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# UNIT 7    TRANSPORTATION,           WAREHOUSING AND STORAGE\*

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## 7.0    OBJECTIVES

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After reading this Unit, you should be able to:

- Discuss the various modes of transportation that play a key role in logistics management;
- Provide an overview of transportation function;
- Examine the important aspects of warehousing and storage; and
- Describe the types of documents used in transportation and warehousing.

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## 7.1    INTRODUCTION

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In the domain of logistics management, physical distribution systems link manufacturers, wholesalers, and retailers into marketing channels making the products available. The major logistics function includes transportation in which certain decisions about the movement of goods and services are made in the interests of the organisation. Transportation function is important because it affects the delivery performance, pricing of product, and condition of the arrived goods which ultimately determine the satisfaction of the customers. There are five different transportation modes that can be adopted by an organisation in the delivery of their products to the dealers, warehouses, and customers.

It assumes importance in logistics management as all products are to go through the phase of warehouse and storage. Warehousing is the act of storing goods that will be sold or distributed later. While a small, home-based business might be warehousing products in a spare room, basement, or garage, larger businesses typically own or rent space that is specifically designed for storage.

This Unit orients you with the basic aspects of transportation, warehousing and distribution.

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## 7.2 TRANSPORTATION MODES

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Logistics is the physical flow of materials and products which are commonly to be transported in the supply chain. The five basic transportation modes are road; rail, air, water, and pipeline which are described below.

### **Road (Trucks)**

In India trucks are an important means of transportation of products than any another means. It is estimated that the Indian truck market reached a value of US\$ 10,140 million in 2019 (IMARC). Shipping by truck is fast relative to other modes except by air. Trucks can reach several areas including rural, hilly terrains and in contrast to rail transport, trucks can accept products in small quantities. Within cities, trucks are considered as the largest transportation mode. The routing and timing schedules of trucks are highly flexible, and their service is much faster than railways. High value goods to be sent to short distances are effectively transported through trucks. Heavy or bulky goods require many trucks and hence uneconomical to use them over long distances. The amount of pollutants emitted by trucks is also high relative to some of the other transportation modes, so it is not an ecologically preferable solution. In India in 2017, the road transportation sector contributed to about 67 per cent of the freight traffic across the country.

### **Rail**

Railways are the largest carrier of any nation delivering 26 per cent of total cargo. These can transport large amounts of bulk products to the distant locations such as sand, mineral, coal, agriculture, and forest items in a cost-effective way. In terms of speed and cost, shipping by rail falls somewhere between truck and water transportation. Businesses that need to ship heavy, bulky goods often try to locate their facilities nearer to railway lines.

### **Air**

Air transportation is the least popular among the business organisations and only about 1 per cent of the total cargo is transported through air. The cost of air transportation is quite high due to expensive freight rates, but it is the fastest way of transporting goods, especially in case of perishable goods and smaller quantity of high value products.

### **Shipping (Water)**

Shipping is the oldest mode of transporting goods from one region to another, but it is more time consuming than other modes. International trade is mostly conducted by cargo shipping. They transport “loose” cargo such as grain, coal, iron ore, petroleum, and other mined products; but also, consumer products. Waterway is inexpensive but slow, and many markets are also not directly accessible by water. Inland water transport is being developed wherever feasible.

### **Pipelines**

Pipelines are generally used to transport oil, natural gas, and chemicals. Two-thirds of petroleum products are transported by pipeline. Pipelines are costly to be built, but once they are constructed, it is considered a cost-effective mode of transportation. The oil moves 5 to 12 km per hour and reaches the destination in two to three weeks depending on the size of the pipe, its pressure, and the density

of the liquid. The products shipped through pipelines often must be moved using two different transportation modes.

### **Inter-modal**

Inter-modal transportation is shipping used together in combination with the other modes of transportation. Consumer goods are often shipped in inter-modal containers which are metal boxes. The largest containers are 53 feet long and 100 inches tall; the biggest cargo ships carry as many 15,000 containers. By contrast, a train can carry around 250 containers stacked on top of each other. A significant percentage of inter-modal containers offloaded from ships end up on railways bound for inland destinations. The containers are then trucked over shorter distances to distribution centres, warehouses, and storages.

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## **7.3 TRANSPORTATION: AN OVERVIEW**

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India has a large and diverse transport sector. Transportation has been recognised for many years as being one of the most important activities in the physical distribution of materials and products. Companies face different trade-offs when choosing transportation methods. The choice of transportation method depends on the customers' needs, speed, cost, frequency of delivery, or flexibility to respond to different market conditions. Some of the functional issues related to transportation are:

- a) Transport transactions are often influenced by five parties: the shipper (the original party), the consignee (destination party or receiver), the carrier, the government, and the public.
- b) Transport economics and pricing are concerned with the factors and characteristics that determine transport costs and rates. In transportation, economy of distance is the tapering principle since rates or charges taper with distance i.e. transportation cost per unit of distance decreases as distance increases.
- c) Economy of scale is the characteristic where transportation costs are proportional to the weight of the shipment. The cost per unit of weight decreases when the size of the shipment increases.
- d) The freight transportation structure consists of vehicles, and carriers that operate within five basic transportation modes.
- e) Transportation service is achieved by combining the capabilities of modes.
- f) Government transportation regulations can be grouped into two categories: economic regulation and safety and social regulation.

Given a facility network and information capability, transportation is the operational area of logistics that geographically positions inventory. Because of its fundamental importance and visible cost, transportation has received considerable managerial attention over the years. The transportation managers are fundamentally responsible for:

- a) Operations management
- b) Freight consolidation

- c) Rate negotiation
- d) Freight control
- e) Auditing and claims; and
- f) Logistical integration.

Transportation requirements can be accomplished in three basic ways:

- a) Private fleet of equipment
- b) Contract with transport specialist; or
- c) Common carriage where in the services of carriers that provide different modes of transportation on an individual shipment basis are engaged.

The transportation requirements in the logistical network must ensure proper facility selection, total transportation cost within the freight bill, and ensuring the delivery service which is not sporadic or inconsistent.

### Check Your Progress Exercise 1

- Note:** 1) Use the space below for your answers.  
2) Check your answers with those given at the end of the Unit.

- 1) Identify functional issues relating to transportation.

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- 2) List the functions of transportation manager.

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## 7.4 WAREHOUSING AND STORAGE

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### Distribution Centre

The terms warehouse and distribution centre are often used interchangeably, however, a warehouse provides only storage; and a distribution centre not only stores the products but also executes the orders. In a distribution centre the emphasis is on processing and moving goods on to other parts of the supply chain. Modern supply chains equipped with better information can forecast product demand well in advance, plan accordingly and deliver the right product in the right place at the right time. Therefore, the static warehouses are evolved into distribution centres. The differences between a warehouse and a distribution centre are:

- A warehouse is used for storing products while a distribution centre, apart from storing products offers value-added services like product mixing, order fulfilment, cross docking, and packaging.
- A distribution centre stores products for relatively lesser periods compared to a warehouse. Hence, the flow velocity through the former is much greater than the latter.
- A distribution centre is customer-centric bridging the supplier and its customers. While the role of a warehouse is to store products efficiently, the role of distribution centre is to efficiently meet customer requirements.
- Typically retail and warehouse orders are shipped from a distribution centre and not from a warehouse. Basically, a warehouse generally does not serve external customers like a distribution centre.
- The operations at a distribution centre are much more complex than that at a warehouse. As a result, the distribution centres are equipped with latest technology for order processing, warehouse management and transportation management.
- Warehouses exist and serve a purpose. An example is when inventory is pre-built months in advance to meet the high seasonal demand and is stored in typical warehouses before being sent to a distribution centre for customer service. However, the importance of warehouses in supply chain has gone down and the distribution centres have now emerged as the nerve centres of the modern supply chains.

### Warehousing Elements

The basic elements that help monitor inventory and store it safely in a warehouse, whether only storage or also order fulfilment, are:

- a) Shelving and rack systems that offer maximum storage capacity and easy product access.
- b) A climate control system for the product being stored. This is particularly important for frozen products or those requiring refrigeration.
- c) Inventory control software giving details where all individual units are in the system.
- d) Equipment for moving products within the warehouse.
- e) Shipping supplies for order fulfilment.
- f) Pickers or people who load products into a warehouse, others who fill orders in a true distribution centre, and those who manage the facility and operation.
- g) Security to protect stored products.
- h) Access to cost-effective transportation to bring products in or move them out as orders are fulfilled. That often means easy access to highways, railways, or airports.

## Functions Performed by Warehouses

Warehouses usually perform the following functions:

- a) **Procurement:** The first step in warehousing where goods are received unloaded and moved to pre-receipt inspection point and for accounting purpose.
- b) **Sorting:** Items received in bulk are sorted out item-wise for better storage and easy identification. Heavy and big sized items are kept separate.
- c) **Breaking (dividing):** Items received in bulk are broken down into smaller portions and packed separately to cater to the requirements of various retail outlets and customers.
- d) **Storage:** After sorting and dividing, items are stored with proper identification and location to take them out as and when required. Big retailers also use computers and merchandise-based software packages to locate, identify and maintain accounting of the items.
- e) **Making items available for consignment/shipment:** In warehouses, goods are stored for short period, and as per the orders from retail outlets or customers; goods are dispatched to the destinations.
- f) **Material handling:** Material handling is a part of physical distribution system consisting of proper handling equipment used for loading, unloading, lifting, and moving goods from one place to another.
- g) **Display:** To promote sales, some warehouses display products.
- h) **Inventory control:** It includes procuring goods and keeping its proper records. Warehouses are also responsible for inspection, maintenance, and accounting of goods to prevent any thefts and unforeseen mishaps. Proper accounting results in avoiding large fluctuations in inventory levels.
- i) **Processing:** Certain goods are not to be consumed in the form they are produced. It requires processing to make them consumable. For instance, ripening of fruits or juice extraction, seasoning of timber, crushing of wheat, polishing of paddy etc. Some warehouses also perform these activities as per the demand from the owners.
- j) **Grading and branding:** Some warehouses perform the functions of grading and branding of goods on the behalf of the producers, wholesalers, or the importer of goods. Besides usual activities, some warehouses provide mixing, blending, and packaging assistance for the convenience of handling and sale.
- k) **Transportation:** In a few cases, warehouses provide transportation facility. It collects goods from the factories and sends these goods to the place of delivery.

## Types of Warehouses

The following are the types of warehouses.

- a) **Private Warehouses:** Private warehouses are owned by the business enterprises to store their products. Because of heavy cost of construction and maintenance of these warehouses, their number is quite small. Only big business houses can afford to have such type of warehouses.
- b) **Public Warehouses:** These are also known as duty paid warehouses and open for public at large. Most of the small and medium business organisations cannot afford to have their own warehouses on account of large financial investment in their construction and maintenance. They make use of these types of warehouses, which may be owned by an individual or some agency whose main object is to provide storage facilities to people for certain fees or charges. These warehouses operate within rules and regulations formed by the government. Public warehouses are especially useful to business houses, usually situated near railway lines or main roads, to provide quick transportation services. Goods lying in the warehouse can be hypothecated for getting loan and financial assistance. Public warehouses ensure greater security and handling of goods on account of latest mechanical devices used in handling and preserving the goods. Goods can be branded, graded, and packed in desired sizes in the warehouses.
- c) **Bonded Warehouses:** Bonded warehouses situated near the port, are used for imported goods which are not granted clearance on account of non-payment of custom duty by the importer of these goods. Goods can only be removed after the custom duties are paid. Bonded warehouses may be run by the government or licensed private agencies having strict control and supervision imposed by custom authorities on their operation and functioning. The importer of the goods can inspect and check the goods. After making part payment of the custom duty, goods can be proportionately withdrawn from these warehouses. Goods kept in these warehouses can be branded, packed, graded, and labelled in the warehouse itself. Bank loans can be raised with the help of receipt issued by these warehouses as a collateral security. There is a least possibility of goods being exposed to any risk of theft, damage, and deterioration. The entrepôt trade i.e., re-export of imported goods is greatly facilitated as the importer can have the delivery of goods without paying any custom duty.
- d) **Special Commodity Warehouses:** These warehouses are constituted for storing a particular type of commodity, e.g., tobacco, cotton, wheat etc. The nature of the commodity is important in selecting the type of warehouse. Storage tanks are needed for storing petrol, and godowns for storing agricultural products.
- e) **Cold Storage or Refrigerated Warehouses:** These are the warehouses which are used for storing perishable commodities like eggs, butter, fruits, vegetables, fish, fresh meat etc. Goods stored in cold storages can be held for longer time making possible the regular supply of certain commodities throughout the year.
- f) **Institutional Warehouses:** Different institutions and bodies have their own warehouses on account of the nature of their operations. Banks keep the

stock of the companies in these warehouses as security against the loans advanced. Railways maintain warehouses to store large quantity of goods to be dispatched to different parts of the country, or goods received for the purpose of delivery are kept till they are disbursed to the claimant. Various transport agencies also maintain warehouses for storing the goods which are to be dispatched and received. The Food Corporation of India has many big warehouses throughout the country for storing agricultural products.

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## 7.5 TRANSPORTATION AND WAREHOUSING DOCUMENTATION

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In transportation and warehousing, there are many types of documents and bills which are needed to transport goods from one place to another. Transport documents lie at the heart of trade transactions. These documents are issued by the shipping company, airline, trucking company, railway, freight forwarder or logistics company. They provide an accounting record of the transaction, instructions on where and how to ship the goods and a statement giving instructions for handling the shipment.

### **Lorry Receipt (L/R)**

It is an acknowledgement of goods given by the transport companies to the persons who send goods. The consignor (sender) sends this receipt to the buyer with the invoice and other documents. The buyer can take delivery of the goods only on production of this receipt at the destination.

### **Railway Receipt (R/R)**

When goods are sent through Railways, the railway authorities acknowledge receipt of goods which is called R/R. Like L/R, it is also a document of title to goods and the buyer must produce this to the railway authorities while taking delivery of goods.

### **Consignment Note**

It is a form issued by railway companies to be signed up by all persons who intend to send goods by railways. It contains terms and conditions on which the railway company undertakes to carry the goods. This form is to be filled in and handed over to the Railways along with the goods.

### **Bill of Lading (B/L)**

B/L is a document issued by the agent of a carrier to a shipper, signed by the captain, agent, or owner of a vessel, furnishing written evidence regarding receipt of the goods (cargo). It includes the conditions on which transportation is made (contract of carriage), and the engagement to deliver goods at the prescribed port of destination to the lawful holder of the bill of lading. It is, therefore, both a receipt for merchandise and a contract to deliver it as freight.

Although the term is used for shipment by sea, it may be used for any type of carriage of goods.

### **Airway Bill (AWB)**

It is a bill of inventory or listing of cargo that is being transported by air. AWB is the most important document issued by an airline either directly or through its



authorised agent. It is a receipt issued by an international airline for goods and an evidence of the contract of carriage. It is a document of title to goods. It is a non-negotiable transport document that covers the transport of cargo from airport to airport. By accepting a shipment, a cargo agent acts on behalf of the carrier whose airway bill is issued.

### **CMR Document**

CMR (*Convention Relative au Contrat de Transport International de Marchandises par la Route*) is an international agreement that contains the rights and obligations of parties involved in road transport, the shipper, carrier, and addressee. This is required when goods are transported internationally by road used by all parties. The carrier usually completes the form, but the sender or exporter is responsible for the accuracy of the information and must sign the form when the goods are collected. The consignee will also sign the form on delivery, which is essential for the carrier to be able to confirm the delivery of the goods and to justify the payment for its services.

### **Multi-modal Bill of Lading**

This is for those goods carried in multi-modal transport units (mainly containers) covering two or more modes of transport, such as shipping by road and by sea. The responsibility for the management and processing of shipping document depends on the sale conditions (In coterms) agreed between the parties. Bill of lading is the title of ownership of the goods and can, therefore, be negotiated. Only authorised forwarders integrated into International Federation of Freight Forwarders Association (IFFFA) can issue this document. It is addressed to the exporter, multimodal transport operator in the destination country, and the importer.

### **Dock Warrant or Warehouse Warrant**

It is a document of title to goods issued by dock authorities certifying that the goods are held by them. To take delivery of the goods, this certificate must be given back to the authorities. It is a transferable instrument and if properly assigned, even a third party can take delivery of the articles from the warehouse or dock.

### **Warehouse Keeper's Receipt**

It is simply an acknowledgement of goods issued by a warehouse keeper to the owner of the goods. It is not a document of title to goods.

### **Delivery Order**

It is an order issued by the owner of goods to the warehouse authorities when delivery in small lots is required from the warehouse. Such orders should accompany the warehouse warrant in which the authorities will enter the details of the goods delivered by the party. The delivery order is the document of title to goods.

### Check Your Progress Exercise 2

**Note:** 1) Use the space given below for your answers.  
2) Check your answers with those given at the end of the Unit.

1) State the functions of warehouses.

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2) List the various types of documents used in transportation.

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## 7.6 CONCLUSION

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A supply chain is composed of a series of suppliers and customers linked together by a physical distribution system. The physical distribution system involves the transportation of goods through the various modes, the inventories that exist in transit and in distribution centres, along with the physical handling of goods. The efficient operation of the warehouse involves several processing activities. Freight transport and storage are crucial activities in logistics systems planning as they determine the logistics costs and affect the service level provided to customers. Each mode of transportation has different cost and service characteristics. These determine which method is appropriate for the types of goods to be moved.

All these logistics activities are linked to each other with detailed information about each. The monitoring of the plethora of information related to the diverse aspects of logistics is a crucial process. These would require integration of various technologies with the logistics data.

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## 7.7 GLOSSARY

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**Consignees:** In a contract of carriage, the consignee is the person to whom the shipment is to be delivered whether by land, sea, or air.

**Entrepot Trade:** It refers to a trade at one centre for the goods of other countries. In this merchandise can be imported and exported without paying import duties.

**Freight Transport:** Freight transport is the process of moving different types of goods from one point to another.

**Shippers:** Consignor, exporter, or seller (who may be the same or different parties) named in the shipping documents as the party responsible for initiating a shipment, and who may also bear the freight cost.

**Cross docking:** A logistics procedure where products from a supplier or manufacturing plant are distributed directly to a customer or retail chain with marginal to no handling or storage time.

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## 7.9 ANSWERS TO CHECK YOUR PROGRESS EXERCISES

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### Check Your Progress Exercise 1

- 1) Your answer should include the following points:
  - Transport transactions are often influenced by five parties namely the shipper, consignee, carrier, government, and the public.
  - Transport economics and pricing are concerned with the factors and characteristics that determine transport costs and rates.
  - Economy of scale wherein transportation costs are proportional to the weight of shipment.
  - Transportation service is achieved by combining the capabilities of modes.
  - Government transportation regulation can be grouped into two categories economic regulation and safety and social regulation.

2) Your answer should include the following points:

The functions of transportation manager include:

- Operations management
- Freight consolidation
- Rate negotiation
- Freight control
- Auditing and claims; and
- Logistical integration

**Check Your Progress Exercise 2**

1) Your answer should include the following points:

The functions of warehouses encompass:

- Procurement
- Sorting
- Breaking
- Storage
- Making items available for shipment
- Material handling
- Display
- Inventory control
- Processing
- Grading and branding
- Transportation

2) Your answer should include the following points:

- Lorry Receipt (L/R)
- Railway Receipt (R/R)
- Consignment Note
- Bill of Lading
- Airway Bill
- CMR Document
- Multi-modal Bill of Lading
- Dock Warrant or Warehouse Warrant
- Warehouse Keeper's Receipt
- Delivery Order