate aircraft operations, improved infrastructure, and a single global market-based measure. Until these are completely and seamlessly met, climate change will continue to be one of the current challenges of the airline industry.

The aviation business creates an important part of the worldwide economy. Pre-COVID, airline firms had to deal with substantial challenges, the remedies of which were being thought out and reviewed by industry professionals periodically. The effect of the pandemic, though, brought forth a set of ground breaking challenges for the airline business that it hadn't encountered in any of the earlier global disasters such as the attack of 9/11 or the 2008 economic recession. It has not only brought regarding a complete 180-degree change in the way earlier challenges were perceived, but a latest set of risks that will at present create the base of how the industry will operate in the forthcoming decades.





### INTEXT QUESTIONS 9.7

1. The state of \_\_\_\_\_ is one of the main challenges of the airline division.
2. \_\_\_\_\_ required to be periodically upgraded and administered.
3. The aviation industry employs a large number of people and contributes a significant percentage to the \_\_\_\_\_ economy.
4. \_\_\_\_\_ change and environmental issues remain among the key challenges faced by the airline market.



### WHAT YOU HAVE LEARNT

- Air transport is a significant enabler of economic growth and development. It facilitates the integration into the world economy and offers very significant connectivity on a national, regional, and international scale.
- Air transport is one of the greatest modes which help to transport passengers and freight through the air using aeroplanes, jets, rockets, helicopters, and drones. Each kind of air transport has a specific way of achieving speed and sustainability.
- The types of air transport are 1.Commercial aeroplanes 2.Helicopters 3.Private planes 4.Blimps 5.Gliders 6.hang gliders 7.Zeppelin and 8.Parachute.
- Organisations in the aviation industry provide employment for hundreds of thousands of workers with an expanded diversity of professional qualifications. However, the real importance of air transport moves far beyond jobs in aviation. Air transport contribution greatly to people's individual mobility and thus enhances international understanding and cultural exchange.
- The airlines in India are mainly fuelled by the fast developing civil aviation industry in India. As per the data of 2018 November, India's domestic airline market is positioned as the third biggest in the world. It expected to reach the top rank in the next 10 to 15 years.
- The merits of air travel are 1. High speed 2. Comfortable and quick services 3. No Investment in Track construction 4. No physical barriers 5. Easy access 6. Emergency services 7. Quick Clearance 8. Mainly suitable for carrying light cargoes of high value 9. National Defence and 10. Space exploration.



Notes



**Notes**



**KEY TERMS**

Transport	Air	Speed
Perishable	Airlines	Cargo
Planes	Trade	High value
Track	Travel	Carrier



**TERMINAL EXERCISE**

1. Define air transport.
2. What do you mean by gliders?
3. Explain about Vistara airline.
4. What is Zeppelin?
5. Define the Blimps.
6. Air transport plays a crucial role in economic development.
7. State the various definitions of air transport.
8. Spotlight the air travel.
9. List out the demerits of air transportation.
10. Mention the top cargo airlines in India and the world.
11. Point out air transport characteristics.
12. Explain the various types of air transport.
13. Highlight the implication of air transportation.
14. Sketch the merits of air transportation.
15. State the airline industry challenges.



**ANSWER TO INTEXT QUESTIONS**



**Notes**

**9.1**

1. Air transport
2. Modest
3. 1903.
4. Investment

**9.2**

1. Cargoes
2. Inter- state
3. Freight
4. Aircraft

**9.3**

1. Private
2. Ferdinand von
3. Glider
4. Blimps

**9.4**

1. CO<sub>2</sub>
2. Business
3. Aeroplane
4. Employers

**9.5**

1. High speed
2. Very small



**Notes**

3. Heavy
4. Quickly

**9.6**

1. Indigo
2. Kochi
3. Cargo
4. Alliance

**9.7**

1. Global economy
2. Air craft
3. Global
4. Climate



**DO AND LEARN**

Learners can undertake their activity work in the areas of different air transportation / airlines / air consolidators / IATA organisations .

## TRENDS IN LOGISTICS INDUSTRY

The logistics industry assists the business entrepreneurial activities bound by two or more parties by means of shipping, storing and distributing commodities via B2B, B2C or C2C distribution chain systems. In the current scenario, logistics firms execute commodity transportation services by surface, air and ocean while adapting to the varying nature of the economic mold and digitization. This industry is one of the pillars of global trade worth over 5.7 trillion Euros. The Asia-Pacific province was the most important logistics market in 2020. With 161 billion Euros market dimension, the worldwide freight forwarding offers the logistics industry faster and easier remedies to the shipping process. Ever since 2004, international air logistics traffic sustained to grow somewhat progressively with the exclusion of 2020, when the corona virus pandemic began and touched 66.2 million metric tons in 2021. The ocean trade transport quantity dropped to 10.65 billion metric tons in 2020, whereas the worldwide seaborne business carried by container vessels augmented exponentially to 1.85 billion tons stuffed in 2020. In 2019, the international rail cargo traffic amounted to approximately 9.3 trillion tonne kilometres and is to touch around 12 trillion-ton kilometres by 2025. This division in Asia, Europe and America has a growing trend, whereas in Africa the trend is volatile or decreasing.



### LEARNING OUTCOMES

After studying this lesson the learner:

- identify the fundamental concept of the logistics industry;
- differentiates present and future trends of logistics business;
- assesses the prospects of the logistics industry;



- identifies innovative trends in the logistics business;
- discusses the opportunities of the logistics industry.

### 10.1 LOGISTICS INDUSTRY-INTRODUCTION

Logistics is normally the detailed organisation and execution of a complex operation. In the common trade sense, logistics is the administration of the flow of commodities from the point of origin to the point of destination to meet the needs of the customers or companies. The logistics industry assists the business entrepreneurial activities between two or more traders by means of shipping, storing and distributing cargoes through B2B, B2C or C2C distribution chain networks. At present, logistics firms implement goods transportation services by surface, air and ocean by accepting the changing nature of the economic outline and digitization. This industry is considered as one of the backbones of global trade with a value over 5.7 trillion Euros. In 2020, the Asia-Pacific region was the most important logistics market.

The term logistics includes the physical movement of accumulating resources, the transportation or positioning of those resources and the final distribution of resources. In recent times, the term has become widespread in the military, explaining the exercise occupied in the acquisition, storage and transport of supplies, utensils, arsenal, munitions, encampment as well as soldiers. Further more, it plays a very important role in national and international trade by moving the commercial cargoes from one destination to another.

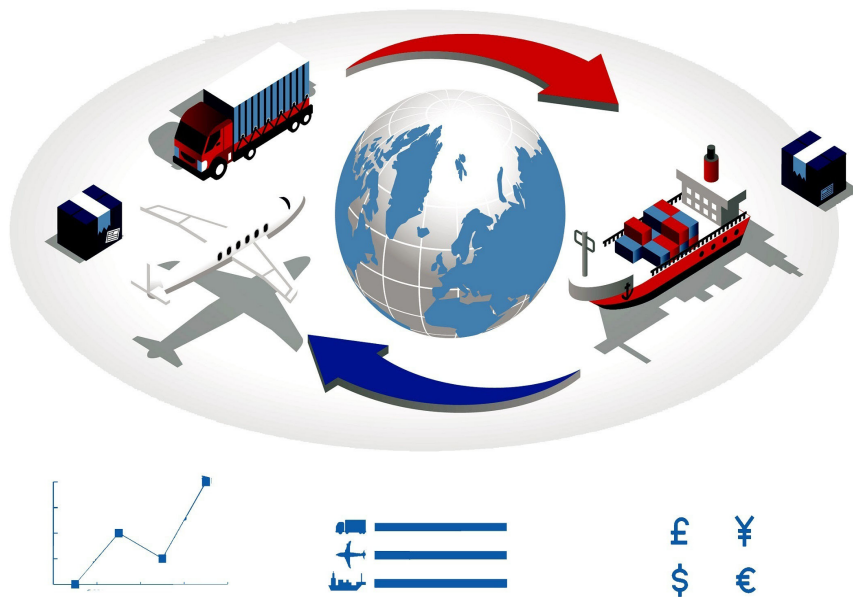


Fig. 10.1: Logistics Industry



Logistics can be as easy as a transaction in which an exporter makes his own commodities and ships it straight away to his importer by involving several layers of handlers in Fourth-party logistics provider (4PL) and agent transactions. The number of intermediaries on any shipment may expand well ahead of just a Fourth party, such as 5PLs and on up.

### 10.1.1 How huge is the logistics industry?

Measures of the amount of the worldwide logistics industry series from \$8 trillion to \$12 trillion yearly. The rule of thumb is that several forecasters utilize a percentage of GDP. In a developed nation like the U.S., few measure that up to 10% of GDP which is contributed to the logistics industry in a given year. In connection to economic activity in 2019, the U.S. logistics market will end at around \$2 trillion level. Globally, several may trust that the logistics market symbolises around 12% of the whole world's GDP. The difference in the percentage of GDP utilised to foresee the size of the logistics market which has been contributed towards the ineffectiveness that occurs in distribution chains in several regions outside the U.S., which generated an elevated price structure by comparison.

According to research and consulting organisation, Armstrong & Associates Inc, the worldwide logistics market was \$9.6 trillion in 2018; The Trucking alone accounted for 43% of the entire logistics charges globally. The charges connected with storing the stock represented one-third with non-trailing modes such as ocean, rail and air which represent less than 14% of the whole.

**Table 10.1: 2018 Global logistics by mode / function**

S. No.	Mode / Function	\$ in Billions
1	Trucking	4132
2	Inventory carrying	2116
3	Warehousing	1056
4	Logistics Administration	772
5	Water & Misc	714
6	Air	301
7	Rail	297
8	Forwarding	223



The firm is forecasting the entire global logistics charges to continue to develop at a more than 5% compounded yearly development rate in the year 2023. Other intellectual research firms add in charges linked with shipment infrastructure, like surface, sea ports, rail and airports comprising these investments, some calculate that the size of the worldwide logistics industry will go beyond \$15 trillion by 2023.



### INTEXT QUESTIONS 10.1

1. Logistics can be as easy as a transaction in which a \_\_\_\_\_ makes his own commodities and ships it straight away to his importer.
2. \_\_\_\_\_ plays a very important role in national and international trade by moving the commercial cargoes from one destination to another.
3. Logistics industry is considered as one of the backbones of \_\_\_\_\_ trade.
4. Logistics is the administration of the flow of commodities from the point of origin to the point of \_\_\_\_\_.

## 10.2 LOGISTICS INDUSTRY GROWTH IN INDIA

In the year 2020, the worldwide logistics industry was valued approximately 8.6 trillion U.S. dollars. North America was considered as the second biggest region in that year, accounting for around two trillion U.S. dollars.

### 10.2.1 Logistics industry growth in Asia-Pacific

With approximately 3.9 trillion U.S. dollars in size, the logistics industry in the Asia Pacific province is the largest one internationally. The foremost position of the province in the logistics industry could be described mostly because of the significance of the region in movement of most of the essential trade cargoes globally. Since it was extremely economical for western firms to begin moving the complete manufacturing of cargoes to less-developed nations in Asia. Most of the firms at present have their complete amenities performing from Asian nations. The extension of trade routes and the movement of industrial manufacture towards the Asian nations contributed to the logistic industry's growth immensely. However, when one looks at the supply of foremost shipping companies by the origin of the nation, the leading companies are non-Asian headquartered. Moreover, the Asia Pacific province has the world's leading sea or air ports which is developing at a constant rate. The four major marine terminal operators from the province are:

1. PSA International



2. Hutchison Port Holdings,
3. China Cosco Shipping and
4. China Merchants Ports.



Notes



**Fig. 10.2: Logistics Industry growth in Asia-Pacific**

### 10.2.2 Logistics industry growth in India

Logistics is considered as the backbone of the economy as it makes sure the sufficient and economical flow of cargoes and at the same time the other commercial segments are mainly dependent on it. The Indian Logistics industry is evolving quickly. It is the relationship between infrastructure, sophisticated technology and new forms of service providers, which explains whether the logistics industry will be capable of assisting its customers to decrease their costs and offer adequate services. In spite of its weak response, the logistics industry carries on to witness development owing to the growth in retail, e-commerce as well as manufacturing segments. The worldwide Logistics division which was to develop at the range of 10 to 15 per cent in 2013-14 but at present has to reach approximately \$ 2 billion by 2019. Increase of e-commerce logistics and augmented domestic consumption has paved the way for this industry to grow further as well in future too. With the assurance of steady increase and development, this service related logistics industry is prepared to enlarge beyond the horizons in the latter half of this decade.



- A. Recent Scenario:** The present Indian logistics segment consists of inbound and outbound divisions of the manufacturing and services of distribution chains. Further, the logistics infrastructure has increased the much required (a word is missing here) which has been boosted from trade houses as well as strategy makers. Administering the infrastructure to sufficiently compete with other units has not been offered its own emphasis. Insufficient logistics infrastructure can generate bottlenecks in the expansion of an economy. The logistics administration regimen has the ability to overcome the demerits while offering cutting-edge competitiveness in the extended run. There exist numerous challenges and prospects for the segment in the Indian economy.
- B. Challenges:** The biggest conflict faced by the industry at present is poor incorporation of transport networks, sophisticated information technology and store house & supply chain facilities. Regulations which are existing at diverse tiers are set by national, regional and domestic authorities. Yet, the rules vary from city to city, hindering the generation of national networks. Trained employees are necessary for the areas of the fourth party logistics, manufacturing units and retailing. It is deficient at the IT, driving and store house as well as at the superior strategic level. The division is in a disorganised condition particularly in India. The common perception of logistics being an employee-driven industry and shortage of sufficient training institutions have generated a crisis of skilled administration and consumer service personnel. Poor amenities and administration are causes behind high stages of loss and damage of materials, mostly in the perishable division. The issues arise largely because of the absence of expert equipment, like appropriate refrigerators as well as shortage of quality training. Though practitioners, as well as academicians are gradually becoming conscious of the significance of logistics and distribution chain, yet, the field is still not sufficiently explored as far as investigation is concerned. It is necessary to prioritise research and growth so that the weakness in the sector can be taken care of and enhanced.
- C. Remedies:** Infrastructure development is the backbone of every nation's growth and prosperity. The same is factual for the logistics industry. Emphasis should be given building world-class road ways, incorporating rail corridors, and sophisticated goods facilities at airports. Further, the logistics parks should be positioned and accorded a status equal to Special Economic Zones. It is essential to identify that the logistics industry can be benefited if firms establish training institutions to enhance the service quality of the division. Excellent storage and store house amenities are significant for the development of the industry. With an increase in the shipment of perishable goods, logistics firms are required to offer a lot of significance to enhance warehouse amenities. Moreover, emphasis on research is effective because it motivates the use of sophisticated technology, which can create the industry economically and can also bring about development in services.



### INTEXT QUESTIONS 10.2

1. \_\_\_\_\_ is one of the major marine terminal operators from the Asia-Pacific.
2. \_\_\_\_\_ development is the backbone of every nation's growth and prosperity
3. The extension of \_\_\_\_\_ and the movement of industrial manufacture towards the Asian nations contributed to the logistic industry's growth immensely.
4. \_\_\_\_\_ employees are necessary in the areas of the fourth party logistics.



### Notes

## 10.3 IMPACT OF LOGISTICS INDUSTRY ON ECONOMIC GROWTH

India's poor logistics as well as customs has been leading towards the competitiveness of our industries. India's logistics charge is steady to account somewhere among 13-14 percent of the GDP. This contrasts poorly with the charge of 7-8 per cent for developed nations. One of the main reasons for poor output is the shortage of automation in the logistics sector. India is an employee surplus and wealth deficit nation, thus it is much more reasonable to deploy employees than to invest in material handling equipment namely a forklift, conveyor belt structure or hand-held laptops. Despite the entire high logistics prices, the 4PL providers struggle to make profits and are frequently recovered for the slightest price differential. Overall, there is a scarcity of a premium for sophisticated technology-driven, automatic logistics processes over customary ones.

### A. Low investment in technology:

Investment in sophisticated technology has been at a much lesser level in India when compared to several developed countries. Ironically, given the victory of India's technology industry, the logistics service providers are not able to find technology assets such as information scientists, robotics experts, and professionals related to operations research etc. Nowadays India's logistics industry is moving towards the organised and sophisticated technology-driven and this division is valued at \$160 billion and provides employment opportunities to over 22 million people directly. It is expected to develop at a CAGR of 10 per cent to nearly \$215 billion by 2022. According to the department of Statistics Research reports, the market worth of the store housing by 4PL in India is steady to reach approximately \$6 billion in the financial year 2025 when compared to \$2.1 billion in The financial year 2018. The market worth of transportation by 4PL is steady to reach approximately \$12 billion in the financial year 2025, from \$3.5 billion in the financial year 2018. Since the manufac-



## Notes

turing units were rigorously hit owing to the lack of employees and the limitations being set on shipping the goods and trades, the distribution has been disrupted.

- **Infrastructure boom:** India is also in the centre of an infrastructure construction boom. The government's National Highways Development Project intends to enlarge the nation's present expressway system of 2000 km and strategies to add 18,637 km of eco-friendly expressways by 2022. The Bharatmala venture aims to generate nearly 83,677 km of highways by the year 2024. With the help of Digital Transformation which is mutely underway and will re-define the Indian logistics over the subsequent decade. At present the entire generation of start-ups aimed at solving India particular logistics problems deploying sophisticated state-of-the-art technology. Also, the government has moved towards digitization in a main way via initiatives namely a) E-way bills b) Fast tag c) E-invoicing d) GPS-based toll, etc.

### B. Green logistics

One of the main trends for future development will be the appearance of Green Logistics. With India focusing on Net Zero emissions across segments, Logistics firms will require to decrease their carbon footprint as well as and grow quickly. Further, digitization will also assist in several ways. For instance, India has come up with GPS to facilitate the Toll to make sure zero wastage of fuel and resulting emissions among hundreds of Toll Plazas. Current logistics parks are constructed with solar made rooftops and sell carbon-free electricity instead of consuming it. E-commerce firms have dedicated 30 percent of consignments utilising Electric Vehicles. The Pandemic has sped up the adoption of digital technologies and set the phase for the future. India requires a thriving and sufficient logistics segment to attain its growth goal, and digitization is central to distributing the same.



**Fig. 10.3: Green Logistics**



### INTEXT QUESTIONS 10.3

1. India's poor logistics as well as customary has been led towards the \_\_\_\_\_ of our industries.
2. One of the main trends for future development will be the appearance of \_\_\_\_\_ Logistics.
3. Investment in sophisticated technology has been at a much lesser level in \_\_\_\_\_ when compared to several developed countries.
4. Several logistics firms cater to this demand while sticking on to security protocols with OTP-related \_\_\_\_\_ distribution of items.



Notes

### 10.4 TRENDS OF TRAVEL AND HOSPITALITY INDUSTRY

What are the current trends in the travel and hospitality industry? It moves without specifying that the pandemic as well as the downturn of economic downturn than the recession of 2008 and disorder which is created by variation in demand have had an important impact on travel hospitality all through the years 2020 and 2021. Few innovative reaction to there extraordinary circumstances like attempting to attract patrons back into foodstuffs and beverage channels and assure holiday movers that it is certainly secure to enjoy travel and a hotel stay, have gone faster by obtainable hospitality industry trends and activated lasting transform. In the meantime, there has been a change in society, partly because of changing values after the sensitive stage of the pandemic. Where as in 2020 and 2021, the fame of satiations, cleanliness, protocols and contactless technologies all at present firmly embedded in the regular activities of travel and hospitality trades has increased sharply, some new trends are emerging. Increase in consumer alertness of all things sustainable, focused and health and well being has put a new platform for travel and hospitality enterprises.



**Fig. 10.4: Trends of Travel and Hospitality Industry**



The major trends that are shaping the travel and hospitality industry in 2022 are as follows.

### 1. Leisure time travellers & hotel work spaces:

Working distantly has today become quite routine for many workers and is predicted to become more than merely a passing trend. A shift speed up by the worldwide public health disaster, an unprecedented figure of high-profile firms with large technological firms like Facebook, Twitter, Facebook, and Amazon directing the path had announced that they will take on a mixture or flexible mode to work remotely. In the year 2022, the percentage of employees around the globe that are eternally working remotely was predicted to double. This refers that the travel and hospitality venues are being utilised as make such shift premises for leisure travellers, as well as domestic seeking to alter of work surroundings. This is a huge opportunity for travel as well as hotels and F&B venues to exploit the trend and adapt them by providing to meet the requirements and wants of this emerging division; plenty of plug sockets, free high-speed WIFI and high coffee are excellent starting points.

### 2. Holistic hospitality, health & well-being:

Preventive medicine and self-care are no doubt has become trending at present owing to the COVID pandemic. The travel and hospitality industry is moving towards trillion dollar market and venues are well located to take a big piece of the pie, particularly those with accessible spa amenities. Additionally to the common beauty and recreation spa offering, there is fast growing demand for fitness diagnostic technology and modified treatment strategies will be delivered by professionals who conduct classes for personal or group sessions to expand vitality, healing, stress administration, emotional balance, mindfulness and improved sleep. Discover more spa trends for 2022 in this article.

### 3. Digitised guest experiences:

Apps are increasingly important in the way hoteliers manage the services they provide to their customers and can now control many aspects of the guest cycle and experience. Needless to say, the trend towards digital and contactless services has gained new momentum since 2020. Traditionally, customer-facing services are being given an overhaul thanks to the more widespread use of technology-assisted choices, such as mobile verification-in, online payments, voice power and biometrics. At present customers who have become familiar with unlocking their elegant phones and laptops by utilising facial and fingerprint acknowledgment will soon arrive to expect the similar convenience in accessing their hotel rooms as well as booking for travel and rooms. Regrettably, installation and maintenance of these upgrades might be expensive.





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#### 4. Personalization:

The current guests have developed and anticipated to be identified and treated them as individuals. Firms are moving towards the extra mile personally to welcome their guests, whereas several firms have done personalized email promotion which is accessible to the masses, by making sure of an extremely target audience with specific communications. Furthermore, they simply add the consumer's name towards email greetings, data offers insight into past receiving habits, by facilitating travels and hotels to tailor their offerings and advertisements, and mechanically offer similar services to earlier travel and stays.

Technological stages such as CRM and CEM utilise big data to generate one-to-one relations between the guest and the host at the level. AI-powered chat bots have been confirmed to be a customer service benefit both during the stage of booking and in reaction towards recurring questions. Moreover, travel; and hotel executions are generally shaped by the utilisation of organisationed structures to examine and optimise revenues, consumer relationships, property, methods and reputation.

#### 5. Experience economy & essentialism:

Consumers request both great personalization and unique experiences. This could direct to the reduction of the travel intermediaries and motivates to be as independent traveller. Travellers are seeking plentiful displays of prosperity, preferring as an alternative to spend intelligently, purposefully and create a positive impact on the globe. Special experiences that provide back to domestic communities in purposeful ways are in demand, as are position properties, adventurous holidays and recreation retreats.

#### 6. Asset administration strategy:

The asset-light method has become widespread in the industry. The separation among the administration of operations and real-estate possessions now permits travel and hospitality firms to focus on their core trade, thus improving effectiveness. Yet it persuades additional structure and possible agency issues, by describing the emergence of new sorts of employments, such as asset executives. Additionally, new work profiles have emerged following the rising structure of the hospitality industry. Similarly, the requirement for quantitative capabilities has also been raised.

#### 7. Solo travel:

In the era of mindfulness, several have embraced the thoughtful worth of spending time alone and project out into the large wide globe unencumbered, interrelate and create friends to anything degree suits. In an attempt to make solo travellers feel



relaxed, barriers among hotel employees and guests are being decreased; interior design preferences made to remind a sense of homeliness and a relaxed atmosphere would be cultivated. This, along with a low stark split among guests and locals, motivates a feeling of hotel community.

#### 8. Sustainability:

The trend of hospitality which is both present and a hallmark of current years: “sustainability” has once again assumed its place. A natural expansion of avoiding throwaway plastics, eradicating unnecessary paper utilisation thanks to opt-in bills and decreasing food waste, more far-reaching moral and ecological considerations are shaping the decisions done at the hospitality administration level. The decisions related to things as easy as which towel rails to implement during renovations have uneven repercussions when executed at scale. Simple ecological-friendly switches include replacing small toiletries with bigger, locally purchased dispensers, selecting ethically manufactured bed sheets created from organic stuff and decreasing energy consumption with elegant bulbs, etc. Vegetarian as well as vegan choices also harbour well-known ecological advantages.

9. **Virtual & augmented reality:** Following the orientation till visually attractive content, it appears only natural that trades in the hospitality sector should look for exploiting characteristics such as virtual tours, which lead to digital surroundings for customers to picture themselves in. Videos offering 360-degree views of the restaurant atmosphere, café terraces surrounded by greenery or beachfront hotel spots, for instance, are merely the ticket to create a firm to stand out this year. As ever, holding the access doorstep low is the key to reach as extensive an audience as feasible with virtual realism material: by creating content accessible on a diversity of devices, without the requirement for a VR headset.

#### 10. Travelling less (& Stay cautious):

Travel limitations in the years 2020 and 2021 have assisted the growth of sanitation. Even with global travel opening back up, among the airline the prices were hiked, the need for covid testing and the difficult bureaucracy comprising moving foreign now, numerous deem foreign journeys either too expensive for a big family vacation or directly too difficult for the weekend breaks. Therefore, opting in favour of staying trend has changed and travelling also become much lower than in pre-pandemic phases. In reality, there are several reasons that vacationers may also be selecting to stay closer to their homes, such as for ecological or budgeting causes, and could see people spending their holidays more locally.





### INTEXT QUESTIONS 10.4

1. The travel and hospitality industry is moving towards the \_\_\_\_\_ dollar market.
2. The \_\_\_\_\_ method has become widespread in the travel and hospitality industry.
3. The trend of hospitality which is both present and a hallmark of current years: \_\_\_\_\_ has once again assumes its place.
4. The current's guests have developed and anticipated to be identified and treat them as \_\_\_\_\_.



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## 10.5 FUTURE PROSPECTS OF TRAVEL AND HOSPITALITY INDUSTRY

The travel and hospitality industry is spirited, and trade needs to hold up with the newest hospitality trends in order to avoid being left behind. In addition, keeping pace with the sector as a whole is a huge way to make sure that the trade delivers the sort of consumer experience people need and anticipation. However, the requirements and priorities of consumers have also altered due to COVID.

### 10.5.1 Features accountable for upcoming hospitality growth

The term 'trend' explains a change in behaviour or a more widespread change of circumstances. By bearing this in mind, the hospitality trends may consist of changes in the way consumers behave, innovative ways of offering hospitality services, or common moves in connection with adopting innovative hospitality technology. These trends are naturally influenced by a variety of diverse factors. For example, the rise of sophisticated technology like artificial intelligence has led to a trend where machine learning is utilized more frequently, and AI technology is positioned more regularly for consumer service purposes. For the moment, the urgency of virtual realism technology has changed several travel and hospitality firms to promote their services. Often, the wider worldwide events can persuade hospitality trends too. A good instance of this can be viewed with the COVID-19 pandemic, which made trade across the hospitality division to place a better spotlight on hygiene, sanitation, protection and local markets. Likewise, climate transform concerns have created firms to spotlight on eco-friendly remedies.

Moreover the future prospects of the travel and hospitality industry at present had mainly been influenced by the Covid-19 which is as follows.

- A. Safety & Hygiene:** There are a number of hospitality trends that can be generally explained as being connected to safety and hygiene and these have become particularly



## Notes

significant with the urgency of COVID, as the globe adjusts to the disease and exercise to contain the stretch. It is vital that these concepts are a main concern for hotels, travel agents, restaurants, bars and cafes. Any particular regulations require to be done clear ahead of time and require to be enforced to create people feel secure. Furthermore, the hospitality marketing implementation also requires emphasising the protection and hygiene footstep. Describing these steps could be the variation among creating bookings and having consumers look elsewhere.

**B. Contactless Payments:** Most of the largest hospitality firms are concerned with decreasing friction and contactless cash have been one of the largest examples. When contactless cash is accepted, consumers save time on categorization through payment or entering their PIN. The urgency of things like certain payment apps like Apple Pay, Google Pay also takes away the requirement to even hold a wallet.

**a. Voice Search & Voice Control**



*Fig. 10.5: Travel & Hospitality*

The utilisation of voice search is becoming quite widespread among clientele penetrating for and booking tickets, hotels and restaurants, so one is required to respond to this altar in behaviour and create a clear effort to capture these consumers. Above this, voice control can also be utilised to control strategy within hotel rooms, upgrading the guest experience. For instance, smart speakers can offer guests with answers to queries and can also react to voice requests to switch on the lights and devices inside the room.

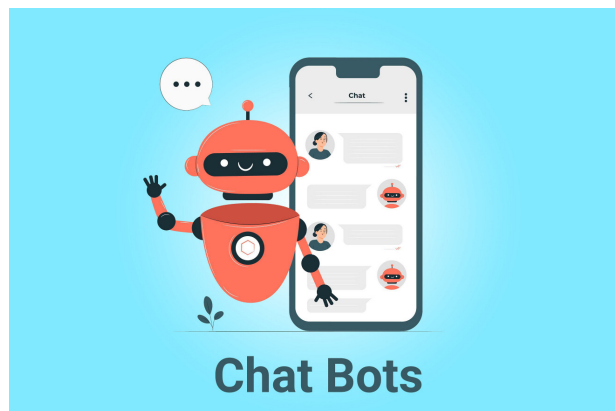
**b. Improve F&B distribution at home:** Several restaurants and firms are providing food tailored to the COVID circumstances by growing food and



## Notes

beverage distribution, permitting customers to take pleasure in something akin to the café experience at home. Often, this refers to accepting orders via telephone and online distributing quickly and providing contactless distributions. In relation to food and beverage distribution, bars are exploring paths to bring several drinks to consumer's houses, whereas restaurants are increasingly providing extras, including candles, free food, or QR codes with certain playlists.

- c. **Robots in Hotel & Restaurants:** Automation stands high up on the catalogue of hospitality to be conscious of and robotics is a fine example of this being taken ahead. Hotels, restaurants and similar trades can utilize robots to greet consumers and offer customer data, whereas they can also function an important role in safety operations too. Inside the hotel setting, robots have been utilized to provide room service and execute cleaning and other cleaning chores.
- d. **Chat bots:** Chat bots are considered as the major hospitality trends connected with customer service and can be particularly helpful for distributing swift responses to queries, even when staff is not available. In several cases, this can direct to first contact declaration, but the Chabot can also collect data and pass it on to a human representative if needed.



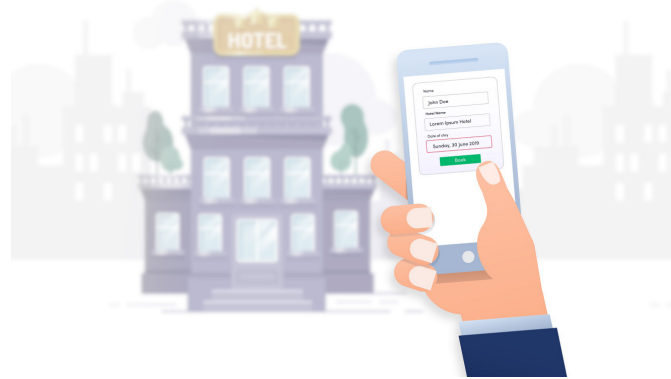
*Fig. 10.6: Chat Bots*

- e. **Virtual Reality Tours:** Virtual reality stands among the most thrilling hospitality technology trends, offering the means for prospective hotel guests to experience what their environment will be like, all from the console of their own residence. This can be vital for moving these guests from the planning phase till they visit. Virtual tours / 360 videos can assist some consumers to enhanced understand the amenities available.
- f. **Mobile Check-In Service :** It is primarily linked with hotels and other modes of accommodation, providing a mobile check-in service is one of the most helpful



## Notes

hospitality trends for decreasing the requirement for human-to-human contact and this is a particularly significant concept inside the situation of the COVID pandemic and the linked exercise to hold the virus.



*Fig. 10.7: Mobile Check-In Service*

- g. **Local Experience:** Those in the hospitality sector are obtaining to grips with the wish for travellers to take pleasure in local experiences. Several people do not merely want to experience a life alike to their own, but in a diverse location. As an alternative, they desire to experience a genuine way of life in the place they visit. Trades in the hospitality industry are reacting to this, in order to feed to these demands.
- h. **Healthy and organic foodstuffs & nature drinks:** in the past, a substantial division of the hospitality sector was created with fast food restaurants chains and bars able to sell sugary alcoholic drinks. Yet, there is somewhat of a civilising shift, with people becoming more conscious of the belongings they are adding in their bodies, directing to healthy foodstuffs and natural drinks. For restaurants, this refers to revamping their menus with healthier choices, comprising options like gluten-free, low fat, dairy-free, vegetarian, vegan and organic.
- i. **Sustainability:** Consumers are anxious with ecological issues and desire to know that the trades they deal with are behaving morally. For this cause, sustainability has been one of the most visible hospitality trends of current and future times, with a rising number of hospitality trades enhancing their eco-friendliness.
- j. **Personalization:** Across nearly all sectors, the requirement for personalization is a main trend, and the travel and hospitality segment is no different. This is mainly driven by the increase of big data. In the meantime, a rising number of



## Notes

hotel guests desire to be treated as individuals, rather than merely another unidentified customer. Personalization can be positioned in a diversity of ways. Inside hotels, for example, returning consumers can be automatically offered with similar services as they stayed last time, whereas they can further be personally greeted by a member of the executive upon arrival, utilising GPS technology and booking information. Moreover, with the increase of smart appliances, hotel guests can too be facilitated to utilize their own appliances and accounts on entertainment platforms.

- k. Smart Hotels:** In general terms, a smart hotel is one that creates the utilisation of internet-facilitated devices, which are competent in sending information to one another. The designs of Smart hotel have joined in with the thought of the ‘Internet of Things’ and have come out as a more admired concept while smart speakers and elegant hubs became admired of consumer goods. A smart hotel may, for instance, permit guests to control the air conditioning from their smartphone, or turn on / off the TV by providing a voice control to a smart speaker. In several cases, smart rooms also mechanically regulate light bulbs brightness or the radiator temperature, in order to uphold best conditions.
- l. Artificial Intelligence:** Artificial intelligence plays a diverse role within the hospitality sector, but the major one is to progress customer service. The AI-powered chatbots is an example of AI, which can be utilised for online consumer interactions, eliminating the lengthy waiting times and offering swift, bright responses to queries. Still, there are extra benefits offered to travel and hospitality sectors through artificial intelligence technology. For example, some hotels have invented AI and voice-controlled consumer service or tourist data hubs inside their hotels. In the meantime, AI can also be utilized to sort via data, mechanically make alterations to process, and so on.
- m. Augmented Reality:** In several ways, augmented reality technology is similar to virtual reality technology, but relatively more than generating innovative digital surroundings for users. Further it is concerned with improving the real-world surroundings via graphical or data overlays. Other than a Smartphone and an app, unlike the VR technology, it generally needs nothing. These apps can be designed so that consumers can spot their phone at a hotel / restaurant and glance reviews, or opening / closing times. Hotels and other stay related information can also utilise augmented reality to offer the interactive tourist data maps inside their properties, or to generate fun opportunities to produce user-created content.



### INTEXT QUESTIONS 10.5

1. Most of the largest hospitality firms are concerned with decreasing friction and \_\_\_\_\_.
2. \_\_\_\_\_ is primarily linked with hotels and other modes of accommodation
3. The term 'trend' explains a change in \_\_\_\_\_ or a more widespread change of circumstances.
4. A \_\_\_\_\_ hotel is one that creates the utilisation of internet-facilitated devices, which are competent in sending information to one another.

### 10.6 PROSPECTS OF LOGISTICS INDUSTRY IN INDIA

Gone are the years where logistics was just a lesser consideration in the minds of huge trades. At present, it has become a very important part of the distribution chain system. Even Though the logistics service segment was mostly unorganised earlier, but today the rising demand for online distributions and availability of cargoes by people has directed the industry to develop at a CAGR of 10.5% by 2025. This segment offers jobs to nearly 40 million people in India and it is on the way to becoming one of the leading employee generating segments in the nation by 2022. There are mostly three transformations in trade that have considerable results on the procurement and distribution methods of the assembling sectors. These three forms are: (1) The globalisation of business; (2) Real time data; (3) Changing customer behaviour and their demand. The basic attributes of future logistics development are:

#### 10.6.1 Logistics focuses:

The development of logistics focuses is helpful for industry progression and the advancement of national monetary framework. Logistics spotlight could sufficiently abbreviate the division in the middle of creation and advertising upright. Moreover to coordinate diverse trades evenly and accordingly reduce the expenses. Governments can recommend unique provinces for storage amenities and logistics to reduce the land procurement. The future logistics will contribute towards e-trade, the Internet and the new way of management to generate new trade prospects.

#### 10.6.2 Role of Government

To hold intensity of commercial firms, the legislature requires directing the approach to assist the logistics business ventures. For instance, moving the cargo toward the city



logistics provides to elevate logistics efficiency and reduce the operation charges. Simultaneously, it consists of extensive speculation and a few problems associated with laws and national plans.

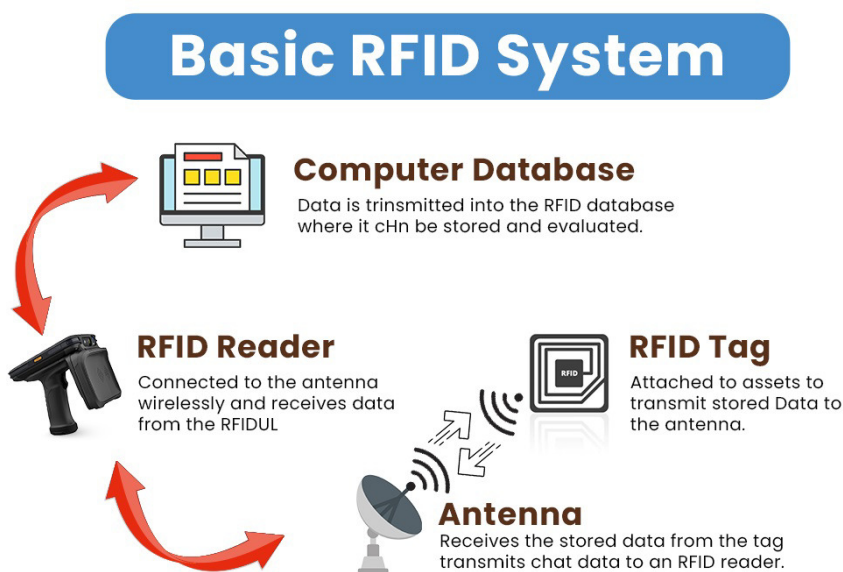
### 10.6.3 Development of global goods transport

The growth of global cargo transport is contributed by a few mechanism. 1. Blooming of E-trade 2. Change of generation system requires international participation 3. The weight of globalised trade, for instance, The WTO pushes nearby business project in order to promote themselves to attain a universal standard .

### 10.6.4 Improvement of administrations:

The personality of administrations is the basic component to persuade expending conduct between the undertakings with elevated closeness. The administration structure comprises a few generated processes at present, for instance, 1. Adequate Consumer Response (ECR) and 2. Quick Response (QR) and few innovative new structures would be linked in providing better administrations to consumers.

### 10.6.5 Revolution of logistics execution:



**Fig. 10.8: Revolution of logistics execution**

IT structures and related items convey output and likeness to the logistics structure. One of these methods is Radio Frequency ID (RFID). The main difference among the



Notes



standardised recognition structure and RFID is it does not need the activity of verifying the scanner tag on products. RFID could standby physical operation time radically. RFID structure could intellectually evaluate merchandise in the labels obviously and right away when the customers push their trolley throughout the way out.

### 10.6.6 Shorter cargo life cycle

With the present pattern, the stock pattern is varying step by step, and consequently, the product life cycle is shorter, mainly in software engineering. To see the consequence, the logistics structure must augment its output and unwavering excellence of merchandise delivery. In general an improper logistics structure would block the greatness of new cargoes and the trade benefits.

#### A. Other attributes

- Development of logistics offices
- Channel collaboration between organisations
- Specialised logistics conveyance
- Freight transport

India at present is the prime location for logistic service agents globally and it is reliable that there can approximately be a 9-10 percent development in the next few years. The boom in the retail sector of our nation right now is enormous. Thanks to the augmented buying capability of the middle-and upper-class divisions of customers. But, what is stopping us from being the next major distribution chain and logistics service provider in the globe? The main cause is poor and under developed infrastructure. Still, India is not that advanced in introducing inventive and path-breaking sophisticated technology and right now things are changing slowly. The logistics and distribution chain market in India is likely to touch nearly \$307 billion by the end of 2021. Here are the strong reasons for the future of the distribution chain and Logistics in 2022 of India to be bright:

### 10.6.7 Improved logistics

India is steadily on the path to attain its vision of becoming an economic and logistical source of power with more investment in the area of infrastructure and operational competence. Tech-driven incorporated logistics are presently becoming an integrated segment of the nation. The store houses in the nation are presently equipped with several automatic sorts and handlers with IoT devices. This assists in saving time in the operation of in-house logistics.





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### 10.6.8 Export opportunities are growing

At present the Indian markets are gaining exposure to quality brands with unconventional niches. This is directing to the boost up of both global exports and domestic utilisation. Manufacturing amenities are much enhanced now than earlier. The production standards have also moved up. The government has introduced several new policies namely 'Zero Defects, Zero Effect' so that our nation ranks up superior in the worldwide market.

### 10.6.9 Upgraded Logistics infrastructure

Reliable exercise is being set towards pushing the Indian logistics pattern towards a healthier tomorrow. The present logistics hubs and store houses are much superior and improved. Also, at present they are situated more around the prime ports. The spaces as well as logistic divisions are tailor-made which is established to be supportive. Information shows that 9 renowned sea ports of the nation have handled an increase in traffic by 3.11 percent during the period of April 2018 to January 2019 contrast to the period flanked by 2017 and 2018. Thus, all these main sea ports are portrayed as positive expansion indicators and the worth is only supposed to develop even more in 2022.

### 10.6.10 Leaping marketing strategies

Are you aware what has increased the bilateral business prospects of the nation the best? The bright marketing plans and widespread cultural research. In international trade forums, PM Modi motivates the worldwide trade tycoons to invest in our nation. This assists in optimising whatever technological talent our nation possesses. This is due to the enormous development in the amazing FDI inflows. The exponential development in the worldwide market of audio books and the logistics distribution chain market in India are rising at a similar pace ever since the last three years. In March 2020, the digits went up to \$405.64 billion which will let up furthermore by 2021.

### 10.6.11 Optimising asset use through cloud computing

In order to progress the operational effectiveness, optimising asset utilisation is vital. The logistics of the nation has to aspire towards being leaner and this is merely achievable via cloud computing. Logistics service providers can join forces by sharing their trucks, vessels and networks via cloud computing. When they share that information on cloud-related stages in real-time, it becomes simple for logistics service providers to harmonise and work together in the picking up and distribution of freight. This decreases the idle time of their journey. It also assists in making the distribution ecology more sufficient.

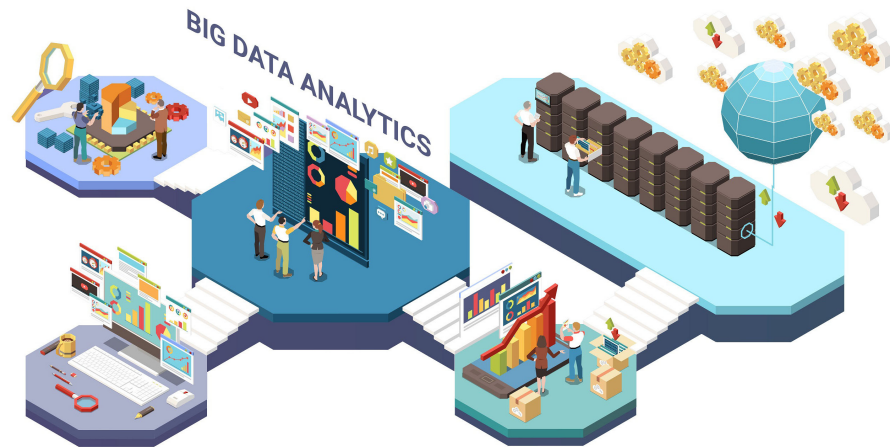
### 10.6.12 Facilitating simple storage and access to data through cloud computing

Cloud technology facilitates the simple storage of huge amounts of information. There is



## Notes

no necessity for even hard drives or physical servers. The Logistics service agents can simply access whatever data they need in almost no time. Thus, the logistics service providers attain the flexibility and control over vital procedure which require 24\*7 monitoring.



**Fig. 10.9: Big data analytics is driving the future strategy of logistics**

### 10.6.13 Big data analytics is driving the future strategy of logistics

Achieving the operational effectiveness in the nation's logistic structure and recognizing the improvement prospects are becoming simple because of Big Data Analytics. Analytics can be executed on the complete logistics value chain. This analytics can be utilised for the growth of algorithms and opinion of the remaining constructive life of assets. It can further be utilised to recognize the sectors of operational ineffectiveness and remove redundant charges by driving future plans.

### 10.6.14 New age technologies

The inflows of FDI are pushing the logistics division to invest even higher towards the new-age technologies. Path-breaking as well as extremely innovative technologies namely a) machine learning b) data analytics c) deep learning which much forward of their time are at present being executed. According to the IDG's 2020 State of Digital Business Transformation Report highlights that 93 percent of the companies are at present considering operating these innovative technologies to modernise the logistics and distribution chain units.

### 10.6.15 Development in the trade policies

The Bilateral business and global business is being augmented and developed because of

the enhanced data policies. Business policies namely 1. The Merchandise Exports from India Scheme (MEIS) and 2. The Service Exports from India Scheme (SEIS) are creating the trade environment much more productive. It is also directed to constructive development in the distribution and logistics chain administration. The ministry of Commerce and Industry had spotlighted that the healthy logistics and distribution chain division has catalysed towards the exports by a massive \$439 billion and also spotlights that in 2025 is moving to be even brighter. The Indian Government has provided incentive by reducing the tariff charges and taxes to several countries. This occurs because of the steady exercise of the Government for enhanced bilateral trade.

#### 10.6.16 Important reduction in manual intervention

Artificial intelligence is heading to automation of trade processes. This is directing to a decrease in manual involvement for freight handling. The progress is getting quicker and the excellence is getting superior which is bringing down the charges. It is also assisting in eradicating the hidden charges and is bringing down the entire high logistics charges of India. This is further to ensure quick inspection by authoritarian agencies and lowest handling damage. The logistics carriers are being prepared with real-time data on key area statistics. This is all in respect to the RFID and GPS which is creating the complete logistics structures much more receptive.

#### 10.6.16 Important development in the block chain technology



**Fig. 10.10: Important development in the block chain technology**

One point of logistics sequence to another can be flawlessly brought jointly by aligning the progress with the assistance of block chain technology. This is particularly helpful in



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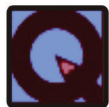
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reducing the duplicity process of the documentation. Because of the manual access of information, there is a possible risk of mistakes in the structure through several points in the value chain. But block chain technology is assisting in controlling this. Also, to attain an incorporated end-to-end logistics structure is becoming much more feasible than before.

**A. Conclusion:** The digital consumer base is mounting but the ill-planned infrastructural amenities are not capable of complementing it. Our nation is getting trapped among the rising demand for logistics services as well as the fragmented segment for logistics services. As of 2021, India is taking massive steps and experiments to adopt the digital technologies in the nation. But still there are more prospects left unexplored for the generation of great value in the Indian economy. If the logistics and distribution chain management division has to take advantage of it, the stakeholders have to add in more alliance and intense exercise. Everyone has to add in the work comprising:

- a) infrastructure providers
- b) operators
- c) technology firms, and finally
- d) the logistics service providers.

This growth will have their result on day-to-day logistics, and firms will require preparing for ‘the new normal’ in distribution chain administration. With all these transforms, keeping up-to-date on the newest trends in logistics is more significant than ever.



**INTEXT QUESTIONS 10.6**

1. QR stands for \_\_\_\_\_.
2. \_\_\_\_\_ is heading to automation of trade processes.
3. \_\_\_\_\_ analytics is driving the future strategy of logistics.
4. The logistics of the nation has to aspire towards being leaner and this is merely achievable via \_\_\_\_\_ computing.



### WHAT YOU HAVE LEARNT

- The logistics industry assists the business entrepreneurial activities among two or more traders through shipping, storing and distributing cargoes through B2B, B2C or C2C distribution chain networks. At present, logistics firms implement goods transportation services by surface, air and ocean by accepting the changing nature of the economic outline and digitization.
- With approximately 3.9 trillion U.S. dollars in size, the logistics industry in the Asia Pacific province is the largest one internationally. The foremost position of the province in the logistics industry could be described mostly because of the significance of the region in the movement of most of the essential trade cargoes globally.
- India's poor logistics as well as customary has been leading towards the competitiveness of our industries. India's logistics charge is steady to account for somewhere between 13-14 percent of the GDP. This contrasts poorly with the charge of 7-8 per cent for developed nations.
- Few innovative reactions to these extraordinary circumstances like attempting to attract patrons back into foodstuffs and beverage channels and assure holiday movers that it is certainly secure to enjoy travel and a hotel stay, have gone faster by obtainable hospitality industry trends and activated lasting transform.
- Often, wider worldwide events can persuade hospitality trends. A good instance of this can be viewed with the COVID-19 pandemic, which made trade across the hospitality division place a better spotlight on hygiene, sanitation, protection and local markets. Likewise, climate transformation concerns have created firms to spotlight eco-friendly remedies.
- At present, logistics has become a very important part of the distribution chain system. Even though the logistics service segment was mostly unorganised earlier, today the rising demand for online distributions and availability of cargo by people has directed the industry to develop at a CAGR of 10.5% by 2025.



### Notes



**Notes**



**KEY TERMS**

Logistics	Transport	Travel
Hospitality	Manufacturer	Hotel
Commodity	Distribution	Cargo
Automation	Trade	Technology



**TERMINAL EXERCISE**

1. Define Logistics.
2. Explain Logistics industry.
3. Define Green logistics.
4. What is the Travel industry?
5. Define Hospitality industry.
6. Explain the importance to hold the latest hospitality trends
7. How huge is the logistics industry?
8. Discuss the logistics industry growth in relation to Asia-Pacific
9. Highlight the role of artificial intelligence in logistics sector
10. Spotlight the functions of Robots in Hotel & Restaurants
11. Discuss the logistics industry growth in India
12. Highlight the impact of logistics industry on economic growth
13. Explain the major trends that are shaping the travel and hospitality industry
14. Point out the main features which are accountable for upcoming hospitality growth
15. Bring out the prospects of logistics industry in India



**ANSWER TO INTEXT QUESTIONS**



Notes

**10.1**

1. Manufacturer
2. Logistics
3. Global
4. Destination

**10.2**

1. PSA International
2. Infrastructure
3. Trade routes
4. Trained

**10.3**

1. Competitiveness
2. Green
3. India
4. Contactless

**10.4**

1. Trillion
2. Asset-light
3. Sustainability
4. Individuals

**Notes****10.5**

1. Contactless cash.
2. Mobile check in service
3. Behaviour
4. Smart

**10.6**

1. Quick Response
2. Artificial intelligence
3. Big data
4. Cloud

**DO AND LEARN**

Learners can undertake their activity work in the areas of different logistics / travel / hospitality organisations .



## MULTIMODAL TRANSPORTATION

In the current world, multimodal transport is an essential element for moving commodities from one location to another utilising different modes of transport so that, the cargo reaches its final destination rapidly and safely with a single transport agreement. It is the coordination of various means of transport used to move commodities from point of manufacture to the destination, through a shipping contract. Worldwide framework, multimodal transport can be intermodal, where diverse forms of transport will be used to transport the consignment or merge transport that will use a similar chain of vehicles to shift the consignment. This being the incident, the implementation of the same delivery may need different transport means such as, for example, a vessel, trailer or train and all this through a single agreement. Another significant feature of multimodal transport is that its means of shipment can be adapted to short or long distances based on the category of commodities and their destination. In this manner, there are bulky or small transports that can be utilised in a multimodal shipment so that, the cargo can leave or arrive at its location merging surface cargo trucks by road to take the commodity from the warehouse to the sea port, or railway cargo terminal that can transport more goods over long distances. This option makes the entire process simpler on a commercial stage, without having to engage more intermediaries. This is where the significance of multimodal transport mostly lies.



### LEARNING OUTCOMES

After studying this lesson the learner:

- compares the diverse aspects of transportation;
- applies analytical techniques to arrive at cost effective remedies to Indian transportation needs;



- manages global logistics partners and service providers;
- decides optimal transportation modal benefit;
- summarizes domestic and international transportation networks;
- identifies transport problems in logistics and warehouses.

## 11.1 INTRODUCTION TO MULTIMODAL / INTERMODAL /COMBINED TRANSPORT

Multimodal transport is a mode of transport that involves more than one form of transportation to ship the commodities from the exporter to the importer. In the operation of multimodal transport the commodities will be shifted from point X to point Y by using different types of word using by a single transport operator. In a great and diverse nation like India where an end to end distribution is a difficult task and the solution will be the multimodal transport. In order to create a standardised regime for the multimodal transport operators (MTOs), the Multimodal Transport Act was approved by the Indian Parliament in the year 1993. The Director General of Shipping was recognized as the capable ruler under this law. This Act provided the path for MTOs to register themselves with the regulation and begin their operations. IT has been a main enabler of multimodal transport in India and has been broadly used to automate the distribution chain and documentation. For consignments entering into India, documentation begins at the ea / air ports, CFSs, ICDs and then final custom clearances before distribution. ICES is presently operating at 134 major custom areas across India which handles more than 98% of India's global trade of export and import.



**Fig. 11.1: Introduction to Multimodal / Intermodal /Combined Transport**



Till the early 2000s the Multimodal transport was a monopoly which was under the control of CONCOR. Recently Indian government had given licences to private organisations to operate their own freight trains. At present, in India there are more than 15 Private Freight Train Operators (PFTOs) with top organisations such as a) Hind Terminals b) DP World, c) Adani Logistics and d) CWC all operating their own rail wagons. Indian Railways has also permitted PFTOs to operate their own Private Freight Terminals (PFTs), in order to transport nearly 20-25 mn tonnes of additional loading capability and attract investments of more than \$ 1 bn. Indian Railways also commenced to transport goods in specialised DSO containers. When compared to the developed countries, the completion of the Dedicated Freight Corridors (DFCs) will further increase the share of rail shipment in the nation from the present 30% to approximately 60-70%. Inland waterways goods development has already commenced from NW – 1 by companies like a) Pepsi b) Dabur c) Emami d) IFFCO from Kolkata to Varanasi where to link towards the eastern DFC. Air shipment is considered the best mode for perishable cargoes whereas inland waterways have just commenced.

### 11.1.1 Appropriate container for shipping cargoes using multimodal transport

Standard containers are generally used to transport cargoes by intermodal transport. In order to generate that they can be fine stacked and protected on cargo vessels, trailers and on board aeroplanes. In common, the stronger the containers, the low risk for exporters will lose their cargoes when changing the mode of transport.

### 11.1.2 Characteristics of Multimodal Transport

Among the most widespread characteristics of multimodal transport, we can spotlight the following:

- Two or more forms of transport are utilised to transport a consignment.
- The movement can be at national or global level.
- It is available to utilize maritime, air or surface transport vehicles united or of the same form.
- Can transport materials or cargoes using a single contract.
- Transport towards long or short distances.
- Goods tracking via satellite systems.

### 11.1.3 Types of multimodal transportation

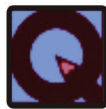
Among the main forms utilised by multimodal transport we can highlight the following:

- **Short sea transport:** This form of multimodal transport takes place because



large goods vessels cannot receive their commodities in all small ports. Therefore, it is essential that the cargoes are shipped in feeder vessels (small ships) so that they can move from a major port to a small port. This form of ship is referred to as “feeder”. In this form of transport, multi-modality comprises the transfer of mini-ships to huge vessels.

- **Land shipment (road/rail):** This form comprises the transfer of commodities between two modes of transport, in this case, the road shipment to reach storage houses or distribution hubs, and rail mode for moving over long distances quickly and without the hassles of land traffic.



### INTEXT QUESTIONS 11.1

1. \_\_\_\_\_ is a mode of transport in which it involves more than one form of transportation.
2. PFTs stand for \_\_\_\_\_.
3. The Multimodal Transport Act was approved by the Indian \_\_\_\_\_ in 1993.
4. This form of multimodal transport takes place because large goods vessels cannot receive their \_\_\_\_\_.
5. Commodities in all \_\_\_\_\_ ports.

### 11.2 IMPORTANCE OF MULTIMODAL TRANSPORT

To export and import the cargo, manufacturing units or merchant exporters and importers are always looking for shipping firms all the time. Apart from the quality services, traders nowadays are choosy in nature and they look for logistics agents who transit throughout the world. Due to the different cargo of availability in many countries, and the tastes and preferences of the consumers, a single mode of shipment is sometimes not enough. Constantly, multimodal transportation provides customers and trades to search for a shipping line that helps them select the transit method for their freight. More significantly, multimodality consists of door to door distribution in their services which perhaps makes it the most favoured in the transportation segment.

Multimodal transport involves that, for cargoes to be transported, it is essential to use definite modes of transport in order to arrive at their final location, which is previously generated by contract. This being the situation, the execution of a similar shipment may desire a specific transport division such as, for instance, a vessel, trailer or train and all this through a single agreement. This opportunity makes the entire part simpler on a

commercial level, and this occurs with the assistance of intermediaries. This is where the significance of multimodal shipment largely lies.



**Fig. 11.2: Importance of Multimodal Transport**

Another significant aspect of multimodal shipment is that its form of transport can be adapted to the distances both short and long based on the nature of the cargo and its final destination. In this sense, there are big or small transports that can be utilised in a multimodal shipment so that, the merchandise can move or arrive at its final destination by combining surface cargo trailers by road to take the commodities from the warehouse to the sea or airport, or railway terminal and other bigger ones such as vessels or railroads that can ship more goods over long distances. Further, this multimodal shipment helps a trader in the following ways 1. Decrease of goods handling times. 2. Reduction of charges per vehicle. 3. Reduction in customs controls. 4. Only one agreement is made. 5. Tracking commodities through satellite structures. 6. Economical rates, robbery or damage to the goods that favour the charges of insurance premiums overseas.

### 11.2.1 Multi-modal Logistics

Multimodal transport is the shipment of goods under a single agreement, but executed with at least two specific modes of transport; the carrier is responsible (in a legal sense) for the whole carriage, even though it is functioned by many modes of transport. Infrastructural Reforms Technological Investment Regulatory Reforms

### 11.2.2 Need of the hour

- Sufficient use of the modal mix
- Drive down logistics charges



Notes



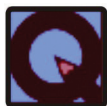
**Notes**

- Decrease the chances of pilferage related to containerization.
- Decrease overall transit time
- Decrease carbon footprint and convert towards the “green logistics”.

**11.2.3 Prospects in multi modal logistics**

In a country like India, multimodal transport provides a lot of opportunities which are highlighted below:

1. Single document clearance for all phases of multi modal transport
2. Triple as well as double deck train wagons
3. System of Roll on and Roll off
4. Waiting for docks for trailers and trucks
5. Rising hub and feeder executions at sea ports along the coast
6. Enhancement of multi modal shipment parks
7. Superior material handling sophisticated equipments
8. Incorporated IT structure that forecasts and tracks
9. System of fleet exchange
10. Palletization of cargo containers
11. Trucking Cubes: with three standard dimensions of containers
12. Arrive ahead towards Tier 2 and Tier 3 Cities
13. Strategic grouping with railway and logistics corporation
14. Creating one stop terminals for all worth added services



**INTEXT QUESTIONS 11.2**

1. Multimodal transport is the shipment of goods under a \_\_\_\_\_ agreement.
2. Multimodal shipment is that its form of transport can be adapted to the \_\_\_\_\_ of both short and long.
3. Multimodality consists of \_\_\_\_\_ distribution in their services which perhaps makes it the most favoured in the transportation segment.
4. Multimodal logistics provide the system of Roll on and \_\_\_\_\_ .

### 11.3 MERITS OF MULTIMODAL TRANSPORT

Multimodal Transport is the blend of definite modes of transport, in order to enhance the development of commodities, i.e. making it quicker and more adequate. When it arrives to this form of transportation, there is more than one type of means of shipment that is essential to take the cargoes to their final location, by utilising the trailers, rail, vessels, aeroplanes or some other mode of shipment for the delivery. The merits of Multimodal Transport lies in the most efficient grouping of multiple forms of transport, at the same time by optimising the deadlines, cutting back on stock charges, therefore holding the charges of the merchandise below control. In spite of the support of ecologists and cargo shipment experts, multimodality may induce certain charges through the utilisation of modal borders , such as handling of transshipments,etc.



Notes



**Fig. 11.3: Merits of Multimodal Transport**

Multimodal transportation is also referred to as combined transport because it moves goods from various parts with different forms of transport. International shipment is a division of multimodal transport which comprises road , rail, air as well as the ocean. The improvement is done with shipping containers that can simply move from one transport mode to another. Pickup from the manufacturing unit and drop off part towards the warehouse or port is usually by road, and in some circumstances rail, whereas the main transit comprises the ocean or air transport. The shipment during multimodal shipping is simple to track due to following reasons. This form of transportation influences the distribution time of the freight, the mode of the freight, the budget limitations and the point of destination. Multimodal freight is generally handled by a intermediary referred as





multimodal transportation operator (MTO, or freight forwarder) who undertakes job on the behalf of the exporter and the importer.

1. Communications is less in nature
2. Improvement in routing system
3. Transit time is shorter

This form of transportation influences the distribution time of the freight, the mode of the freight, the budget limitations and the point of destination. Multimodal freight is generally handled by an intermediary referred as multimodal transportation operator (MTO, or freight forwarder) who undertakes job on the behalf of the exporter and the importer. The MTO is responsible for sufficient and secure administration of trader freight.

**A. Merits:**

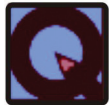
Due to the arrival of new driving hour limits on trailer drivers, the surface transportation takes longer transport time compared to earlier years. The mixture of multimodal shipping is required for goods to make it from port of origin to final destination. Moreover the main merit being the capability to transport the world had expanded, and there are several other merits of multimodal transportation which are as follows:

1. Decrease the overpopulation, ocean ports are congested owing to the chain of vessels and feeder vessels.
2. Decreases the charge in monitoring the cargoes and offers greater safety in tax collection.
3. Decrease the customs charges and rising smuggling control.
4. Decrease the costs of imported cargoes.
5. Enhance the competitiveness of national goods in the global market.
6. Permit scheduling of activities and manage of compensation cargoes.
7. Decrease the cargo shipment on time.
8. Decrease the transportation charges.
9. Decrease the risk of loss owing to robbery or looting
10. Minimum time and effort
11. Reduction of cost





12. Timely efficiency on Handling and distribution
13. Increased shipping security
14. Single contract to keep track of and
15. Easier shipment tracking



### INTEXT QUESTIONS 11.3

1. Multimodal transportation is also referred to as \_\_\_\_\_ transport.
2. Multimodal freight is generally handled by a intermediary referred as \_\_\_\_\_.
3. The merits of Multimodal Transport lies in the most efficient grouping of \_\_\_\_\_ types of transport.
4. Ocean ports are congested owing to the chain of mother and \_\_\_\_\_ vessels.

## 11.4 MULTIMODAL TRANSPORTATION IN SUPPLY CHAIN MANAGEMENT

Multi-modal shipment refers to where more than one method of transport is utilised in a distribution chain. A multi-modal shipment structure may consist of road, train, sea and air shipment which is a definite location among the network.

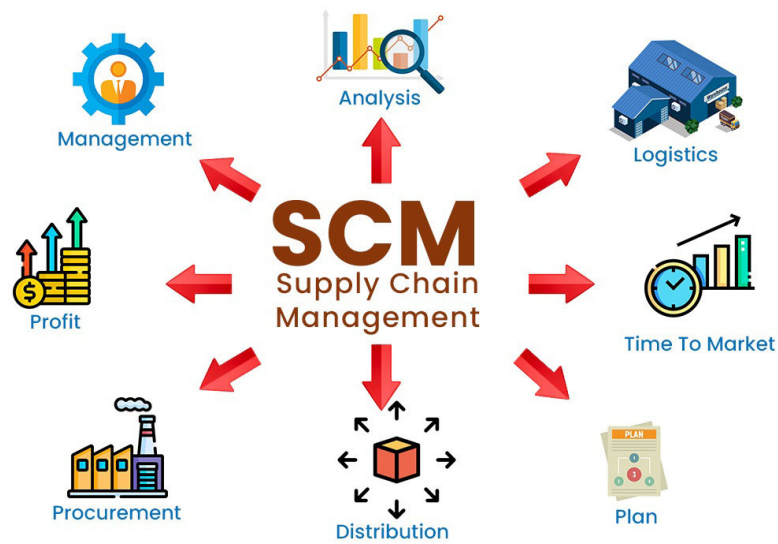
This form of transport system may be also classified as:

- **Multimodal:** It is a multiple shipment part are utilised across the distribution chain and cargoes are transferred among different parts during their journey
- **Inter-modal:** It is mainly found with container shipment, where the cargoes remain inside the containers but the container moves among the transport areas
- **Co-modal:** It is "A" term coined by the EU which refers to the utilisation of more than one mode of transport to distribute the most sustainable on the whole result.

Of all the parts of the distribution chain, few have a force on the business quite like the trader's choice of shipping. Transportation accesses generate deliveries to and from the competence flow smoothly and move at their designated locations on time. Because of the significance of transportation to any trade's success, it's vital to comprise this factor in the distribution chain management plan. In fact, it is so significant that transportation is measured as one of the three main components of distribution chain management.



Notes



**Fig. 11.4: Multimodal Transportation in Supply Chain Management**

#### 11.4.1 The three components of distribution chain management

A distribution chain attributes three main components 1.Purchasing 2.Manufacturing and 3.Transportation. A trader require to make several key decisions among these three components from beginning to end comprising

- Material to be utilised for goods.
- Production charges
- Stock Levels
- Supply Network Configuration
- Shipment for both receiving and shipping

Sufficient transportation administration is often the spirited definition for a company and should be added in any distribution chain management plan.

#### 11.4.2 Transportation works in distribution chain management

Transportation in a distribution chain refers to the movement of cargoes from port of origin to another, which starts at the distribution chain as materials make their path to the storehouse and loaded into containers and it moves further to the end user and the order is delivered at the doorstep. Because of the significance of transportation, warehouse executives should consider transportation within their distribution chains. Eventually, this is the only method to attain lower total charges for a method where shipment can account

for as much as 60 percent of entire operational charges, an important portion of an organisation's distribution chain charges.

### 11.4.3 Supply chain transportation risks considering

The current risks facing the transportation segment consist of a) driver shortages b) cyber attract and c) deteriorating infrastructure, to mention a few. Generally a driver in America at the age of 56 will soon retire in huge numbers and they are in need of adequate drivers as replacement with lesser drivers, huge demand will be placed on the drivers still on the surface, which could boost the risks of fatigue created accidents. With a sacking of automobile technology in present years comprising the risks, such as cyber attacks performed by hackers, it's significant that drivers should use the newest security tactics in the software structure. Another mounting risk in the transportation segment is the continued decrease of America's surface paths and shipment infrastructure. From crumbling the bridges and surface ways to augment traffic overpopulation on the trains and in the air shipment, delays can take place anywhere. An instance would be to implement an active transportation structure, which utilises the cross docking by exchanging the goods between trailers so that each trailer delivers goods from definite vendors to the final destinations. To assist and manage these risks and to increase success the companies require to welcome visibility and often transparency among the shipping supply chain and utilise a well executed shipping management structure.

### 11.4.4 Benefits of Multi-Modal Transport Optimization

If an exporter uses the definite transport method to shift the cargoes, it is in their interest to innovate a multi-modal system that associates the success with value. The similar applies if they are considering by implementing a multi-modal structure. In both cases, the subsequent questions should be taken into consideration:

1. What mixture of transport parts distributes the most economical overall system solution?
2. Which are the possible combinations of transport modes given the demand and supply points?
3. Should a port-centric distribution strategy be considered?
4. What mixture of transport mode will distribute the most sustainable overall remedy?

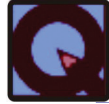
Obviously there are merits to using economical mode of transport such as surface or ocean, if viable. Whether an exporter can utilize these reasonable modes will be based on numerous factors. Do they have access to sea ports and terminals? Are they moving acceptable cargoes in bulk or volume to generate large adequate shipments? What are the lead time needs?



Notes



Executing a less carbon supply chain can furthermore be an incentive to consider the multiple transport segments. Offering an acceptable amount of commodities, a multimodal shipment solution can bring down the charges while lowering the usage of carbon.



### INTEXT QUESTIONS 11.4

1. \_\_\_\_\_ is "A" term coined by the EU which refers to the utilisation of more than one mode of transport.
2. A distribution chain attributes \_\_\_\_\_ main components.
3. A firm's supply chain's success relies on a strategic use of \_\_\_\_\_ transportation.
4. Transportation in a \_\_\_\_\_ refers to the movement of cargoes from port of origin to destination.

## 11.5 MULTIMODAL TRANSPORTATION OF GOODS ACT 1993

### 11.5.1 Multimodal Transportation

This sort of Multimodal Transportation can be executed only by registered persons i.e. they should have registered with MTO under 1993 Act of MTG. Further the Director General of Shipping has been informed as the capable organisation to rule and to execute these functions under the Act comprising registration of MTOs. The registration certificate of MTO is valid for a period of 1 year and can also be renewed for another one year from time to time. The 1993 Multimodal Transportation of Goods Act was invented to enhance the exporters and offer them a sense of protection in transporting their cargoes. Under the stipulation of the Act only those shipping agents who are registered by the capable regulations which have been highlighted to be the Director General of Shipping, can perform the Multimodal Transportation. According to the Act of MTG three types of organisations are eligible to be registered as MTO's. In order to be eligible for registration as MTO., the Shipping Companies (which own containers and vessels) as well as Freight Forwarding firms should have a turnover of Rs.50 lakhs and above during the last three years.

1. Within the meaning of C. A. Act 1949, they have to present a certificate of turnover which is duly signed and provided by a Chartered Accountant
2. They should possess offices/agents/representatives in at least two other nations.

### 11.5.2 Multimodal Transport Document and its implementation in India

1. The trade environment is moving quicker than ever before. Augmented competition



at domestic and international means quality as well as prosperity must be preserved. We live in a continually evolving globe where harmonisation is tremendously important and the business desperately desires a sufficient and simple door to door responsibility structure. This was one of the causes why ICC and UNCTAD innovated the new UNCTAD/ICC Regulations for documents related to Multimodal Transport.

2. Development of containerization has resulted in the Multimodal Transport of cargoes under a single shipping document covering all modes of transport from the exporter's unit to the importer's premises such as Multimodal Transportation by under a single transport document which has a number of merits like a) decrease in entire transport b) price reduction in delays, c) smoother and faster development d) and development in the quality of services. In India, there was no regularity followed in connection with the MULTIMODAL Transport of cargo. The Government observes that the absence of regularity in such practices, directs to ambiguity and inequity of interests among the operators and the commodity owners. A working land was therefore; set up to consider the widespread situation and to suggest a law which should obviously determine the tasks and liabilities of MULTIMODAL shipping operators for loss or damage towards the cargo. The recent law on MULTIMODAL transport was created by giving an ordinance in October 1992 and was afterwards replaced by the 1993 Act of Multimodal Transportation of Goods.

### 11.5.3 The multimodal transport document

One of the most significant ingredients included in such Multimodal Transport is the continuation of a legal rule to govern the terms of the agreement and indicate the basis of responsibility and tasks of the Multimodal Transport Operator. In India, (FEDAI) i.e. the Foreign Exchange Dealers Association of India has developed its own regulations laying down the tasks and responsibility of Combined Transport Operators from the respective inland container depots. Looking to the vital requirement of Industry and bearing in mind the necessities of the Multimodal Transportation of Goods Act 1993 which is significantly based on the regulations created by the ICC and also taking into account the requirements of the UN rule of 1980 on Multimodal Transportation of cargoes, the Director General of Shipping, with the sanction of the Govt., has presented an Order on 17th March, 1994 mentioning a approach for the Multimodal Transport Document (MTD). The document has been created to perform the provisions of the Act bearing in mind the main objective of the legislation that the carriers are there to serve business and not the other way around.

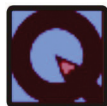
- An agreement for the Transportation of Goods by Multimodal Transport.



- A negotiable document except it is marked non negotiable at the option of the consignor.
- A document of title on the origin of which its holder can take distribution of the cargoes covered by it. The relevant parties who would have business interest who would be governed by the document once it is implemented it would begin) The MTO who a person accountable for the carrying out of the Multimodal Transport agreement) The exporter who places the cargoes in question with the MTD for shipping the same and the importer who is to take delivery towards the final destination.
- The bankers who would provide the mechanism for documentary credit.
- The insurers who insure the cargoes against loss or damage and the responsibility insurers who would cover the MTO's responsibility under agreement.

#### 11.5.4 Standard conditions governing multimodal transport

Definitions of pertinent terms are provided in Para 1 as per the Act. Since this is a current legislation, the suitable to be applied in linkage with India's abroad trade and the importers would be outside the nation, it is essential to provide the definitions in these normal conditions so that all related parties in specific nations are aware of the meaning of several terms as understood as per the Act. The capacity of applicability of the document is to be limited in accordance with the preface of the Act and, consequently, has been mentioned in the second condition. The negotiability as well as the title to the cargoes has been included in the standard stipulations in accordance with division 8 of the Act. Reservations related to inaccuracies, grounds of doubt or the absence of logical means of verification have been spotlighted in condition 5 and are in flow with Section 10 of the Act. The evidentiary consequence of the Multimodal Transport Document is as per with Section 11 of the Act. The Guarantee by the exporter as mentioned in Section 12 has been spotlighted in Condition No.7.



#### INTEXT QUESTIONS 11.5

1. The Multimodal Transport Act came into existence during the year \_\_\_\_\_.
2. B/L stands for \_\_\_\_\_ .
3. The registration certificate of MTO is valid for a period of \_\_\_\_\_ year.
4. The \_\_\_\_\_ has set the Multimodal Transport Document in accordance with 1994, Rule 3 of Multimodal Transport Document.



## Notes

## 11.6 MULTIMODAL TRANSPORT OPERATORS

The worldwide exports over the past 3 years stand at an average of 18 trillion US Dollars. Trade across the globe deliver cargoes to their clients both domestic as well as global, by several modes of transport. Cargoes are shipped over the road by trailers or trucks, by train or rail on freight trains, ocean freight on cargo vessels, and by air on air cargo flights. Cargoes may be shipped by a single mode of transport or it could be a mixture of two or more. When cargoes are transported by utilising two or more definite types of transport, it is referred to as multimodal transport. The model of door delivery in trade is developed only through multimodal transport. It assists in the faster the development of cargoes while reducing the overall logistics charges of doing trade. A multimodal transport operator is a person one who handles the shipment of goods from the manufacturing unit to the port of destination or importer premises by specific modes of transport. The goods that are shipped will commonly move under a single transport agreement or bill of lading. It will explain all the specific type of transport that is forced for the movement of the goods from its point of origin to its final destination.

### 11.6.1 Merits of multimodal transport operators

- A. Easy Communication:** It is very simple to communicate with a single MTO rather than communicating with numerous transport operators. They are responsible for coordinating the shipment of cargo by several modes of shipment and its related logistics. The exporter who is sending the commodity has a single point of contact which is the multimodal transport operator. Updates in shipping schedules such as delay occurs or early arrivals are easily communicated by this way instead of different transport intermediaries.
- B. Saves Time:** The MTO is generally an expert in his field of trade. They are aware of the easiest and quickest way to move cargoes from one destination to another. Their extended variety of contacts and to transport goods and the executives makes it easier for them to position towards the movement of goods between diverse locations by utilising the right mode of transport and in the shortest time period. This saves time as well as effort and cargoes reach their final destinations on time and as scheduled. Documentation and other shipping formalities such as clearance at port and customs, loading the cargo, arrangement of workers, etc. can be burdensome for exporters as well as importers. These can be simply handled by skilled multimodal transport operators by saving the exporter's precious time.
- C. Cost advantage:** The MTO performs several transport infrastructures and the expertise to handle it. Successful trade organisations concentrate on their core areas such as manufacturing and outsource the non-core tasks with service providers. Sending cargoes through multimodal transport operators can be a cost advantage as





they are the professionals and can opt for the greatest transport which would benefit to send the cargoes. By utilising the right method of transport and customs formalities they can assist to save on the cost.

- D. More benefit:** MTO's are aware of what form of transport will best suit a precise type of goods. They can choose from an expanded series of shipping and logistics service providers and often obtain services at the finest rates. With an extended phase of operators to select from, they are in an enhanced environment to obtain the best freight rates that can then be passed on to their client by way of cost reductions.

### 11.6.2 Types of shipment utilised by Multimodal Transport Operators

- A. Road:** Road shipment is the most widespread form of transport in several nations. It assists to move passengers as well as goods between different places over land. The road connectivity among several places has been increased considerably in present times. These roads have been put down at very high altitudes and over rough terrains by making sure that it is available to move passengers and goods to these locations by automobiles such as cars, buses, Trucks and freight trailers. Road transport links the cargo depots, store houses, and business organisations to seaports, airports, and other surface transport hubs. They link almost all corners of a nation as well as join over most worldwide land territory. Further, this mode is easily accessible and inexpensive; it is measured as the backbone of moving the overall transport structure of the nation.
- B. Rail:** Another popular mode of transport for the movement of passengers and freight is by train. Locomotives which are powerful engines that can haul numerous rail cars over a track, at a time. Freight rails assist to transfer huge quantities of goods over a long distance. Almost any form of cargo is shipped over trains these days. Commodities such as Coal, ores, fuel oils, cement, food grains, gases, and various other commercial products are shipped by freight trains. Since rail moves over fixed steel tracks, they go behind a fixed path and require the essential infrastructure such as sophisticated signaling structures and railway terminals to finish smoothly. But it is still an economical mode of transport.
- C. Ocean:** It is predictable that sea or ocean shipment accounts for the movement of 80% of the world's goods. They largely transport through boats, barges, vessels, and super tankers which facilitate to move freight through waterways and oceans, among the world's best ports. Containerization invention, advances in vessel building, and consistent accesses of packaging and packing namely boxes, barrels, pallets, etc. is considered as another revolution towards the ocean transport industry. Ocean freight is extremely cost effective and has access to carrying the bulk cargo and heavy consignments over a vast distance.





## Notes

**D. Air:** Air transport is certainly the quickest mode of transport when it comes to moving passengers or goods over a long distance. But here, the infrastructure charges are high and so the charges to passengers or transport of goods are also obviously high. It is, however, an easy and fast mode for the transport of passengers. Cargoes such as Perishable, high-value, or time-bound distribution of cargo that require to be shipped over a long distance are finest moved by air transport. The temperature-controlled store houses at airports and innovations in packaging by using special packing materials would facilitate keeping such products fresh without decline in quality. The utilization of dry ice in packing assists to control the freshness of perishable goods or the excellence of temperature-sensitive cargoes during their waiting period. Dry ice which is a solid carbon dioxide (CO<sub>2</sub>) has a temperature of -78.5 °C.

In India, multimodal transport is regulated under the Multimodal Transportation of Goods Act of 1993 (MMTG). The Director General of Shipping (DGS) in support with the Ministry of Road Transport and Highways (MORTH) assists in framing the rules and stipulations in connection to the multimodal transport of the nation and in regulating them.



## INTEXT QUESTIONS 11.6

1. MTO is generally an \_\_\_\_\_ in his field of trade.
2. DGS stands for \_\_\_\_\_.
3. The utilization of \_\_\_\_\_ in packing assists to control the freshness of perishable goods
4. It is predictable that \_\_\_\_\_ shipment accounts for the movement of 80% of the world's goods.

## 11.7 MULTIMODAL TRANSPORTATION CHALLENGES IN INDIA

Let's have a glance on what challenges multimodal and intermodal transportation possess and what sort of remedies exporters and shipping companies revert to.

### 11.7.1 Road movement challenges

- Inadequate infrastructure and quality of roads
- Last mile distribution, pricing per ton varies very much, based on the accessibility to a metropolitan

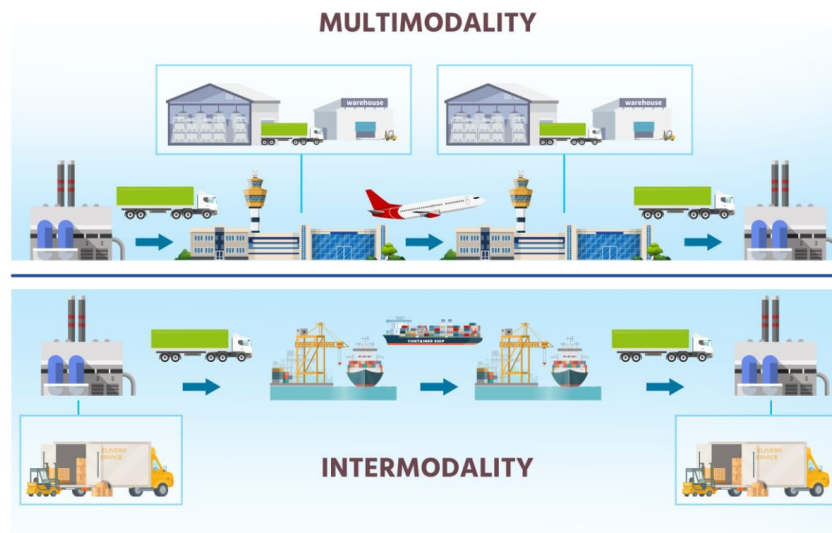


Notes

- Lack of training between Indian drivers and insufficient real time visibility
- Intra-state taxes augment the charges of transportation
- At present typically unorganized players (9:1 ratio)
- High CO<sub>2</sub> emissions per tonne-km

**A. Opportunities:**

1. Level of GST to eliminate inter-state taxes, so 4PL firms may set up store houses based on savings from decreased transportation charges.
2. Innovation of multi-modal logistics parks.
3. Utilization of GPS and information analytics for optimized path analysis
4. Generating the fleet exchanges similar to Stock or Commodity Exchange to unite together shipping customers and transport manufacturers for the mostly unorganized transport.
5. Uniting together the unorganized players such as Trailer Porter, Trailer Mandi, Lets shipment)
6. Use of high load tonnage trailers for better effectiveness.



**Fig. 11.5: Road movement challenges**

**11.7.2 Rail shipment challenges**

- At present average velocity is a meager 25 kmph, although cargo trains can move speeds up to 160 kmph



- Overused
- 7 extensive haul corridors
- 27% of system but 50% of the traffic

### A. Opportunities :

1. Generating of committed freight corridors
2. Scheduled shipment trains
3. Covers the Eastern Corridor: From Ludhiana towards Punjab to Dankuni adjacent to Kolkata (1839 Kms) and the Western Corridor from Jawaharlal Nehru Port (JNPT) in Maharashtra towards Tuglakabad as well as Dadri adjacent to Delhi 1499 km.
4. Three proposal towards development of East to West, North to South and East Coast.
5. Charge freight possible to go down from 1 rupee/NTKM(Net tonne km) towards 0.18-0.53 Rupee/NTKM

### 11.7.3 Air transport challenges

- Much high cost per ton of commodities transported
- Last mile link is not achieved
- Lesser entry in Tier-2 and Tier-3 cities

**A. Opportunities:** 1.1500 crores allocated by government for 200 economical airports in Tier-2 and Tier-3 cities. Decrease in Dwell time for air consignment. 2. Develop government policies. 3. Develop of ecological field airports. 4. Progress of infrastructure for movement of perishable goods, till last mile.

### 11.7.4 Ocean Transport Challenges

- Short of last mile linkage and incorporation with other parts.
- There is ineffectiveness in berthing and delays in stuffing and de-stuffing. i.e. high turnaround time of ships
- There are delays in harmonization among seaports and the Customs officials
- There is poor hinterland linkage and poor sea port and surface side infrastructure and old equipment.
- Navigation mode of constraints does not permit bigger ships to be berthed.



**Opportunities:** 1. Growth of mega-ports. 2. Improve capability utilization especially for sea ports which are potentially limited by the hinterland. 3. Improving the sea port infrastructure by focusing on upgrading the ocean side and surface side infrastructure 4. Improvement of an incorporated structure for inland waterways that also is linked to the roads as well as railways for last mile distribution 5. Acceptable numerous ships to handle bulk as well as container cargo. 6. The initiative of Sagarmala that focuses on port development will be an immense move and will harmonize the Golden Quadrilateral venture. 7. Containerization to assist to bring down the handling charges and enhance the multi modal shipment.

### 11.7.5 Warehousing challenges

- Problems in land acquisition owing to huge capital.
- Low stage of customization in the store houses.
- Insufficient operational employees that handle the store house.
- State of cold warehouses in India is not of high-quality.
- Shortage of IT enablement to make executions sufficient in warehouses.
- Maximum Utilization of store houses.

**A. Opportunities :** 1. Execution of GST: The landscape of fragmented which is existing, unorganized little go-downs will probably undergo important reorganization. 2. Improvement of new warehouse and networks: The urgency of next-generation warehouse mode such as a) multi- modal logistics parks (MMLPs) b) mega food parks (MFPs) and c) FTWZs must be allied with the improvement of main infrastructure ventures connected to port, highway, and rail ventures. 3. Services connected to value added to be offered with store houses like cross docking, quality verification and repackaging. 4. Improvement of free trade store housing zones. 5. Improve the operations in the areas of Elevated Transfer Vehicle (ETV) or else the Automatic warehouse and retrieval system (ASRS) at the relevant terminals.

### 11.7.6 Other challenges with remedies

**A. Extreme paperwork:** Even though the intermodal as well as the multimodal improvements are definite in terms of the numerous agreements one has to hassle with, multimodal transport can still be troublesome in connection to paperwork. For example, you've settled on a carrier company that handles multimodal transport for you. As a firm spends more and more time towards each paper invoice, the total



shipping charges keep growing. This is an indication for the shipping and logistics segment to go paperless.

**a. Challenge:** These paper invoices are required for specific services individually.

**b. Solution:** The paperless distribution management structures can support a firm in creation of e-sign and photo proof of distribution.

**B. Deprived tracking & coordination:** In vast-haul freight, tracking a single consignment can desire a mixture of resources even when shipping boils down to one exporter and one carrier. Even the inland improvement can be tricky to scrutinize, such as the air consignment and port-to-port Ocean transports.

**a. Challenge:** Shortage of tracking system and the requirement of constant updates.

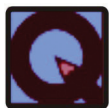
**b. Solution:** Track and trace and automatic transport notifications.

**C. Distribution chain disruptions:** During the year 2021, no exporter is immune to distribution chain disruptions. The pandemic has created several challenges to both intermodal as well as multimodal transport structures, and the shipping industry is still taking a drive to this day. Especially with specific modes of transport concerned, exporters require to have security that in realism requires being prepared for distribution chain disruptions and having specific intermodal and multimodal remedies as alternatives.

**a. Challenge:** Security concerns, disrupted service, and inflated transport cost.

**b. Solution:** Improvement in safety division like contact of less distribution

**D. Recap:** Every exporter requires knowing their merits when it arrives at intermodal and multimodal shipment. To ship commodities over long distances, a mixture of parts of shipment will be concerned anyway. The exporter should know whether to move with a single agreement service or move towards the intermodal way.



### INTEXT QUESTIONS 11.7

1. The next-generation warehouse mode is \_\_\_\_\_ logistics parks.
2. \_\_\_\_\_ bring down the handling charges and enhance the multi modal shipment.
3. The initiative of \_\_\_\_\_ that focuses on port development will be an immense move and will harmonize the Golden Quadrilateral venture.
4. The \_\_\_\_\_ distribution management structures can support a firm in creation of e-sign and photo proof of distribution.



Notes



**WHAT YOU HAVE LEARNT**

- Multimodal transport is a mode of transport which it involves more than one form of transportation to ship the commodities from the exporter to the importer. Further, it can be a mixture of two or more modes of transport, such as road, train, ocean or air freight.
- Due to the different cargoes availability in many countries, and the tastes and preference of the consumers, a single mode of shipment is sometimes not enough. Constantly, multimodal transportation provides customers and traders to search for a shipping line that helps them select the right transit method for their freight.
- Multimodal Transport is the blend of definite modes of transport, to enhance the development of commodities, i.e. making it quicker and more efficient. When it comes to this form of transportation, there is more than one type of means of shipment that is essential to take the cargoes to their final location, by utilizing the trailers, rail, vessels, airplanes or some other mode of shipment for the delivery.
- Multi-modal shipment refers to where more than one method of transport is utilized in a distribution chain. A multi-modal shipment structure may consist of road, train, sea and air shipment which is a definite location among the network.
- The Multimodal Transportation of Goods Act, 1993 (MMTG) offers for the regulation of Multimodal Transportation of cargoes from any location in India to any destination outside India by comprising two or more type of Transport on the basis of single contact of Multimodal Transport. This act came into existence on 2.4.1993 and it offers the Registration of a person to become a Multimodal Transport operator.
- A multimodal transport operator is a person one who handles the shipment of goods from the manufacturing unit to the port of destination or importer premises by specific modes of transport. The goods that are shipped will commonly move under a single transport agreement or bill of lading.



**KEY TERMS**

Transport	Multimodal	Intermodal	Combined
Operator	ICD	Supply chain	Warehousing
Document	Cargoes	Goods	Shipment

**TERMINAL EXERCISE**

1. What is Multimodal transport?
2. Note on Inland Container Depot.
3. What is Supply chain management?
4. Who is a Multimodal transport operator?
5. What is a Combined transport document?
6. Discuss the prospects of multimodal transportation
7. State the benefits of multi-modal transport optimization
8. Explain the standard conditions governing multimodal transport
9. Spotlight the merits of multimodal transport operators
10. Bring out the challenges in warehousing.
11. Explain the role of multimodal transportation in a supply chain
12. Discuss the Multimodal Transportation of Goods Act,
13. Sketch the multimodal transport document in detail
14. Bring out various types of shipment used by Multimodal Transport Operators
15. Spotlight the challenges and opportunities in connection to road movement

**ANSWER TO INTEXT QUESTIONS****11.1**

- |                         |                              |
|-------------------------|------------------------------|
| 1. Multimodal transport | 2. Private Freight Terminals |
| 3. Parliament           | 4. Small                     |

**11.2**

- |                 |              |
|-----------------|--------------|
| 1. Single       | 2. Distances |
| 3. Door to door | 4. Roll off  |



Notes



**Notes**

**11.3**

- |             |                                       |
|-------------|---------------------------------------|
| 1. Combined | 2. Multimodal transportation operator |
| 3. Multiple | 4. Feeder                             |

**11.4**

- |              |                       |
|--------------|-----------------------|
| 1. Co -modal | 2. Three              |
| 3. Suitable  | 4. Distribution chain |

**11.5**

- |         |                                 |
|---------|---------------------------------|
| 1. 1993 | 2. Bill of Lading               |
| 3. One  | 4. Director General of Shipping |

**11.6**

- |              |                                 |
|--------------|---------------------------------|
| 1. Expertise | 2. Director General of Shipping |
| 3. Dry ice   | 4. Ocean                        |

**11.7**

- |                |                     |
|----------------|---------------------|
| 1. Multi-modal | 2. Containerization |
| 3. Sagarmala   | 4. Paperless        |



**DO AND LEARN**

Learners can undertake their activity work in the areas of different multi modal transportation / warehouse /distribution organizations.



## AIR TRANSPORTATION

Air transport assists integration into the worldwide economy and offers vital linkage on a national, regional, and global scale. Aviation assists drive the development of the current world. Air shipment is a main universal employer, supporting a total of 87.7 million jobs globally and offering 11.3 million direct jobs. If aviation were a nation, it would be the 17th biggest economy in the world, supporting 87.7 million jobs and nearly 3.5 trillion dollars in economic impact. As our worldwide economy grows ever more connected, aviation is the feature that brings



### LEARNING OUTCOMES

After studying this lesson the learner:

- defines the role of international bodies in regulation of the airline industry;
- assesses the prime concern of IATA;
- classifies the applicability of the rules of the air;
- explains the air traffic services and management;
- identifies international laws related to air transport.

### 12.1 AIR CARGO & TRANSPORT-INTRODUCTION

Air freight is an extremely valuable form of transport when the goods start moving very fast and timely around the globe. Air cargo is of two types namely a) general and special Air freight permits to transport cargoes quickly by air. Companies who are utilising the air freight services generally might be having two main assumptions. In general the airfreight can be costly in some cases but in other Further a firm can also transport a lot of things



Notes

by air, even though it is normally required for FMCG (Fast-Moving Consumer Goods).



**Fig. 12.1: Air Cargo & Transport**

There are two main branches of air freight services.

- A. General Cargo:** This sort of service is generally less expensive when compared to Special Cargo service. Transit time might be sometimes longer. Goods can be classified as “General Cargo”, it does not have any special requirements like temperature control or quick-moving for short shelf life. It also should not be extra-large or have odd sizes (like over length).eg, Clothing (in boxes and palletized), Computers and computer parts (no battery included), books, etc.
- B. Special cargo:** Commodities that fall under this method of service normally should be handled with care. Some airlines are normally doubtful about accepting certain goods when it comes to special goods service. Some of the cargo sorts that fall below the special cargo class are as follows:

**Table 12.1: Special Air cargo**

S. No.	Special Air cargo
1	Temperature controlled
2	Hazardous materials
3	Heavy weight and over dimensional freight
4	Live animals
5	High value /Fragile items
6	Human remains / Organs /Samples of tissue



Notes

- **Temperature Controlled:** This service is for the goods that need being stored under a positive temperature owing to the special nature of the goods. Such as vegetables, fruits, medical kits, etc.
- **Dangerous/Hazardous goods:** Few groups of cargoes they fall under hazardous in nature. Those commodities are flammable, poisonous, radioactive, explosive etc. These cargoes should be packed perfectly and stuffed in a certain space in the airline. For this reason, the rates are anticipated to be higher than the general goods.
- **Live Animals:** The service is generally used to carry pets. Shipping live animals such as cows, horses, dogs, cats, turtles need a properly ventilated space and they should be located in a suitable crate that permits their comfortable stay during the journey. The charges will be based on the chargeable load of the crate including pets.
- **Human Remains/Tissues and Organs:** While shipping the human remains and tissue (or organs) it always needs special handling and packaging. In several cases, it requires temperature control, so the charges related to shipping such goods are very costly in comparison to general goods.



### INTEXT QUESTIONS 12.1

1. Air Freight, also referred to as \_\_\_\_\_ .
2. \_\_\_\_\_ cargo does not need any special requirements
3. \_\_\_\_\_ cargoes should be packed perfectly and stuffed in a certain space in the airline.
4. \_\_\_\_\_ is transported through the same gate path by combining the passenger as well as commercial airlines.

### 12.2 ROLE AND FUNCTIONS OF IATA

IATA refers as the International Air Transport Association and is the official trade For air carriers, IATA offers a polled resource for scheduling, routing, standardising services and the generation of a international public service for the air segment. For customers, IATA sets the global standard for services and trade practices between member airlines. As an instance, the three-digit airport codes utilised globally are an IATA convention. that one should ensure that their carrier/forwarder is an IATA agent.

IATA is one of the biggest travel and tourism organisations announcing the connection among the airlines all over the globe. The organisation currently has 278 airlines below its



Notes

wings which represent 117 nations. The IATA members transport around 83% of the total air traffic. The organisation sets guidelines and corporate policies for the airlines and helps airline activities. IATA headquarters is located in Montreal, Canada, and their executive office is situated in Geneva, Switzerland.

### 12.2.1 Main functions of IATA

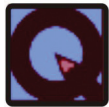
- A. Safety:** The main favourite of the organisation is to make sure the safety of aeroplanes and the air travellers. IATA has set up a board to generate safety standards for the air borne carriers and experts to determine that the guidelines are stringently observed. These attempts by IATA ushered many developments in terms of air travel security and the quantity of air accidents has been extremely reduced.
- B. Security:** The airplanes are exposure to terrorism as well as hijack activities. After the increasing amounts of hijack incidents and the September 11 attacks, IATA has taken rigorous standardisation and made necessities to tighten the safety of airlines. The structure works on the basis of passenger segregation and risk evaluation.
- C. Environment:** Air shipment contributes to the air pollution in a huge way and it consumes tons of fuel. The introduction of IATA teamed up with aircraft producers to set up energy efficiency with less polluting engines. These attempts were helpful in enhancing the fuel capability to 1.5 per year. The carbon emissions created by aircraft engines were decreased and the organisation is now intended for a 50% decrease in carbon emissions by 2050.
- D. Services:** Apart from strategy making and relevant regulatory services, IATA offers several training and advising services. Here are a few services recommended by IATA to enhance the standards of airlines and air travel :
  1. The organisation publicises accreditation for travel intermediaries and travel experts, differentiating them from fake travel agencies.
  2. The services related to billing and settlement of IATA operate a 300 billion financial structure to verify airline revenue.
  3. The ticket tax box service which is a record for airlines to preserve the tax expenditure.
  4. IATA determines the course outline and course formation for several travel and tourism courses. The IATA certification assists students to enrol for organisation approved and legitimate courses. All the foremost airlines and travel firms hire the students who possess IATA certification.



### 12.2.2 IATA Services:

The services rendered by IATA are as follows:

1. Accreditation – Travel & goods.
2. Intelligence and data.
3. Compliance remedies.
4. Monetary Services.
5. Consulting.
6. Security & Flight execution solutions
7. IATA Codes and
8. Advertising



### INTEXT QUESTIONS 12.2

1. IATA sets the global standard for services and trade practices between \_\_\_\_\_ airlines.
2. IATA headquarters is located in \_\_\_\_\_.
3. Air shipment contributes to the air \_\_\_\_\_ in a huge way and it consumes tons of fuel.
4. The IATA members transport around 83% of the total \_\_\_\_\_.

## 12.3 DUTIES AND FUNCTIONS OF IATA CARGO AGENT

### 12.3.1 Cargo and Freight Agent

Cargo and freight intermediaries play a very vital role in the economy by assisting to transport goods or raw materials from one location to the next. They coordinate and assist the incoming and outgoing shipments for shipping industries such as airlines, shipping firms, and rail / road Organisations .

### 12.3.2 Nature of cargo and freight agent

They help the exporters and importers by receiving or sending the goods through airline, shipping, train, and trailer terminals as well as docks. Further they make sure that shipments are picked up and distributed on time, paperwork is finished, and applicable charges are collected. For worldwide shipments, these agents prepare and confirm customs and tariff forms.



**Notes**

**A. Other duties of cargo and freight agents:**

1. Determine transporting methods and dispatch from pick-up spots to final destination.
2. Advise their customers on shipping and payment choice.
3. Coordinate shipping and logistics details with respective shipping and freight organizations.
4. Estimation, negotiate, and decide postal charges, shipment prices, and other charges.
5. Announce clients of goods shipments, status en route, and on time delivery.
6. Prepare the Air way bills, invoices, and other necessary shipping documents.
7. Record data such as commodity amount, weight, sizes, time of shipment.
8. Trace lost consignments as essential.

**12.3.3 Workplace of an IATA Cargo Agent**

IATA agents usually work in warehouses, stockrooms, or transporting and receiving stations. They frequently join hands with clients, logistics firms, and others in the shipping business. They must be capable to courteously and completely offer shipment updates, cost quotes, and other data upon request. Further, they must ensure that the goods enter or are picked up at its delivery on time and must be capable to plan consignments to ensure prompt delivery.

**12.3.4 Duties of IATA in a Freight-forwarding company**

Eight duties can be related to the duty which an IATA agent performs for a IATA **freight-forwarding company**. The agent utilises all the resources at his transfer to finish the task of moving the commodities.

1. The first duty that the agent has is to explain the routes the goods will move from the pick-up location to the final destination. Determining which methods of transportation to utilise, the storage plan and who will be accountable for stuffing and unloading the consignment.
2. The agent deals with the exporter and the importer to organise and establish the charges for transportation, who is paying the insurance, and how the costing affects the several modes of transportation utilised in the shipment.
3. Once the shipping strategy is set, the agent then must commence to coordinate the



## Notes

chapter of the strategy to establish the timely and competent execution and follow-through. At this phase, the agent's communication as well as networking ability play a huge part in carrying out all the pieces are in place.

4. There are always charges related to road transport, customs clearance, air freight charges, charges related to documentation and any other extra charges that may be linked to any given consignment. The agent has to have an extensive awareness of the regular and customary fees and also be capable of drawing upon his capacity to predict any unusual charges or taxes that are exclusive to the consignment. This fourth job on the list is frequently downplayed, but a lot of cash can be lost when this job is not done well.
5. These agent must keep both the consignee and exporter informed of the progress of the consignment once it has left the store house. The clients will want to know when the consignment left, whether the cargoes were packed properly and whether they were all in the consignment and what is the anticipated arrival or departure.



## INTEXT QUESTIONS 12.3

1. Cargo and \_\_\_\_\_ play a very vital role in the economy.
2. For worldwide shipments, IATA agents prepare and confirm customs and tariff forms -True / False
3. IATA agents usually work in \_\_\_\_\_, stockrooms, or transporting and receiving stations.
4. \_\_\_\_\_ duties can be related to the duty which an IATA agent performs for a IATA freight-forwarding company.

## 12.4 RESPONSIBILITIES OF FORWARDERS ORGANISATION – FIATA

**FIATA is generally** called the International Federation of Freight Forwarders Associations and this name is derived from the French acronym of Federation International des Associations de Transitaires ET Assimilés. This organisation is the biggest non-governmental transportation firm in the globe with its headquarters area in Geneva was born in 1926 in Vienna. FIATA is a recognized worldwide organisation representing the curiosity of the freight and logistics business worldwide. At present, it represents a business covering comparatively 40,000 forwarding and logistics organisations, employing around 10 million people in 150 nations. FIATA's membership consists of 109 Association



**Notes**

Members and over 5,500 Individual Members, on the whole representing a trade of 40,000 freight forwarding and logistics organisations worldwide.

### 12.4.1 Objectives of FIATA

FIATA has five major objectives. They are as follows

1. Put forward to fetch together the international IATA Segments
2. Aims to enhance safe guard and represent the interests of the logistics division. Moreover, they take up the position of industry professionals during conventions of the worldwide transportation and logistics segment.
3. To standardise and value the level of services offered by IATA companies. To this end, they enhance and generate standardised trading circumstances and forwarding IATA documents.
4. Look for to intimately the IATA segment and its clients with the services offered by agent companies. They do this by broadcasting appropriate data and publications.
5. It facilitates vocational education for IATA agents. Further, they also bring many e-trade platforms plus facilities of barcodes and e-data exchange. They also assist their members with accountability insurance issues.

### 12.4.2 Form of FIATA memberships

FIATA members can be categorised under two forms namely Association Members and Individual Members.

**A. Association members:** *Association* Membership comprises global representation of the members between the main participants and industry professionals in the shipping and logistics industry. They support member-friendly policies that are intended to enhance their members in their domestic environments. Moreover, these members are to unite a worldwide community of IATA freight forwarders. They offer them a series of resources and platforms to reinforce their voices in the business. Members are needed to comply with the regulations and objectives of FIATA. The Trade Integrity Statement will provide a fair idea about the system that one would be required to stand for by as a member. Furthermore, the reputation linked with being a member of an extremely sheltered brand like FIATA will permit these agents to accomplish new projects.

**B. Group members:** They are global companies that symbolise the logistics division of a number of nations. Yet, if all the group members are nationwide federation, they are known as Association members. They can also comprise global FIATA forwarding bodies that state similar interests as that of FIATA. It also comprises groups whose





members are only dynamic in a particular section of the FIATA sector.

- C. Yellow Membership:** This type is planned for carriers, vendors, shippers and other groups that work surrounded by the FIATA industry. Even lawyers who are specialised in logistics law can turn into a Type Yellow member of FIATA. For this membership one requires to pay a total registration price of 1,185 CHF (Swiss Franc). There is an annual membership fee of 1,000 CHF, a courier fee of 35 CHF and a one time entrance charge of 150 CHF.
- D. Blue & Green Membership:** This sort of membership is delightfully meant for the independent freight forwarders. Type Blue members are those firms that are in nations with a FIATA Association member. Members in boundaries without FIATA association members are the sort of Green members. The net registration price for Blue and Green Type members is around 335 CHF. In addition, they also have to pay yearly membership charges of 250 CHF, and a one-time entrance charges of 50 CHF and courier charges of 35 CHF.

FIATA's work facilitates the complete industry by representing its members and developing several business solutions. Documents developed by the firms are a valuable cause of information about worldwide policies and laws which normalise the shipping and logistics firms. The group also engages with preparing appraisal for worldwide organisations. An uniformly significant element of FIATA's mission is collaboration with worldwide transport, freight, and world trade organisations. Surrounded by those associations are:

- a) The International Chamber of Commerce
- b) The International Air Transport Association
- c) The International Union of Railways
- d) The International Road Transport Union
- e) The World Customs Organisation, and
- f) The World Trade Organisation.

### 12.4.3 Transport documents related to FIATA

1. FFI (FIATA Forwarding Instructions)
2. FCR (FIATA Forwarder's Certificate of Receipt)
3. FCT (FIATA Forwarder's Certificate of Transport)
4. FWR (FIATA Warehouse Receipt)



**Notes**

5. SDT (FIATA Shipper's Certification for the Dangerous Goods)
6. SIC (FIATA Shippers Intermodal Weight Certification)
7. FWB (Non-Negotiable FIATA Multimodal Transport Waybill)
8. FBL (Negotiable FIATA Multimodal Transport Bill of Lading)

When Forwarders are using these types of documents it leads to the certainty of increased profit and the security of the shipped goods. Such results are feasible thanks to FIATA for directing their members, both directly and through the given nation's.



**INTEXT QUESTIONS 12.4**

1. FIATA is generally called \_\_\_\_\_.
2. The yellow membership is provided to \_\_\_\_\_.
3. An uniformly significant element of FIATA's mission is collaboration with worldwide transport, freight, and \_\_\_\_\_ organisations.
4. FIATA \_\_\_\_\_ members can use the FIATA Logo on their trade cards, organisation brochure, letterheads, automobile, website as well as print materials.

**12.5 ACTIVITIES OF AIR CARGO AGENTS ASSOCIATION OF INDIA**

The only National Association representing the Air Cargo Industry in India. is the Air Cargo Agents Association of India (ACAAI). It came into force in the year 1970 with merely 16 members, but at present, it has a strength of nearly 203 Active Members, 186 Associate Members, 30 Allied Members (comprising Airlines & GSAs) and 1 Commercial Member. Besides protecting the interests of its members and developing the fellowship among them, it provides expert assistance and guidance not only to its members but also to several Central and State Government sections /authorities connected with the business. Their membership covers mainly a) IATA approved air cargo agents b) India's National Airlines c) Foreign Airlines and d) General sales agents.

- A. UPLIFT Features (For exporters):** The uplift features for shippers are as follows
- Exporters can enter consignment information and forward it to the forwarder online



- Exporter and Forwarder can upload consignment data from excel or other folder formats on UPLIFT
- e-Docket characteristic facilitate e-transmission of consignment documents and its archival
- Verifications & validations during consignment booking prevent of entry of junk information into the system
- Exporter can obtain status updates via SMS/ e-mails
- UPLIFT facilitates the compliance to e-Freight and Cargo 2000

**B. UPLIFT merits :**

- Single spot for data entry' thus by saving time, attempts & charges.
- Float numerous RFQ's at a single click to hand over service providers.
- Single window outlook assists the exporter to manage & track position of numerous RFQ's floated
- UPLIFT offers HAWB for validation & authorization to establish fast cargo clearance
- Pre-defined arrangement for analyse & booking requests to contain with exporters internal system.
- Online chat assistance helps the exporter to renegotiate on individual quotes.
- Choose milestones to list routine emails/SMS/status updates.
- Generate & Conduct transport documents online
- A checklist of documents assists to ensure compliance
- Uploading the files such as documents & images
- Exporters can make online disbursement through UPLIFT

**C. Uplift Features (for Forwarders) :**

- Forwarder can glance RFQ's floated by exporters
- Forwarder can glance airline schedule.
- Forwarder attain approach to profiles of numerous service intermediaries (airlines & other 3PL providers)



- View previous consignment records from the exporter
- Forwarder can recommend RFQs and suitability booking services online
- Forwarder can generate & forward reference online to numerous shippers
- UPLIFT permits quotation revision and receipt, assessment & re-negotiation of quotes
- E-Payments related to Customs Cess, duty and TSP charges
- Online filing of Shipping Bill, Bill of Entry & CGM on ICEGATE
- Cooperate with Customs, custodian, banks and airlines via EDI messages
- Send/r obtain pre-alerts on UPLIFT
- Search related access HS codes
- Updates on customs notices & circulars
- Online transmission and acknowledgment of consignment documents & AWBs
- UPLIFT offers end-to-end consignment visibility
- It offers a single window to all custodians

**D. UPLIFT Benefits :**

- Forwarders can fetch out online bookings with several airlines
- A single spot of data entry in the complete distribution chain helps save communication charges
- Forwarder can verify flight program and availability of space on UPLIFT
- UPLIFT assist the space for online exhibition for the community to purchase, sell or develop services
- End-to-end consignment visibility (goods, documents & information) improve customer satisfaction
- Forwarder can be grateful for the velocity through online submission of Shipping Bill, Bill of Entry and CGM
- Real-time position updates, alerts and receipts assist the forwarder to offer proactive response to the exporter
- CGM filing via online will result in savings (owing to elimination/ decrease in penalties)



- With UPLIFT, a forwarder can move toward a single portal to link to several custodians for generation of TSP receipts
- UPLIFT interacts with the Forwarder's internal execution system in pre-defined pattern by utilising the flat file, such as csv, xml and xl etc...

### E. Uplift Features (for Airlines) :

- Receipts of electronic methods for booking application are distributed to airlines through UPLIFT
- UPLIFT authorise electronic bill of Airway bill data like MAWB/HAWB
- UPLIFT plan customs relation for transfer of information like IGM / EGM / AMS/ EU customs
- Airlines obtain information from custodian / agent
- For sharing carting orders and consignment status a single window to custodians.
- Proper validations offered at the data entry spot during consignment booking and AWB clarification.
- UPLIFT characteristic e-dockets to store information like scanned images of MAWB / HAWB
- UPLIFT assists the airlines to publish charges to agents via a single channel
- Airlines can benefit UPLIFT platform as advertising method to communicate discounts & offers to whole community

### F. Uplift Benefits :

- Airlines can now obtain queries for schedules and space availability via online following in decreased attempts in handling enquiries
- Online bill of RFQ, Quotation floating and negotiation assists to improve efficiency.
- E-submitting of AWBs decreases the requirement for double data entry
- Filing of Manifests (FFM) through online, offer of Carting Order and online communication with customs facilitates to decrease errors
- Automation assists to create CAN, CSR / Invoice and distribute personalised alerts and messages to business partners



**Notes**

- Airlines can also prompt trade engagements & initiatives online via e-meetings and web casts
- UPLIFT assists community members share & attain industry greatest practices
- Airlines can also use the UPLIFT for advertisement of on spot offers, discounts and charges
- Uplift presents trade prospects for conduct marketing
- Airline consumer experiences improved customer service
- Airlines identify cost savings from decreased paper-work, decrease communication charges & economic conservation of structures for linkages with customs and custodians
- With UPLIFT, the Airlines stay willing to worldwide initiatives such as e-freight / C2K
- Airlines can obtain status updates on goods movement to and surrounded by airport terminal

**G. Uplift Features for Custodians:**

- Uplift helps online bill of authorised consignment data
- Proactive milestone vigilant
- Generate Terminal Charges (TSP)
- Create Online TSP bills

**H. UPLIFT Benefits:**

- Consignment data obtained populated online in the Custodian's system via MAWB
- Online declaration of e-payments done for TSP and Demurrage
- Decreasing overpopulation at the airport inside given infrastructural need.
- Obtaining more forceful alerts for safeguarding service failures
- Enhanced Customer Satisfaction by bringing superior visibility to business
- Improved compliance to plan such as e-freight and goods 2000



### INTEXT QUESTIONS 12.5

1. ACAAI came into force in the year \_\_\_\_\_
2. HAWB stands for \_\_\_\_\_ .
3. Through \_\_\_\_\_, exporters can enter consignment information and forward it to the forwarder online.
4. \_\_\_\_\_ of AWBs decreases the requirement for double data entry



Notes

## 12.6 PURPOSE OF ICAO

Its main function is to maintain a managerial and authority bureaucracy by supporting this diplomatic communication and to research fresh air transport rule and standardisation innovations as intended and endorsed by the governments which are completed by the ICAO Assembly, or by the council of ICAO which the assembly elects. Business and civil society divisions, and other distressed provincial and worldwide organisations, also contribute to the exploration and growth of new standards at ICAO in their capability as 'Invited Organisations'. diplomatically generate new international standards and suggested practices for civil Once governments accomplish diplomatic unity around a fresh standard scope and particulars, it is then implemented by those 193 nations in order to bring international alignment to their national guidelines, assisting to realise secure, safe and sustainable air executions on a reliable global basis. Additionally to these hub diplomatic as well as research potentiality, it also serves as a vital coordination stage in civil aviation via its seven provincial offices.

### 12.6.1 Strategic Objectives

In its continuing mission to support and facilitate a global air shipment structure that meets the social and economic growth and wider connectivity required of global businesses and passengers, and admitting the clear requirement to forecast and administer the projected doubling of worldwide air shipment accommodation by 2030 without pointless adverse force on system security, effectiveness, convenience, ICAO has created five widespread Strategic Objectives:

1. **Safety:** To develop global civil aviation safety, this objective is focused mostly on the State's regulation oversight potential. The Global Aviation Safety Plan (GASP) spotlights the main activities for the triennium.
2. **Air Navigation Capability and Effectiveness:** Develop the capacity and enhance the efficiency of the worldwide civil aviation system. Even though functionally and



organizationally inter-reliant with Safety, this objective is to spotlight the development of air navigation and airport infrastructure and developing innovative procedures to optimize aviation structure performance. The Global Air Navigation Capability and Effectiveness Plan (Global Plan) outlines the main activities for the triennium.

3. **Security & Facilitation:** In order to increase global civil aviation security as well as facilitation, it reflects the requirement for ICAO leadership in aviation protection, facilitation and associated border security matters.
4. **Economic development of Air shipment:** In order to boost the growth of a sound and economically pertinent civil aviation system it reflects the requirement for ICAO's leadership in maintaining the air shipment framework intended on economic guidelines and supporting activities.
5. **Environmental Protection:** In order to reduce the adverse ecological effects of civil aviation activities it boosts ICAO's leadership in all aviation- connected ecological activities and is reliable with the ICAO and UN structure environmental defence policies and practices.

### 12.6.2 Purpose of the ICAO

The ICAO generates guidelines for aviation safety, security, effectiveness and regularity and ecological protection. The organisation also facilitates the operating practices and policies covering the technical area of aviation. This compilation ensures a smooth air shipment and territory crossing process and ensures to:

- a. create fair opportunity to execute international airlines
- b. Enhance flight safety and
- c. Decrease expenses and penalties.

The intend and objectives of the ICAO is to create principles and system for worldwide air navigation and to develop planning and growth of global air transport so that it can:

- Ensure the safe and regulated development of global civil aviation
- Enhance the art of aircraft innovation and application for peaceful intentions
- Enhance the growth of runways, airports and air navigation amenities for worldwide civil aviation
- Meeting the requirements of the nations of the globe for safe, orderly, effectiveness and reasonable air transportation





- Protect economic waste created by unreasonable competition
- Ensure that the agreement rights of the Union are completely respected and that every member State has fair prospect to execute international flights;
- Avoid difference among union contractors;
- Enhance flight safety in global air navigation; and
- Enhance general development of all features of worldwide civil aeronautics.

### 12.6.3 Functions of ICAO

The ICAO consists of two major functions as mentioned below.

#### A. Describe the protocols for air accident investigation

The ICAO describes protocols that are utilised by signatory agencies of the Convention on global civil aviation in their relevant nations during an investigation of air accidents.

#### B. Monitor standards and practices for worldwide civil aviation

The ICAO monitors the standards and practices of air routing and its infrastructure. They ensure flight scrutiny is conducted as per the practices and make sure that qualities are met. Further it is also accountable for the avoidance of unlawful interference, and assists territory-crossing processes for global civil aviation.



### INTEXT QUESTIONS 12.6

1. ICAO was founded in the year \_\_\_\_\_.
2. The intent and objectives of the ICAO is to \_\_\_\_\_ and system for worldwide air navigation.
3. The ICAO monitors the standards and practices of \_\_\_\_\_ and its infrastructure.
4. The ICAO generates guidelines for aviation safety, security, effectiveness and regularity and \_\_\_\_\_ protection.

## 12.7 TYPES OF AIRCRAFT

The aircrafts are generally divided into Passenger and Cargo which are as follows

**A. Passenger Aircraft (PAX):** This type of aircraft is generally used as commercial



and regularly carries passengers with a space in the aeroplane for goods as well. However, the goods division in an aircraft has to be organised for stuffing; for instance, the first priority arrives to a) diplomatic mail b) passengers baggage c) courier consignment and d) general cargo.

- a. **Cargo Only Aircraft (CAO):** This form is merely to carry cargo and passengers on board. Hence, it is more convenient than PAX when it arrives to accept goods. But it is imperative to bear in mind that CAO service is more costly than PAX even when transporting general cargo. In some nations, like the USA, there is a co-operation pointing to “known” and “unknown” exporters related to their history of doing business. If the exporter is “Unknown”, air consignment is not accepted on PAX no matter what the particulars of the cargo are.
- b. **Aircraft:** Any vehicle which is produced and created to fly in the air is referred to as an aircraft. Whereas the aeroplane is the most recognized, intimate, and appropriate form of aircraft. We are aware, other vehicles too that fly via the air also arrive in this kind. All of these aircrafts have propellers with supported wings or machinery to move through the air; though, they might differ according to their dimensions, types, usage, and more.

### 12.7.1 Co ordinations of Aircraft

Before we enter into knowing various types of aircrafts, let us understand how these aircrafts are categorised. In most ordinary terms, there are two kinds of coordinations for aircrafts 1) lighter than air aircrafts, also referred to as aerostats, and 2) is further than air aircrafts, referred to as aerodynes.

**1. Aerostats (Lighter than Air):** Aerostats are very light in weight and these kinds regularly utilise buoyancy like vessels, which assist them float in the air. In order to operate the low-frequency gases are used, namely hydrogen, helium, or hot air balloons to fill in the aeroplane. This low-frequency gas is lighter than air, and hence the name. The most widespread kinds of aerostats known to us are a) hot air balloons and b) sky lanterns.

**2. Aerodynes (Heavier Than Air):** On the other hand, this aircraft is heavier than aerodynes and is much higher in weight and dimension. They push the gas towards downwards; which reaction assists to generate aircraft higher. Since these are forceful during journeys in the air, they are referred to as aerodynes. a) Fixed-wing co-ordination is similar to planes. In this segment of fixed-wing aeroplanes, the whole mechanism is dependent upon forward velocity to generate airflow all over the wings. b) The rotorcraft, which utilises the spinning rotors that are similar to wings. The helicopter is the most frequently referred aircraft in connection to this coordination .



## Notes

### 12.7.2 Types of Aircrafts in the World

The different forms of aircrafts are as follows:

- 1. Amphibious:** This aircraft is also referred to as amphibian which is a multipurpose aircraft which can be operated in both land and water. In this, the engine is located in front, or else above the wing, that is most frequently seen in floatplanes. The latest and other amphibious aeroplanes, the engine and propeller, are located above the wings. The dimensions of amphibians vary as per the purpose namely military, leisure and civil aeroplanes.
- 2. Helicopters:** This is also referred to as a chopper, which belongs to rotorcraft. The horizontally spinning rotors would assist and aid to lift and thrust the helicopter and it has the advantage of taking the direction vertically or horizontally, and even fly both backward and move forward or laterally. The engine is purely based on the purpose, dimension, and execution of the chopper. At present, the helicopter is mostly used for military purposes, goods, construction, rescue, tourism, aerial inspection, and the government.
- 3. Multi-Engine Piston:** The multi-engine piston aircraft consists of one single-engine, which has a second power authority, and is greatly supportive during the failure of another engine. Owing to this manifold power and engine effectiveness, the aircraft excellence, capability, speed, and climb rate is much superior to the common aircraft's.
- 4. Biplanes:**



*Fig. 12.4: Biplanes*

This aircraft arrives under the division of fixed-wing aircraft and two wings arrive



## Notes

one above the other on both the sides. This form of plane is the first aircraft innovated with fixed-wing planes. Even Though it is lower weight but has an excellent stiffness and capability. Their engines are reciprocating in nature which is used to carry two adults and are spotted and utilised for army and military purposes.

5. **Balloons:** These type aircraft are standard in nature and are typically spotted during tourist activities. It arrives under a kind of aircraft that floats in the sky and is very different from other aircraft types. The balloon's top is referred to as an envelope, and the bottom division is surrounded with a basket where citizens can sit. The most widespread ones are hot air balloons.
6. **Gliders:** These are fixed-wing aircraft which are utilised via air reaction against lifting location and mostly do not utilise any engine. Even though small engines might be utilised as needed, they are competent for self-take without the usage of engines. During take-off or landing, a wheeled undercarriage would assist to perform this activity. During past; they were used for military and war purposes but at present nowadays are used in tourist activities such as entertainment or leisure. They can carry a maximum of two people and the most popular gliders are hand and par gliders.
7. **Gyroplanes:** They are popularly known as autogiro or gyrocopter, and it is a rotorcraft aircraft segment that utilises rotor machines to lift. They are the same as helicopters in appearance, even though a bit narrow, and surrounded by an engine-driven propeller. The air stream assists the planes to lift upwards, and the rotor self-propels as per the path air flows via it. They were widely utilized for military and war during the 20th century and at present they are used in Olympics and department of police in some states.
8. **Parachutes:** They are slow going aircraft which can accommodate two, that assists to move through, generating drag to land. They are lightweight but stable and fitted with fabric namely nylon or silk. The shapes are generally round, dome, or inverted dome and spotted during leisure progress and entertainment. They are also used by state during exceptions to ice locations such as polar ends.
9. **Single Engine Piston Aircraft:** This aircraft has a single engine and is used for shorter distance works and not utilised for heavy works. They were able to access the smaller runways, occupy less space, with lesser climb and speed. These can carry four to six people based on their size.
10. **Tricycle Gear Aircraft:** This form of plane that has tricycle fashion with attached landing gear. It has a nose wheel in the front as well as two more towards the main



## Notes

- wheels. They are lightweight in nature and have enhanced clearness of the ground, which are very easy to take off and land. It has less drag which permits the application of a full brake and is utilised for lighter and rapid uses, which provides the advantages of simple runs.
11. **Business Jets:** It is referred to as private jet aircraft are luxurious in nature which are designed to transport small groups, even individuals. While they are expensive owing to their design, plush form, with sophisticated looks. They are mainly used by diverse classes of people from government executives to armed forces for certain special executions to organisations and private ownership. Whereas the speed, engine, and other production are similar to aeroplanes, the dimension differs from lightweight with small jets to mid-sized ones to long trade jets. The heavy and long jets can carry 16 to 18 people, while the mid-size (based on the capacity) can carry up to 12 or 10 people. The smaller forms of business aircraft can accommodate four to six individuals.
  12. **Taildraggers:** These are referred to as the tail-wheel form of gear draggers, comprising two main wheels at the forward size and a small-sized wheel to skid adjacent the tail location. These are the conservative aircraft variety which utilises such gear draggers as an alternative of the current tricycle propeller aircraft. These are the greatly lighter dimension and weight aircraft and can even be executed in skis. Yet, they have extremely poor visibility on the ground and are complicated during heavy wind circumstances.
  13. **Tilt rotors:** These are powered rotors for propulsion which helps to create lift also referred as proprietors, which are added to rotate the shafts towards a fixed-wing. These utilise transverse rotor design and unite the vertical lift capacity of a helicopter. It is similar to the chopper, which assists to lift this aircraft. Though, the propulsion is much more effective and can evade retreating blade stall, frequently seen in choppers. The velocity and series are heavier and higher than a standard helicopter and approximately near a fixed wing aeroplane. The altitude ability of tilt rotors is superior to helicopters.
  14. **Light-Sport Aircraft:** This is also known as LSA, which varies from nation to nation. Though, they are into the new type of small and extremely lightweight aircraft which is easy to fly. They are a bit heavier than ultra light aeroplanes, and their sophisticated looks are grand. These are generally two-seater versions and are much more reasonable too.
  15. **Turboprops:** It has a gas turbine engine linked to the gears to turn the propeller to shift them through and roughly the air. They burn greatly lesser fuels and have



lesser executing charges too. They are larger than piston air planes and can lift more passengers. They also fly high and can move to an altitude of 35000 feet. Yet, they are slower in pace when compared to jet planes. Their size differs according to the requirement and can fit into a small set of groups or up to eight or ten at maximum.

- 16. Floatplanes:** These are similar seaplanes, which float on water via the floats raised under the fuselage. These mounts are included in spite of the undercarriage, where wheels are located in other planes. These do not possess landing gear, which makes it possible to land, in which it becomes alike to amphibious aircraft. They were heavily utilized during the world war period for military executions and nowadays it is witnessed more of an enjoyment in several countries.
- 17. Fighter Jets :** These are also referred to as fighter aircraft, which are military exacting fixed-wing aircraft. They are innovated in order to utilize for combating air towards air fights beside other aircraft. They have extremely high speed, produced for use against air attacks only. Yet, few fighters have a second capability to utilize for ground attacks, too, in which they are referred as fighter bombers. There are numerous kinds in the fighters: such as a) light fighter b) heavy fighter, c) interceptor d) night fighter e) all-weather fighter, and more. With the assistance of sophisticated technology and breakthroughs, at present fighters have several other capabilities and innovations namely
  - a) data transmissions
  - b) sensors
  - c) secure cockpit
  - d) high bandwidth, and more.
- 18. Cargo planes:** These are referred to as freight aircraft, airlifter, or cargo jets. These are surrounded with fixed-wing co-ordination of aeroplanes only for carriage of goods. These planes are particularly designed only for lifting carriages and do not have facilities for fitting groups. They have extensive doors and amenities to safeguard and office shipment. Unlike common passenger jets, the elevated wings presence permits to preserve and make the goods sit near the ground. The number of wheels is also additional in cargo jets. These cargo aeroplanes can be utilised both for civil as well as military purposes.



### INTEXT QUESTIONS 12.7

1. \_\_\_\_\_ are referred as freight aircraft, airlifter, or cargo jets
2. \_\_\_\_\_ has a gas turbine engines linked to the gears to turn the propeller to shift them through and roughly.
3. \_\_\_\_\_ are popularly known as autogiro or gyrocopter, and it is a rotorcraft aircraft segment that utilises \_\_\_\_\_ rotor machines to lift.
4. Helicopters are also referred to as a chopper, which belong to \_\_\_\_\_.



Notes

## 12.8 MERITS AND DEMERITS OF AIR TRANSPORT (CARGO)

Air freight shipment is the quickest mode of transporting cargoes in the national as well as global markets. The merits and demerits that air freight shipping services are as follows:

### A. Merits of Air freight transportation

- a. **High Speed:** Air freight is appropriate for transporting cargoes which require to be distributed at long distances in a short time. Given the pace at which carriage of goods can be achieved, air freight cannot be altered by any other form of transport in times of urgent needs.
- b. **Permits to transport of perishable cargoes:** Air shipment is the perfect mode for shipping perishable cargoes which do not have a long shelf life.
- c. **No infrastructure investment needed:** Air cargo does not need any capital related investments in construction of air ports or like ships or tracks like railways.
- d. **Simple Access:** In spite of of landscape obstructions air shipment is accessible in all locations of the world which is not within simple to reach of other transportation forms.
- e. **Decrease of damage:** Shipping through air refers that there is faster delivery less handling of commodities during transit. Air freight transportation is by far extremely safe and has a less degree of risk of damage.
- f. **Worldwide flexibility for Shipping:** After the invention of air was introduced, several spots are opened to dispatch. Trust on marine vehicles as well as land Transportation via major shipment networks. Smaller nations of the world are frequently overlooked. Opening numerous doors to manifold parts of the world refers to enormous reach and more customers served.

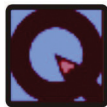




- g. Reliability of arrival and departure :** With the assistance of airline services, it is simple to track the cargo and follow its promised distributed time.
- h. This is beneficial for agriculture:** Air shipment is appropriate for injecting pests and insects that harm crops.
- i. Trustworthy Air traffic services:** When a firm can select a qualified, experienced and representative carrier who holds IATA and offer reasonable prices. With their experience they were able to provide reliable air traffic services.

### B. Demerits of Air freight shipping

- a. Extremely Costly:** Air shipment is regarded as the costliest form of shipping. Air freight charges are so high that it is not realistic for low-value goods..
- b. High Risk:** Air transport is perhaps the riskiest form of shipping since a minor glitch can create a substantial loss.
- c. Less carrying capacity:** The cargo capacities of aeroplane are limited and frequently too small to fulfil the needs of most worldwide shippers. Aeroplanes are not suitable for moving bulky and voluminous cargoes.
- d. Unreliable:** Air shipment is severely impacted by unfavourable weather circumstances thus making it unsure and unpredictable. Often aeroplanes are cancelled owing to fog, heavy rainfall and snow.



### INTEXT QUESTIONS 12.8

1. Air freight shipment is the \_\_\_\_\_ mode of transporting cargoes
2. Air shipment is the perfect mode for shipping \_\_\_\_\_ cargoes.
3. Air shipment is regarded as the \_\_\_\_\_ form of shipping
4. Air shipment is severely impacted by unfavourable \_\_\_\_\_ conditions thus making it unsure and unpredictable.



### WHAT YOU HAVE LEARNT

- Air Freight, also referred to as air cargo and it is considered as one of the modes of transport which is used to transport consignment speedily by air. Airfreight is an extremely valuable form of transport when the goods start moving very fast and timely around the globe.





**Notes**

- IATA refers as the International Air Transport Association and is the official trade organisation for the globe’s airlines (by admitting more than 85 participating countries). For air carriers, IATA offers a polled resource for scheduling, routing, standardising services and the generation of a international public service for the air segment.
- Cargo and freight intermediaries play a very vital role in the economy by assisting to transport goods or raw materials from one location to the next. They coordinate and assist the incoming and outgoing shipments for shipping industries such as airlines, shipping firms, and rail / road Organisations.
- FIATA is generally called the International Federation of Freight Forwarders Associations and this name has arrived in the form of the French acronym of Federation International des Associations de Transitaires ET Assimilés. This organisation is the biggest non-governmental transportation firm in the globe with its headquarters area in Geneva was born in 1926 in Vienna.
- ICAO which is referred as International Civil Aviation Organization was founded in the year 1947, April.4. Its headquarters are located in Montreal, Canada and it is a specialised agency of the United Nations. It is funded and headed by 193 national governments to promote their diplomacy and collaboration in air shipment as signatory states to the Chicago Convention (1944).
- The aircrafts are generally divided into Passenger and Cargo which are Passenger Aircraft (PAX and Cargo Only Aircraft (CAO)



**KEY TERMS**

Air	Freight Shipment	Cargo	Goods IATA
ICAO	FIATA Consolidator	Transport	Carrier Perishable



**TERMINAL EXERCISE**

1. Define Air freight.
2. Explain Special cargo.
3. What is the full form of IATA?



**Notes**

4. Define IATA cargo agent.
5. What is the full form of FIATA?
6. State the services rendered by IATA.
7. List out the benefits of FIATA's blue type membership.
8. Sketch the main objectives of FIATA.
9. Highlight the functions of ICAO.
10. Bring out the two main branches of air freight services.
11. Spotlight the duties of IATA in a Freight-forwarding company.
12. Mention the activities of the Air Cargo Agents Association of India.
13. Highlight the purpose of ICAO.
14. List out various types of aircrafts in the world.
15. Point out the merits of air freight transportation.



**ANSWER TO INTEXT QUESTIONS**

**12.1**

1. Air cargo
2. General
3. Dangerous
4. Air cargo

**12.2**

1. Member



2. Canada
3. Pollution
4. Air traffic

**12.3**

1. Freight agent
2. True
3. Warehouses
4. Eight

**12.4**

1. International Federation of Freight Forwarders Associations
2. Shipper
3. World trade
4. Blue type

**12.5**

1. 1970
2. House airway bill
3. UPLIFT
4. E-submitting

**12.6**

1. 1947
2. Create principles
3. Air routing
4. Ecological



**Notes**

**12.7**

1. Cargo planes
2. Turboprops
3. Gyroplanes
4. Rotorcrafts

**12.8**

1. Quickest
2. Perishable
3. Costliest
4. Weather



**DO AND LEARN**

Learners can undertake their activity work in the areas of different Air transportation / air cargo warehouse / air cargo distribution organisations

# Senior Secondary Course

## Transportation & Warehouse Management

### CURRICULUM

#### 1. Rationale

The rationale for a transportation and warehouse management course at the senior secondary level is to provide students with the knowledge and skills necessary to understand the logistical processes involved in the movement and storage of goods. This course can help students develop an understanding of the transportation industry, including modes of transportation, freight rates, and regulations. Additionally, students can gain an understanding of warehouse management, including the principles of inventory control, storage systems, and order fulfillment. These skills and knowledge can prepare students for careers in logistics and supply chain management, which are critical components of many industries in today's globalized economy.

#### 2. Objectives

The objectives of developing this course are to enable learners to:

- understand the role of transportation and warehouse management in the overall supply chain;
- identify the different modes of transportation and analyze the factors affecting transportation selection;
- understand the principles of warehouse management, such as site selection, design, and layout, as well as inventory management and control;
- appreciate the importance of logistics information systems and technology in transportation and warehouse management;
- understand the impact of globalization and intermodal transportation on transportation and warehouse management;
- develop skills in problem-solving and decision-making in the context of transportation and warehouse management;
- adopt ethical and legal practices in transportation and warehouse management.

### 3. Scope

A transportation and warehouse management course at the senior secondary level has a broad scope that covers various aspects of logistics and supply chain management. It includes an introduction to the transportation industry, including different modes of transportation, regulations, and freight rates. The course also covers principles of supply chain management, inventory control, and order fulfillment, as well as warehouse operations, storage systems, and inventory control. Learners will also learn about transportation planning, including route selection and shipment consolidation, and risk management strategies to mitigate risks associated with transportation and warehouse management.

In addition to these foundational topics, the course also covers emerging technologies such as autonomous vehicles and drones, and the impact of these technologies on transportation and warehousing. The course also emphasizes the importance of sustainability in transportation and warehousing and provides learners with strategies to develop environmentally sustainable practices. The overall goal of the course is to provide students with a comprehensive understanding of the logistical processes involved in the movement and storage of goods, and to prepare them for careers in logistics and supply chain management.

### 4. Course Structure

Name of the Lesson	Marks	Hours
<b>Module 1: Transportation-1</b>	<b>14 marks</b>	<b>34 hours</b>
1. India's Road Network 2. Highways in India 3. Institutional Framework of Infrastructure Development 4. Structural Framework of NHAI -PPP Model 5. Railways in Indian Logistics 6. Features of Freight & Passenger Movement		
<b>Module 2: Transportation-2</b>	<b>18 marks</b>	<b>46 hours</b>
7. Inland Waterways 8. Indian Inland Waterways 9. Modes of Air Transportation 10. Trends in Logistics Industry 11. Multimodal Transportation 12. Air Transportation		

<b>Module 3: Introduction to Warehouse</b>	<b>16 marks</b>	<b>40 hours</b>
13. Warehouse: Meaning, Definition and Objectives 14. Need for Scientific Warehouses 15. Types of Warehouses 16. Warehouse Organisation Structure - Roles and Responsibilities		
<b>Module 4: Warehouse Management</b>	<b>18 marks</b>	<b>46 hours</b>
17. Warehouse Utilization Management 18. Inventory Management of a Warehouse 19. Operations and Handling of a Warehouse 20. Need for Physical Distribution in Warehouse 21. Channels of Distribution		
<b>Module 5: Warehouse Activities and Warehouse Documentation</b>	<b>14 marks</b>	<b>34 hours</b>
22. Warehouse Activities 23. Cross Docking Method 24. Warehouse Handling Equipment 25. Methods of various Material Handling Systems in Warehouse 26. Technology for Warehouse Management		
<b>Subtotal</b>	<b>80</b>	<b>200 hours</b>
<b>Internship</b>	<b>20 Marks</b>	<b>40 hours</b>
<b>Total</b>	<b>100 Marks</b>	<b>240 hours</b>

### 5. Target Group

Learners, pan India, who opts for NIOS model of schooling and persons willing to avail of employment opportunity in the logistics centers.

### 6. Approach

The approach for the Transportation and Warehouse Management course emphasizes a hands-on, applied learning experience. The course combines lectures, case studies, projects, and individual

assignments to provide learners with a comprehensive understanding of the theories, principles, and practices of transportation and warehouse management within the context of supply chain management. The course covers topics such as modes of transportation, warehouse management, logistics information systems and technology, globalization and intermodal transportation, problem-solving and decision-making, and ethical and legal considerations. The course approach is designed to help learners apply the concepts they have learned to real-world scenarios, giving them a deeper understanding of transportation and warehouse management and the role they play in the overall supply chain. The approach is intended to equip learners with the knowledge and skills needed to succeed in careers in logistics, transportation, and warehousing.

## 7. Pre-Requisites

Class 10<sup>th</sup>/Secondary pass

## 8. Duration of the course

The duration of the course shall be one year, with a maximum of 5 years to complete the course

## 9. Weightage

Theory: 80%

Internship: 20%

TMA: 20% of the theory

## 10. Teaching Methodology

**Theory:** Printed self learning material with face-to-face contact sessions for academic support.

**Assignment:** One assignment shall be administered for continuous assessment and project work.

**Internship:** Compulsory attachment in relevant industry/warehouse for a period of 3 weeks (40 hrs); to be monitored and assessed by the study centers.

## 11. Medium of Instruction

English (The course shall be translated in Hindi and other languages required)

## 12. Evaluation

Evaluation for this subject shall consist of internal evaluation through Tutor Marked Assignments (TMA) and external term end examination. The external examinations will be conducted twice a year i.e. in the months of April and October. TMA will be treated as a learning tool. It will enable the learners to know their progress and to prepare well for the examination. Besides the above strategies of evaluation, certain inbuilt components for self evaluation in the form of Intext Questions, Terminal Questions, Role Play and Activity for learners would also be provided in each lesson.



### **13. Evaluation Procedure**

Term End Examination (TEE) – 80 Marks

Internship-20 Marks

Tutor Marked Assignment (TMA) – 20% of Theory

Pass Criteria 33% separate pass in theory and internship

### **14. Course Description**

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#### **Module 1: Transportation-1**

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##### **Lesson 1 - India's Road Network**

- India's Road Network, Expressways, National Highways, State Highways

##### **Lesson 2 - Highways in India**

- Understanding the Highway Grid and numbering System in detail.

##### **Lesson 3 - Institutional Framework of Infrastructure Development**

- Increase in Numbers as we move Westwards/Southwards)-Functioning of NHAI, NHIDCL, State PWD coordinated action for creating the infrastructure.

##### **Lesson 4 - Structural Framework of NHAI -PPP Model**

- NHAI – PPP Model for Highway development, Maintenance & Toll Collection-Overview of Bharatmala Project & NHDP.

##### **Lesson 5 - Railways in Indian logistics**

- Importance of Railways in Indian Logistics - role of railways in the logistics value chain

##### **Lesson 6 - Features of Freight & Passenger Movement**

- Features of Freight & Passenger movement contributing to Economic Growth in India

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#### **Module 2: Transportation-2**

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##### **Lesson 7 - Inland Waterways**

- Inland waterways: Introduction –Scope and Sources

##### **Lesson 8 - Indian Inland Waterways**

- Indian Inland waterways-Structure and locations

### **Lesson 9 - Modes of Air Transportation**

- Modes of Air Transportation

### **Lesson 10 Trends in Logistics Industry**

- Current Trend, Future & Opportunities of Travel, Hospitality & Logistics Industry

### **Lesson 11 - Multimodal Transportation**

- Multimodal Transportation

### **Lesson 12 - Air Transportation**

- Roles and Functions of IATA/FIATA/ACAAI/I CAO in Airlines, Aircraft, Cargo and Logistics

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## **Module 3 Introductions to Warehouse**

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### **Lesson 13 - Warehouse: Meaning, Definition and Objectives**

- Warehouse: Meaning, Definition and Objectives

### **Lesson 14 - Need for Scientific Warehouses**

- Users of Warehouse: Manufacturers/Wholesalers/Retailers

### **Lesson 15 - Types of Warehouses**

- Types of Warehouses: Government, Private, Bonded, Cooperative, Open Warehouse

### **Lesson 16 - Warehouse Organisation Structure - Roles and Responsibilities**

- Warehouse Organization Structure - Roles and Responsibilities

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## **Module 4: Warehouse Management**

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### **Lesson 17 - Warehouse Utilization Management**

- Warehouse Utilization Management Study on emerging trends in warehousing sector

### **Lesson 18 - Inventory Management of a Warehouse**

- Inventory Management of a warehouse

### **Lesson 19 - Operations and Handling of a Warehouse**

- Inbound & Outbound operations of a warehouse and handling of Inbound & Outbound Operations

### **Lesson 20 Need for Physical Distribution in Warehouse**

- Distribution and need for physical distribution

## **Lesson 21 - Channels of Distribution**

- Channels of Distribution

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## **Module 5: Warehouse Activities and Warehouse Documentation**

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### **Lesson 22 - Warehouse Activities**

- Warehouse Activities - Receiving, Sorting, Loading, Unloading, Picking, Packing and Dispatch

### **Lesson 23 - Cross Docking Method**

- Cross Docking Method

### **Lesson 24 - Warehouse Handling Equipment**

- Warehouse Handling Equipment

### **Lesson 25 - Methods of various material Handling Systems in Warehouse**

- Types of material handling systems-manual system, automated systems & semi-automated, Merits & demerits of various handling systems

### **Lesson 26 Technology for Warehouse Management**

- Technology for Warehouse Management- Bar code, RFID, Scanning Devices, EDI, ERP