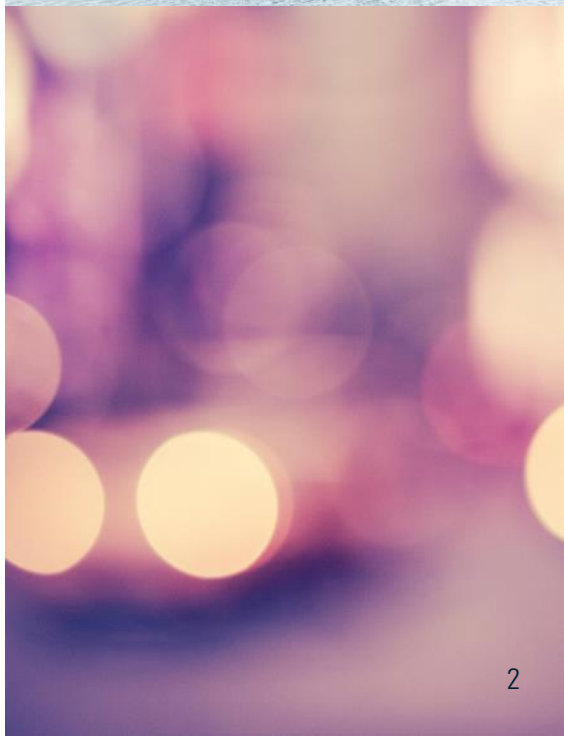
TRANSPORTATION

Module 3

Mousumee rout

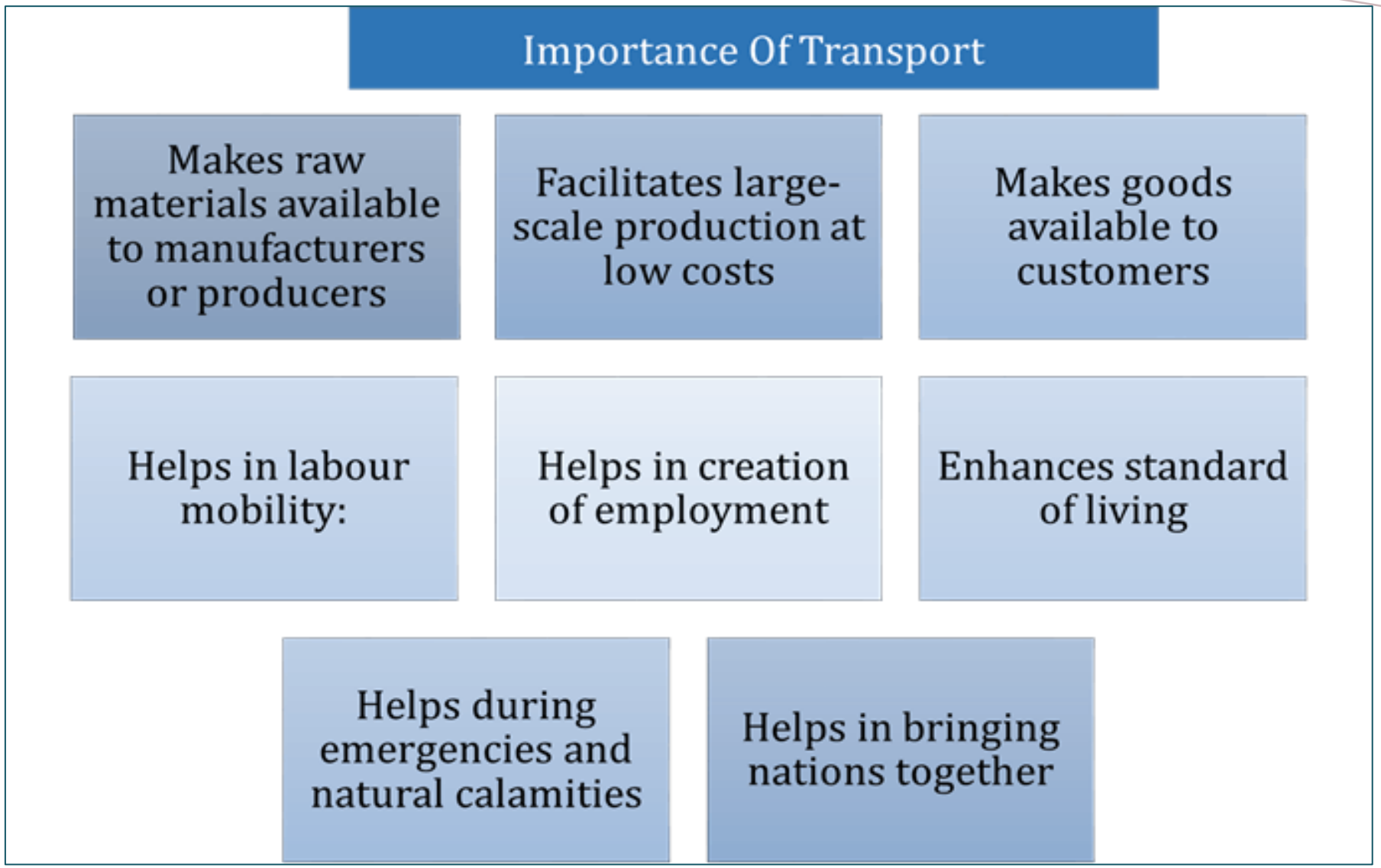


INTRODUCTION

Transportation refers to system that are designed to move people and goods.

Transportation is vital for the economic development of any region.

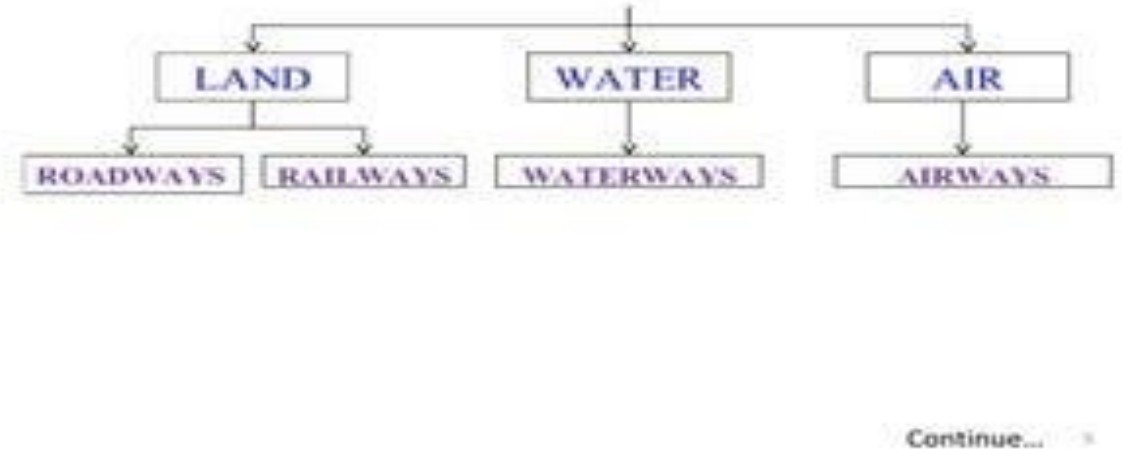
It provides personal mobility, it reduce travel time and provides access to education food recreation and other essentials.


Importance Of Transport
Makes raw materials available to manufacturers or producers
Facilitates large-scale production at low costs
Makes goods available to customers
Helps in labour mobility:
Helps in creation of employment
Enhances standard of living
Helps during emergencies and natural calamities
Helps in bringing nations together

IMPORTANCE OF TRANSPORTATION

- Transportation increases business profits by providing inexpensive raw materials from different locations and by supplying your end products to distant customers.
- It ensures enough goods of different varieties are always available in the market.
- The avoids monopoly that in turn reduces the price.
- As their commodity can reach distant places, the companies may upscale their production to satisfy the demands of large customer base.
- it enhances mobility and allows people to move larger distances in a shorter period.

MODES OF TRANSPORTATION



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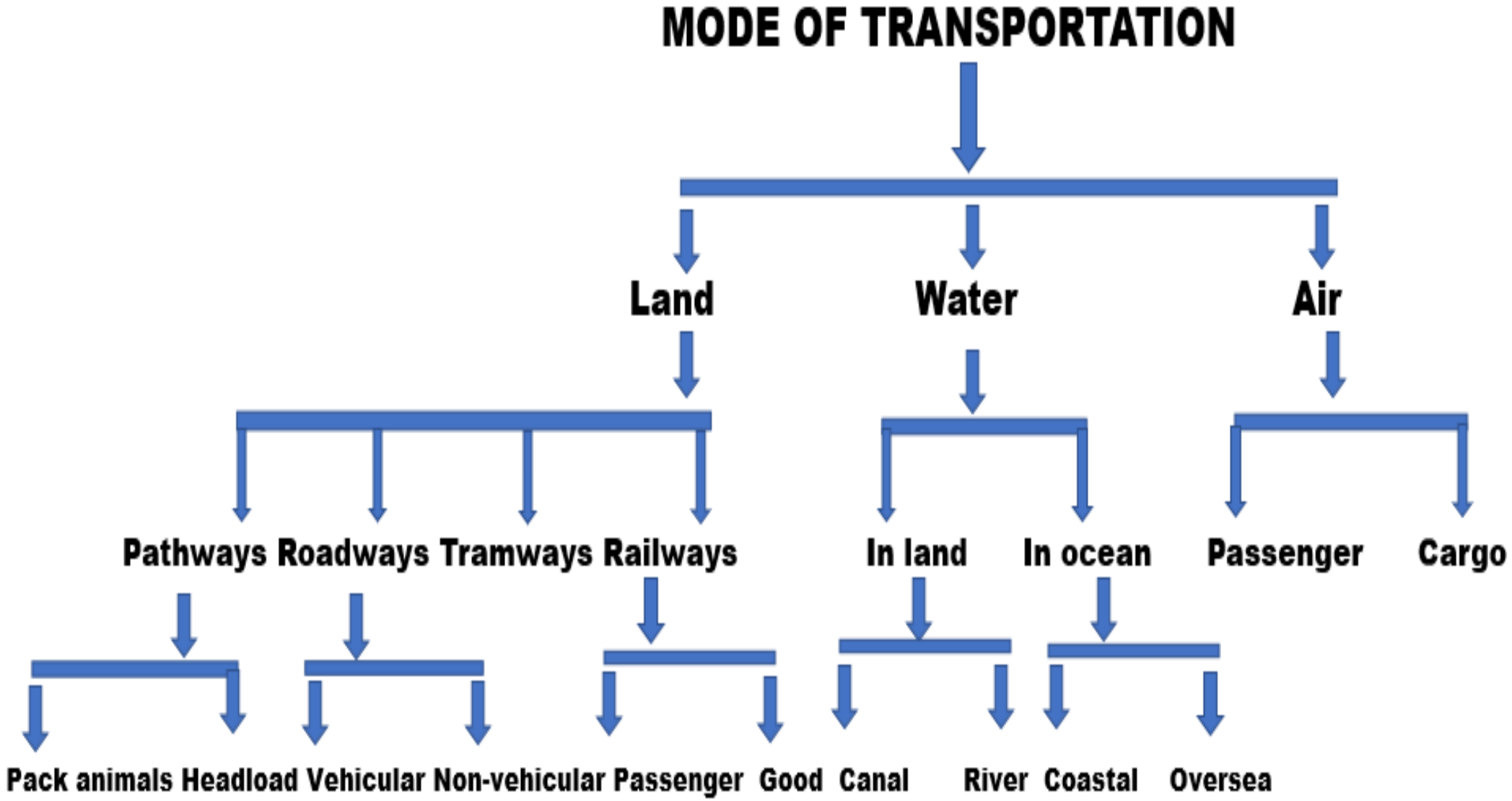

MODE OF TRANSPORTATION
Land
Water
Air
Pathways
Roadways
Tramways
Railways
In land
In ocean
Passenger
Cargo
Pack animals
Headload
Vehicular
Non-vehicular
Passenger
Good
Canal
River
Coastal
Oversea

ADVANTAGES OF ROAD TRANSPORTATION

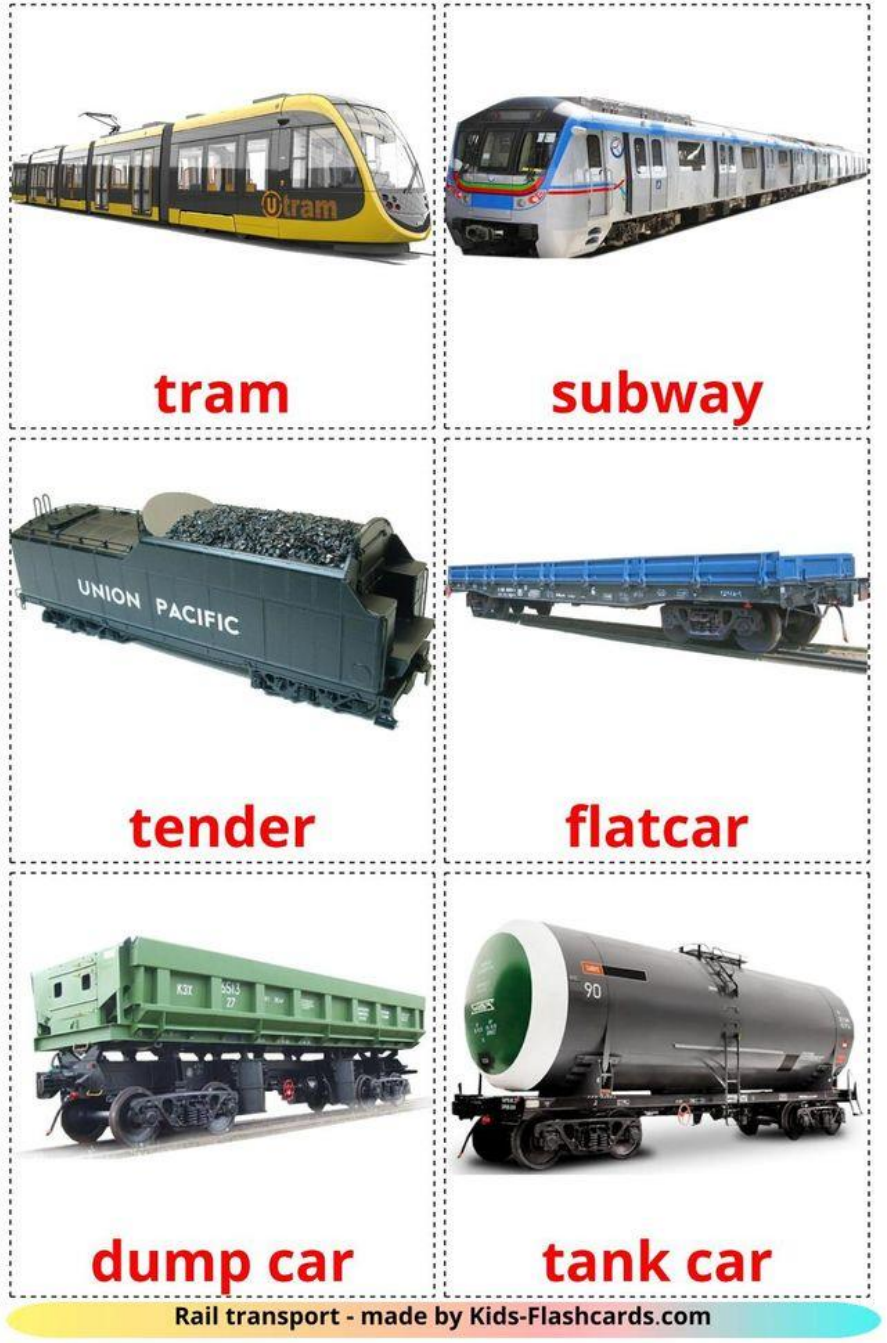
- Road transportation offers maximum service flexibility in terms of availability and adaptability of vehicles of any type and any capacity, the route chosen the time the speed of travel etc.
- in particular for short distance travel road transport save time.
- it can enable door to door delivery of goods and materials and provide a very cost effective means of cartage loading and unloading.
- road transport has the highest level of penetration into populated areas in any country. some places road is the only way of transportation to connect cities and towns.
- road transport also acts as a feeder service to the railway, shipping and air traffic.

LIMITATIONS OF ROAD TRANSPORTATION

- for instance there are more chances of accidents and breakdowns in case of road transport. So motor transport is not safe as other means of transport.
- road transport is also quite less organized in comparison with other modes. It is regular and undependable.
- Roads for road transportation are also unstable and unequal, while the speed of road transport is slow and limited, a major drawback.
- transporting bulky goods over long distances is also unsuitable and costly.

RAIL TRANSPORTATION

- rail transportation is also known as trai transport. Its also means transport on vehicles which run on tracks known as rails. It is one o the most commonly used important transpor system, also cost effective over long distances.
- it was introduced 1825 in England by pioneer o railways.

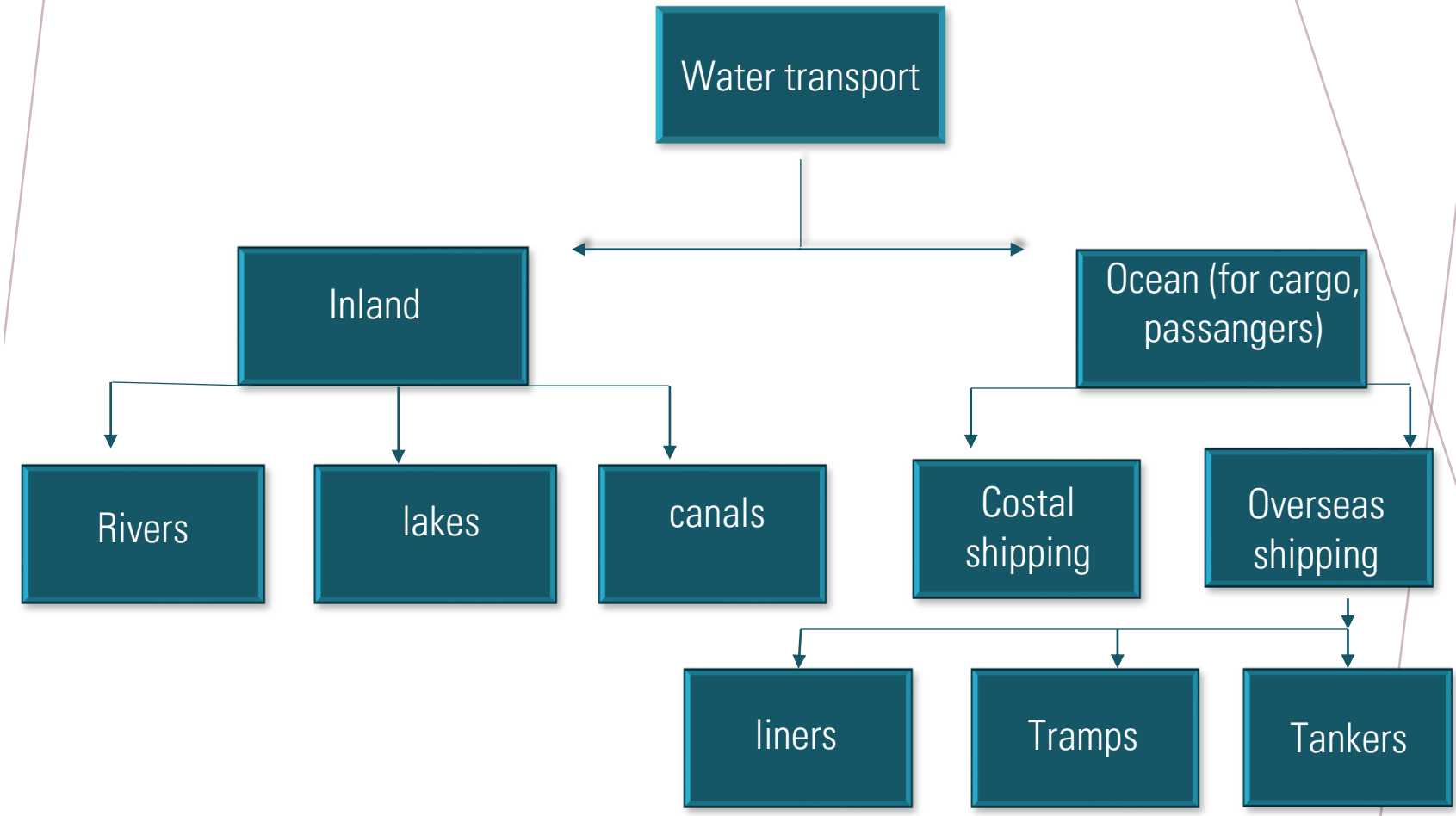


ADVANTAGES

- With time, rail transport has emerged as one of the most dependable modes of transportation, in terms of safety.
- Better organized. Fixed schedule. Services more certain, uniform and regular.it is one of the fastest mode of transportation.
- runs on metal(steels) rails and wheels. So it has lesser frictional resistance. This helps to attach more load in terms of wagons or carriages to a single engine.
- one of the cheapest mode of transportation, especially for carrying heavy and bulky goods over long distances.




WATER TRANSPORTATION



ADVANTAGES OF WATER TRANSPORT

- Water transport has the capacity of conveying bulky and heavy cargoes such as coal, oil, minerals etc.
- it is the cheapest mode of transportation for bulkier cargo over a long distance. Its operational expense is relatively cheap.
- water transportation takes place through nature gifted routs such as rivers, lakes, seas etc.
- water transportation causes the lowest pollution among all modes of transportation for the conveyance of the unit weight of cargo.

LIMITATION OF WATER TRANSPORT

- it is also *unsuitable for short-distance* journeys, due to being costly and time-consuming. It is the slowest mode of transport.
- Sometimes there are *delays* in shipment at docks and locks which hinder navigation *poor weather conditions* might also cause.
- weather transport is also risky as *poor weather and sea* storms may cause an accident leading to significant economic loss and causality.
- *vassal oil spillage, noise, smoke* and fumes cause pollution endanger marine life.
- water transport is *not suitable* for the transportation of *perishable goods*.
- canals can also be very expensive to construct maintain as well as drege.

AIR TRANSPORTATION

PIPES AND CONVEYORS

Pipes and conveyor systems are unconventional modes of transportation used for specific types of cargo and in particular industries.

These transportation methods have unique characteristics that make them suitable for the efficient movement of goods and materials.

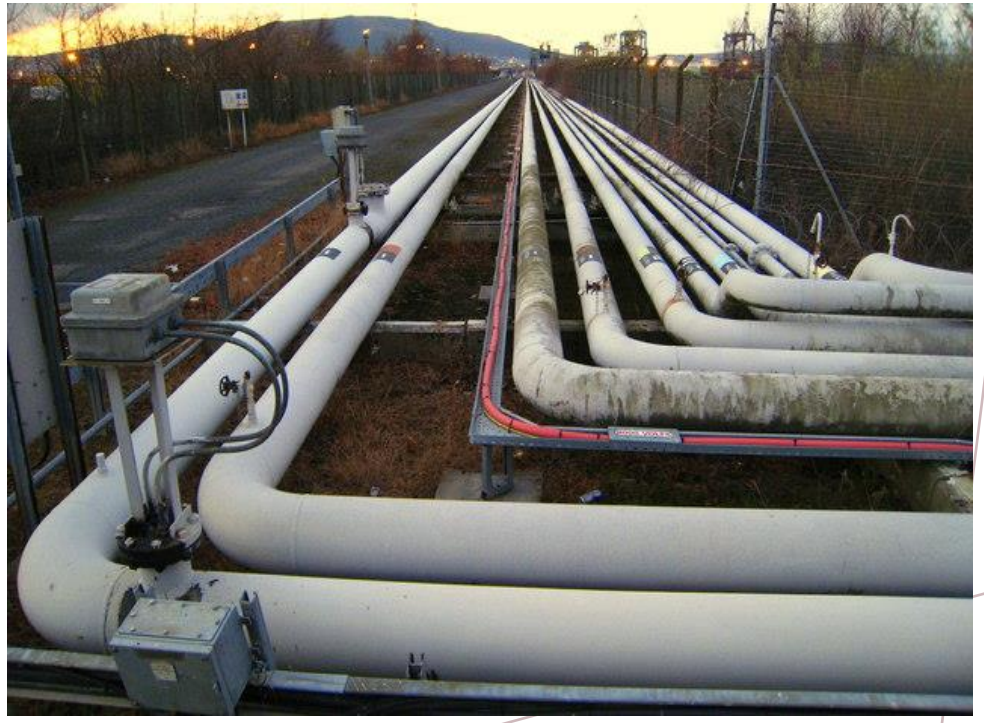
Here's an introduction to pipes and conveyor mode of transportation

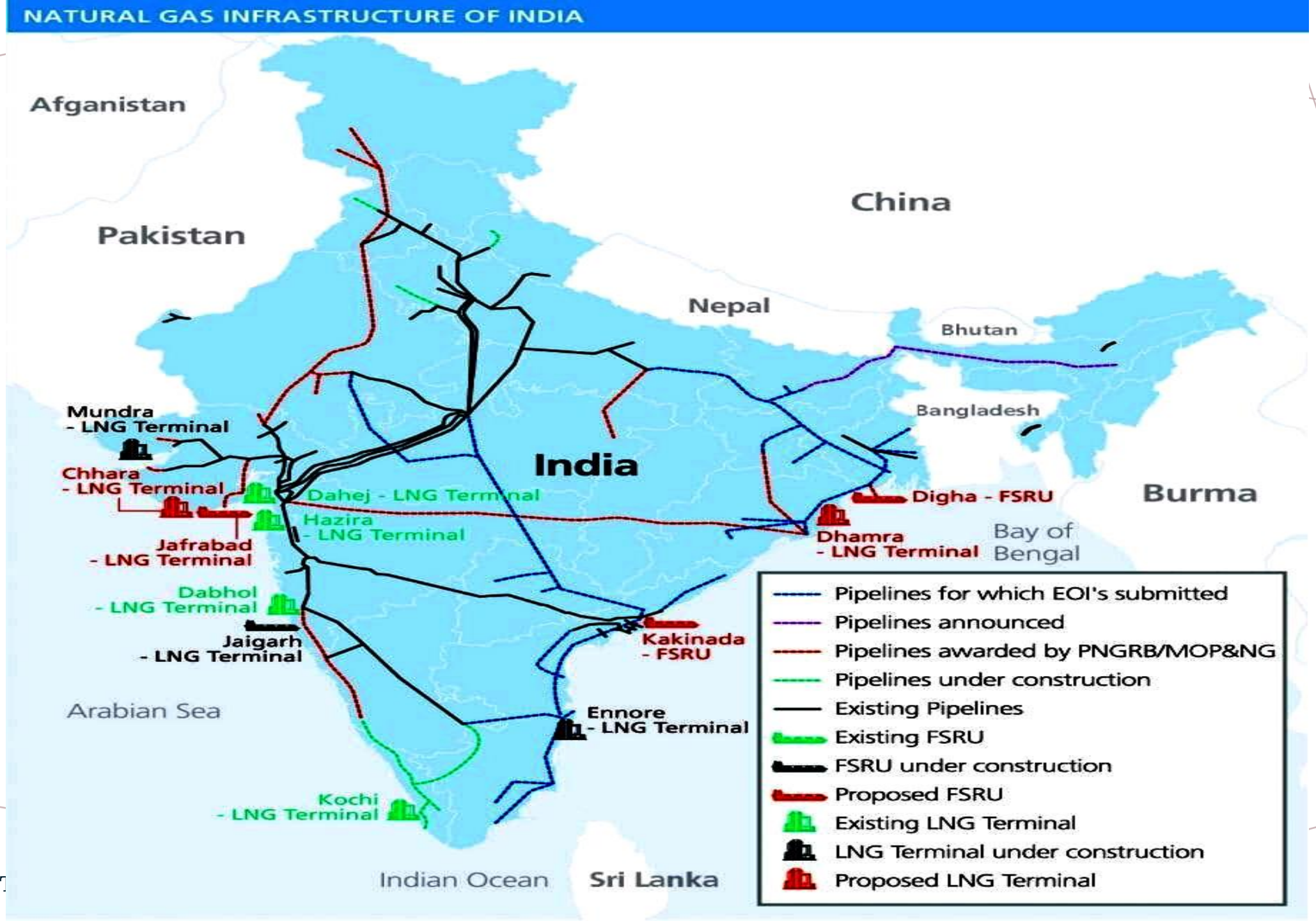
PIPES MODE OF TRANSPORTATION

Overview: The pipes mode of transportation involves the use of pipelines to transport *liquids, gases, and certain types of bulk materials from* one location to another.

This method is typically used for the continuous and *efficient movement of substances over long distances*.

Applications: Pipelines are commonly used in various *industries, including oil and gas, water supply, chemical manufacturing, and food processing*. They are especially well-suited for transporting *oil, natural gas, water, and other fluids.*




NATURAL GAS INFRASTRUCTURE OF INDIA
Afganistan
Pakistan
China
Nepal
Bhutan
Bangladesh
India
Burma
Mundra
- LNG Terminal
Chhara
- LNG Terminal
Jafrabad
- LNG Terminal
Dahej - LNG Terminal
Hazira
- LNG Terminal
Dabhol
- LNG Terminal
Jaigarh
- LNG Terminal
Digha - FSRU
Dhamra
- LNG Terminal
Bay of
Bengal
Kakinada
- FSRU
Ennore
- LNG Terminal
Kochi
- LNG Terminal
Arabian Sea
Indian Ocean
Sri Lanka
Pipelines for which EOI's submitted
Pipelines announced
Pipelines awarded by PNGRB/MOP&NG
Pipelines under construction
Existing Pipelines
Existing FSRU
FSRU under construction
Proposed FSRU
Existing LNG Terminal
LNG Terminal under construction
Proposed LNG Terminal

Advantages:

i. **Efficiency: Pipelines are known for their efficiency in moving large quantities of materials with minimal energy consumption.**
ii. **Reduced Environmental Impact: They can help reduce the environmental impact by minimizing the need for trucks and other transportation methods.**
iii. **Continuous Flow: Pipeline systems provide a continuous and reliable flow of materials without the need for frequent stops.**

Limitations

i. **Though optional and maintenance cost are minimal. Capital cost for laying pipe lines is much higher than other modes of transportation**
ii. **Not flexible, as it can be used in limited area of work, its capacity cannot be increased once it laid.**
iii. **damages and leakages in the underground pipelines are difficult to detect and repair. It may cause explosion and environmental damages.**

Conveyor Mode of Transportation:

Overview: Conveyor systems are mechanical devices designed to transport materials, goods, or products from one location to another within a facility or production process.

They consist of belts, rollers, or other moving components that facilitate the movement of items along a defined path.

Applications: Conveyor systems are widely used in manufacturing, distribution, warehousing, and mining industries.

They help automate material handling and assembly processes.

Advantages:

i. **Automation: Conveyors are ideal for automating repetitive tasks and improving efficiency in production and logistics.**
ii. **Precision: They offer precise control over the movement of goods, reducing errors and enhancing quality control.**
iii. **Labor Savings: Conveyor systems can reduce the need for manual labor in material handling.**

Challenges:

i. **Initial Investment: Acquiring and installing conveyor systems can be costly, and they require regular maintenance.**
ii. **Limited Range: Conveyors are suitable for moving goods within a confined area or facility and are not designed for long-distance transportation.**
iii. **Complexity: Designing and managing conveyor systems requires expertise to ensure they meet the specific needs of the industry or application.**

➢ *Types of roads:*

1. **National Highways (NH)**

- **National Highways are the most important roads in India's road network and are maintained by the National Highways Authority of India (NHAI).**
- **They connect major cities, states, and regions, serving as critical transportation corridors for long-distance travel and the movement of goods.**
- **National Highways are identified by numbers (e.g., NH1, NH44) and are typically multi-lane roads, including expressways and controlled-access highways.**

1. **State Highways (SH):**

- **State Highways are maintained and administered by state governments.**
- **They connect district headquarters, important towns, and industrial or agricultural areas within a state.**
- **State Highways are designated with numbers and often serve as major intra-state routes.**

1. **District Roads (DR):**

- **District Roads link rural and semi-urban areas to district headquarters.**
- **They are crucial for local transportation and provide access to educational, healthcare, and agricultural facilities.**
- **These roads are typically maintained by district authorities.**

1. **Village Roads (VR):**

- Village Roads are the smallest and most local road category, connecting villages to each other and to the district roads or state highways.
- They serve as lifelines for rural areas, providing access to markets, schools, and healthcare facilities.
- Village roads are usually maintained by local gram panchayats (village councils) or rural development authorities.

1. **Border Roads (BR):**

- Border Roads are strategically important for connectivity in border areas and are managed by the Border Roads Organization (BRO).
- They provide essential transportation links in remote and often challenging terrains near India's international borders.

1. **Expressways:**

- Expressways are high-speed, controlled-access, and grade-separated highways designed for efficient long-distance travel.
- India has several expressways connecting major cities and regions, such as the Mumbai-Pune Expressway and the Yamuna Expressway.

1. **Urban and City Roads:**

- Within cities, roads are classified into various categories, including arterial roads, sub-arterial roads, and local roads.
- These roads serve urban transportation needs, connecting residential areas, commercial centers, and industrial zones.

- **Rural and Feeder Roads:**
- Rural roads include unpaved and dirt roads connecting remote villages to the broader road network.
- Feeder roads serve agricultural purposes, providing access to farmlands and helping farmers transport their produce.

1. **Ring Roads and Bypasses:**

- Ring roads encircle major cities and metropolitan areas to divert traffic away from the city center.
- Bypass roads provide alternative routes to avoid congested urban areas, enhancing traffic flow.

➢ *Classification of Highway:*

In India, highways are classified into several categories based on their functional significance and connectivity. The classification of highways in India includes the following types:

1. **National Highways (NH):**

- Highways are the most critical and extensive road network in India, connecting major cities, state capitals, and important regions across the country.
- They are designated with a unique NH number (e.g., NH-44) and are maintained by the National Highways Authority of India (NHAI).
- National Highways are typically multi-lane roads, including expressways and controlled-access highways.

1. **State Highways (SH):**

- State Highways are roads maintained by state governments and serve as major transportation routes within a state.
- They connect district headquarters, major towns, industrial areas, and tourist destinations.
- State Highways are designated with state-specific codes (e.g., SH-1, SH-2).


National Highway
NH
State Highway
SH
Village Road
VR
Classification of Road in India

➢ *Urban Road:*

The design and construction of urban roads are critical to ensuring safe, efficient, and sustainable transportation within cities. Several basic requirements must be considered when planning and developing urban roads to meet the needs of both residents and businesses.

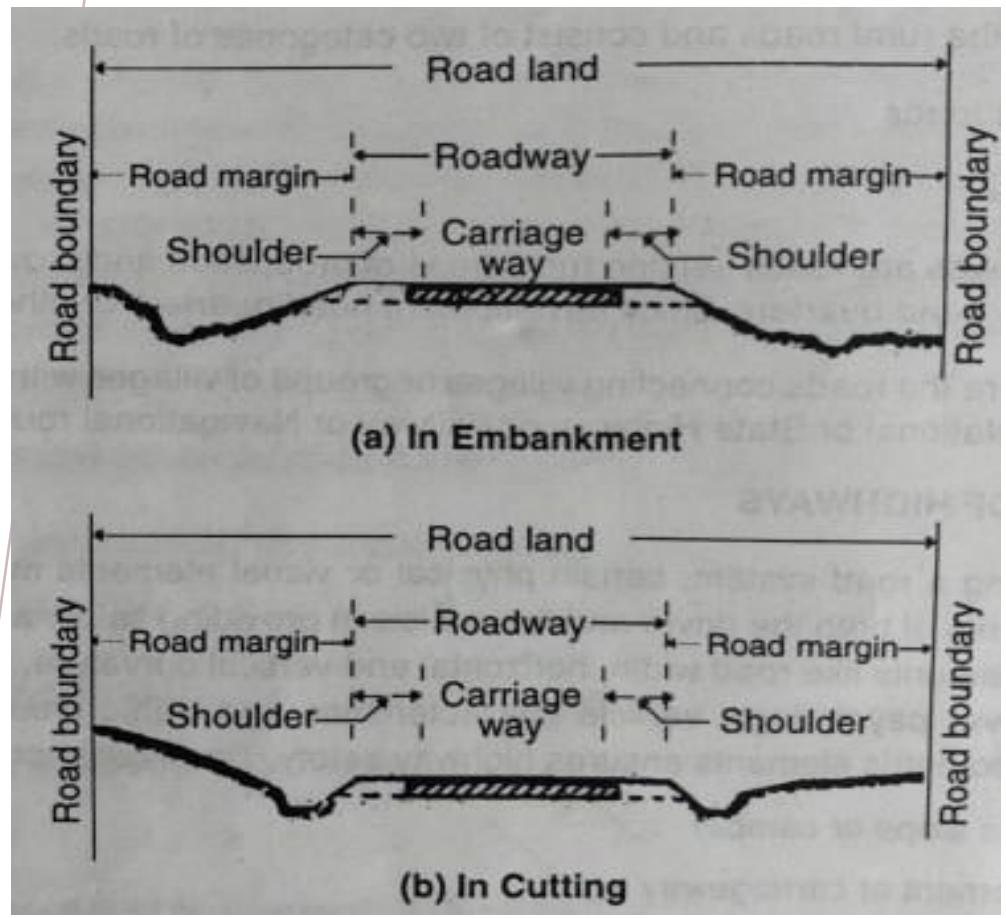
The basic requirements include:

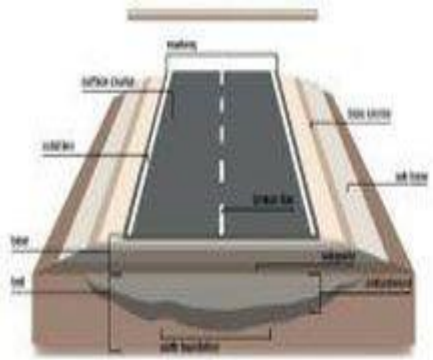
1. **Width and Capacity:** The width of urban roads should be adequate to accommodate the expected traffic volume, considering present and future needs. Roads in busy commercial or residential areas may require more lanes for increased capacity.
2. **Geometric Design:** Proper geometric design, including the layout of lanes, intersections, curves, and gradient, is essential to ensure safe and smooth traffic flow.
3. **Pavement Quality:** High-quality pavement materials and construction are crucial to withstand heavy traffic loads and adverse weather conditions. Durable and well-maintained road surfaces are essential.
4. **Drainage:** Effective drainage systems, including stormwater drains, culverts, and gutters, are necessary to prevent waterlogging and erosion, especially during monsoons.

- ***Basic components of road:***

The basic components of a road are:

- **Carriageway (pavement)**: This is the part of the road that is intended for vehicles to travel on. It is typically made of asphalt, concrete, or cobblestone.
- **Roadway (formation width)**: This is the entire area of the road, including the carriageway, shoulders, and any other features such as medians, sidewalks, and drainage systems.
- **Camber (cross slope)**: This is the transverse slope of the carriageway, which helps to drain water away from the road surface.
- **Kerbs (curbs):** These are raised edges that separate the carriageway from the shoulders or sidewalks.
- **Medians (central reservations)**: These are raised areas that separate opposing lanes of traffic on divided roads.
- **Road margins:** These are the areas between the carriageway and the kerbs (or the shoulders, if there are no kerbs). They may be used for parking, landscaping, or other purposes.

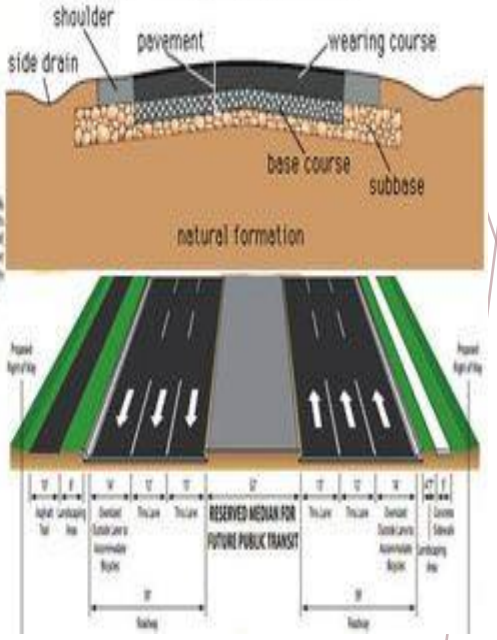

Road land
Road boundary
Road margin
Roadway
Road margin
Shoulder
Carriage way
Shoulder
Road boundary
(a) In Embankment
Road land
Road boundary
Road margin
Roadway
Road margin
Shoulder
Carriage way
Shoulder
Road boundary
(b) In Cutting




Surface Course
Base Course
Subbase Course


Cross Section of the Road


3'
9'
Sidewalk
6'
Bike Lane
10'
WB Travel
10'
Median / Left Turn Lane
10'
EB Travel
6'
Bike Lane
9'
Sidewalk
3'
42' curb-to-curb
60' right-of-way (ROW) | 66' with additional ROW


carriageway
traffic lanes
shoulder
pavement
wearing course
side drain
base course
subbase
natural formation
RESERVED MEDIAN FOR FUTURE PUBLIC TRANSIT

Rigid pavements are made of concrete slabs that are placed on a prepared subgrade. The slabs are typically 4 to 10 inches thick and are reinforced with steel bars to prevent cracking. Rigid pavements are strong and durable, and they can withstand heavy traffic loads. They are also relatively low-maintenance, as they do not require frequent sealing or resurfacing.

Flexible pavements are made of asphalt concrete, which is a mixture of asphalt binder, aggregate, and filler. The asphalt concrete is laid down in layers on a prepared subgrade. The thickness of the pavement varies depending on the traffic load and the strength of the subgrade. Flexible pavements are more flexible than rigid pavements, and they can conform to the movement of the subgrade.

Difference between Flexible Pavements and Rigid Pavements:

	Flexible Pavement	Rigid Pavement
1.	It consists of a series of layers with the highest quality materials at or near the surface of pavement.	It consists of one layer Portland cement concrete slab or relatively high flexural strength.
2.	It reflects the deformations of subgrade and subsequent layers on the surface.	It is able to bridge over localized failures and area of inadequate support.
3.	Its stability depends upon the aggregate interlock, particle friction and cohesion.	Its structural strength is provided by the pavement slab itself by its beam action.
4.	Pavement design is greatly influenced by the subgrade strength.	Flexural strength of concrete is a major factor for design.
5.	It functions by a way of load distribution through the component layers	It distributes load over a wide area of subgrade because of its rigidity and high modulus of elasticity.
6.	Temperature variations due to change in atmospheric conditions do not produce stresses in flexible pavements.	Temperature changes induce heavy stresses in rigid pavements.
7.	Flexible pavements have self healing properties due to heavier wheel loads are recoverable due to some extent.	Any excessive deformations occurring due to heavier wheel loads are not recoverable, i.e. settlements are permanent

THANK YOU

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