Chapter 12

Transport, Communications and Trade

TRANSPORT

Provisions of quality and efficient infrastructure services are essential to realise the full potential of growth impulses surging through the economy. In fact, a well-knit and coordinated system of transport plays an important role in the sustained economic growth of a country. The present transport system of India comprises several modes of transport including (i) road, (ii) rail, (iii) inland waterways, (iv) coastal shipping (coastal and international), and (v) airways. Transport has recorded a substantial growth over the years both in the spread of its network and in the output of its system. The Ministry of Transport is responsible for the formation and implementation of policies and programmes for the development of various modes of transport except the railways and the civil aviation.

Roads

India has one of the largest road networks in the world with an aggregate distance of 4.1 million kilometers (India 2012, p. 1079). Roads in India connect village to village and village to urban centres. Moreover, roads offer door-to-door service and their construction can be undertaken even in areas of difficult terrain and steep slopes. The movement of goods is safer through road transport. They help the farmers to move their perishable commodities (flowers, fruits, milk, and vegetables) to the urban markets. The role of roads in the economic development and regional planning cannot be underestimated.

The country's road network consists of: (i) Expressways, (ii) National Highways, (iii) State Highways, (iv) Major District Roads, (v) Other District Roads, and (vi) Village Panchayat Roads. The road network comprises 70,934 km of National Highways, 128,000 km of State Highways, 470,000 km of Major District Roads, and about 2,650,000 km of other District and Rural Roads.

Out of these, the National Highways and State Highways together account for about 195,000 kilometres length. Though, the National Highways—the construction and maintenance of which is the responsibility of the Central Government—has about 66,590 km of length and comprises only about 2 per cent of the total length of roads, they, however, carry over 40 per cent of the total

traffic across the country.

About 65 per cent of freight and 80 per cent of traffic is carried by the roads. The pressure on the road network is increasing day by day. The number of vehicles have been growing at a rapid pace of 10.50 per cent per annum over the last five years. The rapid expansion and strengthening of the road network, therefore, is imperative both to provide for present and future traffic, and for improved accessibility to the hinterland. In addition, road transport needs to be regulated for better energy efficiency, lesser pollution, and enhanced road-safety.

Border Roads Organisation (BRO) The Border Roads Organisation was established in 1960 for the development of roads of strategic importance in the northern and north-eastern borders of the country. The Border Roads Organisation has not only linked the border areas of the North and North-East with the rest of the country, but has also developed the road infrastructure in Bihar, Maharashtra, Karnataka, Rajathan, Andhra Pradesh, Andaaman and Nicobar, and Chhattisgarh. It has also constructed roads and air fields in Tajikistan, Afghanistan, Bhutan and Myanmar. So far it has constructed more than 32,000 km of roads and surfaced 40,500 km of roads. The Zojila–Kargil and Manali–Leh roads were completed in 1998. The Pathankot–Jammu–Srinagar National Highway is also maintained by the Border Roads Organisation.

Highways and Roads

1. National Highways The Central Government is responsible for the development and maintenance of the National Highways System. The National Highways of India have been shown in **Fig. 12.1.** The total length of the National Highways in 2010 was 70,548 km. The Ministry is carrying out development and maintenance work of the National Highways through three agencies: (i) the National Highways Authority of India (NHAI), (ii) the State Public Works Department (PWD), and (iii) the Border Road Organisation (BRO).

In order to give boost to the economic development of the country, the Government has embarked upon massive National Highways Development Projects (NHDP) being implemented by the National Highways Authority of India (NHAI). Some of the important National Highways Projects under progress are given below:

Golden Quadrilateral (GQ) The National Highways Development Project (NHDP) has taken up a massive programme of road building in the country. Launched in January 1999, the Golden Quadrilateral Project is perhaps one of the largest projects of road building in the country (**Fig. 12.2).** The project is being implemented by the National Highways Authority of India (NHAI). The National Highways Development Project has the following components:

(i) **Phase I—Golden Quadrilateral**: This phase comprises connecting Delhi-Mumbai, Chennai, and Kolkata-Delhi by six-lane super highways. It has a total length of 5846 km. The four sides of the quadrilateral have varying length. The side of the quadrilaterals between Delhi and Mumbai is 1419 km long, Mumbai to Chennai 1290 km long, Chennai to Kolkata 1684 km long, and Kolkata to Delhi 1453 km.

(ii) Phase II—

(i) *The North South Corridor*: This corridor aims to connect the National Highways from Srinagar (J & K) to Kanniyakumari including Kochi–Salem; and

(ii) *The East West Corridor:* This corridor aims to connect the National Highways from Silchar in Assam to Porbandar in Gujarat (**Fig. 12.2**).

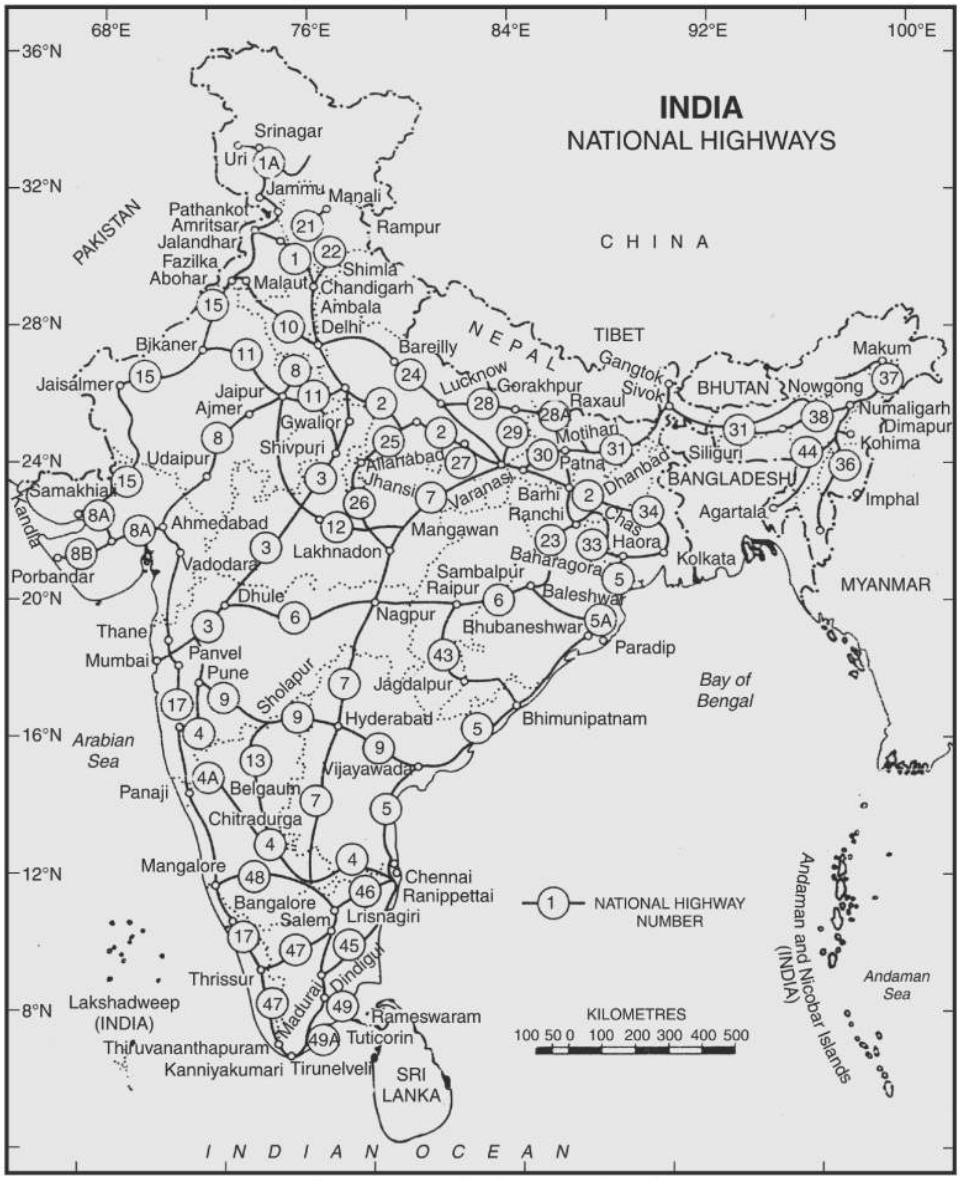


Fig. 12.1 Network of National Highways

(iii) Phase III—Phase three comprises widening of the existing National Highways to 4/6 lane standard. Thus to connect state capitals, seaports, and the important tourist locations with the Golden Quadrilateral.

Traditionally, the road projects used to be financed by the government. But in the last decade after the liberalisation or globalisation, a significant contribution is being made by the private sector. To encourage the private sector, several steps, given below, have been taken by the government.

1. Declaration of the road sector as an industry.
2. Provision of capital subsidy up to 40 per cent of the project cost to make project commercially viable.

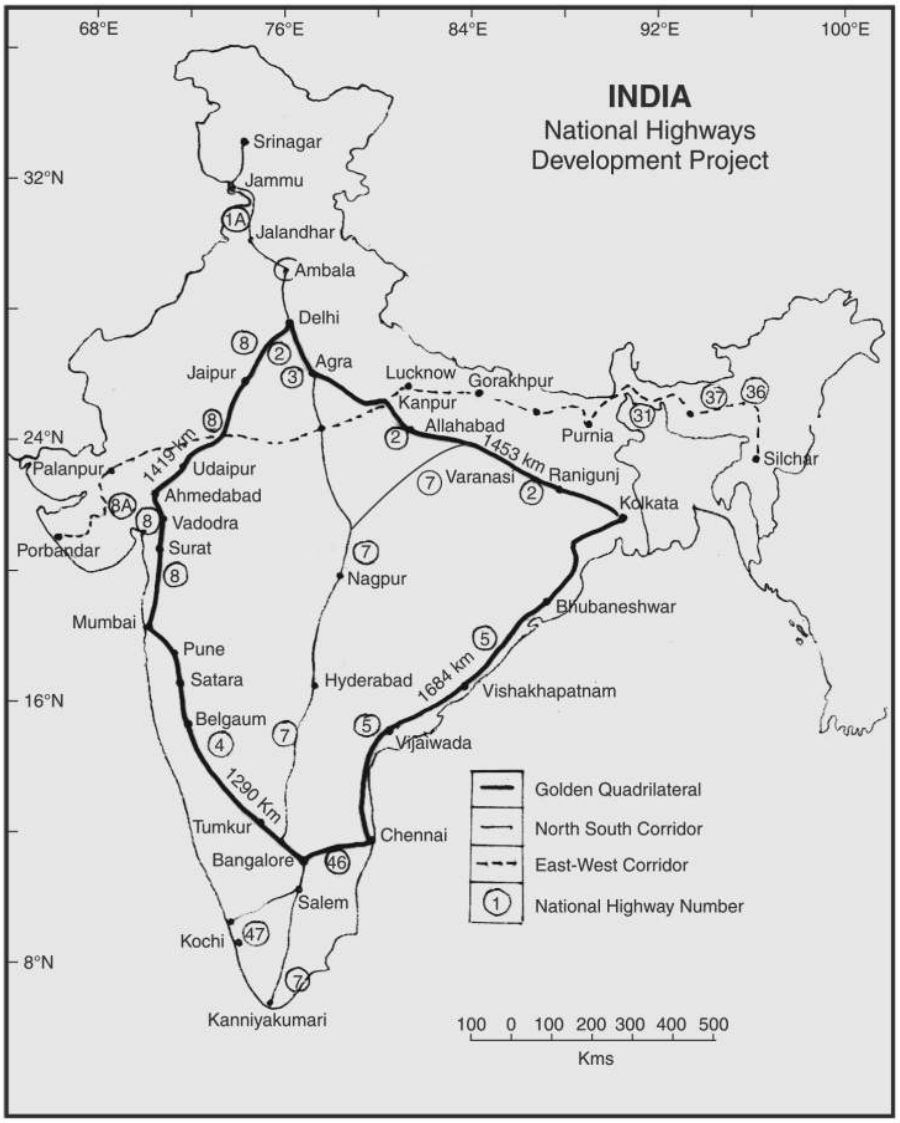


Fig. 12.2 National Highways Development Project

3. Full (100 per cent) tax exemption in any consecutive 10 years out of the first 20 years of the project.
4. Provision of encumbrance free site work, i.e., the Government shall meet all expenses relating to land and other pre-construction activities.
5. Foreign direct investment upto 100 per cent in road sector.
6. Easier external commercial borrowing norms.
7. Higher concession period (upto 30 years).
8. Right to collect and retain toll.

2. State Highways The length of state Highway is 128,000 Km (2010). The State Highways and Rural Roads are developed and maintained by the various agencies of the state and union territories. The funds, however, are also provided by the Central Government for the development of roads under the following schemes.

(a) **Improvement of State Roads from the CRF**: The funds from the CRF are provided for improvement of state roads other than the rural roads.

(b) **Economic importance and Inter State Connectivity Scheme**. To promote inter-state facilities and also to assist the state governments in their economic development through construction of roads bridges of inter-state and economic importance, the Central Government provides 100 per cent grant for inter-state connectivity projects and 50 per cent for projects of economic importance.

(c) **Rural Roads:** Roads are also being developed in rural areas under the *Pradhan Mantri Gram Sadak Yojna* (PMGSY). The objective of this scheme is to link all the villages with a population of more than 500 with all weather roads by the end 2007.

3. District Roads These roads mostly connect the towns and large villages with one another and with the district headquarters. The construction and maintenance of roads is the responsibility of the Zila Parishad and the PWD. The length of major district roads is 4,70,000 km.

4. Village Roads Village roads are constructed and maintained by the *village panchayats*. These roads are generally, narrow and zig-zag. They are generally not suitable for heavy mechanised traffic. The length of rural roads is 26,50,000 km.

5. International Highways Under the agreement with the Economic and Social Commission on Asia and Pacific (ESCAP) some of the country's highways linking neighbouring countries have been declared international highways. These highways are of two types:

(a) **The Main Arterial Routes**, linking the capitals of the neighbouring countries like (i) Lahore–Amritsar–Delhi–Agra–Kolkata–Golaghat–Imphal–Mandalay (Myanmar), (ii) Agra–Gwalior–Hyderabad–Bangalore–Dhanushkodi, and (iii) Barhi–Kathmandu;

(b) **The routes joining the main cities, seaports, and industrial centres with the arterial road-network**, like (i) Agra–Mumbai Road, (ii) Delhi–Multan Road, (iii) Bangalore–Chennai Road, and (iv) Golaghat–Ledo Road.

The World Bank provides funds for the maintenance of these roads.

6. Express Highways These are multi-lane well-paved highways used for movement of goods and traffic. Some of the important express highways are (i) Kolkata–Dum–Dum Airport Highway, (ii) Durgapur–Kolkata Express Highway, and (iii) Mumbai–Pune Express Highway.

Some of the important National Highways have been shown in **Fig. 12.1 and Fig. 12.2** while **Table 12.1** gives their routes and length in kilometres.

Table 12.1 *India—Some of the Important National Highways and their Lengths*

NH No.	*Route*	*Length*
1.	Delhi–Ambala–Jalandhar–Amritsar	456
1A.	Jalandhar–Madhopur–Jammu–Srinagar–Baramulla–Uri	663
1B.	Batote–Doda–Kishtwar–Khanabal	274
2.	Delhi–Mathura–Agra–Kanpur–Allahabad–Varanasi–Barh–Kolkata	1465
3.	Agra–Gwalior–Shivpuri–Indore–Dhulia–Nashik–Thane–Mumbai	1161
4.	Thane–Pune–Belgaum–Hubli–Bangalore–Ranipet–Chennai	1533
4A.	Belgaum–Anmode–Ponda–Panaji	153
5.	Baharagora–Cuttack–Bhubaneshwar–Vishakhapatnam–Vijaiwada–Chennai	1533
6.	Hajira–Dhule–Nagpur–Raipur–Sambalpur–Bhargora–Kolkata	1949
7.	Varanasi–Rewa–Jabalpur–Nagpur–Hyderabad–Bangalore–Madurai–Kanniyakumari	2369
8.	Delhi–Jaipur–Ajmer–Udaipur–Ahmadabad–Vadodra–Mumbai	1428
9.	Pune–Sholapur–Hyderabad–Vijaiwada–Machlipatnam	841
10.	Delhi–Fazilka	403
11.	Agra–Bharatpur–Jaipur–Bikaner	582
12.	Jabalpur–Bhopal–Kota–Bundi–Jaipur	890
13.	Sholapur–Chitradurga–Mangalore	691
14.	Beawar–Sirohi–Radhanpur	450
15.	Pathankot–Bhatinda–Bikaner–Samakhiali (Jaisalmer)	1526
16.	Nizamabad–Samkhiyali–Jagdalpur	460
17.	Panvel–Mangalore–Edapally (Kochi)	1269
18.	Kurnool–Nandyal–Cuddapah–Chittor	369
21.	Chandigarh–Ropar–Mandi–Kulu–Manali	323
22.	Ambala–Kalka–Shimla–Narkanda–Rampur–Shipki La	459
24.	Delhi–Bareilly–Lucknow	438
28.	Barauni–Muzaffarpur–Gorakhpur–Lucknow	570
47.	Salem–Coimbatore–Thiruvananthapuram–Kanniyakumari	640
49.	Kochi–Madurai–Dhanushkhodi	440
58.	Delhi–Mana Pass	538
150.	Aizawl–Imphal–Kohima	700

Roads and Rural Development Plan

This includes construction of roads under Minimum Needs Programme (MNP), Rural Landless Employment Guarantee Programme (RLEGP), *Jawahar Rozgar Yojana* (JRY), and Command Area Development (CAD) to connect all villages having a population of 500 or more with all-weather roads and those having less than 500 with the link roads.

Density of Roads

The state-wise density of roads has been shown in **Fig. 12.3**. It may be observed from this figure that the density of roads is the highest in the states of Goa, Kerala, and Punjab, followed by Maharashtra, Tamil Nadu, Haryana, and Uttar Pradesh. The density of roads is however, very low in Bihar, Chhattisgarh, Jammu & Kashmir, Jharkhand, Madhya Pradesh, and the states of North-

East India.

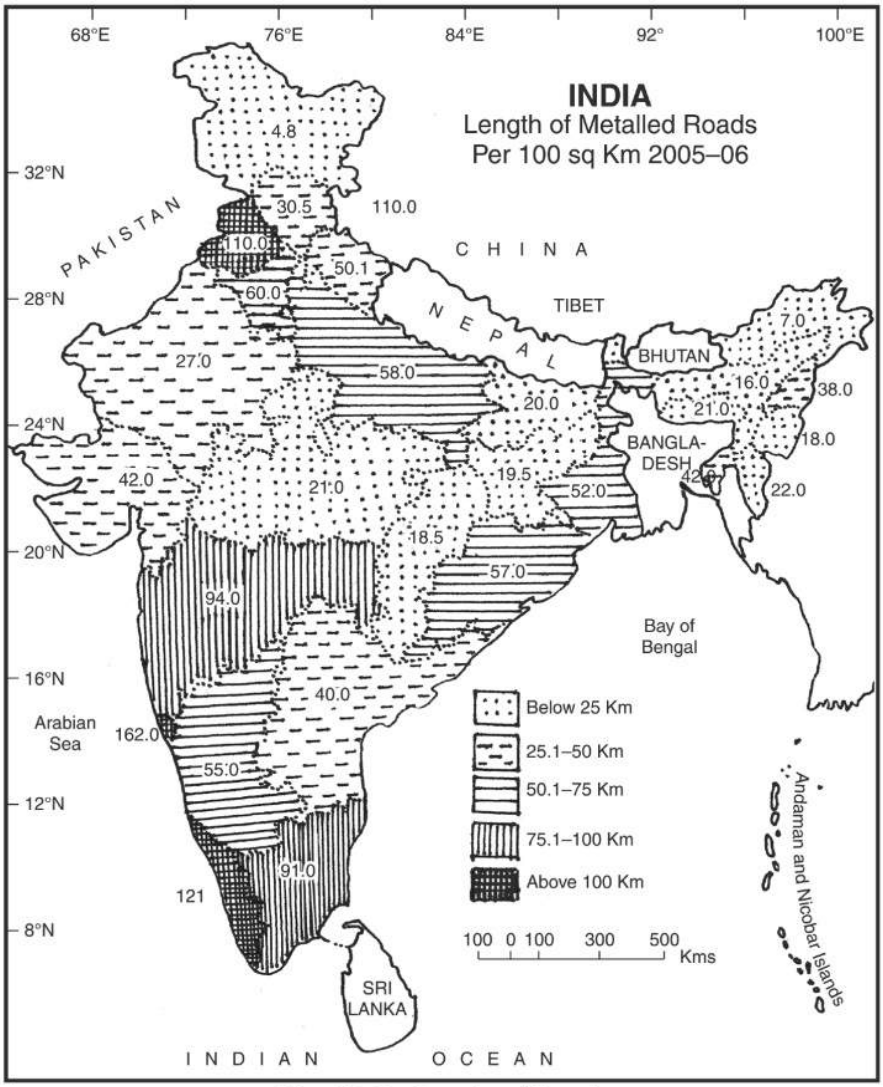


Fig. 12.3 Density of Roads

Transformation of Roads

With the new policy of globalisation of our national economy and emphasis on promotion of exports of agricultural and industrial products, a dense and efficient road network is a must. The Government has opened up road construction and its maintenance to private sector including joint venture with foreign collaboration. One of the policies is to invite private parties to 'build', 'operate', and 'transfer' (BOT) roads decided upon by the Government. The parties would bear cost of construction, operate roads for stipulated period, collect road taxes from users and return the roads to the

Government at the end of the contracted period. Various International Agencies have given funds for this specific purpose.

Main Problems of Road-Transport

Although India has one of the longest road networks in the world, it is facing a number of problems. Some of the important problems of road transport are given here:

1. Unmetalled Roads and their Improper Maintenance About 40 per cent of the roads are not metalled. Moreover, the roads are not properly maintained which accentuate the problems, especially during the rainy season.

2. Mixed Traffic Mixed traffic is a serious problem of Indian road transport. In fact, over greater parts of the country including the megacities, the same road is used by cars, trucks, two-wheelers, tractors, harvesters, animal driven carts, cyclists, rickshaws, and pedestrians. This increases travel time, congestion, pollution, tension, and road accidents.

3. Multiple Check Posts There are multiple check posts, toll tax, and octroi duties collection points on the roads which bring down the speed of the traffic, waste time, and causes irritation. Moreover, the rate of road tax varies from state to state and in the different regions of the same state.

4. Inadequate Side Amenities Along the roads, repair shops, first-aid centres, telephones, toilets, restaurant, rest-places, and cheap hotels are not adequately developed.

5. Shortage of Funds There is shortage of funds for the construction and maintenance of roads. Unfortunately, there is insignificant participation of the private sector as a result of which capital for development, extension, and maintenance of roads is not adequately available.

6. Unstable Road Policy There is not a stable policy for the construction, extension, and maintenance of roads. The road policy in the states, generally changes with the change of government. This leads to poor maintenance of roads.

Rail Transport

India has the fourth largest rail network in the world after USA (224,792 km), China(98,000 km), and Russia (81,157 km). Railways connect different parts of the country. The total length of Indian Railways presently is around 64,000 kms. Indian railway carries two crore people on 18,000 trains daily.

Indian Railways have grown into a vast network of 7030 stations spread over a route length of 63,974 km with a fleet of 8,593 locomotives, 51,030 passaenger service vehicle, 6,505 other coaching vehicles and 2,19,931 wagons as on 31st March, 2010 (India - 2012, p. 1076).

About 30 per cent of the route kilometer, 41 per cent of running track kilometer and 41 per cent of total track kilometre is electrified. About 85 per cent of the total railway route is in broad gauge, 11.3 per cent in meter gauge and only 3.70 per cent in narrow gauge.

Passengers originating had risen from 1284 million in 1950-51 to 7246 Million in 2009-2010. Despite constraing of resources, the railways have been able to cope with increasing demand of passenger traffic. Railways are the premier mode of passenger transport both for long distance and suburban traffic.

Revenue freight traffic has increased from 73.2 million tonnes in 1950-51 to 888 million tonnes in 2009-10 (India-2012, p. 1079). They provide the principal mode of transportation for freight and passengers. Thus, they unite people from the farthest corner of the country and make possible

the conduct of business, sight seeing, pilgrimage, and education. It has also played an important role during the periods of droughts, floods, wars, epidemics, and natural calamities. The process of industrialisation and economic development has also been accelerated with the help of railways.

The railway system started in India in 1853 when the first railway line between Mumbai (Bombay) and Thane (a distance of 34 km) was inaugurated. This was followed by the opening of another railway line between Kolkata (Calcutta) and Raniganj in 1854 , and Chennai (Madras) and Arkonam in 1856. The railway development was, however, quite fast after 1900 and a tremendous progress in the development of railway network was made after Independence (1947). Originally the railways were operated by private companies owned by the British; but in 1950, the entire railway management was taken over by the Central Government.

Main Features of Indian Railways

Railway Gauges There are four different types of gauges of the Indian railways. They are: (i) Broad Gauge (width 1.676 metres), (ii) Metre Gauge (width one metre), (iii) Narrow Gauge (width 0.762 metre), and (iv) Lift Gauge (width 0.610 metre). These gauges were designed during the colonial period keeping in mind the volume of traffic and goods movement. The major port cities were connected by Broad Gauge to facilitate the export of raw materials from India to Britain and the Commonwealth countries.

After Independence, the Government of India decided to convert all the gauges into Broad Gauge to facilitate the traffic and transport of goods. Prior to Independence, the whole railways system was under steam traction. Since it had poor efficiency and caused great environmental pollution the diesel engines were introduced in 1950s. At present, Diesel Locomotive Works (DLW), Varanasi (UP), Chitranjan Locomotive Works (West Bengal), and Mihijam and Tat Engineering and Locomotive Works, Jamshedpur (Jharkhand), are producing diesel engines for railways. The diesel engines were also the cause of environmental pollution; therefore, in order to overcome the pollution problem and to cope with the growing pressure of traffic and goods, a decision was taken to switch over to electric traction all the important routes. In the electrification process, priority was given to high density sections of railway lines. Of the two main segments of the Indian Railways, ((i) freight and (ii) passenger), the freight segment accounts for about 66 per cent of the revenues. Within the freight segment, bulk traffic accounts for nearly 95 per cent, of which more than 45 per cent is coal.

Distributional Pattern The distributional pattern of railway network is closely influenced by the terrain, topography, density of population, minerals, fertility of land, and arid and semi-arid climatic conditions The railway network of the country has been shown in **Fig. 12.4** while **Table 12.2** shows the density of railway-line per 1000 sq km of area in the major states **Table 12.2 (Fig. 12.5).** It may be observed from the **Fig. 12.5** that the density of roads is significantly high in the Northern Plains of India while in the hilly states their density is very low.

Table 12.2 *Length of Railways in Major States—2007*

States	*Railway length per 1000 sq km area*
1. Punjab	42.78
2. West Bengal	41.85
3. Bihar	30.82
4. Uttar Pradesh	30.20

(*Contd.*)

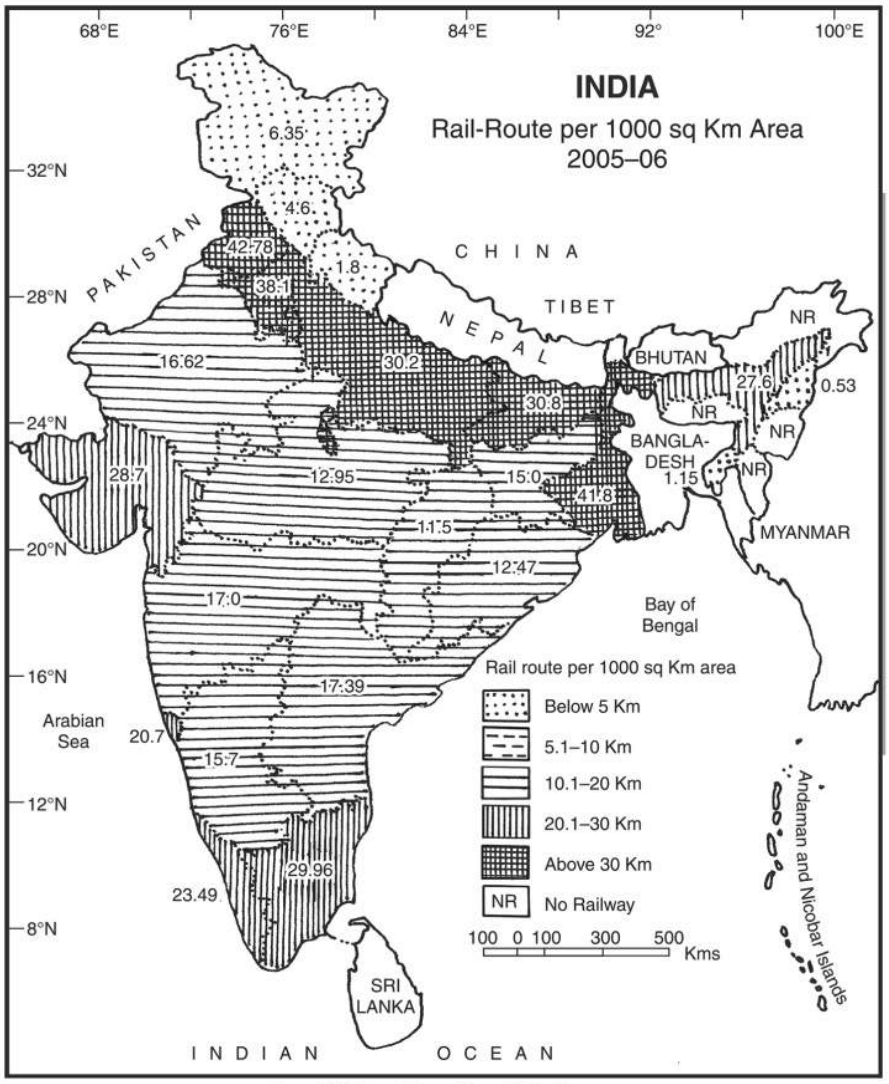


Fig. 12.5 Density of Railways

Railway Management The entire railway system is managed by the Railway Board. The railway network has been divided into 16 railway zones which are subdivided into divisions (**Table 12.3**). These divisions are the basic operating units for the Indian railways.

Table 12.3 *India—Railway Zones*

Zones	*Date of Formation*	*Headquarters*
1. Southern	14.4.1951	Chennai
2. Central	05.11.1951	Mumbai (CST)

(*Contd.*)

(*Contd.*)

3.	Western	05.11.1951	Mumbai (Churchgate)
4.	Northern	14.04.1952	New Delhi
5.	North-Eastern	14.04.1952	Gorakhpur
6.	South Eastern	01.08.1955	Kolkata
7.	Eastern	01.08.1955	Kolkata
8.	North-Eastern Frontier	15.01.1958	Maligaon (Guwahati)
9.	South-Central	02.10.1966	Secunderabad
10.	East Central	01.10.2002	Hajipur
11.	North-Western	01.10.2002	Jaipur
12.	East Coast	01.04.2003	Bhubaneshwar
13.	North Central	01.04.2003	Allahabad
14.	South-East Central	01.04.2003	Bilaspur
15.	South Western	01.04.2003	Hubli
16.	West Central	01.04.2003	Jabalpur
17.	Metro Railway, Kolkata	31.12.2010	Kolkata

Impact of Railways on Economy and Society

The impact of development and expansion on the economy and society is enormous. The construction and expansion of the railways have improved the economy of the country appreciably. Railways have played a significant role in the development of cotton textile industry in Maharashtra and Gujarat; jute industry in Hugli Basin; coal industry in Chhattisgarh, Jharkhand, Maharashtra, Odisha, and West Bengal; tea-plantation and petro-chemical industries in Assam and West Bengal. In the post-Independence period, railways have helped substantially in setting up of industries in the under-developed and backward areas (Bhilai, Bokaro, Durgapur, Raurkela, etc.), of isolation and relative isolation. Railways have played an important role in the transportation of grains, and chemical fertilizers in the regions of Punjab, Haryana and Western Uttar Pradesh where Green Revolution is a success.

Merits of Railway Transport

Some of the important merits of railway transport are as under:

1. Easy Mode of Travel Railways provide the cheapest and the most convenient mode of passenger transport, both for short and long distances. Railways are particularly suited for long distance journeys.

2. Accelerates Industrialisation Railways have played a vital role in the process of economic development, industrialisation, and urbanisation of the country.

3. Agricultural Development Railways have played a significant role in the development and intensification of agriculture. In fact, the farmers can sell their perishable and non-perishable commodities to long distant market at a remunerative price. The fertiliser used in the High Yielding Varieties is also generally transported to the farmers in different parts of the country by the railways.

4. Connects Remote Cultures Railways connect people from the areas of isolation and relative isolation with the urban centres and thus accelerate social interaction and national integration and help in the diffusion of new ideas and innovations.

5. Helps in the Maintenance of Law and Order At the time of communal tension and socio-political turmoil, railways play a significant role

10. Miscellaneous Problems Late running of trains, filthy trains, choked toilets, lack of passenger facilities, cleanliness at railway stations, lack of security arrangements on the railways result into frequent thefts, robberies, and dacoities.

Looking at the above problems, it will be decades before India gets close to Japan's superfast and clean trains.

Water Transport

Prior to the development of railway network, waterways were the main mode of transportation in India. Waterways are the cheapest means of transportation. Moreover, they are the most suitable for carrying heavy and bulky goods. Despite all these merits, water transport in India at present provides only about one per cent of the total transport of the country.

Ports

There are 12 major and 200 minor ports in India. Ports not only play a crucial role in facilitating international trade, they also act as fulcrums of economic activity and development in their surrounding areas. India has about 7517 km of main coastline spread over 13 states/union territories, and studded with 12 major ports and 200 non-major ports (minor and intermediate). Of the non-major ports, around 60 are handling traffic. The major ports are under the jurisdiction of the Central Government, while the minor and intermediate ports are managed and maintained by the respective state governments. The number of cargo vessels handled at major port is about 16,500 per annum.

The total traffic carried by both the major and minor ports during 2005–06 was estimated at around 570 million tonnes. The 12 major ports carry about 75 per cent of the total traffic with Vishakhapatnam as the top traffic handler in each of the last six years (2000–01 to 2006–07).

Major Seaports of India The major seaports of India are: (i) Chennai, (ii) Cochin, (iii) Ennore, (iv) Jawaharlal Nehru Port (Nhava Sheva), (v) Kandla, (vi) Kolkata/ Haldia, (vii) Mormugao, (viii) Mumbai, (ix) New Mangalore, (x) Paradwip, (xi) New Tuticorin, and (xii) Vishakhapatnam **(Fig. 12.6).** The salient geographical features of the major seaports of India have been described briefly here:

1. Chennai Situated along the northern coast of Tamil Nadu, it is an artificial seaport. It spreads over an area of about 80 hectares with an average depth of about 16 metres. The harbour has an entry from the north. It can accommodate 22 vessels. The main exports from the Chennai port are food-grains, hides and skins, iron-ore, mica, oil-cake, sugar, turmeric, timber, and tobacco. The port imports chemicals, coal, cotton, cotton-goods, edible-oils, fertilisers, iron and steel, machinery, metals, and petroleum.

2. Ennore Situated about 20 km to the north of Chennai, Ennore is a natural harbour. It was developed to ease the pressure of the Chennai-seaport. Ennore exports hides, machinery, mica, rice, and sugar. The principal imports are cement, cotton, edible-oils, fertilisers, machinery, and petroleum products.

3. Jawahar Lal Nehru (Nhova Shiva) Port Situated about 14 km to the south of Mumbai, this seaport was developed to ease the pressure of the Mumbai seaport. It is a world-class port equipped with all the modern facilities. The seaport is connected by a four-lane Highway with the hinterland. India's largest container port is Jawaharlal Nehru Port.

4. Kandla Located at the head of the Gulf of Kutch, Kandla seaport was developed after Independence to take up the place of Karachi which went to Pakistan. It is a tidal harbour in the Kandla Creek with an average depth of 10 metres. The port has a vast hinterland in the states of Gujarat, Rajasthan, Haryana, Punjab, Himachal Pradesh, and Jammu and Kashmir. Its main imports are petroleum, fertilisers, phosphates, and sulphur, while the export includes bones, cotton, food-grains, naptha, salt, and sugar.

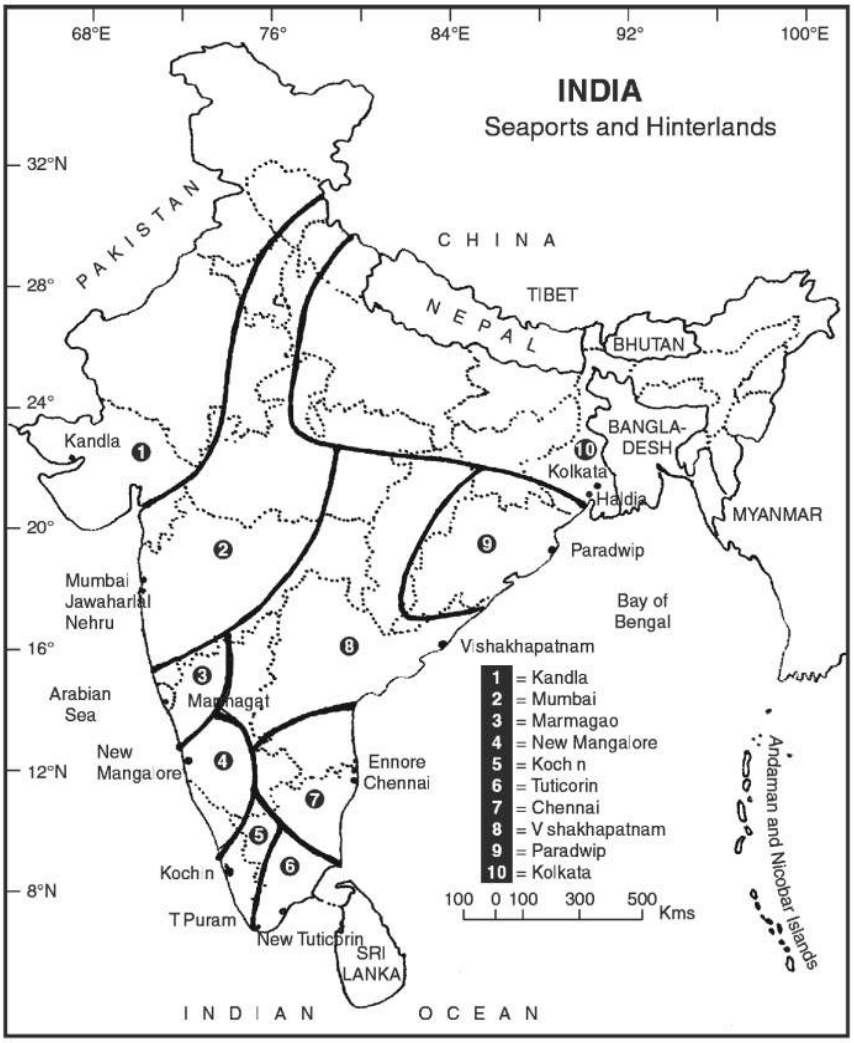


Fig. 12.6 Major Seaports and their Areas of Influence

5. Kochi Situated along the coast of Kerala, Kochi is a natural seaport and the largest shipyard in the country. The indigenous Aircraft Carrier for the Indian Navy is also presently under construction in the shipyard. It remains open for cargo traffic throughout the year. Being situated close to the Suez–Colombo route, it has great commercial and strategic importance. The main items of export

Coastal Shipping Coastal shipping is an energy efficient, environmental-friendly, and economical mode of transportation in Indian transport network. It is a crucial component for the development of domestic industry and trade. Coastal shipping involves movement of goods and passengers from one port to another port within the country. India's coastal Shipping Tonnage in December 2005 was 470 vessels with 8,04,612 GRT.

Coastal shipping has many advantages as given below:

1. It reduces the pressure on rail and road transport systems.
2. It is relatively pollution free.
3. It is less capital intensive.
4. It provides large employment.
5. It is the cheapest mode of transport.
6. It promotes coastal base industries such as fisheries and corals collection.
7. It promotes tourism.

Problems some of the important problems of the Indian ports are given below:

1. Indian ports are the most congested.
2. The ports are not adequately connected with the hinterland.
3. There is heavy pressure on container traffic. The largest container port in the world is Singapore which handles 23.19 million TEUs (twenty foot equivalent units). In comparison to this India's largest container port handled roughly 2.67 million TEUs in 2005–06.

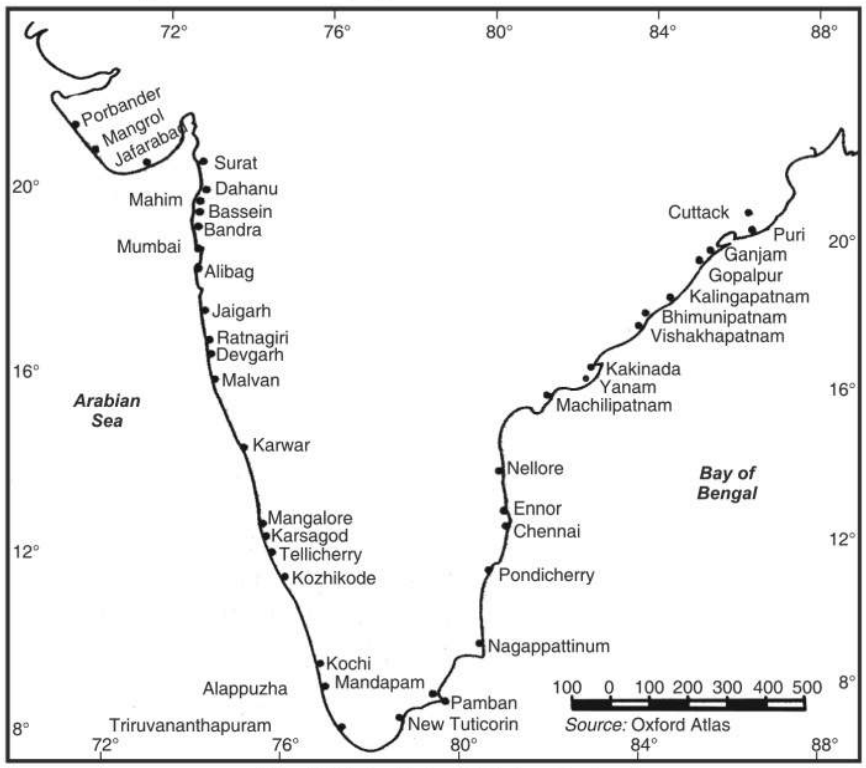


Fig. 12.7 Major Fishing Ports

Inland Water Transport

India has about 14,500 km of navigable waterways which comprise rivers, canals, lakes, backwaters, and creeks. About 45 million tonnes of cargo is being moved annually by Inland Water Transport. It is a fuel-efficient and environment-friendly mode of transportation. Its operations are currently restricted to a few stretches in the Ganga–Hugli rivers, the Brahmaputra, the Barak river (Assam), the rivers in Goa, the backwaters of Kerala, inland waterways in Mumbai, and the deltaic regions of the Godavari–Krishna rivers. Besides the organised operations by mechanised vessels, country boats of various capacities also operate in various rivers, lakes, and canals. Data of cargo and passenger-movement in unorganised sector (i.e., by country boats, etc.) has not been compiled, but it is a fact that substantial quantum of cargo and passengers are transported in the unorganised sector as well.

The Central Water Transport Corporation (CIWTC) Constituted in 1967, it has its headquarters at Kolkata. It is mainly engaged in the transportation of goods by inland waterways in the Ganga, Brahmaputra, Hugli, and Sundarban regions. It is operating regular cargo service between Kolkata and Karimganj (Assam), Kolkata and Bangladesh, and Haldia and Patna.

Inland Waterways Authority of India (IWAI) The Inland Waterways Authority of India came into existence on October 27, 1986 for the development and regulation of inland waterways for shipping and navigation. The Authority primarily undertakes projects for development and maintenance of IWT infrastructure on national waterways through grant received from the Ministry of Shipping, Road Transport and Highways. The head-office of the Authority is located at NOIDA (UP near Delhi). The authority also has its regional offices at Guwahati, Kochi, Kolkata, and Patna and sub-offices at Allahabad, Bhagalpur, Farakka, Kollam, and Varanasi. The National Inland Navigation Institute is located at Patna.

National Waterways Following are National Waterways in India:

1. The Ganga between Allahabad–Haldia (1620 km).
2. The Sadiya–Dhubri stretch of the Brahmapputra (891 km).
3. The Kollam–Kottapuram stretch of West Coast Canal along Champakara and Udhyogmandal Canalas (205 km) in Kerala.

Factors Affecting Inland Waterways The following factors have a close bearing on the development and maintenance of inland waterways:

1. Fluctuation Regime of Rivers Many of the rivers are seasonal. Even in the perennial rivers, like Brahmaputra, Ganga, Gandak, Kosi, and Yamuna, the discharge of water decreases substantially during the summer and winter months, while during the rainy season they are in floods. Both the conditions are not conducive for navigation.

2. Natural Obstacles Presence of waterfalls, cataracts, and rapids in the course of rivers hinder the development of inland navigation.

3. Silting of River Beds Silting of river bed reduces the depth of water and creates problems of navigation.

4. Water for Irrigation Diversion of water for irrigation reduces the quantity of water in the river channel.

5. Economically Unviable The demand for waterways is not adequate as the people want fast movement of their commodities. This makes river transport economically unviable.

Shipping

Managing about 95% of the country's trade volume is carried by shipping (2012). India has a long history of shipping. The Scindhia Steam Navigation Co. was set up in 1919 on modern lines. At the time of Independence, there were only 59 ships with less than 2 lakh tonnes of Gross Registered Tonnage (GRT). Since Independence, India has made a significant progress in shipping and the shipping fleet had 872 ships (282 overseas and 590 coastal vessels (India 2010)). Coal, crude oil and natural gas are mainly transported by ship.

At present, shipping plays a significant role in the transport sector of the country's economy. Nearly 95 per cent of the total trade volume is moved by sea making shipping the backbone of trade and economic growth. Today India has one of the largest merchant shipping fleet in the developing world. The major international sea routes of India have been shown in **Fig. 12.8.**

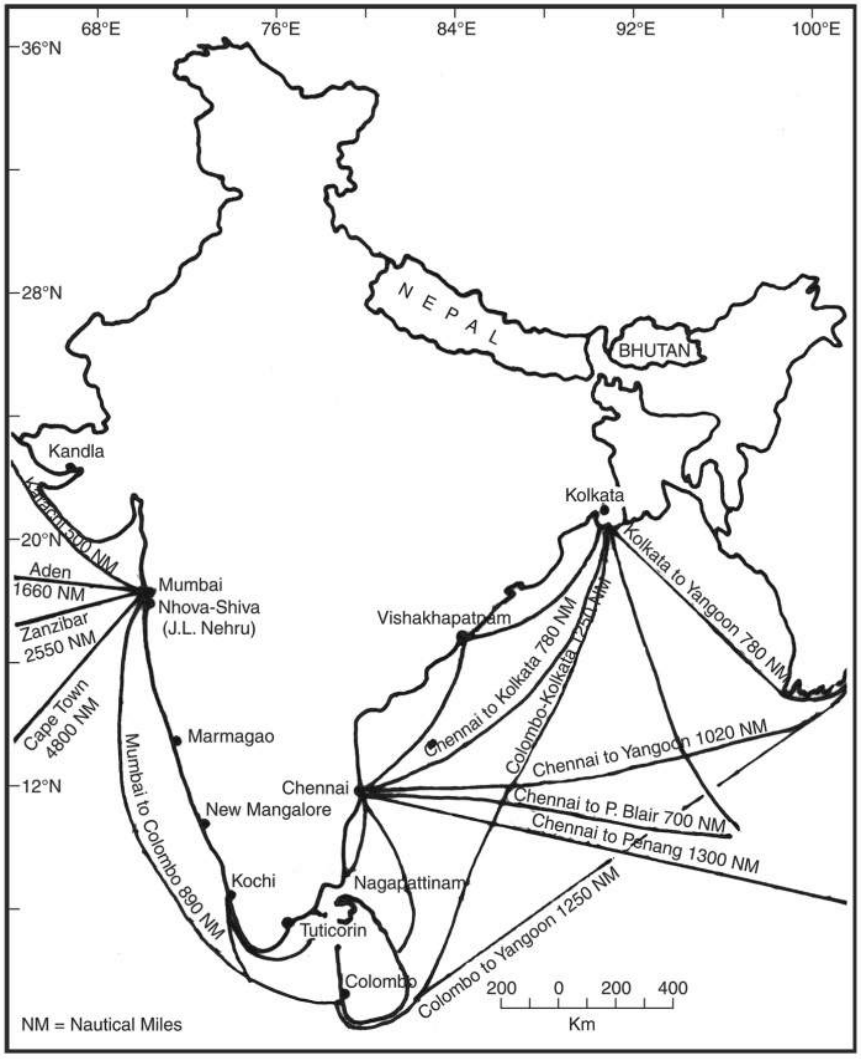
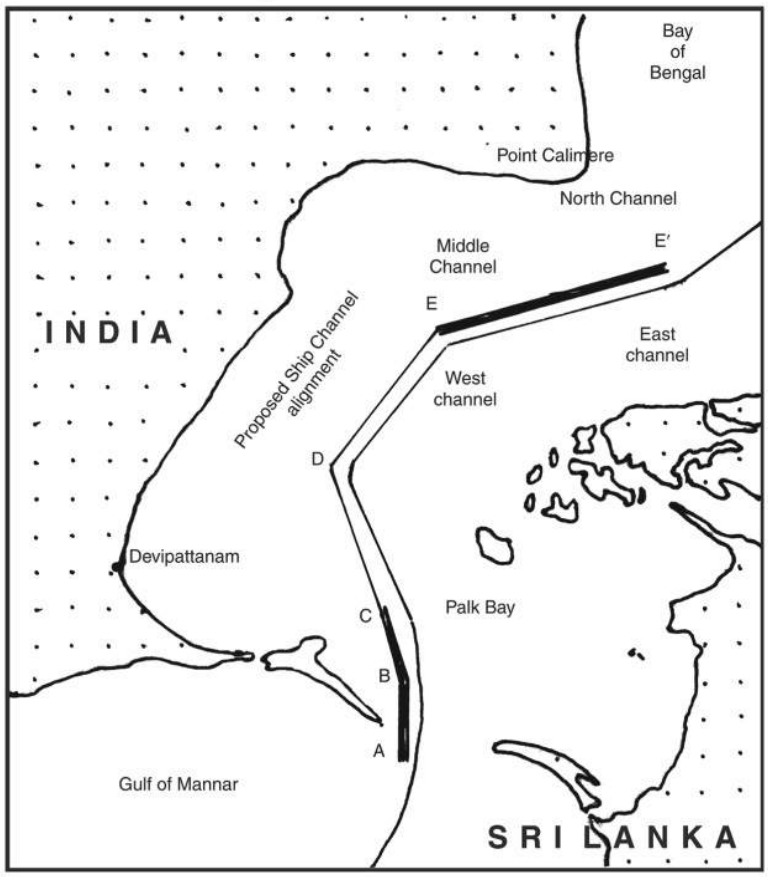


Fig. 12.8 Major Sea-routes

Adam's Bridge (Ram Sethu)

The Adam's Bridge or Ram Sethu is a discontinuous chain of sandbars dotting 30 km stretch in the east-west direction between the southern tip of Rameswaram Island in India and Talaimannar in north-western Sri Lanka. It creates a geological divide between the Palk-Bay and the Gulf of Mannar which form part of the southern Kaveri Basin in the Bay of Bengal (**Fig. 12.8**).

The Sethu-Samudram Ship Channel Project (SSCP) of the Government of India envisages the dredging of the shallow ocean region in the Bay of Bengal to create an artificial 167 km long 300 m wide and 12 m deep channel like passage for (10,000–12,000 gross tonnage) ships across the island formations called Adam's Bridge or *Ram Sethu*.



AB (17.3 Km) North	Adam's Bridge.
BC (13.38 Km) North	Adam's Bridge
CD (37.44 Km)	Palk Bay
DE (40.48 Km)	Palk Bay
EE' (54.25 Km)	Palk Strait

Total 167.22 Km

Fig. 12.9 India—Ram Sethu Project

The proposal for channel linking the Palk-Strait and the Gulf of Mannar goes back to the British in 1860 and since then several proposals have been made and six distinct alignments for the passage

Dr. Ram Mohan a leading geomorphologist and oceanographer, in his research paper entitled 'Geological Evolution of Adam's Bridge' opined that Adam's Bridge consists of sand-bars and coral formations. The possibility of formation of shoals in the shallow continental shelf as barrier bars (sandbars) appear to be the most plausible explanation for the evolution of Rameswaram and Adam's Bridge.

Thus all the scientific studies about the Ram Sethu suggest a consistent picture of natural process that led to the formation of Adam's Bridge. It is not a man-made structure . It is merely a sand and coral formation. The reduction in the distances between Tuticorin and Chennai, Ennore, Vishakhapatnam, and Haldia/Kolkata, etc. has been given in **Fig. 12.10.**

Air Transport

India has bilateral Air Service Agreement with 103 countries. Recently, new Air Services Agreement have been signed with Mexico and Chile. Air transport is the fastest mode of transport. It has reduced geographical distances, making the world a village.

The main advantages and disadvantages of the air transport are:

1. With the help of air-transport one can easily reach the remote and difficult terrains, like mountains, deserts, thick-forests, deserts, and marshy lands.
2. It is the fastest mode of transportation.
3. Air-transport plays a vital role at the time of emergency like a war situation and in the event of natural calamities like earthquakes, cyclones, famines, floods, droughts, epidemics, etc.
4. Air-transport is, however, adversely affected at the occurrence of fog, mist, and stormy weather.

Civil Aviation

The Airport Authority of India (AAI), constituted on 1st April 1995, operates 127 airports including civil enclave and defence airfields for Commercial Airlines operations. The Ministry of Civil Aviation is responsible for the formulation of national policies and programmes for the development and regulation of civil aviation and for the devising and implementing of schemes for an orderly growth and expansion of civil air transport. Its functions also extend to overseeing the provision of airport facilities, air traffic services, carriage of passengers and goods by air, safeguarding civil aviation operations, regulation of air transport services, licensing of aerodromes, air carriers, pilots, and aircraft maintenance engineers.

Airports There are 450 airports in the country in various stages of development. Out of these Ahmadabad, Amritsar, Bangalore, Chennai, Delhi, Guwahati, Hyderabad, Jaipur, Kochi, Kolkata, Mumbai, Panaji, Srinagar and Thiruvananthapuram are the international airports.

The improvement in the infrastructural facilities at the airports need heavy capital investment which the government cannot afford of its own. Therefore, private domestic and foreign investors including Non-Resident Indians have been encouraged to participate in the process of improvement of the Indian Airlines.

Cargo In order to help the Indian exports to make their exports more competitive, the Government had introduced in April 1992 an '*Open Sky Policy*' for cargo. Under this policy, foreign airlines or association of exporters can bring any number of freighters to the country for upliftment of cargo. The Government has also permitted market forces to determine cargo traffic with IATA rates as the floor rates.

Air Services India has bilateral Air Services Agreement with 101 countries. A revised Air Service Agreement between India and USA was signed in 2005 replacing earlier Agreement, signed in 1956. The revised agreement grants unlimited access to the designated airlines to any point of call in the territory of the other country as against four airports under the earlier agreement.

Air India The Air India was constituted in 1947, after which the Air India International launched its first service to London via Cairo and Geneva on June 8, 1948 with Constellation aircraft. In 1952, the Planning Commission recommended the nationalisation of Air Transport Industry which was effected in March 1953 with the creation of nationalised Corporations—Air India International Limited, which retained its identity and international flag carrier status; and the Indian Airlines, to operate domestic services.

Fleet Air India owns a fleet of 16 aircrafts consisting of six B747-400, two B747-300, and eight A-310-300. In addition, Air India has inducted six B747-400, eleven A310-300, and four B777-222 on dry lease basis, taking the total number of aircrafts in Air India to 37. Additionally, B737-800 have been leased for Air India Express.

Air India operates 173 flights per week serving 59 stations (45 international and 14 domestic). Air India also has code-share agreements with 12 airlines to offer its passengers more destinations and convenient connections.

Indian Airlines Indian Airlines was set up under the Air Corporation Act, 1953 with an initial capital of Rs. 3.25 crore with its Headquarters at Delhi. The India Airlines is the major domestic air carrier of the country. The Indian Airlines operates to 55 domestic stations alongwith its wholly-owned subsidiary Airlines, Allied Services Ltd. (Alliance Air). Besides Indian Airlines also operates to 18 international stations.

The Indian Airlines presently has a fleet of 73 aircrafts comprising 03 Airbus, A-300s; 48 Airbus, A-320s, 5 Airbus, A-319s; 11 Boeing 737s; 18 Dornier DO-228; and 04 ATR-42-320. All B-737 and ATR aircrafts are operated by Alliance Air.

In addition to Air India, there are: Jet Airways, Kingfisher Airlines, Deccan Aviation Co; Jet-lite, Paramount Airways, MDLR Airways, Jagson Airlines and Go-Air airlines.

Pawan Hans Helicopters Limited The Pawan Hans Helicopters Ltd (PHHL) is one of India's leading helicopter companies and is known for its reliable helicopter operations. The company was incorporated in 1985 with the objective of providing helicopter services to the petroleum sector, linking inaccessible areas of the country and operating charters for promotion of tourism.

Private Companies In addition to these, five companies are providing services in India : out of these Jet Airways and Air Sahara are operating on domestic as well as international air-routes, while Air Deccan, Kingfisher, and Spice-Jet are operating on domestic routes only.

Problems

The air transport of India is facing the following main problems:

1. Running in Loss Both the Air India and the Indian Airlines are incurring constant losses. Some better airlines like Singapore and Lufthansa have shown willingness to join with Air India.

2. Strikes Strikes have become regular feature in the air-transport industry. For example, the September/October 2009 strike of pilots created great inconvenience to the passengers and heavy losses to the Indian Airlines.

Offices. All the categories of Post Offices retain similar postal services, while delivery function is restricted to specified offices. In terms of management control, accounts are consolidated progressively from Branch Post Offices to Sub Post Offices and finally in Head Post Offices.

The Department has about 2.47 lakh departmental employees and about 2.93 lakh Gramin Dal Sevaks as on March 31, 2005.

Mail System

First class mail, viz., post cards, inland letters, and envelops are given airlift wherever found advantageous, without any surcharge, between stations connected by air. Second class mail, viz., book packets, registered newspapers, and periodicals are carried by surface transport, i.e. trains and road transport.

International Mails

India is a member of the Universal Postal Union (UPU) since 1876 and of the Asian Pacific Postal Union (APPU) since 1964. These organisations aim at extending, facilitating, and improving postal relations among other countries. India exchanges mail with more than 217 countries by air and surface.

Money can be remitted from selected foreign countries to India by way of money orders and postal orders. India has money order service with 27 countries. India has two-way money order service with Bhutan and Nepal wherein money orders can be sent to and received from these countries. With the remaining 25 countries, only inward service is available where money orders booked in these countries can be paid in India. British Postal Orders and Irish Postal Orders are encashable in India at selected post offices.

International EMS, which started in 1986 with five countries, has now been extended to 97 countries. With a view to facilitate export and import to and from foreign destinations, principal foreign offices of exchanges have been set up at Chennai, Delhi, Kolkata, and Mumbai. In addition, six sub-foreign post offices have been established at Ahmadabad, Bangalore, Cochin, Jaipur, NOIDA, and Srinagar. Export Extension Windows have also been made operative at Guwahati, Kanpur, Ludhiana, Moradabad, Surat, and Varanasi to cater to the needs of the exporters, tourists in these areas.

Telecommunication

India's telecom sector has been one of the biggest success stories of market-oriented reforms, and India is now amongst the fastest growing telecom markets in the world. The total number of telephones has increased to 190 million in December 31, 2006.

The announcement of the New Telecom Policy, 1999 was a watershed event in telecommunications in India. Other policy milestones include the opening of the long-distance market in 2002. As a result, telecom tariffs which were among the highest in the world less than four years ago have now dipped among the lowest. The growth of wireless services has been phenomenal, with wireless subscribers growing at a compound annual growth rate of above 90 per cent per annum since 2003.

The total number of telephone has increased from 54.63 million on March 31, 2006 to 189.92 million on December 31, 2006. About five million subscribers are added every month. With this growth, the number of telephones is expected to reach 250 million by the end of 2007. Today the wireless subscribers are not only much more than the fixed subscribers in the country, but also

increasing at a much faster pace. The share of wireless phones has increased from 24 per cent in March 2003 to 79 per cent in December, 2006.

Internet

As on December 31, 2006, there are 400 licenses for provision of Internet Services out of which 128 have signed Licenses for Provisions of Internet Services (including Internet Telephony). Based on reports received from Internet Service Providers till March 2006, there are approximately 12.00 million Internet subscribers in India (India 2010).

Manufacturing of Telecom Equipments

The Indian telephone industry manufactures a complete range of telecom equipments using state of the art technologies designed specifically to match the diverse terrain and climatic conditions. Production of telecom equipments has increased from Rs.16,090 crore in 2004–05 to Rs. 17,833 crore in 2005–06. There is heavy demand of the mobile phones from domestic and international markets. It is expected that within the next decade, India is expected to become a manufacturing hub for telecom equipments.

Telegraph and Telephone Service

Telegraph services were introduced at Calcutta in 1851 and a telephone service began also at Calcutta in 1851–82 soon after their invention in the United States of America. Today there are over 45,000 telegraph offices. There are over 25,000 telephone exchanges in the country by 2005–06. Ours is the largest telecom network in Asia.

Radio, Television, and Cinema

Radio, television and cinema (films) are the electronic media of mass communication, unlike postal, telegraphic, telephone, and telex services which are essentially of personal nature. Unlike telephone, radio is a means of wireless communication. It is a very powerful medium to transmit and receive useful information, news and variety of entertainment programmes including sports.

At the time of Independence, there were six radio (Akashwani) stations. At preset All India Radio is accessible to almost 98.5 per cent of the total population of the country.

Doordarshan is the national television service of India. It started in 1959. It is one of the largest and essential networks in the world with over 900 transmitters. Its programmes are watched by over 500 million viewers in their homes. Its commercial advertisements brought in a huge revenue of over Rs.10,000 million in 2005–06. Now under the open skies policies a large number of private parties registered in India. It manages radio and television channels and have been assigned to private parties registered in India. It manages radio and television services under the supervision of parliamentary Committee.

Cinema is the most popular means of entertainment in India. It is the largest producer of feature films in the world. Hindi films by far is the most dominant section. Almost all the regional languages bring out their own films almost continuously. Personal computers and Internet services have brought about a new revolution in the age of explosion of information technology.

Print Media

The total number of newspapers and periodicals being published was over 42,000 on December 31, 2006. Hindi publication has the largest share of over 40 per cent of the total. Books are an equally important means of communication for preserving and propagating knowledge, information and entertainment to posterity.

INTERNATIONAL TRADE

A flow of commodities from producers to consumers is known as trade. It is an important tertiary sector of economy which is carried out at the local, regional, national, and international levels.

India has a long tradition of trading with countries located far and near. Today we are living in a fast shrinking world mainly because of tremendous advances in both transport and communications. We are living in an economically interdependent world, where the world itself has turned into a global village with a self-contained economy. Because of fast means of transport and communications, India conducts international trade with about 200 countries with an endless list of around 8000 commodities. The share of trade in the GDP is about 15 per cent, which engages 7.3 per cent of work force in the country.

There was a time when commodities were imported only for domestic consumption. But now more and more countries including India, have been importing certain raw or semi-processed materials, not for their own domestic consumption, but to process them further and export them after value addition. *Indirectly, what the country exports are items of human skills.* For example, Japan exports cotton and woollen textiles although it imports all its requirements of raw materials from other countries. The same is true of mineral based industries. India imports raw cashewnuts only to re-export them after they are further reprocessed. India imports crude diamonds and other precious stones only to process them further and re-export them as highly finished fine products at a considerable upward margin. India also imports gold and silver and exporting them in the form of attractive and expensive ornaments. International or foreign trade has played a crucial role in India's economic growth.

During the colonial days India used to export almost entirely agricultural raw materials. India's traditional exports consisted of jute, cotton, tea, spices, hides, skins, oil-seeds, especially groundnut. At present, instead of exporting raw materials, India is exporting jute-packing materials (gunny-bags, linen, and carpets). In place of cotton, India exports quality yarn, cotton fabrics, including hosiery, readymade garments and skilled and semi-skilled workers. India also exports silk woollen, and synthetic textiles, processed marine products, manufactured leather goods, sports goods (cricket bats, hockey sticks, etc.) engineering goods like fans, sewing machines, bicycles, three-wheelers, scooters, cars, commercial vehicles, chemicals and allied products, carpets, rice, processed food, medicines, electric goods, books and films.

Table 12.4 shows India's total export, import, total value of foreign trade and balance of trade from the year 1990–91, 2000–01, and 2005–06.

Table 12.4 *India's Foreign Trade (in Rupees crore)*

Year	*Exports*	*Imports*	*Total trade*	*Trade deficit*
1950–51	606	608	1214	–2
1960–61	642	1122	1764	–480
1970–71	1535	1634	3169	–99
1980–81	6710	12,549	19,259	–99
1990–91	32,558	43,193	75,751	–10,635
2000–01	20,3571	2,30,873	4,34,444	–27,302
2008–09	696,498	870,399	15,66,897	–173,901

Source: ***India 2010***, p.148.

An examination of **Table 12.6** vividly shows that about 34 per cent of the total import consists of crude oil, petroleum and allied products. Capital goods constituting 12.1 per cent of the total import ranks second, while electric goods and gold and silver rank third and fourth in the list of import respectively. Other important items of import are chemicals, pearls and precious stones followed by metal scraps and coke.

Table 12.7 *India's Major Trading Partners (2005–06)*

Country	*2005–06*
1. USA	12.5
2. United Arab Emirates	5.6
3. China	5.4
4. UK	4.5
5. Belgium	4.2
6. Germany	4.0
7. Hong Kong	3.5
8. Japan	3.5
9. Switzerland	2.8
10. Malaysia	2.5
11. Russia	2.4

Source: ***The Economic Survey, 2005–06***

At present India's largest international trade partner is USA, followed by UAE, China, UK, Belgium, Germany, Hong Kong, and Japan (**Table 12.7**). There is, however, enough scope to increase the import and export with the India's adjacent countries.

Salient Features of Foreign Trade

Following are the salient features of the Indian foreign trade:

1. Unfavourable Balance of Trade

India is importing enormous quantity of crude-oil, petroleum, petroleum products, precious stones, gold, silver, copper, machinery, cashewnuts, fertilisers, and mainly exporting agro-based products, engineering goods, commercial automobiles, etc. The balance of trade and balance of payment are still unfavourable as import exceeds the export. India's balance of payment in the post-reform period (1991) is growing from strength to strength.

2. More Export of Manufactured Goods

India is exporting nearly 8000 commodities, and the number of exports of finished commodities is increasing appreciably.

3. Worldwide Trade

India exports its products to 200 countries and imports from 150 countries.

4.Change in Import

Earlier India used to import almost all types of machinery, precision instruments, surgical equipments, automobiles, and electrical goods. Now India is exporting all sorts of machinery including vehicles, electronic, and chemical goods, and importing raw materials like diamonds, precious stones, gold, cashew-nuts, jute, mineral ores, and raw and semi-processed raw materials.

5. Maritime Trade

About 96 per cent of our foreign trade is carried out through sea routes. Trade through land routes is limited either because of the physical barriers of Himalayas or the less friendly relations with the neighbours.

6. Trade through Selected Ports

India has only 12 major international seaports which handle about 92 per cent of foreign trade. The remaining seaports handle insignificant amount of the foreign trade.

7. Insignificant Position in the International Trade

India has almost 17 per cent of the total population of the world but unfortunately, its share in the International trade is less than one per cent.

8. State Trading

Over 95 per cent of the overseas trade is done in public sector by the state agencies. There is insignificant trade done by the private undertakings.

9. Increasing Import of Raw Material

India is importing cashew-nut, cotton, gems, jute, mineral ores, pearls, precious and semi-precious stones, and raw silk.

10. Increasing Import of Capital Goods

Goods like manufactures of metals, electrical and non-electrical machinery, transport equipments, chemicals, and new technology are being increasingly imported.

Export Processing Zones (EPZ)

In order to promote International trade, the government of India has created seven Export Processing Zones. The zones and their headquarters are as under:
1.Chennai (Tamil Nadu), 2. Falta (West Bengal), 3. Kandla (Gujarat), 4.Kochi (Kerala), 5. NOIDA (Uttar Pradesh), 6. Santa Cruz (Maharashtra), and 7. Vishakhapatnam (Andhra Pradesh).

Each zone provides the basic infrastructural facilities in addition to whole range of fiscal incentives. Customs clearance facilities are offered within the zones. However, EPZs were not able to emerge as effective instruments for export promotion on account of multiplicity of controls and clearances, absence of world class infrastructure, and an unstable fiscal regime.

General Agreement on Tariff and Trade (GATT)

The General Agreement on Tariff and Trade (GATT) was established in 1948 in Geneva to pursue the objective of free trade in order to encourage growth and development amongst all member countries of the world. The main objective of the GATT was to ensure competition in commodity trade through the removal or reduction of trade barriers. The first seven rounds of negotiations conducted under GATT were aimed at stimulating international trade through reduction in tariff barriers and also by reduction in non-tariff restricts on imports imposed by the member countries.

BALANCE OF TRADE AND BALANCE OF PAYMENT

The exports and imports of a country should be roughly equal in value, since the foreign exchange earned by exports is necessary to finance imports, but such a balance is rarely achieved. This is

partly because trade passes through the hands of many different companies working independently, and thus an exact balance can never be reached, but is also due to fluctuations in markets leading to changes in import and export values over a period of years. The difference in value between imports and exports is referred to as the balance of trade. If exports exceed imports a country is said to have a *favourable balance of trade*, while if imports exceed exports it has an *adverse balance of trade*. These terms are relics of an earlier trading era, when if a country exported goods in large quantities they were paid for in gold. Thus, an excess of exports brought an addition to gold reserves. A country which has consistent adverse balance of trade, as Britain has done for more than a century, can enjoy great prosperity, while a favourable balance of trade is often characteristic of underdeveloped countries today, which often have great financial difficulties notwithstanding.

The balance of trade only takes account of visible trade or the value of actual goods transferred from one country to another. But there are many other ways in which foreign exchange can be earned or spent. These are collectively called *invisible trade* which accounts for a quarter of all transactions with foreign countries can be worked out. This is called the *balance of payments.*

Transactions which bring money into the country are called invisible exports and can be of several kinds.

1. **Payment for financial services** including insurance, banking, brokage, and other services carried out on behalf of foreigners.
2. **Payment of transport services** such as shipping or air transport of passengers or freight. Britain and certain other European countries have large invisible earnings in these two fields because of their importance in trade and financial dealings.
3. **Expenditure by foreign tourists**. This is often an extremely important source of foreign exchange.
4. **Interest and dividends on foreign investments**. India is earning a substantial amount in the form of interest and profit on foreign investment, annually.
5. **Remittance from emigrants.** Many emigrants send money to their families and thus countries like India, which have supplied large number of emigrants, may receive considerable foreign exchange in this way.
6. **Loans and aids** from foreign countries or international organisations. Many underdeveloped countries receive aid or loans to finance development, while other countries may obtain loans to cover balance of payments deficits.

Transactions which take money out of the country are called *invisible imports.* Payment for services, payment of interest on investments, remittances of immigrants, repayment and interest of foreign loans, or deficit on tourism, may all be greater than invisible exports in the same fields.

When these invisibles, both exports and imports, are brought into account, many countries which would have an unfavourable balance of trade are found to have a more favourable balance of payments. It is much more important that the total payments and receipts rather than the visible trade, should be well balanced as long-term loans may have to be obtained, which may lead to future difficulties when they have to be repaid; or gold reserves may be reduced; or overseas assets may be sold so that longer-term invisible exports are reduced; or currency values may be changed by devaluation or revaluation to alter the relative value of exports and imports and thus balance total transactions more nearly.

All these measures may have detrimental effects on the economy in the long term but have to be resorted to by many countries. Other ways of balancing transactions are to increase visible or invisible exports, or to apply trading restrictions in order to cut down on imports. Countries may also reduce the mobility of money, restrict tourism, or confiscate foreign property to reduce the outflow of money.

(ix) Revitalising the Board of Trade by redefining its role, giving it due recognition and inducting experts on Trade Policy.

(x) Activating our Embassies as key players in our export strategy and linking our Commercial Wings abroad through an electronic platform for real time trade intelligence.

INDIA—SPACE PROGRAMME

History: India's experience in rocketery began in ancient times when fireworks were first used in the country, a technology invented in neighbouring China, and which had an extensive two-way exchange of ideas and goods with India, connected by the Silk Road. Military use of rockets by Indians during the Mysore War against the British inspired William Congreve to invent the Congreve rocket, predecessor of modern artillery rockets, in 1804. After India gained Indepenedence from British occupation in 1947, Indian scientists and politicians recognised the potential of rocket technology in both defence applications, and for research development. Recognising the fact that a country as demographically large as India would require its own independent space capabilities, and recognising the early potential of satellites in the fields of remote sensing and communication, these visionaries set about establishing a space research organisation.

Phase I: 1960–70

Dr. Vikram Sarabhai was the founding father of the Indian space programme, and is considered not only a scientific visionary by many but also a national hero. After the launch of Sputnik in 1957, he recognised the potential that satellites provided. India's first Prime Minister, Pt. Jawaharlal Nehru, who saw scientific development as an essential part of India's future, placed space research under the jurisdiction of the Department of Atomic Evergy in 1961. The DAE Director Homi Bhabha, who is regarded as the father of India's atomic programme, then established the Indian National Committee for Space Research (INCOSPAR) with Dr. Sarabhai as Chairman in 1962.

From its establishment in 1962, the Indian space programme began establishing itself with the launch of sounding rockets, which was complemented by India's geographical proximity to the equator. These were established from the newly-established Thumba Equatorial Rocket Launching Station (TERLS), built near Thiruvananthapuram in south Kerala. Subsequently, India developed indigenous technology of sounding rockets called *Rohini Family* of sounding rockets.

Recognising the need for indigenous technology, and possibility of future instability in the supply of parts and technology, the Indian space programme endeavoured to indigenise every material supply route, mechanism, and technology. As the Indian Rohini Programme continued to launch sounding rockets of greater size and complexity, the space programme expanded and was eventually given its own government department, separate from the department of Atomic Energy. In 1969, the India Space Research Organisation (ISRO) was created and finally the Department of Space was established in 1972.

Phase II: 1970–80

Sarabhai had taken part in an early study with NASA regarding the feasibility of using satellites for applications as wide as direct television broadcasting. India started designing and creating an independent launch vehicle. Meanwhile, India also began development of satellite technology, anticipating the remote sensing and communication needs of the future. India's first foray into space began with the launch of its satellite Aryabhata in 1975 by a Soviet booster. By 1979, the SLV was ready to be launched from a newly-established second launch site, the Sriharikota Rocket

Launching Station (SRLS). The first launch in 1979 was a failure, attributed to control failure in the second stage. By 1980, this problem had been worked out. *The first indigenous satellite launched by India was called Rohini.*

Phase III: 1980–90

Following the success of the SLV, ISRO was keen to begin construction of a satellite launch vehicle that would be able to put truly useful satellite into polar orbit. The Augmented Satellite Launch Vehicle (ASLV) was tested in 1987, but this launch was a failure. After minor corrections, another launch was attempted in 1988, and this launch again failed.

Phase IV: 1990–2000

It was not until 1992 that the first successful launch of the ASLV took place. The first successful launch took place in 1994., and since then, the PSLV has become the workhorse launch vehicle, placing both remote sensing and communications satellites into orbit, creating the largest cluster in the world, and providing unique data to Indian industry and agriculture.

Phase V: 2000–2010

In 2001, the first development flight of the GSLV took place. India is developing a project to send unmanned probe to the moon in 2008, as the first attempt at exploration of solar system.This project is called *Chndrayaan.*

ISRO has entered the lucrative market of launching payloads of other nations upon its rockets from Indian soil. ISRO is planning a mission to Mars early in the next decade.

Major Events

1962: Indian National Committee for Space Research (INCOSPAR), formed by the Department of Atomic Energy, and work on establishing Thumba Equatorial Rocket Launching Station (TERLS) near Trivendrum began.
1963: First sounding rocket launched from TERLS on November 21, 1963.
1965: Space Science & Technology Centre (SSTC) established in Thumba.
1967: Satellite Telecommunication Earth Station set up at Ahmedabad.
1972: Space Commission and Department of Space set up.
1975: First Indian Satellite, Aryabhatt launched (April 19, 1975).
1976: Satellite Industrial Television Experiment (SITE) conducted.
1979: Bhaskara-1, an experimental satellite, launched. First experimental launch of SLV-3 with Rohini satellite on board failed.
1980: Second experimental launch of SLV-3; Rohini satellite successfully placed in orbit.
1981: Bhaskara II launched on November 20.
1982: INSAT-1A launched (April), deactivated in September.
1983: Second launch of SLV-3; RD-D2 placed in orbit. INSAT-1B launched.
1984: Indo-Soviet manned space mission (April). Rakesh Sharma became the first Indian to reach space.
1987: ASLV with SROSS-1 satellite on board launched.
1988: First Indian Remote Sensing Satellite, IRS-1A launched.
1990: INSAT-1D launched successfully.
1991: Launch of second operational Remote Sensing Satellite, IRS-1B (August).

1992: Third developmental launch of ASLV witth SROCC-C on board (May). Satellite placed in orbit. First indigenously built satellite, INSAT-2A, launched successfully.

1993: INSAT-2B launched in July successfully. First developmental launch of PSLV with IRS-1E on board fails.

1994: Fourth developmental launch of ASLV successful (May). Second developmental launch of Polar Satellite Launch Vehicle (PSLV) with IRS-P2 successful (October).

1995: INSAT-2C launched in June.

1996: Third developmental launch PSLV with IRS-P3 successful in (March).

1997: INSAT-2D launched in June and became inoperational in October. Arabsat-1C, since renamed INSAT-2DT, acquired in November. First operational launch of PSLV with IRS-1D successful (September).

1998: INSAT system capacity augmented with readiness of INSAT-2DT aquired from Arabsat (January).

1999: INSAT-2D the last satellite in the multi-purpose (INSAT-2D series), launched by Ariane from Kourou French Guyana (April 3, 1999). IRS-P4 (OCEANSAT), launched by Polar Satellite Launch Vehicle (PSLV-C2).

2000: INSAT-3B was launched on March 22, 2000.

2001: Geosynchronous Satellite Launch Vehicle-D1 (GSLV-D1), the first developmental launch of GSLV V with GSAT-1 on board, partially successful.

2002: INSAT-3 CGSLV-D2 launched successfully by Ariannespace (January); launch of KALPANA-1 (September).

2003: GSLV-D2, the second developmental launch of GSLV with GSAT-2, successful (May).

2004: First operational flight of GSLV (F02) unsuccessfully launches EDUSAT (September).

2005: Launch of CARTOSAT and HAMSAT by PSLV-C6 from the second launch pad (Universal Launch Pad) (May 1). ISAT-4A launched successfully on July 10, 2006. GSL V-F02 carried INSAT-4C.

2006: Second operational flight of GSLV (F02) unsuccessful July 2006.

2007: Successful launch of CARTOSAT-2, SRE-1, LAPAN-TUBSAT and PEHUENSAT-1 on PSLV V C7 on January 10, 2007.

2008:
- PSLV-C11 successfully launches CHANDRAYAAN-1 from Sriharikota (October 22, 2008).
- PSLV-C9 successfully launches CARTOSAT-2A, IMS-1 and 8 foreign nano satellites from Sriharikota (April 28,2008).
- PSLV-C10 successfully launches TECSAR satellite under a commercial contract with Antrix Corporation (January 21, 2008).

2009:
- PSLV-C14 successfully launches Seven Satellites - OCEANSAT-2, FourCUBESAT Satellites and Two RUBIN-9 from Sriharikota (Sept. 23, 2009).
- PSLV-C12 successfully launches RISAT-2 and ANUSAT from Sriharikota (April 20, 2009).

2010:
- GSLV-F06 launched from Shriharikota (Dec 25, 2010). GSAT-5P could not be placed into orbit as the GSLV-F06 mission was not successful.
- Successful launch of advanced communication satellite HYLAS (Highly Adaptable Satellite), built by ISRO on a commercial basis in partnership with EADS-Astrium of Europe, by Ariane-5 V198 from Kourou French Guiana (November 27, 2010).
- PSLV-C15 successfully launches Five Satellites - CARTOSAT-2B, ALSAT-2A, two nanosatellites-NLS-6.1 & 6.2 and a pico-satellite- STUDSAT from Sriharikota (July 12, 2010).
- GSLV-D3 launched from Sriharikota (Apr 15, 2010). GSAT-4 satellite could not be placed in orbit as flight testing of the Indigenous Cryogenic Stage in GSLV-D3 Mission was not successful.

2011:
- PSLV-C18 successfully launches Megha-Tropiques, Jugnu, SRMSat andVesselSat-1 from Sriharikota (October 12, 2011).
- PSLV-C17 successfully launches GSAT-12 from Sriharikota (July 15, 2011).
- Successful launch of GSAT-8 by Ariane-5 VA-202 from Kourou French Guiana, (May 21, 2011).
- PSLV-C16 successfully launches Three Satellites - RESOURCESAT-2,YOUTHSAT, X-SAT from Sriharikota (April 20, 2011).

2012:
- Successful launch of GSAT-10 by Ariane-5 VA-209 from Kourou French Guiana (September 29, 2012).
- ISRO's Polar Satellite Launch Vehicle, PSLV-C21 successfully launchesSPOT 6 and PROITERES from Sriharikota (September 09, 2012).
- PSLV–C19 successfully launches RISAT-1 from Sriharikota (April 26, 2012).

2013:
- PSLV – C25 successfully launches Mars Orbiter Mission Spacecraftfrom Sriharikota (Nov 05, 2013).
- Successful launch of GSAT-7 by Ariane-5 VA-215 from Kourou French Guiana (August 30, 2013).
- Successful launch of INSAT-3D by Ariane-5 VA-214 from Kourou French Guiana (July 26, 2013).
- PSLV – C22 successfully launches IRNSS-1A from Sriharikota (Jul 01, 2013).
- PSLV – C20 successfully launches SARAL and six commercial payloadsfrom Sriharikota (Feb 25, 2013).

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