Since ancient times for the purpose of movement of goods and people transportation system were required
Transportation system comprises of vehicle and infrastructure

Vehicles
The first means of transportation on land were basic slides which were made out from tree trunks to carry heavy loads the most important invention in the history of road transportation was wheel in about 3500 B.C the wheel was first used as a means of transport before that it was only used to manufacture pottery the first wheel carts formed a single piece with axis which was secured under the wagon by leather straps in about 2000 B.C it was switched to fixed axel with moveable wheels later in the same century the wheels were made lighter by the use of spoked wheels
For over 5000 years the most efficient means of road transport were wagons and carriages pulled by horses and oxen in the recent century, in 1780 James watt first steam engine this engine was later adopted for the movement of vehicle as initially this engine was harnessed in factory heavy machinery Steam engine were first deployed in railways which used the rails or rail roads to move locomotives the first and the most famous locomotive was built in 1829 by
George Stephenson the first public railway was opened in England in 1835
The first Italian railway was first built-in kingdom of two sicilies (between Naples and proticies) with length of 8 km
For almost 2 century the rail road was the most important mode of transportation for the internal mobility of goods and people in the western world. This brought about a huge economic and social development
In last 50 years the road systems have taken over the rail road since 1970 the use of road system has multiplied 4x faster than rail road system

Petroleum engine
The history of petroleum engine started in 1876 with the invention of 4 stroke internal combustion engine it was invented by Nikolaus August Otto. When the development of technology this engine was modified and made efficient by 3 companies owned by 3 different engine developers Karl Benz, Gottlieb Daimler and Rudolf diesel these 3 companies are still making engines for cars and trucks modern engines are comparable cleaner efficient and provide passive safety still cleaner engines are being developed with the use of electric motor natural gas bio fuels and hydrogen these new engines are called hybrid engines the most popular excepted clean engines are already used in vehicle in form of electric motor powered lithium Nickle battery

Infrastructure
Road infrastructure the invention of wheel and vehicle subsequently road infrastructure was requiring this pact was derived by Inca civilization which build almost 40000 km of paved roads which only 1 meter wide which were used as foot path and for heard of animals surprisingly Incas didn't know wheel vehicle and use of horse’s development of road system can be attributed to roman civilization according to historian romans have had

3 major principles - opening roads building waterways and disposing severs in the underground they began construction long straight roads for military political and commercial reasons by this their army could move rapidly to extend boundary of their empire later on these roads were used for goods

transportation and people movement later in the roman empire they learned to put milestones to indicate the distances in miles romans contributed to build a hundred thousand km of roads

In ancient Rome around 45 B.C censor enacted a law which banned entry of private vehicle inside town streets to prevent accidents with the pedestals and this law is believed to be the oldest municipal law of the world

For building rail roads, the support system was the road system the direction and pathway were parallel road system which connected one town to other

The history of transportation of water goes back 1000 of year because water was needed by the mankind to survive to build civilization near it and for farming in history you can find that all ancient civilization were located near water. It was learnt by man that it is easier to travel by water in comparison to going over land

Water ways are critically important to the transportation of people and goods throughout the world they allow the ease of transportation to ship goods and people to all parts of the world

Types of water transport include boats ships canoes submarines
Modern waterways are important for trade and economic development

Early civilizations depended on waterways and water craft in 1500 B.C Egypt were first to use sea going vassals Greeks and romans also relied on waterways in Asia about 200 A.D Chinese ships equipped with multiple masts and a rudder were making sea vouge

In around 4 century B.C Chinese relied on internal waterways for transportation of food material and timber to various cities located from river front. Japan also relied on internal and costal waterways early in its history

Before the Cristian era Arabians were failing to spice island for spice trade. European merchants sailed through the sea for tea trade and in search of new lands from 17th to 19th century Americans were evolved in Atlantic shipping for slave trade

In modern era almost 80 country are involved in trading through trans-oceanic shipping it is the most vital part of world economy

The history of aviation starts from the flying of kites in china in the 5th century B.C kites were flown only for pleasure purpose as a game later on some brutal kings of china used larger kites to fly a criminal tight on kite as a punishment later on it was banned

In 15th century the great philosopher Leonardo da Vinci expressed his dream of flight through several rational but un scientific design through his paintings through he did not attempt to construct any of them

In the 18th century hydrogen gas was discovered which lead to invention of hydrogen balloon during the same time Mont golfier brother discovered hot air balloon. Using both technology began maned flights these balloon began to be used for military purposes by end of 18th century the French govt established balloon companies during French revolutions

Gliders were heavier than air crafts which were experimented in the early 20th century the first aero plane with all its characteristic was successfully flown in 1969 by Wilbur wright Oliver wright the technology took 20 years to make actual aircrafts meanwhile the advance hydrogen balloon deigned by Ferdinand zeppelin was used for long distance flight until 1930's and were know as air ships and flying boats with development of engine technology the flying boats were replaced by air planes after the second world war the powerful jet engine were revolutionized air travel and military aviation the civil aviation was dominated by an aircraft company Boeing Inc. by the end of 20th century with the development of digital electronic technology the flight instrumentation system were controlled through electronic media the 21th century can see a large scale use of pilot less drones for military purpose

Transport in India- land water and air
Primary road transport
Indian railways network is second largest network
Aviation in India - military aviation & civil aviation
Indian waterways network river canals backwater and creeks -it is the 9th largest network in the world
21% of Indian have 2 wheelers
Modes

1. Ancient times Walking modern era footpath and pedestal foot over bridges sky walks
2. Ancient times Palanquins - it was meant for rich and Nobel men also used for carrying a deity of a god modern times- Indian weddings pilgrimage and carrying deity of god
3. Bullock carts camel carts horse carts in Indian scenario bullock carts are popular British introduced horse carts model "ikka" single horse 1 or 2 person on cart "tanga" 2 horses 4 to 6 people "buggy"2 or more horses drawn carriage of 4 wheels it is closed
4. Bicycle
5. human puled rickshaw started in west Bengal for the use of English people spread to many places where British offices were there but most popular human pulled rickshaw system can be seen in Calcutta from where the britisher started trading and shimla which were the summer capital of britishers in both these places rickshaw were present were used till late 1960's later it was considered as inhuman and was completely banned
6. Cycle rickshaws introduced in 1940's with one person to pedal and two passengers can be seated they were popular till late 20000 later they were banned by many states due to traffic congestion although it is non polluting mode of transport
7. Bus important means of transport usually owned by state road transport cooperation due to its importance to connect every town and village rapid transport system Bangalore was first city to have air condition bus stops then private interstate bus services ordinary /ac/Volvo
8. Moter vehicles 2 wheelers motorcycle moped initially 2 wheeler were less 4 wheeler were more 1960's by the year 2000 2 wheeler became 5 times more than 4 wheelers royal Enfield England hero MotoCorp India Bajaj auto Honda yahamaha tvs Mahindra 2

wheelers scooters lamereeta Italy Vespa Italy Bajaj took over Vespa then priya now auto geared scooter are manufracted by many Indian and international company four wheelers auto mobiles 140/1000 people cars sedan saloon/hatchback nerck game there tech to Hindustan moter fiat which was taken over by premier Maruti Tata moters Hyundai list goes on……

Unauthorized vehicle made from spare parts and engine of other vehicle jugaad maruta chhakda peter rehda fame

Utility vehicle rights from jeep indian army and police supply maruti zipsy was given to indian army and police tata group with licence from Mercedes they launched 3 vechile tata mobile tata ciara and tata estate later on they started manufracturing there own vehicle Tata sumo empo tracks force moter limited

Matedore initially taxi and cabs were started using embasedor and primeior but later on all makes of cars are used in present day an inovative idea is started just a few years ago two wheeler taxi in which a person can hire a motercycle with a rider same as a taxi

Another development that was started a decade ago of car rentals in which a person(s) can take a vehicle on rent for a limited time and used according to there own wish visiting places or going one town to other. Innovation in this concept came up a couple of years ago in which 2 wheelers can be taken on rent

Issues in transport

- Faster life
- Lack of time
- Distances
- Frequency
- Digitalization
- Customer experience

Integrated and frictionless travel- in current scenario transport and travel planner see a growing need to make travel more seamless with minimal stoppage or check points this trend is influencing in many ways including multi model transportation, mobility as a service, ticketless travel and integration of micro mobility

Digital identity- transit and transportation agency are using digital technology to improve security and help a better travel experience this trend includes biometric facial recognition at airport to enhance security

Customer experience- transport agency are placing more emphases on customer experience they are doing this by putting users needs in priority they are also simplifying IN person transactions by providing better infratruce even for pedestrians

Innovation accelerators- transportation agency are involving private sector expertise and building public private colhaliation in multi mode transportation biggest example is NHAI

Artificial intelligence-transportation agency are using artificial intelligence with power of data analytics which help to reduce travel time manage congestion and deliver many other benefits the recent example is that of Fast Tag

After 2nd world war civil and commercial aviation grew rapidly using ex military pilots to transport people and cargo. Companies that were making military aircraft quickly adapted to producing passenger aircrafts the growth of civil aviation was also accelerated by availability of military airports throughout the world these airports were easily converted to civil aviation airports Britain was the first country to fly commercial jetliners the initial aircraft suffered a series of failure such as cracks in the window, jammed doors etc. meanwhile the American company Boeing overcame all such problems and launched its first aircraft Boeing 707

Civil aviation is one of the 2 major category of flying representing all non military aviation most of the country in the world are members of international Civil Aviation Organization (ICAO) and worked together to establish common standard for civil aviation ICAO is responsible for making and enforcing these standards and practices

Civil aviation includes 2 major category scheduled air transport it includes all passenger and cargo flights operating on regularly scheduled routes
General aviation this includes all other civil flights private commercial or diplomatic

Some countries also allows flying aircrafts that are flown for hire for example
commercial aviation which includes most or all are done on hire bases particularly aircraft hired from scheduled services
Private aviation this includes pilots flying for there own purposes theses purposes could be recreation business etc. without receiving any kind of remuneration
Civil aviation sector is growing fast and will continue to grow due to change in life style the most recent estimates suggest that the demand for sir transport will increase by and average for 4.3% per annum of next 20 years although at present this industry is struggling due to covid 19 pandemic

Facts worlds first air mail service was started in India at prayagraj on 18feb 1911 this intern led to beginning of civil aviation in India the plane used for was humber by plane it took of from Allahabad to naini covering a distance of 10kms

Best airport in the world Singapore Changi airport has won the award for worlds best airport for past 8 years
Tokyo Haneda is rated to be world second best and dohas hamade international airport as worlds no.3

richest airlines delta airlines American airlines group Lufthansa airlines

18 Feb. 1911 saw the first commercial flight from prayagraj to naine flown by a French pilot Monseigneur piguet covering a distance of 10 km carrying 6500 mails on a hummber by plane this is considered to be world first airmail and commercial service and beginning of civil aviation in india

In pre-independence India in Dec. 1912 the first domestic air route between Karachi and Delhi was opened by the Indian state services in collaboration with imperial airways U.K

In 1915 Tata sons limited started the first Indian airline air mail service between Karachi and madras without any aid from govt.

In January 1920 royal air force started regular airmail services between Karachi and Mumbai

In 1924 construction of civil airport began in India- dumdum in Calcutta bamralli in prayagraj and gilbert hill in Mumbai

In April 1927 dept. of civil aviation was launched to look after all matters related to civil aviation in India in the same year aero club of India was also established for amature flying of gliders

In 1932 Tata sons limited launched Tata airlines it started airmail services to various cities Karachi Ahmedabad Bombay berily madras etc.

Between 1933-1934 a no. of airlines company emerged- Indian transcontinental airways madras air taxi services, indian national airways

In 1937 Indian aircraft act was formulated by dept. of civil aviation

In 1940 Hindustan aeronautic limited (HAL) was set up by walchand herachand in association with Mysore govt at Bangalore

In pre independence era Mysore was separate province and had a govt. of his own

In July 1941 India first aircraft the Harlow trainer was rolled out for test flight

In 1945 deccan airways was founded which was jointly owned by Nizam of Hyderabad and Tata airlines which flight bean in July 1946

In the same year air India came into being when Tata airlines changed its name to air India

In 1947 9 air transport company was operational in time of independence. Later the no. reduced to 8 when the orient airways shifted its base to Pakistan the remaining 8 airline company were Air India, Indian National Airways, Airservice of India, deccan airways ,Ambika airways , bharat airways, Mistry airways these airlines were operating with and beyond frontier carrying both air cargo and passengers

In 1948 air India signed and agreement with Indian govt. to operate international named air India international

On June 8 1948 air India inaugurated its international services with weekly flight between bombay and london via kiaro and juniva

In march 1953 indian aviation saw a very large merger the Indian parliament passed the air cooperation act 1953 through which indian airlines and air india international were set up after nationalizing entire airlines industry all 8 independent operator were merged under this act. In the same year civil helicopter services were also introduced in the country

In 1972 the international airport authority of india (IAAI) was constituted in 1981 a govt. owned airlines company vaiooduth airline company started operations in 1985 Pawan hans helicopter limited was established in same year indra gandhi rastriya udan academy was established in ria beraily (UP) was established for purpose of pilot training

in 1986 national airport authority was constituted

In 1986 a major highjack took place of a pan am aircraft routed from bombay to new York it was highjacked in Karachi and became a major issue to security of passengers after this event in 1987 the beauro of civil aviation security was established

In 1990 Indian civil aviation saw a major upsurge in air traffic the govt adopted open sky policy and allowed air taxi operators to operate flight from any airport they were also allowed to decide there own flight schedules cargo charges and passenger fairs.
East west airline was the first national private airline to operate in the country after almost 37 years In 1991 Sahara airlines became the second private operator In 1993 jet airways became the third private operator in 1994 in the month of march the air cooperation act of 1953 was repealed and was replaced by air cooperation (transfer of undertaking and repeal) act of 1994 this act enabled private airline operators to operate scheduled services the private players that commenced domestic operation were jet airways air Sahara modiluft airlines damania airlines NEPC airlines and east west airlines

In 1995 India's 6 private airline accounted for more than 10% domestic traffic
Many foreign airline started providing international services in the same year 42 airlines operated air services to and from and via India in the same year in april air authority of india was constituted. AAI was constituted by merging IAAI with national airport authority

In 1997 policy on airport infracture of india were developed for the use and development for airport infrastures

In 1999 in the month of june cochin international airport limited (CIAL) was the first airport in india build with public private partnership and was made operational cochin airport operated as a private airport since 1993

In year 2000 sahara airlines was rebranded as air sahara

In the year 2003 low cost carriers entered the indian civil aviation. Air deccan was the first

In the year 2004 govt. approved to set up private airports at hyderabad and banglore in the same year in june go air started its low cost carriers in the same year in december AAI permited private operators in

scheduled operation with a minimum period of 5 years of operation and with minimum 20 aircrafts they were also permitted to operate scheduled service to operate international destinations

In 2005 govt. designated air india air Sahara indian airlines jet airways to operate international services in the same year in the month of may kingfisher airlines started full service carrier and spice jet started low cost carrier

In 2006 indigo started its low cost carriers in the same year govt. approved the restructuring and modernization of Mumbai and Delhi airport through PPP model (public private model)

In 2007 reginal airline policy were formulated in which licenses were given for airline operation within a particular region in the same year Indian aviation saw three mergers 1. air india- indian airlines and were cleared by the cabinet by the end of year 2. jet airways acquired air Sahara for rupees 1450 cr. And air Sahara was renamed jetLite 3. kingfisher airline acquired air deccan for rupees 550 cr and air deccan was renamed simply fly the logo of deccan was replaced by kingfisher logo

In the year 2008 the govt. announced greenfield airport policy

In the same year simply fly deccan was again renamed as kingfisher red

In 2009 Airport economic Regulatory authority (AERA) was established to regulate economic aspect of airport it is an autonomous body set up by an act in parliament

In 2010 airport economic regulatory authority appellate tribunal (AERAAT) was established which is a court to settle matters and disputes related to airport and aviation and airline companies

In the last decade India became 9th largest aviation market in the world with 90 operational airports 10180 aircraft 303 helicopters 11 operational scheduled airlines and 133 non scheduled operators. These figures are continues rising and Indian aviation will be among top 3 civil aviation market in the world by 2025

In civil aviation industry, the passenger traffic is indication of demand demand is accelerated by lower prices of air fare and lower prices of tourism expenditure at a destination it also depend on spending capacity of customer. Other factors include distances safety and health according to demand customer can be categorized into business travelers- there important to airlines because they frequently travel throughout the year and they purchase upgraded services that are financed by there companies business class travelers are attracted by full service airlines in which services of needs luxury seats and in flight entertainment are available

Leisure travelers- these customers travel for non business purposes for eg. Vacations visiting friends and family or for there personal needs. These travelers are highly price sensitive and tend to travel in economy class new private airlines offer low competitive rates to increase there growth dynamics and therefore leisure segment is growing very fast in domestic civil aviation

Factors that affect the demand in civil aviation are as follows

- Price of air tickets
- Geographical boundary of a country
- Income of customer
- Prices of fuel
- Standard of living
- Govt. regulations
- Economic development of country
- Weather conditions
- Inflight services
- Goverence of aviation industry

Between 2008 & 2018 domestic passengers increased from 87million to 138million per year and in international aviation the passenger traffic increase from 30 million to 59 million per annum

Supply
In civil aviation industry supply refer to total no. of seats that are available in each flights it is also known as capacity. Available Seats Kilometers (ASK) is the unit in which supply is measured in aviation industry

Factors affecting supply in civil aviation are as follows

- Availability of capital
- Tax structure
- Demographic condition
- Technological development
- Infracture development
- Marketing strategies

Between the year 2008 &2017 the ASK has increased from 60590 to 116945 seats per flights

functions of ICAO

- Safety what they are suppose to inspect aero plane safety how much it can travel 1 go refueling frequency overall design of craft
- Flying staff there qualification experience no. of flying hours
- Airports there safety and security length of the runway width size of aero plane are safe to land and take off
- safety of airports checking boarding system
- ICAO approves flight routes of any new flight to be launched and also reviews flight traffic around the globe
- In case of mishaps there is a standard operating procedure for search and rescue operations ICAO ensures that the ground staff is trained for such moments and in case of mishap monitors the search and rescue operations

It classifies the principles and techniques of international air navigation, as well as the planning and development of international air transport to ensure safety and security.

IATA (The International Air Transport Association)

- To promote safe, regular and economic air transport
- To foster air commerce
- To study problems connected with airline industry
- To provide a means of collaborating between air transport companies and agencies

To co-operate with other international air transportation organizations Essentially, IATA is airlines working together to standardize and improve service internationally Due to the vital role played by IATA in air transportation issues

The functions of AAI are as follows:

1. Design, Development, Operation and Maintenance of international and domestic airports and civil enclaves.
2. Control and Management of the Indian airspace extending beyond the territorial limits of the country, as accepted by ICAO.
3. Construction, Modification and Management of passenger terminals.
4. Development and Management of cargo terminals at international and domestic airports.
5. Provision of passenger facilities and information system at the passenger terminals at airports.
6. Expansion and strengthening of operation area, viz. Runways, Aprons, Taxiway etc.
7. Provision of visual aids.
8. Provision of Communication and Navigation aids, viz. ILS, DVOR, DME, Radar etc.

functions of DGCA

- Laying down rules and regulations for implementation of ICAO standards and recommended practices
- regulation of air traffic services to/from/within india
- registration of civil aircraft in india
- formulation of standards of airworthiness for civil aircraft registered in india
- licensing of pilots, aircraft maintenance engineers and flight engineers
- licensing of aerodrome's in india
- carrying out investiagtion into air accidents and incidents
- implementation of bilateral air services agreements with foreign countries
- rendering advice on matters pertaining air transport

- processing of aviation registration
- supervision of the training activities of the flying clubs in india
- certification of aircraft

The use of rails goes back to 16th century when they were used for the purpose of moving trollys on wooden rails to bring out minerals from the mines

In 1550 the first frame of trolley on rail was invented in Switzerland to be used in mines

In 1671 denis patten discovered the power of steam under pressure which let to constrution of steam engine

in 1738 the British miners Iranplated wooden rails to reduce their wear

in 1789 wooden rails were replacedby by cast iron rails

In 1804 worlds first locomotive was constructed and tested with 5 cars loaded with 10 tons of iron

In 1808 the second locomotive was construted with a lot of improvement

In 1823 sephenson founded first locomotive manufracturing plant

In 1925 the first passenger railway pulled by steam engine was inaugurated in england

In 1831 france developed its own locomotives

In 1835 belgium and germany started there railways

in 1838 railways used 4 mailbacks for the first time between bermigum and liverpool

In 1839 dutch and italian railway started

In 1840 telegraph was used to monitor movements of train in england

In 1842 first electric locomotive was used which was powered by batteries and invented by davidson in the same year french govt. endulged in financing of the railway network

In 1847 crampton designed broad guage (about 2.25meters) for high speed trains

In 1851 USA used trains called ice-wagon for transportation of periciable foods

In 1853 railway was introduced in india by east india company

In 1859 first sleeping cars were comissioned in USA

In 1863 the first dinning cars were introduced in trains in USA

In 1869 railway safety was improved by invention of air brakes by george wistinhouse

In 1879 electric trams were introduced in berlin by simens

In 1882 electricity was supplied in Saint lazara railway station in france for the first time

In 1883 the first international luxary train orient express was launched

In 1899 rail cars were fitted with dynamo which produced enough electricity to light the cars in french railways

In 1912 the first diesel locomotive was constructed in germany (1200 horse power)

In 1922 international union of railways was formed in paris

In 1929 for the first time canada introduced a facility of telephone system allowing passenger to communicate from moving train

In 1931 renault tested its first railcar on wheels in france which reached the highest speed of 107 km/h

In 1947 the first chair car locomotive was introduced

In 1950 the first electric railway line was used with single phase 20000 volts in france

In 1970 the first high speed train was introduced in rome which used automotive gas

In 1994 tunnel of english channel was crossed by the train eurostar for the first time

Date 18/12/2020

Eurostar is a high passenger train linking London Paris lille and brussels via the channel tunnel Which run at speed of 300 km/h Eurostar was originally owned by UK govt. and now sold to overseas investors Eurostar is now owned by private players of French railways Belgium railways and part of UK railways

Euro tunnel is another company which is mistaken to be owner of Eurostar but euro tunnel is actually owner of only the channel tunnel.

Eurostar started running in 1994 and covers a distance of 492 km in 2hrs 15 mins Eurostar is a fleet of trains which have different pick up and drop points one major route is London to Paris which is 492 km London to liele and brecils 266 km 1 hr. 48mins third route London to Rotterdam Amsterdam this service was stared very recently in April 2018

Eurostar also runs a skie train from London to ST. Maurice which is situated in abs mountain of France this train is operated only twice a week in winters

Amtrak was found in 1971 to serve many rail route its more than 500 distination 46 provience of usa and 3 candanidan provience 300 trains daily and covering 34000 km od track the company owns approximately 900 kms of its own tracks and additionally approximately 220kms of other tracks some of these tracks can allow a train to run at speed of 240km/h the name amtrack has been derived from America and track amtrack started operating in may 1971 in america there are other railway operater also. out of 366 routes amtrack operated only 184

Amtrack originally stared operating with 1200 cars on lease from private railway operators all cars were in best conditions and 90% made of stainless steels as the company took cars from different operators it could not maintain a proper colour scheme of the trains by 1975 amtrack brought locomotives and designed its own logo and colour scheme

In between 2000 and 2010 passenger increased due to few reasons mainly due to raising fuel cost and due to development of high speed trains which were more comfortable than driving own car the first few years of 21th century Amtrak could not add sufficent revenue from fright trains and almost lost self sufficiency Gradually change in policy of amtrck as well as amrican govt gradually came to peak it took 7 years to become self sufficent and profitable 2002 to 2007 many high officials were replaced or fired

- High speed rail coridor- underpass protective fencing etc.
- High speed train gatimaan express Train 18 (vandhe bharat)
- Dedicated fright corridors
- Railway coach refurbishing
- Bio toilets
- Hyperloop development for daily commuters
- Station development- escilators ticket vending wifi cctv cameras automatic fire alarms
- Tracks- dedicated fright corridor geo strategic border rail lines for purpose of military and security track gauge conversion track renewal track electrification
- Fuel and electricity roof top solar panel and train top solar panel in trains lighting system changing over to LED
- Track safety unmanned level crossing automated fog light assistance

Most important trains in India

-

S. No	National Highway	Distance (in km)	Route
1	NH 44 (old NH 7)	3,745	Srinagar to Kanyakumari
2	NH 27	3,507	Porbandar in Gujarat to Silchar in Assam

3	NH 48 (old NH 8)	2,807	Delhi to Chennai
4	NH 52	2,317	Sangrur, Punjab to Ankola, Karnataka
5	NH 30 (Old NH 221)	2,040	Sitarganj in Uttarakhand to Ibrahimpatnam in Andhra Pradesh.
6	NH 6	1,873	Jorabat in Meghalaya and terminates at Selling in Mizoram
7	NH 53	1,781	Hajira in Gujarat and Pradip port in Odisha.
8	NH 16 (Old NH 5)	1,711	East coast of West Bengal to Chennai in Tamil Nadu.
9	NH 66 (Old NH 17)	1,622	Panvel and terminates at Kanyakumari
10	NH 19 (Old NH 20)	1,435	Delhi to Kolkata
11	NH 34	1,426	Gangotri Dham in Uttarakhand to Lakhnadon in Madhya Pradesh

Roads are an important mode of transport in India.
India has a network of over 5,897,671 kilometres (3,664,643 mi) of roads as of 31 March 2017. This is the second-largest road network in the world, after the United States with 6,645,709 kilometres (4,129,452 mi).[2] At 1.80 kilometres (1.12 mi) of roads per square kilometre of land 7% of total GDP since 1990 modernization road infracture began National Highway increased from 709 km to 142126 km (almost double) 4 lanes express ways state highways are developed with the help of PPP (public private partnership)

At the time of applying for tourist bus permit following information has to be furnished-
Registration no. of the bus
Engine no.
Chasey no.
Original permit no.
Permit issuing authority
Make of the bus
Registered laid in weight.
Un laid in weight

Year of manufacture
Seating capacity
And period for which tourist permit required

The permit is issued by All India tourist bus permit authority
Under this permit there are certain things that operator has to follow

1. Seating capacity of the bus and should not be less than 21 and not more than 39 excluding driver and conductor
2. Age of the tourist bus the age of the bus should not be more than 8 years from date of purchase the bus has to exibuite "all India tourist permit on the back of the bus in some contrasting colour"
3. List of tourist a tourist bus with all India tourist bus permit shall at all times carry a list of tourist passengers in respect of each trip the list shall be produced on demand by any official authority
4. Conformity of mass ambition the tourist bus operator cannot operate if the mass ambition is more than the environmental standards

Permits for passenger vehicles

- Auto rickshaw and taxi permits they are issued by and have permission for flexible routes
- Maxi cab it is a permit issued by state transport authority for carrying passengers on a fixed route at a fixed fare. These have multiple pick up and drop points
- Battery 3 wheelers state issues eco friendly seva permit to battery operated 3 wheel vehicles having seating capacity of up to 10 passengers
- Contract carriage or chartered bus permit this permit is granted to bus owner to operate for a client or company under a legal contract
- State carriage permit this permit is granted to bus owners who are willing to operate for a state transport as an under taking under this permit the bus owner has to operate on a designated route same as state transport buses
- Temporary permit this permit is granted to bus owners for particular route for particular purpose for a limited time for eg. Bus hired for marriage party
- Rent a cab permit this permit is issued to car owners. Under this permit the car is driven by the passenger himself
- Institutional bus permit this permit is issued to bus owners who wish to ploy buses for school college university etc.

The historical development of water-based transportation is connected to the importance of domestic and international trade. Early exploration of North America identified large amounts of natural resources such as fisheries, timber, and furs. Trade centers were established along the east coast of North America where goods could be gathered together and ocean vessels could transport them to consumers in Europe and other foreign areas. The success of commercial trading companies spurred the introduction of

Waterways in developing countries are critical avenues for local and regional commerce. Fruit and vegetable vendors flock to floating markets on rivers and canals, such as this one in Bangkok, Thailand.

more colonial settlements that in turn resulted in additional increases in population, economic activity, and trade.

From the sixteenth to the eighteenth centuries, small subsistence farms were prevalent among the American colonies. Eventually larger farms emerged and produced crops such as wheat, tobacco, rice, indigo, and cotton that were commercially marketable in Europe. Ocean vessels transported the bulk, low-value goods from the colonies to Europe and returned with high-value, low-density goods such as inks, linens, and finished products that had a much higher return on the investment per vessel trip.

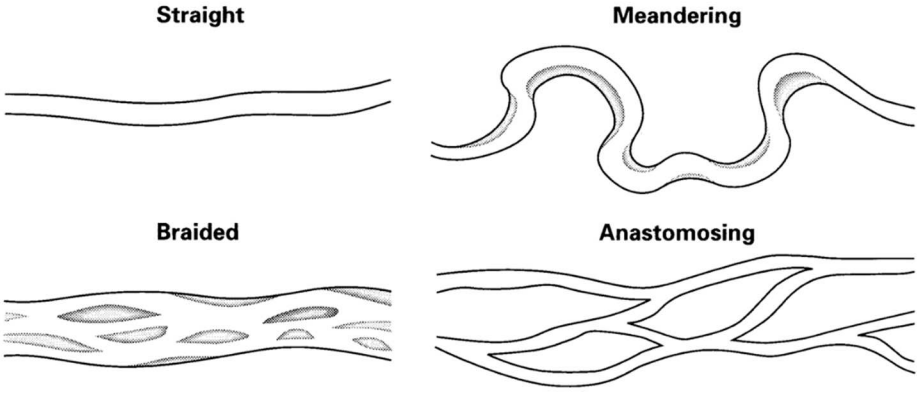
Agricultural production continued to grow and support the growing colonies' economic development. The speed and low cost of transporting goods by water influenced the locations of population settlements near navigable water (rivers, lakes, canals, and oceans). Goods produced on inland farms were transported via inland waterways to the coastal ports. Goods shipped by smaller vessels from surrounding ports were transported to New York, Boston, and Philadelphia, and exported on larger oceangoing ships. These ships from the smaller ports then transported imported goods back to the surrounding ports.

Water transport in India has played a significant role in the country's overall economy and is indispensable to foreign trade. India is endowed with an extensive 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 most suitable for carrying bulky goods over long distances. It is one of the most cheap modes of transport in India, as it takes advantage of natural track and does not require huge capital investment in construction and maintenance except in the case of canals. Its fuel efficiency contributes to lower operating costs and reduced environmental impact due to carbon. India has 14500 km of inland waterways. Out of which only 5685 km are navigable by mechanized vessels.
Inland Waterways Authority of India aims to raise India's 111 national waterway's current cargo handling capacity from 55 MT in 2017-18 and 72 MT in 2018–19 to 100 MT by 2021–22.

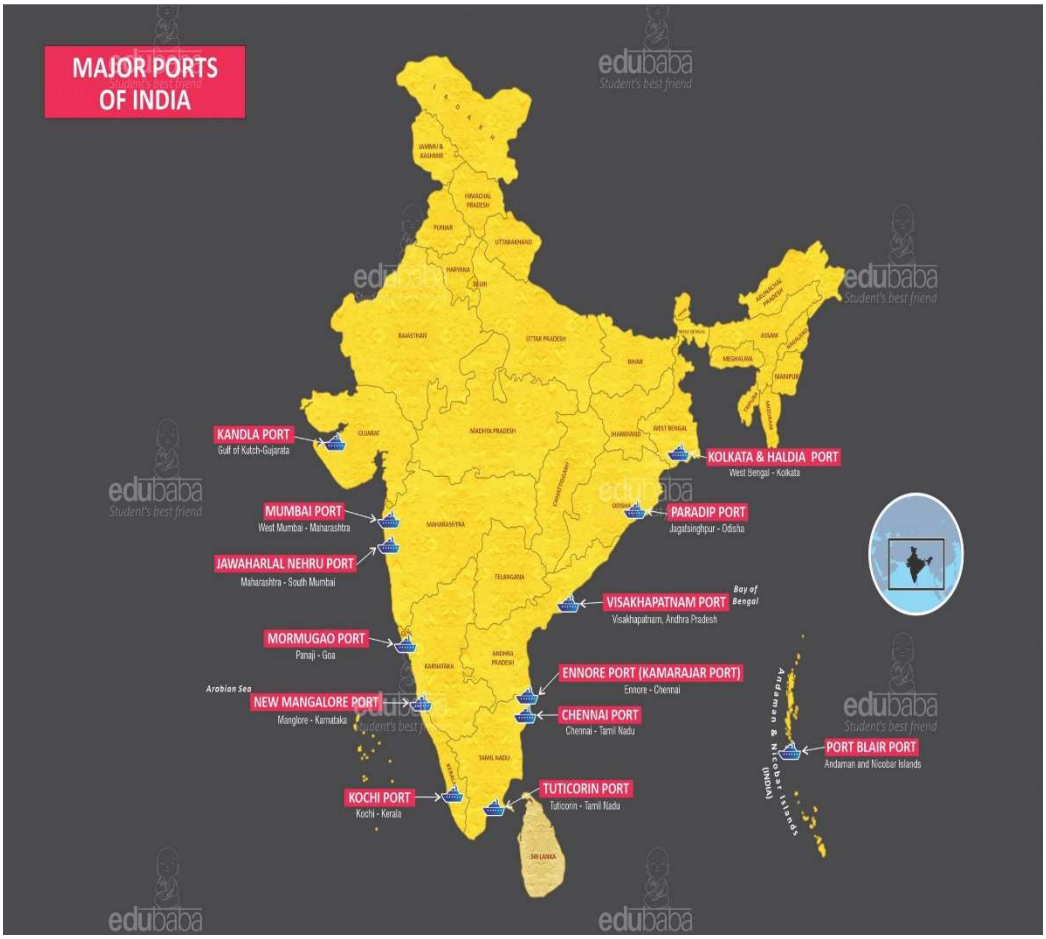
Shipping, transporting of goods and passengers by water. Early civilizations, which arose by waterways, depended on watercraft for transport. The Egyptians were probably the first to use seagoing vessels (*c.* 1500 BCE); the Phoenicians, Cretans, Greeks, and Romans also all relied on waterways. In Asia, Chinese ships equipped with multiple masts and a rudder were making sea voyages by *c.* 200 CE; from as early as the 4th century BCE the Chinese also relied heavily on internal waterways to transport food to their large cities (*see* Grand Canal). Japan, too mountainous to rely on roads for mass transport, also relied on internal and coastal waterways for shipping from early in its history. The spice trade was a great stimulus to shipping trade; Arabians were sailing to the spice islands before the Christian era, and European merchant marines grew up largely because of it. The tea trade had a similar effect, as did the discovery of gold in the New World. From the 17th to the 19th century, the slave trade was a major feature of Atlantic shipping. The U.S. and England were the ascendant shipping nations in the 19th century; Germany, Norway, Japan, the Netherlands, and France joined them in the early 20th century, with Greece dominating the industry by the century's end. Transoceanic shipping remains a vital part of the world economy. Many U.S. merchant ships are registered in a third nation to

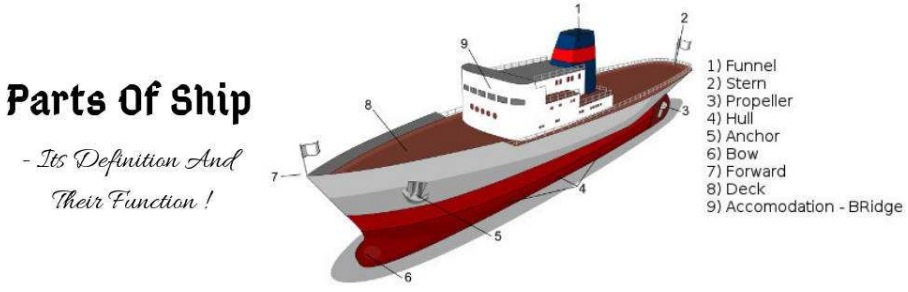
avoid heavy taxes. *See also* British East India Co.; Dutch East India Co.; French East India Co.



West coast cannel

Major ports of India





Dated 1/1/2021

HISTORY OF CANALS

The great canal of Darius I: 6th century BC

The cutting of canals for irrigation has been an essential part of the civilization of Mesopotamia, controlling the water of the Euphrates and the Tigris. Several canals link the two rivers, and small boats use these waterways. But the world's first canal created purely for water transport is an incomparably more ambitious affair.

Between about 520 and 510 BC the Persian emperor, Darius I, invests heavily in the economy of his newly conquered province of Egypt. He builds a canal linking the Nile and the Red Sea. Its access to the sea is close to modern Ismailia, which much later becomes the terminus of another great waterway, the Suez canal.

The Grand Canal: 3rd century BC - 13th century AD

The Chinese (the greatest early builders of canals) undertake several major projects from the 3rd century BC onwards. These waterways combine the functions of irrigation and transport.

Over the centuries more and more such canals are constructed. Finally, in the Sui dynasty (7th century AD), vast armies of labourers are marshalled for the task of joining many existing waterways into the famous Grand Canal. Barges can now travel all the way from the Yangtze to the Yellow River, and then on up the Wei to the western capital at Xi'an.
Along this great Chinese thoroughfare the rice harvest of the Yangtze is conveyed to the centres of political power in the north.

From the 13th century there is a new northern capital. Kublai Khan establishes himself at Beijing, which becomes the capital of the Mongol or Yüan dynasty. The Mongols extend the Grand Canal all the way north to join Beijing's river at T'ien-ching.

Flash locks and pound locks: 10th - 15th century

From the very first construction of canals, some method is necessary to cope with differences in water level. The simplest solution is a weir, to hold up the water on the higher side, with a gap in the middle which can be opened to let a boat through. The removal of the barrier, however achieved, is inevitably followed by a sudden rush of water - carrying the vessel easily through in one direction, but making passage very difficult in the other. A primitive lock of this kind is known, for obvious reasons, as a flash lock.

The development of the more sophisiticated pound lock is traditionally credited to an engineer, Chiao Wei-yo, working on the great Chinese canal system in the 10th century AD.
It is said that Chiao is required to construct two flash locks on the Grand Canal only about 200 yards apart. He realizes that he has created a pool which will be at the upper or lower level of the canal depending on which of the two barriers

is open. Moreover the barrier separating patches of level water can be opened without the obstruction of water pressure.

The result is the pound lock, standard on all modern canals. The first in Europe is believed to have been built in the Netherlands in 1373 at Vreeswijk, where a canal from Utrecht joins the river Lek.
At this stage the barrier is a simple sluicegate which has to be raised and lowered like a guillotine. The process is laborious, and the water pressure against the flat surface requires a very strong construction to hold it.

The last missing piece in the design of the modern lock is the mitred lock gate. On this system each end of the lock is closed by a pair of wooden gates slightly too large to close in a normal flush position. They meet with mitred edges pointing in the direction of the higher water level. Water pressure holds them tightly together, until the level is the same on either side - at which point the gates can be easily pushed open.
The first lock with mitred gates is probably the one built in Milan in about 1500 to join two canals of differing levels. Known as the San Marco lock, it is likely that its design is by Leonardo da Vinci. As his notebooks reveal, Leonardo is interested in all aspects of hydraulic engineering; and he is employed at this time by the duke of Milan.

From the 12th century Europeans have been busy constructing canals, even with the primitive device of the flash lock. The mitre lock makes possible increasingly ambitious projects.

European canals: 12th - 17th century

In one area of Europe, the Netherlands, canal building is an integral part of economic development. The primary purpose is drainage; an efficient transport network is a welcome bonus. But in Italy, in the late 12th century, an ambitious canal is constructed without any subsidiary motive of drainage or even irrigation.

It is the Naviglio Grande, built between 1179 and 1209 to bring marble from near Lake Maggiore for the construction of the cathedral in Milan. The barges float down the river Ticino before diverting into the canal, which has a fall of 110 feet in its length of 31 miles. The next comparable project, a century later, is a canal with a different purpose - to improve trade.
From 1391 the Stecknitz canal is constructed southwards from the city of Lübeck. Its destination is the Elbe, which is reached early in the 15th century. The new waterway joins the Baltic to the North Sea.

This canal rises some 40 feet from Lübeck to the region of Möllner and then falls the same amount again to reach the Elbe, all in a distance of 36 miles. This must be about the limit which can be safely achieved with flash locks. With mitre locks, from the 16th century, anything is possible. And the most ambitious projects are undertaken in France.

The Briare canal, completed in 1642, joins the Seine to the Loire; at one point it has a staircase of six consecutive locks to cope with a descent of 65 feet over a short distance. Even more remarkable is the Canal du Midi, completed in 1681, which joins the Mediterranean to the Atlantic by means of 150 miles of man-made waterway linking the Aude and Garonne rivers. At one point this canal descends 206 feet in 32 miles; three aqueducts are constructed to carry it over rivers; a tunnel 180 yards long pierces through one patch of high ground.

The potential of canals is self-evident. It falls to Britain, in the next century, to construct the first integrated system of waterborne traffic.

Bridgewater Canal:1759-1761

In 1759 a young self-taught engineer, James Brindley, is invited to visit the duke of Bridgewater. The duke is interested in improving the market for the coal from a local mine which he owns. He believes his coal will find customers if he can get it more cheaply into Manchester. He wants Brindley to build him a canal with a series of locks to get barges down to the river Irwell, about three miles from the mine.

Brindley proposes a much bolder scheme, declared by some to be impossible but accepted by the duke. He will construct a more level canal, with less need for time-wasting locks. He will carry it on an aqudeuct over the Irwell on a straight line to the heart of Manchester, ten miles away.

On 17 July 1761 the first bargeload of coal is pulled along the completed canal. Brindley's aqueduct (replaced in 1894 by the present swing aqueduct) crosses the Irwell at Barton. The strange sight of a barge floating in a gutter high up in the air becomes one of the first great tourist attractions of the Industrial Revolution. The investment in this private canal rapidly pays off. The price of the duke's coal is halved in the Manchester market.

The Bridgewater canal is the first in Britain to run its entire length independently of any river. It is the start of the country's inland waterway system, for which Brindley himself will construct another 300 miles of canals.

1972carnival cruise USA introduced concept of "fun ship" involving promotion of cruises as mass tourism. In 1980's the cruise industry introduced gaint passenger cruise liners capable of carrying more than 2000 passengers the design of these mega ships, with all amenities of luxury floating hotels. These cruse liners fully established in marketing of ship board experience as the main selling point.
The presence of mega ships in ports as continued to increase over many decades. The increasing no. of mega ships as affected the world from the view point of social, economic and environmental factors

The cruse sector constitutes one of the fastest growing sector of tourism industry with the continued growth comes the need to develop new ports to accommodate the increasing no. of ships as well as the increasing size of modern cruse ships. Due to this it is important to understand how the development of cruse ports and new cruse ships impacts the local community.

- Social impact- due to the development of cruse tourism the employment rate has increased, life style has improved and the negative impact is crime and narcotics
- Economic impact- due to this development it has played an important role in enhancing local and international economy. The benefits are additional tax received foreign exchange and new sources of revenue. It can also create negative economic impacts which includes increased land and housing prices, higher taxes and inflation levels. The cruse industry largely effects the costal communities. However govt. of most country are encouraging cruse tourism as a potential source economic development
- Environmental impact- with a speedy development of any sector including the cruse sector comes the destruction of environment large cruse liners run on Gaint diesel engines along with smaller auxiliary engines which emits dangerous level of Sulphur dioxide Carbon dioxide and carbon monoxide which pollutes the air. In the oceans it is the largest air polluting industry. Apart from this a large cruse ship generate approximately 1.5-2 lac gallon of sewage on weekly basis. Apart from this pollutant is added to ocean water. Most cruse liners use cheap diesel which is a health hazard for people on cruse as well as for the birds of costal region. Every year 100-1000 of ocean creature die due to sewage and smoke from cruse liners