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HUMAN GEOGRAPHY

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PREFACE

A highly skilled professional team of PW ONLY IAS works arduously to ensure that the students receive the best content for the UPSC exams. A plethora of UPSC Study Material is available in the market but PW ONLY IAS professionals are continuously working to provide supreme quality study material for our UPSC students.

From the beginning, the content team comprising Content Creators, Reviewers, DTP operators, Proofreaders, and others is involved in shaping the material to their best knowledge and experience to produce powerful content for the students.

Faculties have adopted a new style of presenting the content in easy-to-understand language and have provided the team with expert guidance and supervision throughout the creation of this book.

PW ONLY IAS strongly believes in conceptual and fun-based learning. PW ONLY IAS provides highly exam-oriented content to bring quality and clarity to the students.

This book adopts a multi-faceted approach to mastering and understanding the concepts by having a rich diversity of questions asked in the examination and equipping the students with the knowledge for this competitive exam.

The main objective of the study material is to provide short, crisp, concise, and high-quality content to our students.

- Holistic Coverage of 50+ NCERT Books
- Thinking Points in and as 'Points to Ponder'
- Intensive use of Maps, Diagrams and Flowcharts
- Subject-Specific Workbooks for Practice

Alakh Pandey

Every chapter consists of 'Points to Ponder,' where our leaders raise thinking points for the students to go beyond the confines of the book. The students are expected to think about and find out possible answers to these points. The Caricatures used are inspired by Alakh Pandey Sir and Sumit Rewri Sir.

Sumit Rewri

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Human Geography: Nature and Scope

Bibliography: This chapter encompasses the summary of **Chapter 1- XII NCERT** (Fundamental of Human Geography).

Introduction

Human geography explores the connection between the physical and human realms, analyzing the spatial distribution of human phenomena, social, and economic disparities worldwide. It focuses on understanding Earth as humanity's habitat and examines factors that sustain human life. This approach blurs the division between physical and human aspects, emphasizing a holistic view. Geography often employs anatomical metaphors like "face" of the Earth, "eye" of the storm, and "arteries" of transportation networks to describe its subjects, portraying regions, villages, and even countries as living entities. In essence, human geography studies the intricate interplay between nature and human existence on a global scale.

Definitions of Human Geography

Various experts have given the definition of human geography; few of the more commonly used are as follows:

- **Ratzel:** "Human geography is the synthetic study of the relationship between human societies and earth's surface".
  - Synthesis has been emphasized in the above definition.
- **Ellen C. Semple:** "Human geography is the study of the changing relationship between the unresting man and the unstable earth."
  - Dynamism in the relationship is the keyword in Semple's definition.
- **Paul Vidal de la Blache:** "Conception resulting from a more synthetic knowledge of the physical laws governing our earth and of the relations between the living beings which inhabit it".
  - Human geography offers a new conception of the interrelationships between earth and human beings.

Nature of Human Geography

- The **essence of Human Geography** lies in exploring the connection between the natural world and the sociocultural environment shaped by human interaction.
- Human Geography examines how humans, through mutual engagement, create elements of material culture such as homes, villages, cities, transportation networks, industries, and farms using resources from the physical environment.
- This **interaction is reciprocal**, as human actions significantly alter the physical environment, which, in turn, influences human lives.

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Naturalization of Humans and Humanisation of Nature

- Humans employ technology to engage with their surroundings, a measure of a society's cultural advancement, developed after gaining insights into natural laws.
- For instance, understanding concepts like friction and heat led to the discovery of fire, while knowledge of DNA and genetics helped conquer diseases.
- These technological advancements empower humans to harness nature's resources, leading to **three stages of environmental interaction**:
  - **Environmental Determinism:** At this stage, nature is viewed as a potent force, revered and conserved due to humans' direct reliance on it for resources. Society has low technological development and primitive social structures, resulting in a naturalized human who respects and fears nature.
  - **Possibilism:** Nature provides opportunities that humans leverage as they develop socially and culturally. Nature gradually bears the imprint of human endeavors, and technological advancements lead to a transition from necessity to freedom. Humans create possibilities, shaping a cultural landscape with environmental resources.
  - **Neo Determinism or Stop-and-Go Determinism:** Proposed by geographer **Griffith Taylor**, this concept strikes a balance between environmental determinism and possibilism. It seeks to nullify the "either-or" dichotomy, emphasizing that possibilities can be realized within limits that safeguard the environment, preventing reckless exploitation.

Human Geography through the Corridors of Time

- Human geography, which focuses on the interaction between human beings and their environment, has a long history dating back to the appearance of humans in different ecological settings. The discipline has evolved over time, reflecting changing approaches and emphases.
- Early on, there was limited interaction between societies, and knowledge about different regions was scarce. Explorers and travelers gradually expanded this knowledge, particularly in the late fifteenth century, during Europe's exploratory period.
- Colonialism further fueled exploration and information gathering. This historical overview illustrates the continuous development of human geography, as summarized in Table 1.1 below, highlighting its various stages and emphases as a subfield of geography.

Table 1.1: Broad Stages and Thrust of Human Geography

Period	Approaches	Broad Features
Early Colonial Period	**Exploration and Description**	➢ Imperial and trade interests prompted the **discovery and exploration of new areas**. An encyclopedic description of the area formed an important aspect of the geographer's account.
Later Colonial Period	**Regional Analysis**	➢ Elaborated descriptions of all aspects of a region were undertaken. ➢ The idea was that **all the regions were part of a whole**, i.e. (the earth); so, understanding the parts in totality would lead to an understanding of the whole.
1930s through the Inter-War Period	**Areal Differentiation**	➢ The focus was on identifying the **uniqueness of any region** and understanding how and why it was different from others.

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Period	Approaches	Broad Features
Late 1950s To the Late 1960s	**Spatial Organization**	➢ Marked by the use of computers and sophisticated statistical tools. Laws of physics were often applied to map and analyze human phenomena. ➢ This phase was called the **quantitative revolution**. The main objective was to identify mappable patterns for different human activities.
1970s	**Emergence of Humanistic, Radical and Behavioral Schools**	➢ Discontentment with the quantitative revolution and its dehumanized manner of doing geography led to the emergence of **three new schools of thought of human geography** in the 1970s. ➢ Human geography was made more relevant to socio-political reality by the emergence of these schools of thought.
1990s	**Postmodernism in Geography**	➢ The grand generalizations and the applicability of universal theories to explain the human conditions were questioned. ➢ The importance of understanding each local context in its own right was emphasized.

Approaches in Human Geography

- The **Welfare or Humanistic approach** in human geography primarily focused on various dimensions of societal welfare, encompassing factors such as housing, healthcare, and education. Geographers have even introduced a course titled "**Geography of Social Well-being**" into the postgraduate curriculum.
- The **Radical school** of thought applied Marxist theory to elucidate the fundamental roots of poverty, deprivation, and social disparities. It connected contemporary societal issues to the evolution of capitalism.
- The **Behavioral school** of thought placed significant importance on real-life experiences and how different social groups, based on factors like ethnicity, race, and religion, perceived and interacted with space.

Fields and Subfields of Human Geography

- Human geography seeks to elucidate the connection between various facets of human existence and the geographical contexts in which they unfold.
- Consequently, it adopts a markedly **interdisciplinary character**, establishing strong connections with related fields within the social sciences.
- This interdisciplinary approach is adopted to gain insight into and elucidate the presence of human elements across the Earth's surface. With the expansion of knowledge, new subfields of human geography have emerged as follows:

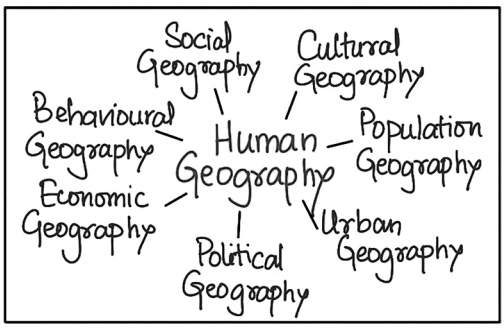

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Table 1.2: Human Geography and Sister Disciplines of Social Sciences

Fields of Human Geography	Sub-fields	Interface with Sister Disciplines of Social Sciences
Social Geography	-	Social Sciences – Sociology
	Behavioral Geography	Psychology
	Geography of Social Well-being	Welfare Economics
	Geography of leisure	Sociology
	Cultural Geography	Anthropology
	Gender Geography	Sociology, Anthropology, Women's Studies
	Historical Geography	History
	Medical Geography	Epidemiology
Urban Geography	-	Urban Studies and Planning
Political Geography	_	Political Science
	Electoral Geography	Psephology
	Military Geography	Military Science
Population Geography	_	Demography
Settlement Geography	_	Urban/Rural Planning
Economic Geography	_	Economics
	Geography of Resources	Resource Economics
	Geography of Agriculture	Agricultural Sciences
	Geography of Industries	Industrial Economics
	Geography of Marketing	Business Studies, Economics, Commerce
	Geography of Tourism	Tourism and Travel Management
	Geography of International Trade	International Trade

Conclusion

The fundamentals of human geography are a cornerstone of our understanding of the complex interplay between people and the spaces they inhabit. Human geography being a multidisciplinary field, explores the spatial relationships, cultural dynamics, and environmental impacts of human societies. Studying human geography, we gain valuable insights into the world's diverse cultures, societies, and environments, helping us make informed decisions about the challenges and opportunities that shape our planet's future. Human geography as a field of study continues to be relevant and essential in addressing the pressing issues of our time, from climate change and resource management to social justice and urban planning.

POINTS TO PONDER

Can we say that our pursuit of Possibilism has also given us lessons and understanding, which, if imbibed and applied today, can help us pursue the core goals and ideals of environmental determinism in sync with our future growth and development strategy?

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Glossary:

- **Environmental Determinism:** Environmental determinism suggests that human societies and cultures are primarily shaped by, and often determined by, their physical environment, including factors such as climate, geography, and natural resources.
- **Possibilism:** In this type of interaction, nature provides opportunities and human beings make use of these and slowly nature gets humanized and starts bearing the imprints of human endeavor.
- **Neo-Determinism:** This concept reflects a middle path between a situation of absolute necessity (environmental determinism) and a condition of absolute freedom (possibilism).
- **Behavioral Geography:** Branch of human science which deals with the study of cognitive processes with its response to its environment through behaviorism.
- **Historical Geography:** A sub-discipline of human geography concerned with the geographies of the past and with the influence of the past in shaping the geographies of the present and the future.

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2 Population: Distribution, Density and Growth

Bibliography: The chapter encompasses the summary of **Chapter 5 - VIII NCERT** (Resource and Development), **Chapter 6 - IX NCERT** (Contemporary India), **Chapters 2 and 3 - XII NCERT** (Fundamental of Human Geography), **Chapters 1 and 2 - XII NCERT** (India-People and Economy).

Introduction

Population dynamics weave a tale far beyond mere numbers. They encapsulate a country's socio-economic progression, significantly swayed by geographic intricacies. With India accommodating 17.5% of global inhabitants on a mere 2.4% of the world's terrain, the dramatic interplay between geography and demography becomes evident. This intricate study, spanning distribution, density, and growth, deciphers not just the current socio-economic state, but also potential trajectories. Initiatives in India, such as the 'Beti Bachao–Beti Padhao' campaign, add unique threads to this demographic fabric. However, it's pivotal to place these narratives against the global backdrop, highlighting universal shifts in population, density, development, and human capital strategy. Across bustling global metropolises to serene rural landscapes, the saga of human advancement and potential is ceaselessly unfolding.

Census in India

- A census is the official count of the population done periodically.
  - **Ist Census in India:** 1872.
  - **Ist complete census:** 1881.
  - **Subsequent censuses:** Every 10th year.
- The Census provides holistic social, demographic, and economic data.

Population

- People are essential for the development of the economy and society.
- People make and utilise resources; people are resources themselves with varying qualities.
- For example, coal becomes a resource when technology is invented to obtain it.
- Population is a central element in social studies. It provides a point of reference for understanding other elements.
- 'Resources', 'calamities', and 'disasters' derive significance in relation to human beings. Population characteristics provide background for understanding various aspects of the environment. Human beings are both producers and consumers of earth's resources.

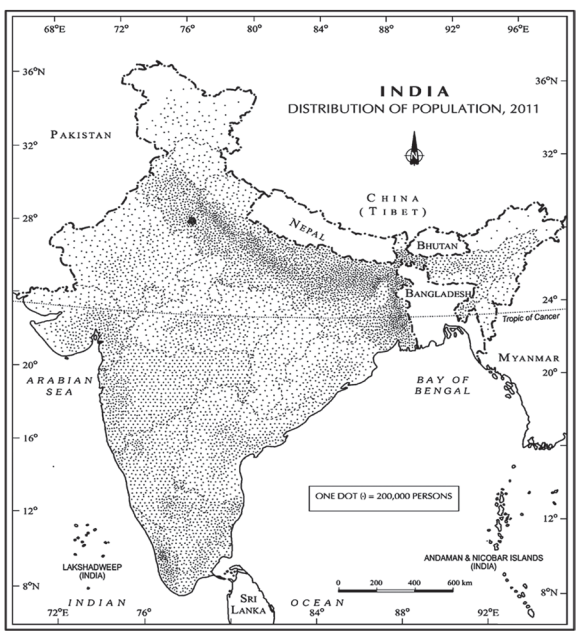

Figure 2.1: India-Distribution of Population

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- ✧ It's crucial to understand the number, distribution, growth, and characteristics of the population.
- ✧ The Census of India offers insights regarding the population of the country.

Importance of Population in a Country

- ✤ India is the second most populous country after China with a population of 1,210 million (2011). **(Refer to Figure 2.1)**
- ✤ India's population surpasses the combined population of North America, South America, and Australia.
- ✤ A large population puts pressure on limited resources and leads to socio-economic challenges.

Population: Size, Distribution, Density, Growth, and Composition

India's Population by Numbers (as of March 2011, Refer to Figure 2.2)

- ✤ Total population of India is 1,210.6 million.
- ✤ India represents 17.5% of the world's population.
- ✤ Population is distributed unevenly across 3.28 million square km (2.4% of the world's area).

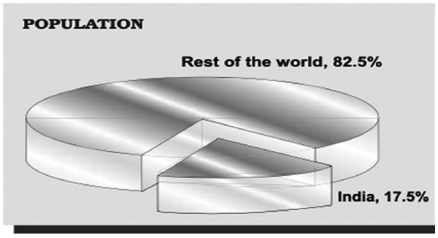

Figure 2.2: World Population by Continents

Global Distribution of Population

- ✤ Population distribution refers to the pattern of how people are spread across the earth.
- ✤ 90% of the global population occupies only 10% of the land.
- ✤ South and South-east Asia, Europe, and north-eastern North America are categorised as crowded regions.
- ✤ Sparsely populated areas are high latitude regions, tropical deserts, high mountains, and equatorial forests.
- ✤ Roughly three-quarters of the global population resides in Asia and Africa.
- ✤ 60% of the world's population is found in just 10 countries, all having over 100 million inhabitants. **(Refer to Figure 2.3)**

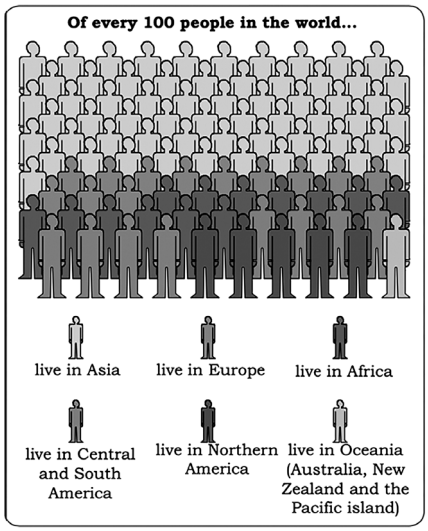

Figure 2.3: World Population by Continents

Factors Affecting Population Distribution

- ✤ **Physical Factors**
  - ✧ **Topography:** Plains are preferred over mountains and plateaus due to suitability for various human activities.
  - ✧ **Climate:** Extreme climatic regions like Sahara and polar regions are less populated.
  - ✧ **Soil:** Fertile lands, such as the Ganga and Brahmaputra plains, attract higher populations.
  - ✧ **Water:** Areas with abundant freshwater sources, like river valleys, are densely populated.
  - ✧ **Minerals:** Mineral-rich regions like diamond mines in South Africa and oil reserves in the Middle East have higher population densities.

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- **Social, Cultural, and Economic Factors**
  - **Social:** Areas with better amenities like housing, education, and health facilities have more people.
  - **Cultural:** Cities with religious or cultural importance, like Varanasi and Vatican City, draw more population.
  - **Economic:** Industrial regions, providing job opportunities, like Osaka and Mumbai, are densely populated.

POINTS TO PONDER

In light of the recent debates on the topic of Terraforming and the advancement of technologies in various fields, can we summarise that in coming times, geographical features which influenced the patterns of distribution and growth of population worldwide will become insignificant?

State-Wise Distribution of Population in India

India showcases a diverse and uneven distribution of its population (Refer to Figure 2.4), largely driven by a blend of physical, socio-economic, and historical factors.

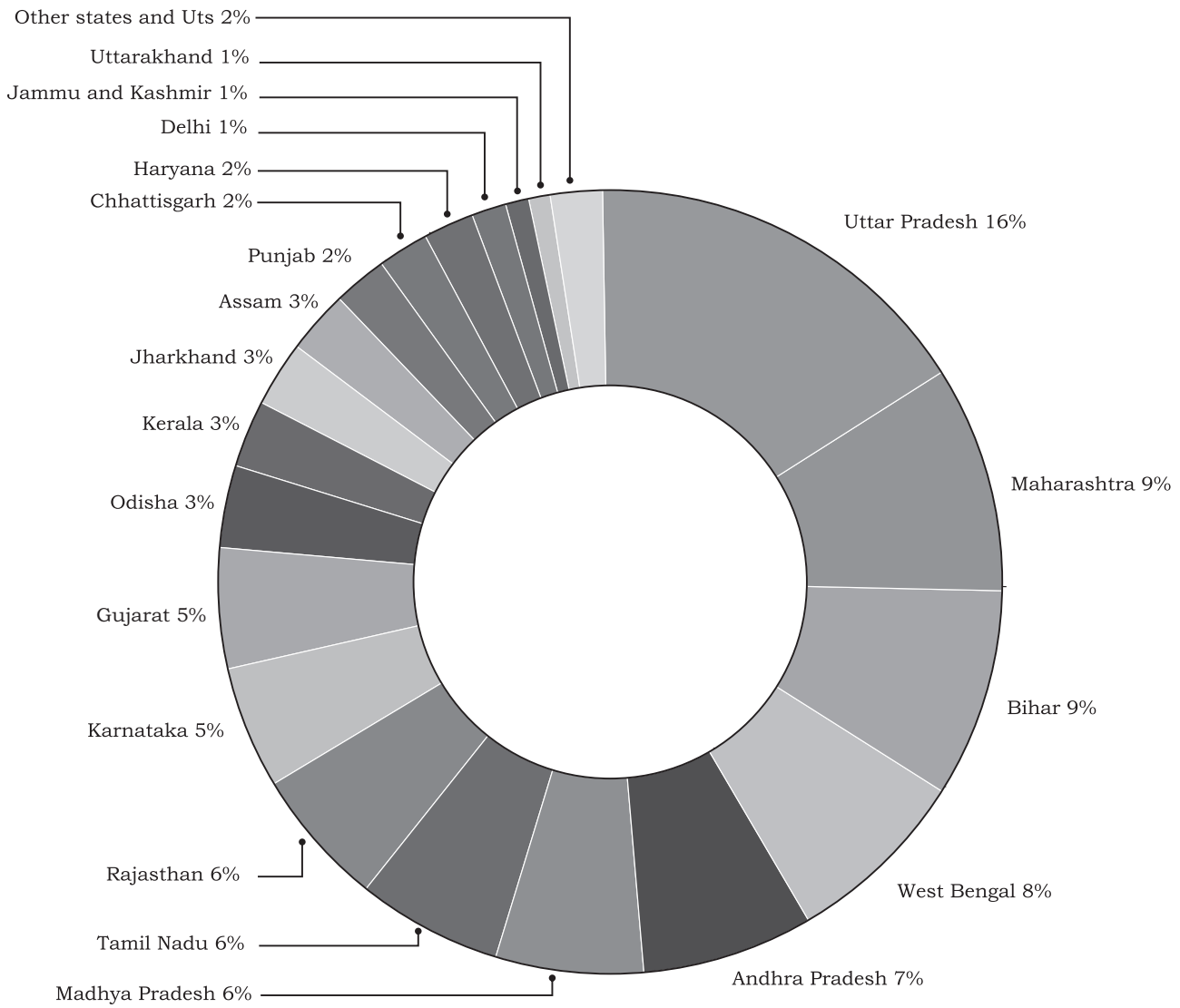

Figure 2.4: State-wise distribution of Population in India

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- **Density Variation**
  - Uttar Pradesh, being the most populous state, accommodates about 16% of India's total population, amounting to 199 million individuals.
  - Conversely, sparsely populated areas like Sikkim and Lakshadweep have a population of 0.6 million and 64,429, respectively.
  - Surprisingly, vast states like Jammu & Kashmir, Arunachal Pradesh, and Uttarakhand house a minimal percentage of the population despite their expansive territories.
- **Major Population Hubs**
  - Following Uttar Pradesh, Maharashtra, Bihar, and West Bengal have significant population counts.
  - Ten states, which include U.P., Maharashtra, Bihar, West Bengal, Andhra Pradesh, Tamil Nadu, Madhya Pradesh, Rajasthan, Karnataka, and Gujarat, encompass approximately 76% of the nation's inhabitants.
  - Half of the nation's populace resides within five pivotal states: Uttar Pradesh, Maharashtra, Bihar, West Bengal, and Andhra Pradesh.
  - Rajasthan, India's largest state in terms of land area, comprises 5.5% of the total national population.

POINTS TO PONDER

Identify the various push and pull factors of the population in the case of India. Also, comment on their spatial variation across India. Can we leverage our knowledge of these factors to stop the brain drain from India and to attract global talent?

- **Factors Influencing Distribution**
  - **Physical Factors:** Predominantly regions with favourable climates, accessible terrain, and adequate water sources, such as the North Indian Plains, coastal plains, and deltas, are densely populated.
  - **Socio-economic and Historical Factors:** Established agricultural practices, historical human settlements, advancements in transportation, industrialization, and urbanisation have played a crucial role. Metropolises like Delhi, Mumbai, and Kolkata have burgeoned due to urbanisation and industrial growth.
- **Urban Appeal**
  - Major cities like Delhi, Mumbai, and Kolkata have burgeoned due to reasons of industrialization and urbanisation, acting as magnets drawing individuals in search of opportunities.

India's Population Distribution by Density

India stands as one of the world's most densely populated countries, with only Bangladesh and Japan having a higher average population density.

- **Statistics & Trends**
  - As of 2011, (Refer to figures 2.5 and 2.6) the overall population density of India reached 382 persons per sq km, showing a significant rise from 117 persons per sq km in 1951.

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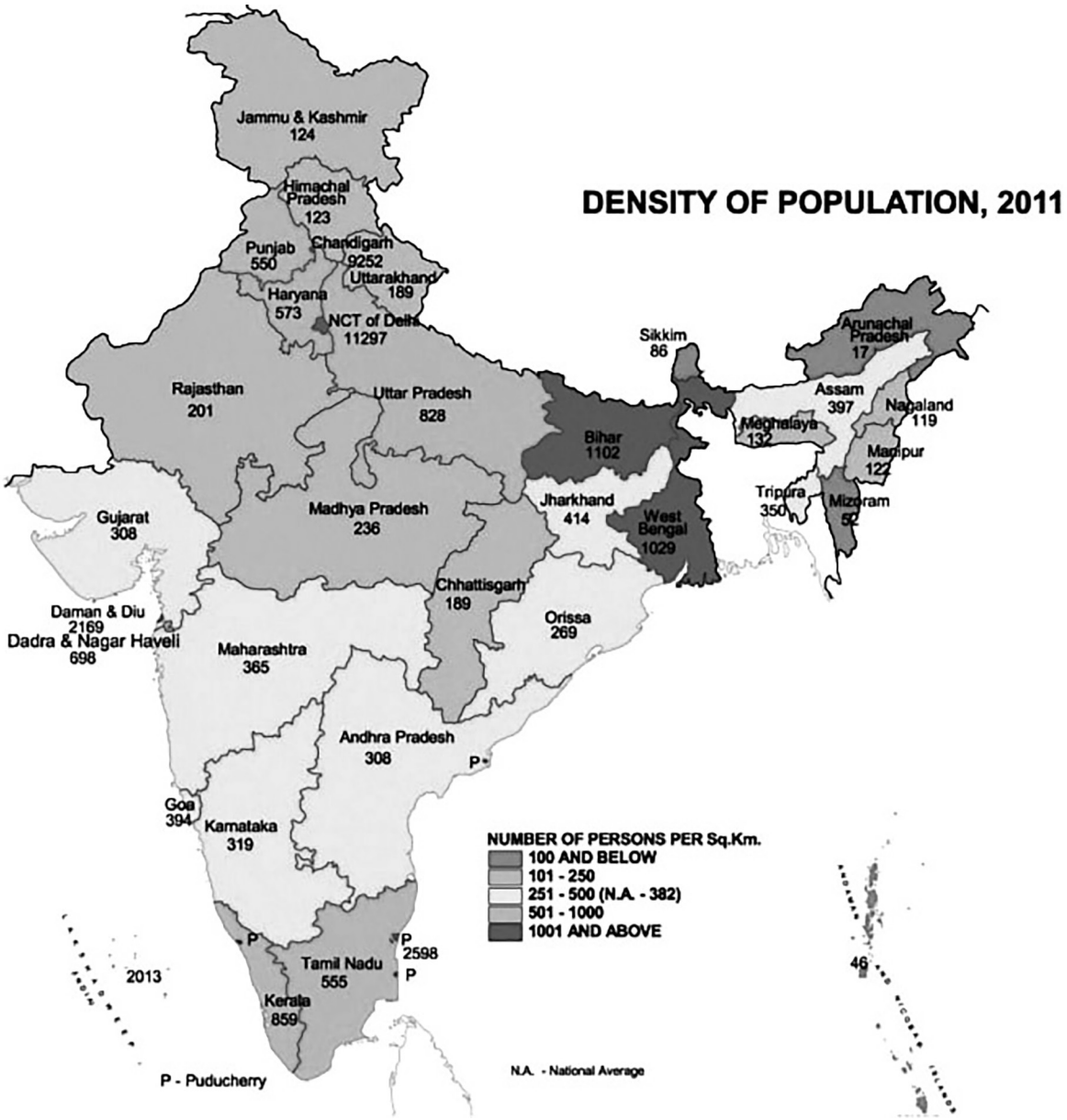

Figure 2.5: Density of Population (Census of India 2011)

- **Variations Across States**
  - Bihar boasts the highest density, with 1,102 persons/sq km.
  - In contrast, Arunachal Pradesh registers the lowest with just 17 persons/sq km.
  - Other noteworthy states in terms of density include West Bengal with 1,029 persons/sq km, Uttar Pradesh with 828, Kerala with 859, and Tamil Nadu with 555.
  - The National Capital Territory of Delhi stands out with a staggering density of 11,297 persons/sq km.
  - Moderation in density is seen in states like Assam and Gujarat, while Himalayan and North-eastern states (barring Assam) record low figures. Additionally, most Union Territories exhibit very high population densities.

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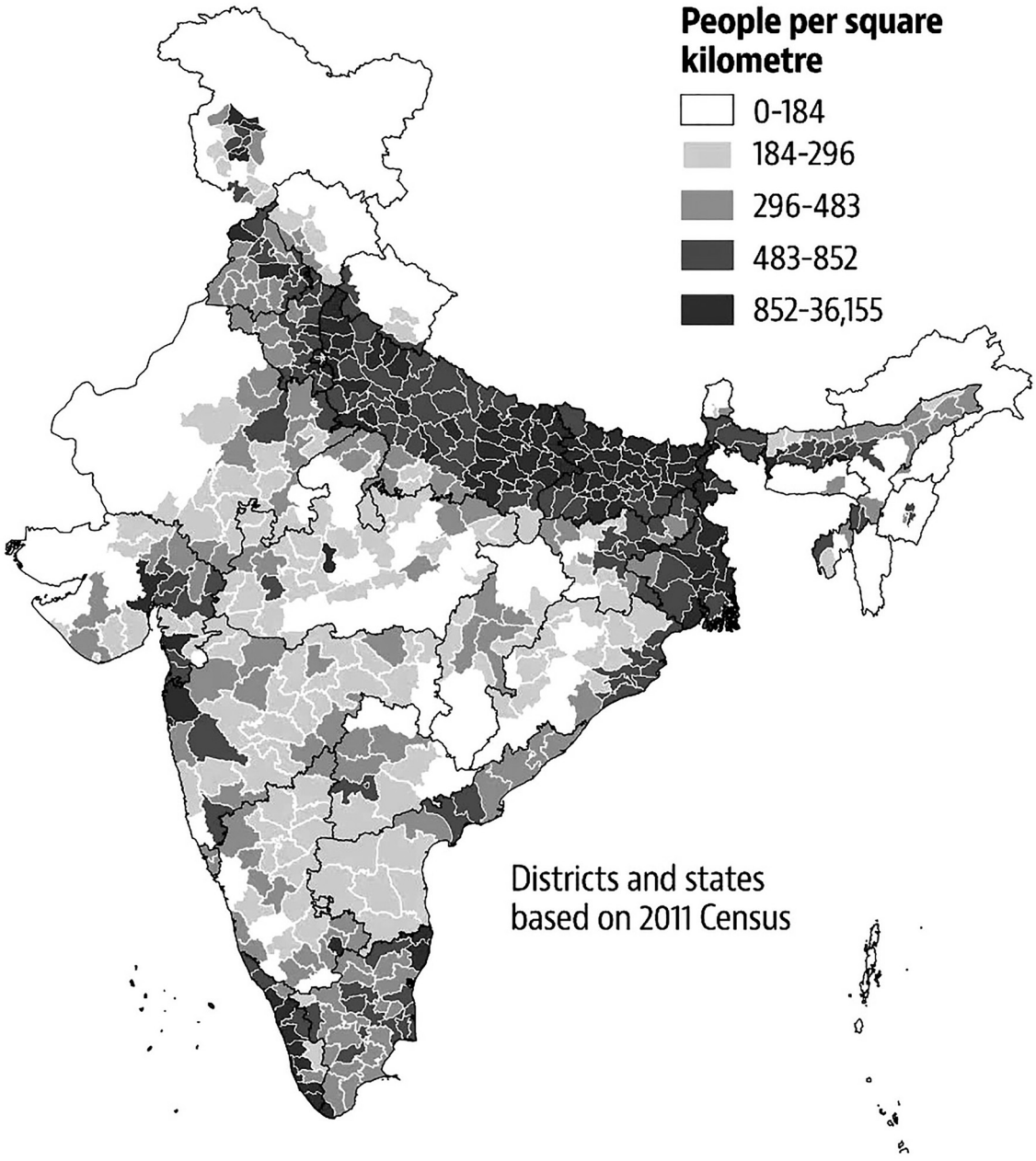

Figure 2.6: India- Density of Population

- **Understanding Density Metrics:**
  - The physiological density is computed by dividing the total population by the net cultivated area.
  - The agricultural density, on the other hand, is determined by dividing the agricultural population by the net cultivable area, where the agricultural population encompasses cultivators, agricultural labourers, and their families.
  - **Importance of Density Metrics:** These densities, especially the physiological and agricultural ones, are pivotal as they provide insights into the population pressure exerted on the available cultivable land.

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Factors Influencing Population Density

Table 2.1: Factors Influencing Population Density

Density Level	Regions/States	Influencing Factors
Low Densities	Areas with population densities below 250 persons/sq km (specific states not provided)	Rugged terrain, unfavourable climatic conditions
Moderate Densities	Assam and most Peninsular states	Hilly and rocky terrain, moderate to low rainfall, less fertile soils
High to Very High Densities	Northern plains and Kerala	Flat plains, fertile soils, abundant rainfall

Population Growth and Processes of Population Change

- **Defining Growth:** Growth of population refers to the change in number of people in an area over time, with its rate expressed in percentage.
- **Population Dynamics:** The population is constantly influenced by three main factors: births, deaths, and migrations.
- **Population Growth:** For India, both decadal and annual growth rates are high. The growth of a population refers to the change in the number of inhabitants over a specific period. This growth can be measured in two ways:
  - **Absolute Increase:** This is calculated by subtracting the earlier population figure from the later one.
    - After 1981, the growth rate of India's population began to decline, though the absolute number of people added remained significant.
  - **Annual Growth Rate:** This is the percentage increase each year (Refer to Figure 2.7).
    - Annual population growth rate as per the census 2011 was 1.64%.

Year	Total Population (in million)	Absolute Increase in the Decade (in million)	Annual Growth Rate (%)
1951	361.0	42.43	1.25
1961	439.2	78.15	1.96
1971	548.2	108.92	2.20
1991	846.4	163.09	2.16
2001	1028.7	182.32	1.97
2011	1210.6	181.46	1.64

Figure 2.7: The Magnitude and Rate of India's Population Growth

- **India's Growth Patterns:**
  - From 1951 to 1981, there was a rapid increase in India's population due to a steadily increasing annual growth rate **(Refer to Figures 2.8 and 2.9).**

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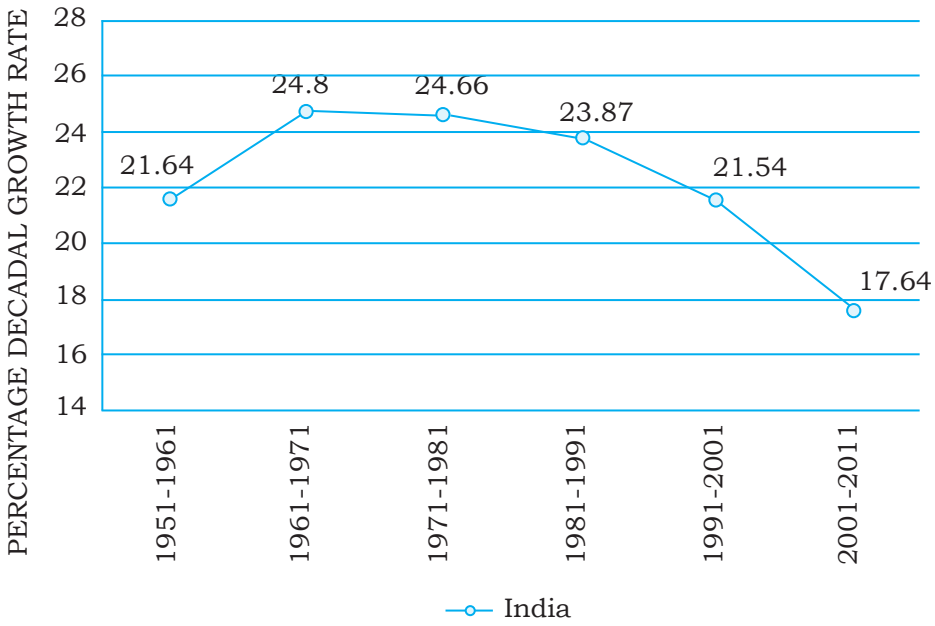

Figure 2.8: The Magnitude and Rate of India's Population Growth

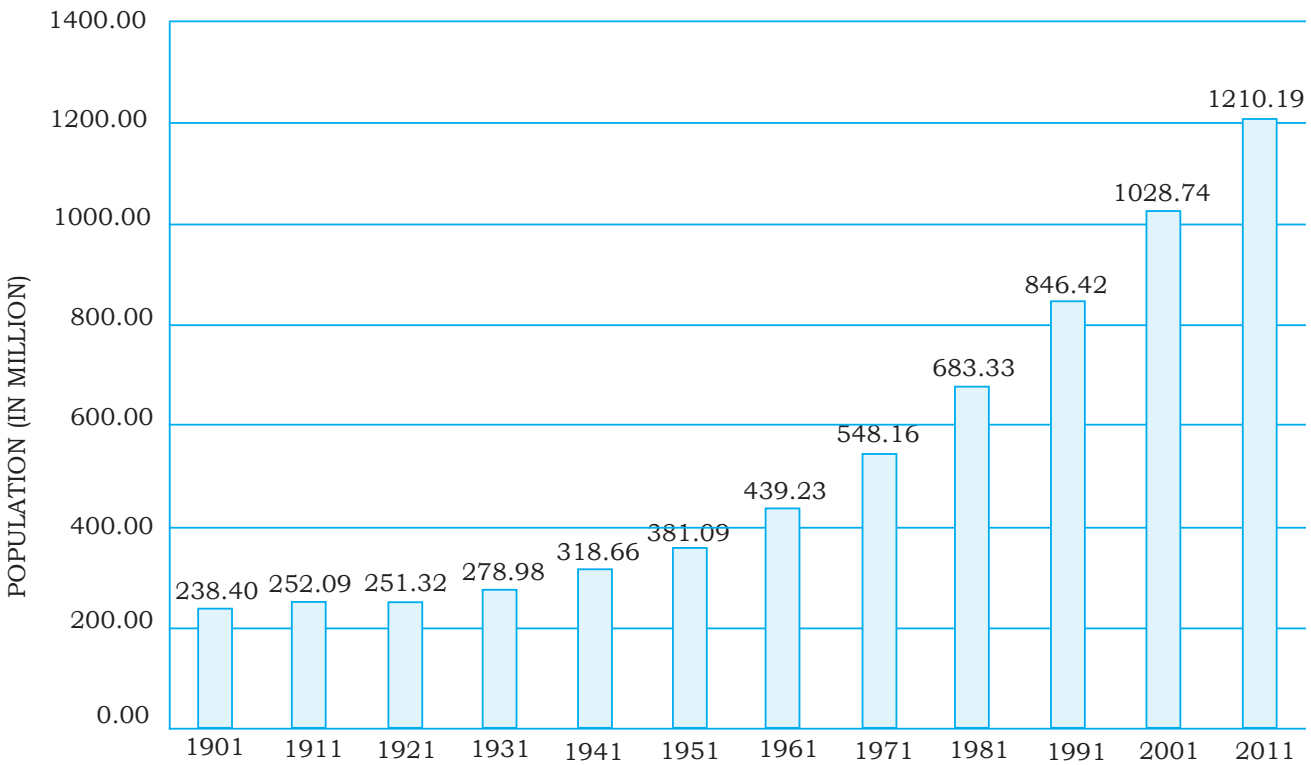

Figure 2.9: India's Population 1901-2011

✧ An important prediction suggests that India might overtake China by 2045 to become the world's most populous country. (According to the United Nations data, India has surpassed China to become world's most populous nation with 142.86 crore people in April 2023)

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- **Global Patterns (Refer to Figures 2.10 and 2.11):**
  - Population growth rates vary globally. Some nations, like Kenya, experience high growth rates due to decreasing death rates and high birth rates.
  - Others, like the UK, have slowing growth rates due to both low birth and death rates.

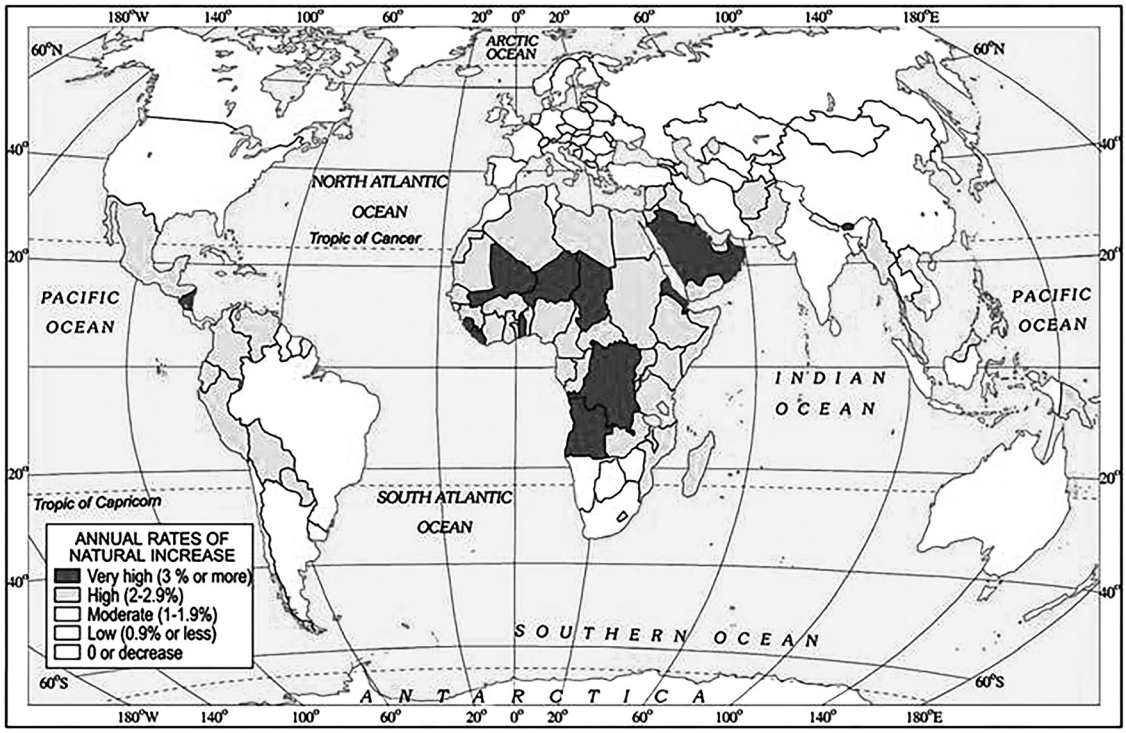

Figure 2.10: World: Differing rates of Population Growth

Components of Population Change

- **Natural Component**
  - **The Crude Birth Rate** (CBR) represents the number of live births per thousand in a year.
  - **Formula:** CBR = Bi/P×1000. Here, CBR = Crude Birth Rate; Bi = live births during the year; P= Mid-year population of the area.
  - **Deaths' Impact:** The death rate has a significant influence on population change.
  - **Assessing Growth via Death Rate:** Population growth can be attributed to a decreased death rate.
  - **Defining Crude Death Rate (CDR):** It indicates the number of deaths per thousand in a year.
  - **Formula:** CDR = D/P×1000. Here, CDR = Crude Death Rate; D = Number of deaths; P = Estimated mid-year population of that year.
  - The **natural increase of a population** is calculated by subtracting the death rate from the birth rate.
- **Induced Component**
  - **The Role of Migration:** It's the act of changing residence from one place (Origin) to another (Destination). Migration can be permanent, temporary, or seasonal.

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- **Immigration:** The process of people moving into a place.
- **Emigration:** The process of people moving out of a place.

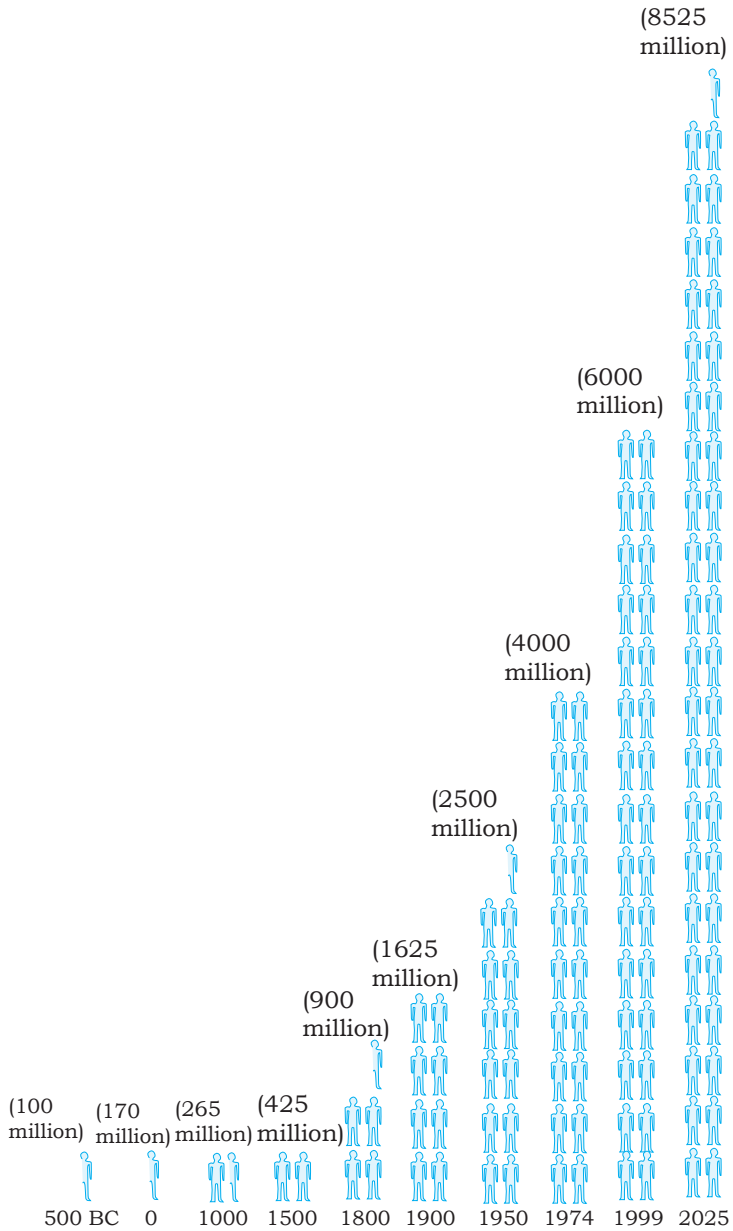

Figure 2.11: World Population Growth

Key Concepts in Population Growth

- **Growth of Population:** Change in population of an area between two time points. For example, the difference between India's population in 2001 and 2011 reveals a growth of 18.15 crores.
- **Growth Rate of Population:** It is the change in population expressed in percentage.
- **Natural Growth of Population:** It is defined as the increase determined by the difference between births and deaths. The formula is, **Natural Growth = Births - Deaths**
- **Actual Growth of Population:** It is calculated as: **Births - Deaths + In Migration - Out Migration.**
- **Positive Growth:** When birth rate exceeds death rate or due to in-migration.
- **Negative Growth:** Population decreases due to lower birth rate than death rate or out-migration.

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- **Reasons behind Migration**
  - **Push Factors:** They make the original place less appealing due to factors like unemployment, poor living conditions, and natural disasters.
  - **Pull Factors:** They make a destination more appealing due to factors like better job opportunities and a stable environment.

Historical Phases of Population Growth (Refer to Figure 2.12)

- These phases and related characteristics are highlighted in the following table:

Census Years	Total Population	Growth Rate	
		Absolute Number	% of Growth
1901	238396327	———	———
1911	252093390	(+) 13697063	(+) 5.75
1921	251321213	(-) 772117	(-) 0.31
1931	278977238	(+) 27656025	(+) 11.60
1941	318660580	(+) 39683342	(+) 14.22
1951	361088090	(+) 42420485	(+) 13.31
1961	439234771	(+) 77682873	(+) 21.51
1971	548159652	(+) 108924881	(+) 24.80
1981	683329097	(+) 135169445	(+) 24.66
1991	846302688	(+) 162973591	(+) 23.85
2001	1028610328	(+) 182307640	(+) 21.54
2011**	1210193422	(+) 181583094	(+) 17.64

* Decadal growth rate: $g = \frac{P_2 - P_1}{P_1} \times 100$

where P_1 = Population of the base year, P_2 = population of the present year

**Source: Census of India, 2011(Provisional)

Figure 2.12: Decadal Growth Rates in India, 1901-2011

Table 2.1: Historical Phases of Population Growth

Phase	Duration	Key Characteristics
Phase I: Stagnant Phase	1901-1921	➢ Very low growth, negative during 1911-1921. ➢ High birth and death rates due to poor health, illiteracy, and inefficient distribution of basic necessities.
Phase II: Steady Growth	1921-1951	➢ Decrease in mortality due to health, sanitation, transport, and communication improvements. ➢ High birth rate led to a higher growth. ➢ Faced challenges like the Great Economic Depression and World War II.
Phase III: Population Explosion	1951-1981	➢ Rapid fall in mortality, but high fertility rate. ➢ Annual growth rate was 2.2%. ➢ Improved living conditions leading to high natural increase. ➢ Increased international migration.
Phase IV: Decelerating Growth	Post-1981	➢ Growth rate started slowing, though still high. ➢ Downward trend in birth rate due to increased marriage age, better quality of life, and female education.

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- **Future Projection:** The World Development Report projects India's population to reach 1,350 million by 2025.
- **Variation in Growth Rates:** The country shows a wide variation in growth rates from one region to another.

Regional Variation in Population Growth

- **1991-2001**
  - Low growth rates (below 20% over the decade) in Southern states: Kerala, Karnataka, Tamil Nadu, Andhra Pradesh, Odisha, Puducherry, and Goa.
    - Kerala had the lowest growth rate in the country at 9.4%.
  - High growth rates (20-25%) in a belt from west to east covering: **Gujarat, Maharashtra, Rajasthan, Punjab, Haryana, Uttar Pradesh, Uttarakhand, Madhya Pradesh, Sikkim, Assam, West Bengal, Bihar, Chhattisgarh, and Jharkhand.**
- **2001-2011 (Refer to Figure 2.13)**
  - Almost all states and UTs had lower growth rates compared to the previous decade.
  - Among the six most populous states, all showed a decline in growth rate, with the most significant decline in Maharashtra by 6.7 percentage points.
  - Contrarily, Tamil Nadu and Puducherry showed growth rate increases during this period.

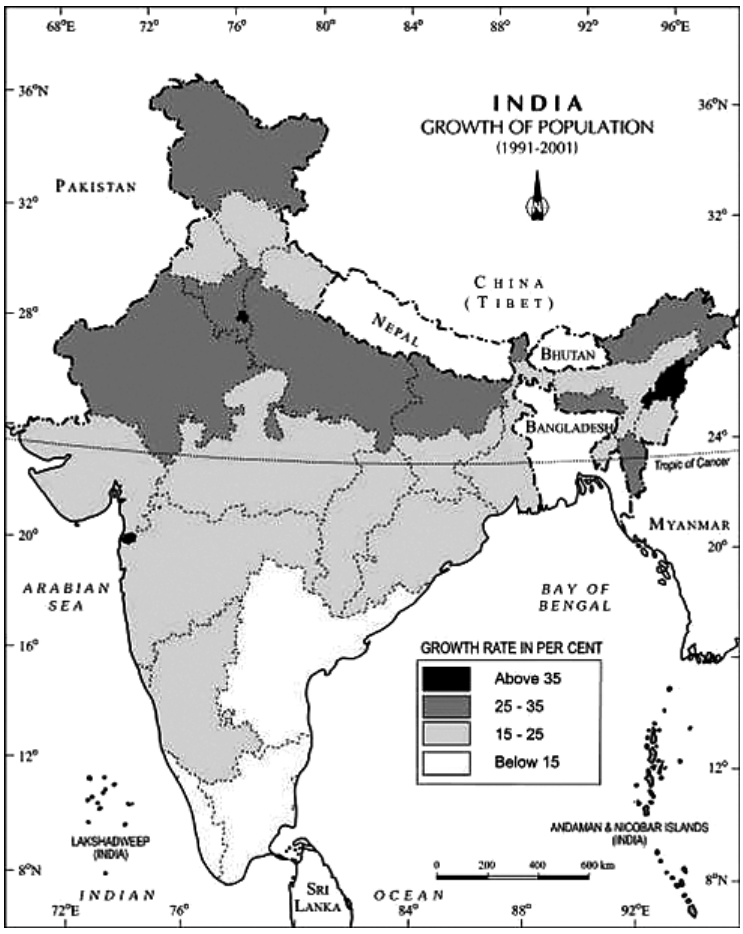

Figure 2.13: India - Growth of Population

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POPULATION: DISTRIBUTION, DENSITY AND GROWTH
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Government Initiatives

- **National Youth Policy (NYP-2014):** It was launched in February 2014 with the vision of empowering the youth for the nation's better position globally.
  - The Policy defined 'youth' as individuals aged 15-29 years.
- **National Policy for Skill Development and Entrepreneurship (2015):** Aims at aligning skilling activities to standards and demand centres.
- **National Youth Policy 2021:** NYP seeks to catalyse widespread action on youth development on five priority areas viz. education; employment & entrepreneurship; youth leadership & development; health, fitness & sports; and social justice.

Population Composition

- It can be defined as the demographic structure of the population.
- Consider age, sex, literacy, health condition, occupation, income level, etc.
- Population pyramids **(Refer to Figure 2.14)** visualise age and gender data of the population.
  - Pyramid shape indicates birth, death, and dependency rates.
  - Broad base and narrow top, as seen in Kenya **(Refer to Figure 2.15)**, suggest high birth and death rates.
  - Broad young age group, as in India, **(Refer to Figure 2.16)** indicates a large young and expanding labour force.
  - Narrow base, as in Japan, **(Refer to Figure 2.17)** suggests low birth rates and a higher elderly population.

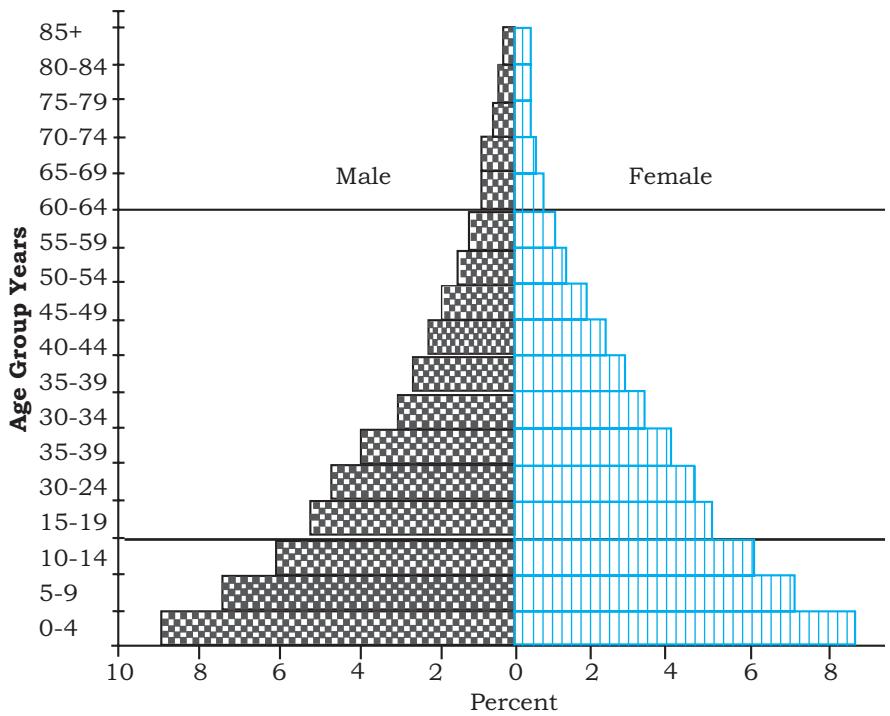

Figure 2.14: Population Pyramid

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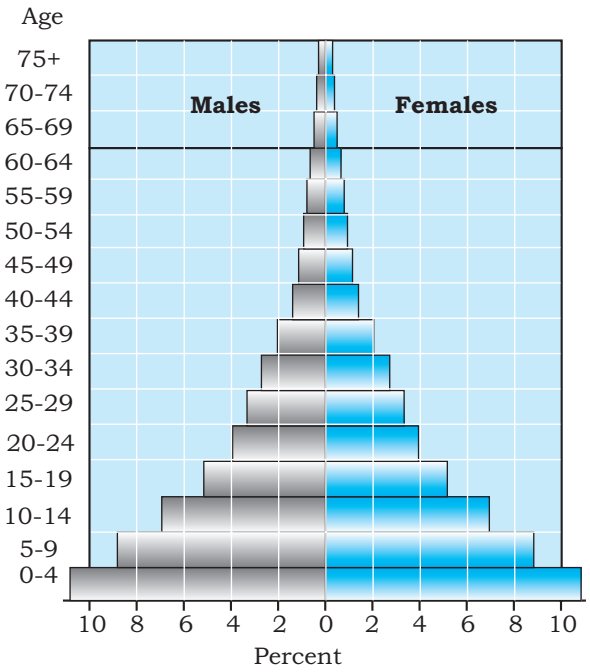

Figure 2.15: Population Pyramid of Kenya

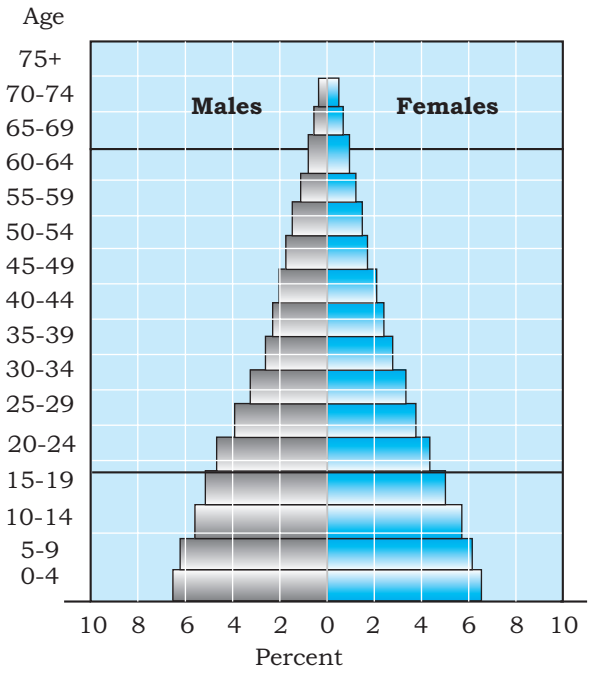

Figure 2.16: Population Pyramid of India

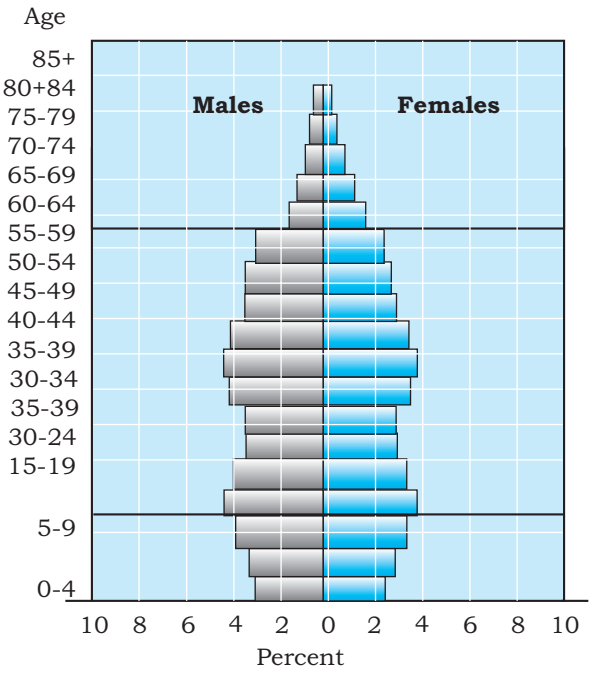

Figure 2.17: Population Pyramid of Japan

Rural – Urban Composition

- About 68.8% of India's population resided in villages as of 2011.
- India comprises 640,867 villages as per the 2011 Census, with 93.2% being inhabited.
- States like Bihar and Sikkim have a very high percentage of rural population, while Goa and Maharashtra have just over half their population in villages.

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- The size of villages varies considerably across the country.
- Urban population accounts for 31.16%, growing rapidly due to economic development and improved health conditions.
- Urbanisation varies across the country with significant rural-urban migration, especially along major road and rail links.

Adolescent Population	India's National Population Policy (NPP) 2000
✤ 20.9% of the population in 2011 were adolescents (10-19 years). 52.7% were male, and 47.3% were female. ✤ Adolescents, although representing potential, also come with challenges: early marriage, illiteracy, school dropouts, nutritional deficiencies, maternal mortality, HIV/AIDS infections, disabilities, substance abuse, juvenile crimes, etc.	✤ The policy was initiated recognizing the pivotal role of family planning in improving health and welfare. ✤ The objectives of this policy encompass goals such as providing free and compulsory education up to 14 years, reducing infant mortality, ensuring universal child immunisation, advocating for delayed marriage for girls, and focusing on making family welfare a people-centric program.

Linguistic Composition (Refer to Figure 2.18)

- India is a diverse nation linguistically. Grierson's survey (1903-1928) noted 179 languages and 544 dialects.
- Modern India recognizes about 22 Scheduled languages.
- Hindi speakers make up the highest percentage among the scheduled languages.
- Linguistic boundaries in India often overlap and are not strictly defined.

Family	Sub-Family	Branch/Group	Speech Areas
Austric (Nishada) 1.38%	Austro-Asiatic Austro- Nesian	Mon-Khmer Munda	Meghalaya, Nicobar Islands West Bengal, Bihar, Orissa, Assam, Madhya Pradesh, Maharashtra Outside India
Dravidian (Dravida) 20%		South-Dravidian Central Dravidian North Dravidian	Tamil Nadu, Karnataka, Kerala Andhra Pradesh, M.P., Orissa, Maharashtra Bihar, Orissa, West Bengal, Madhya Pradesh
Sino-Tibetan (Kirata) 0.85%	Tibeto - Myanmari Siamese-Chinese	Tibeto-Himalayan North Assam Assam-Myanmari	Jammu & Kashmir, Himachal Pradesh, Sikkim Arunachal Pradesh Assam, Nagaland, Manipur, Mizoram, Tripura, Meghalaya
Indo- European (Aryan) 73%	Indo-Aryan	Iranian Dardic Indo-Aryan	Outside India Jammu & Kashmir Jammu & Kashmir, Punjab, Himachal Pradesh, U.P., Rajasthan, Haryana, M.P., Bihar, Orissa, West Bengal, Assam, Gujarat, Maharashtra, Goa

Source: Ahmed, A. (1999): Social Geography, Rawat Publication, New Delhi

Figure 2.18: Classification of Modern Indian Languages

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Religious Composition (Refer to Figure 2.19)

- Religion plays a significant role in India's cultural and political life.
- **Hindus:** They are predominant in many states, except some border districts, Jammu & Kashmir, North Eastern hill states, and parts of Deccan Plateau and Ganga Plain.
- **Muslims:** They are concentrated in areas like Jammu & Kashmir, parts of West Bengal, Kerala, Uttar Pradesh, Delhi, and Lakshadweep.
- **Christians:** Their population is found mainly in the Western coast around Goa and Kerala, and hill states like Meghalaya, Mizoram, Nagaland.

Religious Group	2011	
	Population (in million)	% of Total
Hindus	966.3	79.8
Muslims	172.2	14.2
Christians	27.8	2.3
Sikhs	20.8	1.7
Buddhists	8.4	0.7
Jains	4.5	0.4
Other Religions and Persuasions (ORP	7.9	0.7
Religion Not Stated)	2.9	0.2

Figure 2.19: Religious Communities of India, 2011

- **Sikhs:** They reside primarily in Punjab, Haryana, and Delhi.
- **Jains:** They are largely in urban areas of Rajasthan, Gujarat, and Maharashtra.
- **Buddhists:** They are predominant in areas of Maharashtra, Sikkim, Arunachal Pradesh, Ladakh, Tripura, and Lahaul and Spiti.

India's diversity in rural-urban distribution, languages, and religions provides insights into its complex socio-cultural fabric, which has evolved over millennia and is reflective of the country's rich history and heritage.

Religion and Landscape

Formal expression of religions on landscape is manifested through sacred structures, use of cemetries and assemblages of plants and animals, groves of trees for religious purposes. Sacred structures are widely distributed throughout the country. These may range from inconspicuous village shrines to large Hindu temples, monumental masjids or ornately designed cathedrals in large metropolitan cities. These temples, masjids, gurudwaras, monastries and churches differ in size, form, space use and density, while attributing a special dimension to the total landscape of the area.

Composition of Working Population

- **Economic Status Groups**
  - **Main Workers:** Those who have had work for the major part of the reference year.
  - **Marginal Workers:** Those who worked for a relatively smaller part of the year and were available for work for the remaining major part.
  - **Non-Workers:** Those who didn't work at all.
- **Proportion of Workers:** Only **39.8% of the Indian population** was engaged in work (as of 2011), which suggests a large proportion of the dependent population. The implication is a potential high rate of unemployment or underemployment. (Refer to Figure 2.20)

Standard Census Definition of Working Population

- **Main Worker** is a person who works for atleast 183 days (or six months) in a year.
- **Marginal Worker** is a person who works for less than 183 days (or six months) in a year.

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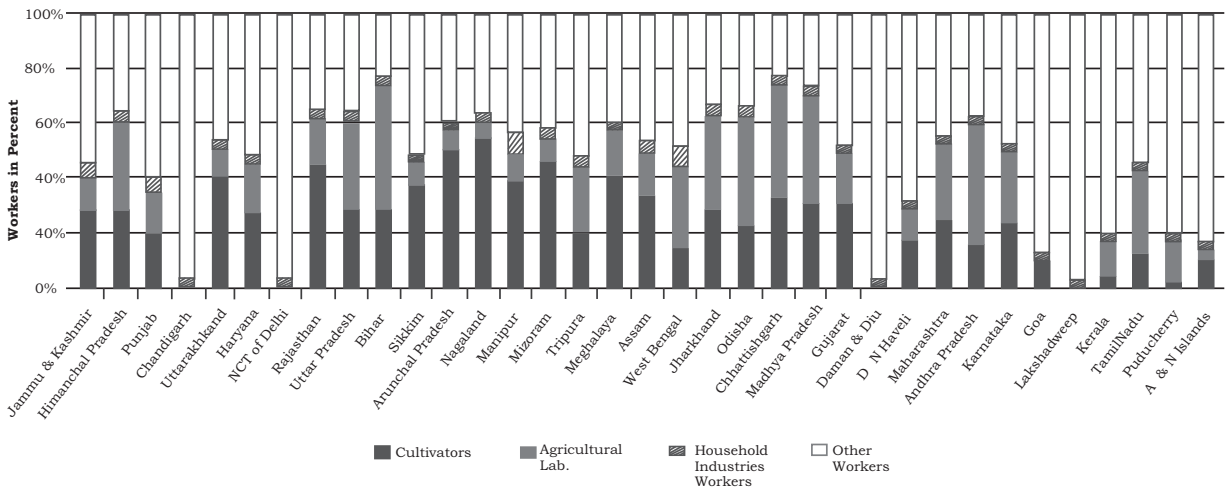

Figure 2.20: India – Occupational Structure, 2011

- **Work Participation Rate (WPR):** It is defined as the percentage of the total population that constitutes the workforce (both employed and unemployed). It indicates how effectively the labour potential is utilised in the economy. The formula for WPR is:

WPR = (Total Workers (Main+Marginal) / Total Population)) × 100

Based on the information provided, the WPR of India in 2011 was 39.8%.

- **Variation in Work Participation Rate:** The WPR varies across states and Union Territories. For example: Goa: 39.6% and Daman and Diu: 49.9%.
  - States with higher WPR include Himachal Pradesh, Sikkim, Chhattisgarh, Andhra Pradesh, Karnataka, Arunachal Pradesh, Nagaland, Manipur, and Meghalaya.
  - Among Union Territories, Dadra and Nagar Haveli and Daman and Diu have higher participation rates.
  - A higher WPR in areas of lower economic development in India can be attributed to the need for manual labour in subsistence activities.
- **Occupational Composition:**
  - **Primary Sector Workers**: A significant portion (54.6%) of the working population is engaged in agricultural activities (cultivators and agricultural labourers).
  - **Secondary and Tertiary Sectors:** 3.8% are engaged in household industries, while 41.6% are involved in other tasks such as non-household industries, trade, commerce, construction, repair, and various services.
  - **Gender Disparity:** Males outnumber females in all three sectors of occupation.

The World Population: Density, Distribution and Growth

- People are a country's true wealth. They utilise the nation's resources and determine its policies.
- **Global Population at a Glance:** As of the beginning of the 21st century, the global population exceeded 6 billion.
- **Patterns of Global Population Distribution:**
  - A striking statistic is that nearly 90% of the global population occupies only about 10% of the total land area.

It's vital to note

- How many men and women a country comprises.
- The annual number of births.
- Death rates and causes.
- The distribution between rural and urban populations.
- Literacy status and occupational distinctions.

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- The ten most populous nations house around 60% of the entire world's inhabitants. Out of these, six nations belong to Asia.

George B. Cressey once remarked,
"Asia has many places where people are few and few places where people are very many."
This observation underscores the global trend in population distribution.

Density of Population

- Density can be defined as the ratio of people to the land's size. It provides a lens to observe how compactly a region is populated.
- **Calculation Formula:** Density of Population = Population/Area.
- **Example:**
  - For Region X with an area of 100 sq km and a population of 1,50,000: Density is computed to be 1,500 person/sq km.
- Asia stands out with the highest population density.

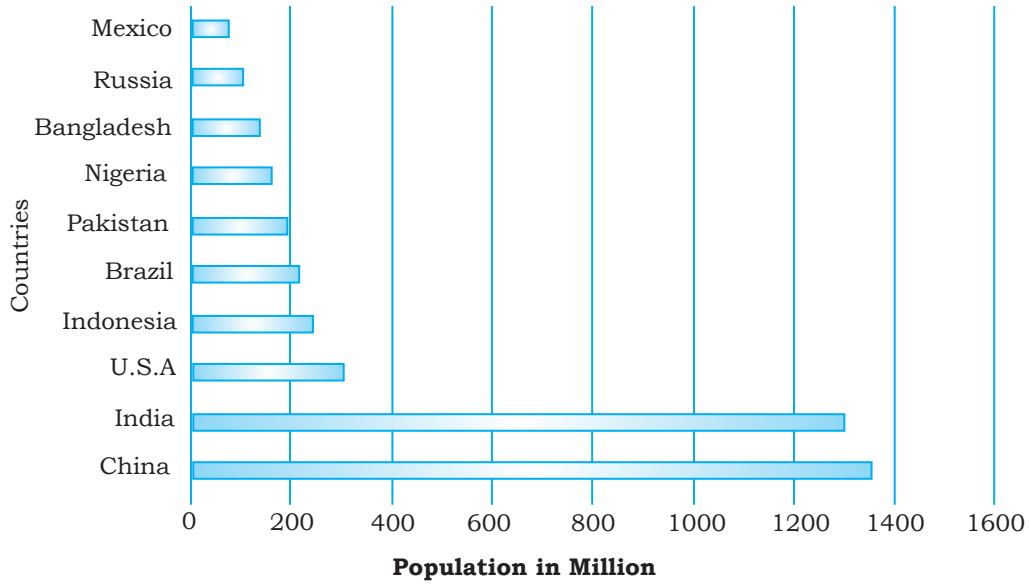
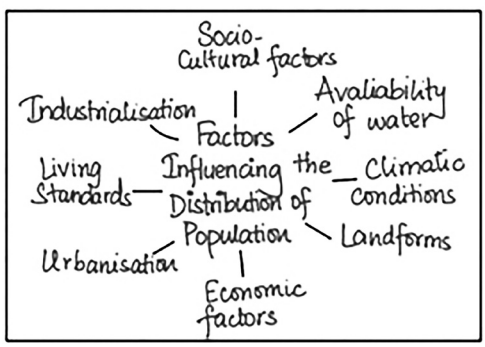


Figure 2.21: Most Populous Countries

Factors Influencing the Distribution of Population

- **Geographical Factors**
  - **Availability of Water:** Water is essential for life. So, there is a preference for areas with easy access to fresh water for drinking, cooking, bathing, agriculture, industries, and navigation. And that is why river valleys tend to be densely populated.
  - **Landforms:** People favour flat plains and gentle slopes due to the ease of agriculture, construction, and infrastructure development.
    - Mountainous and hilly areas impede transport, agricultural, and industrial activities, leading to lower population densities. For example, Ganga plains have high density, while Himalayan zones are sparsely populated.



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- ✧ **Climate:** Extreme climates, like very hot or cold deserts, are not ideal for habitation. Areas with comfortable climates and minimal seasonal variations are preferred.
  - ❒ Heavy rainfall areas or those with harsh climates tend to have low populations.
  - ❒ Mediterranean regions have historically been preferred for their pleasant climate.
- ✧ **Soils:** Fertility of soil plays a role in population distribution. Areas with fertile loamy soils are more populated due to their suitability for intensive agriculture.

✤ **Economic Factors**

- ✧ **Minerals:** Regions with mineral deposits tend to attract industries that create employment opportunities, leading to population influx. For example, the Katanga Zambia copper belt in Africa.

✤ **Urbanisation:** Cities offer better amenities, employment opportunities, education, medical facilities, and transportation. The allure of city life and civic amenities lead to migration from rural to urban areas, causing cities to grow.

- ✧ Mega cities worldwide consistently draw numerous migrants.

✤ **Industrialisation:** Industrial belts provide a plethora of job opportunities, causing a surge in population. Population in these areas consists of diverse professions ranging from factory workers to service providers.

- ✧ The Kobe-Osaka region in Japan, for instance, is densely populated due to its many industries.

✤ **Social and Cultural Factors:** Certain locations draw a larger crowd due to their religious or cultural significance. Areas plagued by social or political unrest often see a decline in population.

- ✧ Governments sometimes provide incentives to promote habitation in less populated areas or to reduce crowding in densely populated regions.

Demographic Transition

✤ Demographic transition theory is a tool to describe and predict future populations based on **societal progressions.**

Rural, Agrarian → Demographic Transition → Urban, Industrial

✤ It notes a transition from high births and deaths to low births and deaths as societies evolve from rural agrarian to urban industrial settings.

✤ These societal changes are categorised into stages, which compose the demographic cycle.

Stages of the Demographic Transition (Refer Figure 2.22)

✤ **First Stage:** This stage witnesses high fertility and mortality due to external factors like epidemics. A majority work in agriculture, valuing large families. Technological levels are low and life expectancy is minimal. About two centuries ago, all countries were in this phase.

✤ **Second Stage:** Fertility remains high initially but decreases over time, accompanied by a reduced mortality rate due to improved sanitation and health. The result is a significant net population addition.

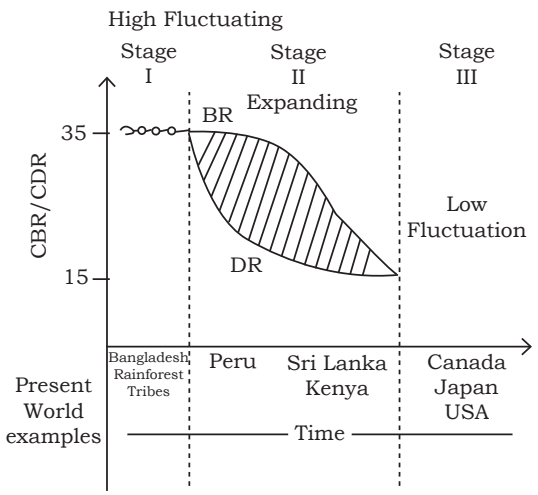

Figure 2.22: Demographic Transition Theory

POINTS TO PONDER

Is it possible to have Demographic transition in an agrarian economy? Cite an example and elucidate how demographic transition can also be realised in a non-industrial agrarian economy?

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- **Third Stage:** Both fertility and mortality rates drop, leading to slow or stable population growth. Societies become urbanised and technologically advanced. Families deliberately limit their size, showcasing human adaptability in fertility. Presently, countries are at varying phases of this transition.

Population Control Measures

- **Family Planning:** It focuses on spacing or preventing births. Providing access to family planning services plays a role in curbing population growth and enhancing women's health.
- **Some Effective Instances:** Propaganda, freely available contraceptives, and tax disincentives for large families can aid in population control.
- **Significance:** For resource sustainability, controlling rapid population growth remains essential.

Thomas Malthus's Insight

In his 1798 theory, Malthus suggested that population growth could outpace food supply, potentially leading to population crashes through famine, disease, and war. Preventive checks are more effective than physical ones.

POINTS TO PONDER

In 1952, India became the first country in the developing world to create a state-sponsored family planning program, the National Family Planning Program. Analyse the reasons behind the failure of our country in this realm, even after being one of the early risers.

Human Resources and Development

Significance of Human Resource

- Human resource is considered the ultimate resource as it turns natural elements into useful resources.
- People differ in their educational levels, age, and sex, and their distribution is not uniform across the world.

Growth vs. Development

Table 2.2: Comparison between Growth and Development

Criteria	Growth	Development
Nature	Quantitative and value-neutral.	Qualitative change and always value-positive.
Direction	Can be positive (increase) or negative (decrease).	Requires an addition or improvement to existing conditions.
Illustration	An increase in a city's population	Growth in population and amenities signifies development.

Traditional Measures of Development

- **Historical Context:** For several decades, the primary metric for a country's development level was its economic growth.
  - A country with a bigger economy was perceived as more developed.
- **Modern Understanding:** Quality of life, opportunities, and freedoms are essential aspects of development.
  - Emphasis on these factors gained traction in the late 1980s-90s, thanks to pioneering economists.

Concept of Human Development

- **Concept:** It was introduced by **Dr. Mahbub-ul-Haq**. People are at the core of this concept. It aims at improving overall quality of life by enlarging people's choices.
- **Objective:** It aims to create conditions for a meaningful life, encompassing health, talent development, societal participation, and freedom to achieve personal goals.

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Example: Pradhan Mantri Kaushal Vikas Yojna (PKVY) was launched in 2015 with the aim to train one crore Indian youth between 2016 to 2020. It focuses on providing quality training to potential and existing wage earners to enhance employable skills.

POINTS TO PONDER

Many Indicators of Human development have been devised in the recent past. Elucidate with examples how these have helped us re-strategise and redirect our development initiatives both globally and locally.

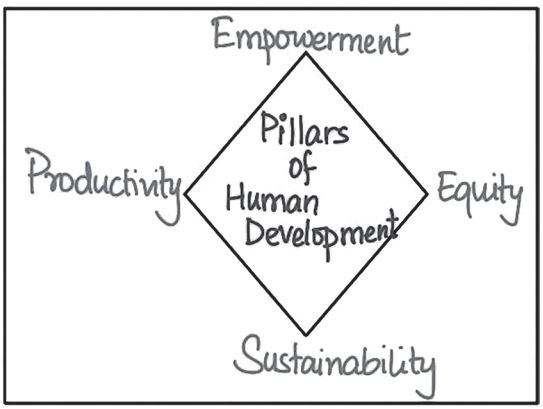
Key Contributions from Economists

Table 2.3: The Contributions from Dr. Mahbub-ul-Haq and Prof. Amartya Sen

Economist	Contribution
Dr. Mahbub-ul-Haq	Introduced the Human Development Index (1990) emphasising choices leading to long, healthy, and dignified lives.
Prof. Amartya Sen	Advocated that development should focus on increasing freedoms. Highlighted the role of social and political institutions in enhancing or limiting these freedoms.

Barriers to Choices and Capabilities

- **Challenges:** Many face difficulties in making basic choices due to:
  - Lack of knowledge.
  - Material poverty.
  - Social discrimination.
  - Inefficient institutions.
- **Significance:** Building capabilities in health, education, and resources is essential for broadening choices.
  - Without these capabilities, people's choices remain restricted. For instance, a lack of education or resources limits career and healthcare choices, respectively.



The Four Pillars of Human Development

Table 2.4: The four pillars of Human Development

Pillar	Definition	Implications/Key Points	Examples/Notes
Equity	Ensuring equal access to opportunities for everyone.	Opportunities shouldn't be biased based on gender, race, income, caste, etc.	In India, disparities are observed with many women and socio-economically disadvantaged groups dropping out of school, limiting their future.
Sustainability	Maintaining the availability of opportunities over time.	Opportunities should remain consistent for every generation. Utilise resources with future generations in mind.	Not emphasising girls' education in a community can limit their future career and life choices.
Productivity	Focusing on human labour productivity or efficiency in human work.	Human capabilities need enhancement to improve productivity. The true wealth of nations is in its people.	Investments in health and education can lead to better work efficiency.
Empowerment	Endowing individuals with the power to make choices.	It comes from increased freedom and capability. Requires effective governance and people-focused policies.	It's essential to empower socially and economically disadvantaged groups.

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Approaches to Human Development

Table 2.5: The Approaches to Human Development

Approach	Description	Key Points
Income Approach	One of the oldest methods, linking human development to income.	The level of income is believed to reflect the degree of freedom an individual has. Higher income is associated with a higher level of human development.
Welfare Approach	Regards human beings as beneficiaries or targets of all developmental activities.	Advocates for increased government spending on education, health, and social amenities. People are seen as passive recipients, not active participants in development.
Basic Needs Approach	Introduced by the International Labour Organisation (ILO) to emphasise the provision of basic necessities.	Identifies six basic needs: health, education, food, water supply, sanitation, and housing. The approach does not focus on individual choices but rather on providing these basic needs.
Capability Approach	Linked with Prof. Amartya Sen and emphasises the development of human capabilities.	Key areas of focus include health, education, and access to resources. Building human capabilities is central to enhancing human development.

Measuring Human Development

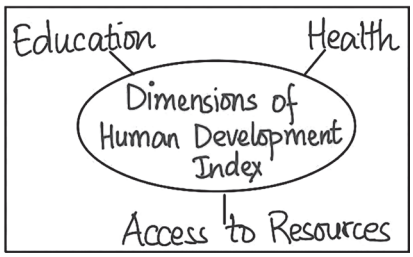
- The methods to measure human development are continually being refined.
- Researchers are exploring links between levels of corruption or political freedom and human development.
- There's an ongoing discussion about introducing indices like a political freedom index and corruption listing.

POINTS TO PONDER

Economically strong states provide better services to people to help in human development. So what could be the reasons behind the better performance of Kerala in HDI as compared to other economically advanced states of India.

The Human Development Index (HDI)

- The UNDP has been publishing the Human Development Report annually since 1990.
- The HDI ranks countries based on their performance in **health, education, and access to resources.**
- This ranking system uses a score ranging from 0 to 1. A score closer to 1 indicates a higher level of human development.
  - For instance, a score of 0.983 is considered very high, while 0.268 indicates a very low level.
- The HDI is calculated by summing up weights assigned to specific dimensions, with each dimension given a weightage of 1/3. Although the HDI reflects achievements in key areas, it isn't the most reliable measure since it doesn't consider distribution.
- **Key Dimensions of HDI include**
  - **Health:** The chosen indicator for health is life expectancy at birth. A higher life expectancy indicates that people are likely to live longer and healthier lives.
  - **Education:** This is represented by the adult literacy rate and the gross enrolment ratio, which showcase access to knowledge in a country.



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- **Access to Resources:** This is measured by looking at the purchasing power (in U.S. dollars) of the country's inhabitants.

Bhutan's Unique Approach - Gross National Happiness (GNH)

- Bhutan is the only country that uses GNH as a measure of its progress.
- The country ensures that material and technological advancements do not adversely impact the environment or their cultural values.
- The core principle is that material progress should not come at the cost of happiness, emphasising the spiritual, non-material, and qualitative facets of development.

The Human Poverty Index (HPI)

- The HPI is a tool that measures the shortfall in human development and is a non-income measure. This index considers factors like:
  - The probability of not surviving till the age of 40.
  - The adult illiteracy rate.
  - The number of people who lack access to clean water.
  - The count of underweight children. Often, the HPI provides insights that might be more revealing than the HDI.
- **A Combined Analysis:** Evaluating both the HDI and HPI can give a more accurate picture of a country's human development.

International Comparisons

General Observations

- International comparisons of human development yield fascinating insights such as the size of territory and per capita income aren't directly proportional to human development.
- Often, smaller countries outperform larger ones in human development.
- Poorer nations can rank higher than their wealthier neighbours concerning human development.
  - For example, **Sri Lanka and Trinidad and Tobago have higher HDI ranks** than India despite smaller economies.
  - Within India, **Kerala outperforms Punjab and Gujarat in HDI** despite a lower per capita income.

Rank	Country	
1.	Switzerland	0.962
2.	Norway	0.961
3.	Iceland	0.959
4.	Hongkong	0.952
5.	Australia	0.951
6.	Denmark	0.948
7.	Sweden	0.947
8.	Ireland	0.945
9.	Germany	0.942
10.	Netherlands	0.941
Source: Human Development Report, 2021		

Figure 2.23: Top Ten Ranked Countries with High HDI

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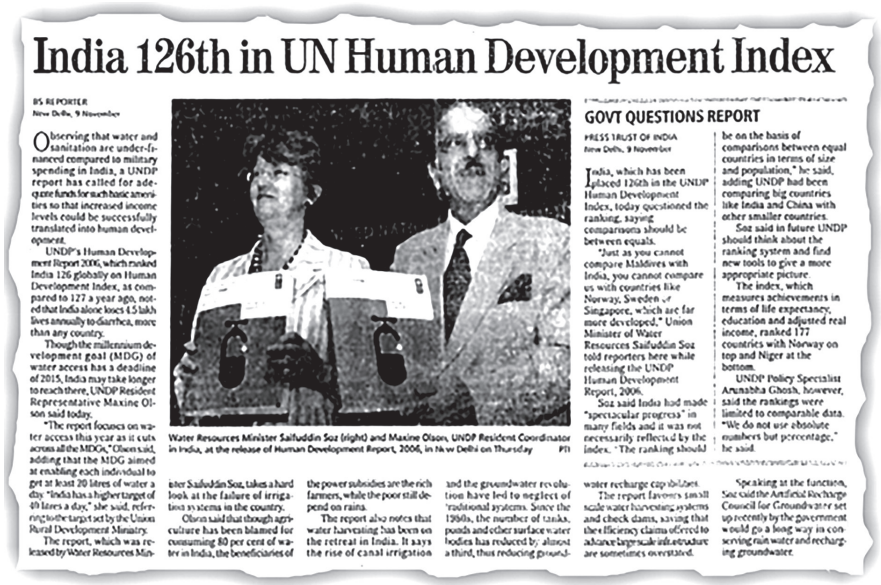
Classification of Countries by HDI

Table 2.6: Classification of Countries by HDI

Human Development Level	Characteristics
Very High Human Development	➢ Score over 0.800 in HDI. ➢ 66 countries as per the Human Development Report of 2020. Top ten countries listed in **figure 2.23**
High Level of Human Development	➢ Consists of 53 countries. ➢ Education and healthcare are primary government priorities. ➢ Heavy investment in the social sector and evidence of good governance.
Medium Level of Human Development	➢ Largest group with 37 countries. ➢ Emerged post-WWII or post-Soviet Union dissolution in 1990. ➢ Improved HDI via people-oriented policies and reduced social discrimination.
Low Level of Human Development	➢ Comprises 33 countries. ➢ Challenges like political turmoil, social instability, famine, or diseases. ➢ Urgent policy interventions needed for human development.

Misconceptions & Insights

- Some attribute low HDI scores to cultural or religious factors, which is misleading.
- To comprehend why an area continually reports specific HDI levels, it's vital to:
  - Examine government spending on social sectors.
  - Consider the political environment and the freedoms people enjoy.
- Countries with high HDI invest more in social sectors, generally enjoy political stability and distribute resources more equitably.
- In contrast, places with low HDI, allocate more to defence rather than social sectors, indicating prevalent political instability and lacklustre economic development.
- In accordance with the Human Development Report 2021-22, the rank of India is 132nd, among 191 countries. The HDR was titled as "Uncertain Times, Unsettled Lives: Shaping our Future in a Transforming World".



India 126th in UN Human Development Index

BS REPORTER
New Delhi, 9 November

Observing that water and sanitation are under-financed compared to military spending in India, a UNDP report has called for adequate funds for such basic amenities so that increased income levels could be successfully translated into human development.

UNDP's Human Development Report 2006, which ranked India 126 globally on Human Development Index, as compared to 127 a year ago, noted that India alone loses 4.5 lakh lives annually to diarrhea, more than any country.

Though the millennium development goal (MDG) of water access has a deadline of 2015, India may take longer to reach there, UNDP Resident Representative Maxine Olson said today.

"The report focuses on water access this year as it cuts across all the MDGs," Olson said, adding that the MDG aimed at enabling each individual to get at least 20 litres of water a day. "India has a higher target of 40 litres a day," she said, referring to the target set by the Union Rural Development Ministry.

The report, which was released by Water Resources Minister Saifuddin Soz, takes a hard look at the failure of irrigation systems in the country.

Olson said that though agriculture has been blamed for consuming 80 per cent of water in India, the beneficiaries of the power subsidies are the rich farmers, while the poor still depend on rains.

The report also notes that water harvesting has been on the retreat in India. It says the rise of canal irrigation and the groundwater revolution have led to neglect of traditional systems. Since the 1960s, the number of tanks, ponds and other surface water bodies has reduced by almost a third, thus reducing groundwater recharge capabilities.

The report favours small scale water harvesting systems and check dams, saying that the efficiency claims of/tred to advance large scale infrastructure are sometimes overstated.

Speaking at the function, Soz said the Artificial Recharge Council for Groundwater set up recently by the government would go a long way in conserving rain water and recharging groundwater.

Water Resources Minister Saifuddin Soz (right) and Maxine Olson, UNDP Resident Coordinator in India, at the release of Human Development Report, 2006, in New Delhi on Thursday PTI

GOVT QUESTIONS REPORT

PRESS TRUST OF INDIA
New Delhi, 9 November

India, which has been placed 126th in the UNDP Human Development Index, today questioned the ranking, saying comparisons should be between equals.

"Just as you cannot compare Maldives with India, you cannot compare us with countries like Norway, Sweden or Singapore, which are far more developed," Union Minister of Water Resources Saifuddin Soz told reporters here while releasing the UNDP Human Development Report, 2006.

Soz said India had made "spectacular progress" in many fields and it was not necessarily reflected by the index. "The ranking should be on the basis of comparisons between equal countries in terms of size and population," he said, adding UNDP had been comparing big countries like India and China with other smaller countries.

Soz said in future UNDP should think about the ranking system and find new tools to give a more appropriate picture.

The index, which measures achievements in terms of life expectancy, education and adjusted real income, ranked 177 countries with Norway on top and Niger at the bottom.

UNDP Policy Specialist Arunabha Ghosh, however, said the rankings were limited to comparable data. "We do not use absolute numbers but percentage," he said.

POPULATION: DISTRIBUTION, DENSITY AND GROWTH
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Gender Discrimination and Societal Implications

- The division of society based on gender (male, female, and transgender) is a mixture of both natural/biological and socially constructed norms.
- The societal roles assigned to genders lead to differentiation, discrimination, and exclusion, which hinder development.
- The UNDP acknowledges the challenge and emphasises the need for gender inclusivity in development processes.
- Discriminating against any gender, especially on grounds of opportunities and rights, is harmful to societal growth and progress.

'Beti Bachao–Beti Padhao' Campaign

- Launched by the Government of India, this nationwide campaign recognizes and addresses the negative impacts of gender discrimination.
- The name translates to "**Save the Daughter – Educate the Daughter,**" emphasising the dual objectives of ensuring the safety and well-being of female children and providing them with equal educational opportunities.

Work Participation of Women

- Women predominantly work in the primary sector, but there's a notable increase in their participation in the secondary and tertiary sectors over the years.

Occupational Categories

The 2011 Census has divided the working population of India into four major categories:

1. Cultivators
2. Agricultural Labourers
3. Household Industrial Workers
4. Other Workers.

Sectoral Shift in the Economy

- The proportion of workers in the agricultural sector has seen a decline, moving from 58.2% in 2001 to 54.6% in 2011. **(Refer to Figure 2.24)**
- The decline in agricultural employment in India signifies a shift towards non-farm sectors, reflecting a broader economic transition seen globally as countries develop.

Categories	Population			
	Persons	% to total Workers	Male	Female
Primary	26,30,22,473	54.6	16,54,47,075	9,75,75,398
Secondary	1,83,36,307	3.8	97,75,635	85,60,672
Tertiary	20,03,84,531	41.6	15,66,43,220	4,37,41,311

Figure 2. 24: Sectoral Composition of workforce in India, 2011

Spatial Variation of Work Participation

- Different states in India have varied work participation rates based on their geographical and socio-economic contexts.
- States like Himachal Pradesh and Nagaland have a significant number of cultivators due to the geographical terrain and the predominance of agriculture.
- Conversely, states such as Bihar, Andhra Pradesh, and West Bengal, among others, have a higher proportion of agricultural labourers, indicating limited land ownership and more dependency on manual labour.
- Urbanised areas like Delhi and Chandigarh have a larger percentage of workers in non-farm sectors, pointing to urbanisation and industrialization's impact.

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Human Settlements

- **Definition:** It is defined as a cluster of dwellings where humans reside, involving grouping of people and allocation of territory for economic support.
- Settlements range from hamlets to metropolitan cities. As the size changes, the economic character, social structure, and other factors also shift.

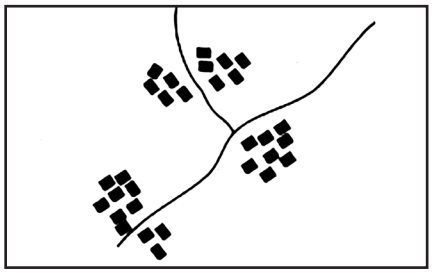
Difference between Rural and Urban Settlements

Table 2.7: Comparison between Rural and Urban Settlements

Type	Description
Rural	➢ **Rural settlements** rely on primary activities with intimate social relations. They derive support from land-based primary activities with intimate social relations.
Urban	➢ **Urban settlements** engage in secondary and tertiary activities, act as economic nodes, and maintain a complex social fabric. They depend on raw material processing, manufacturing, and services. ➢ Urban areas are nodes of economic growth and provide services to their rural hinterlands through transport and communication networks. They also have complex and fast-paced lifestyles with formal social relations.

Types of Rural Settlements

Table 2.8: Types of Rural Settlements

Settlement Type	Characteristics	Examples/Locations
Clustered (Refer to Figure 2.25)	Compact or closely built up area of houses with a recognizable pattern.  **Figure 2.25:** Clustered Settlements	Found in fertile alluvial plains and northeastern states, Bundelkhand region, and areas in Rajasthan for water scarcity reasons.
Semi-Clustered (Refer to Figure 2.26)	Results from fragmentation of a large compact village or clustering in a dispersed settlement's restricted area. Dominant community occupies the central part.  **Figure 2.26:** Semi-Clustered Settlements	Found in the Gujarat plain and parts of Rajasthan.

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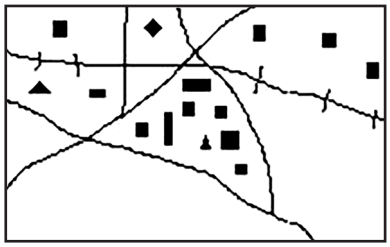
Hamleted	Settlement fragmented into several units bearing a common name (e.g., **panna, para, palli, nagla, dhani**).	Found in the middle and lower Ganga plain, Chhattisgarh, and lower valleys of the Himalayas.
Dispersed (Refer to Figure 2.27)	Appears as isolated huts or hamlets in remote areas.  **Figure 2.27:** Dispersed settlements in Nagaland	Found in Meghalaya, Uttarakhand, Himachal Pradesh, and Kerala due to the terrain and fragmented land resource base.
Note: Factors affecting rural settlements include physical features (terrain, altitude, climate, water availability), cultural and ethnic factors (social structure, caste, religion), and security reasons (defence against thefts and robberies).		

Urban Settlements

- **Urban Settlements** are large and compact settlements primarily engaged in non-agricultural, economic, and administrative functions.
- Urban settlements are functionally linked with surrounding rural areas, facilitating direct and indirect exchanges of goods and services.

Evolution of Towns in India

- The British and other European settlers initially focused on coastal locations. As their influence grew, they built towns in their distinctive style, established administrative centres, developed hill-towns as summer resorts, and introduced new civil, administrative, and military areas.
- After India's independence, the nation undertook the task of growth of new towns for administrative and industrial purposes, as well as the expansion of existing towns.

Table 2.9: Evolution of Towns in India

Town Classification	Characteristics & Examples
Ancient Towns	They have historical backgrounds over 2,000 years. Mainly developed as religious and cultural centres. **Examples:** Varanasi, Prayag (Allahabad), Pataliputra (Patna), Madurai.
Medieval Towns	They are rooted in the medieval period. Developed as headquarters of principalities or kingdoms. Often fortified. **Examples:** Delhi, Hyderabad, Jaipur, Lucknow, Agra, Nagpur.
Modern Towns (Refer to Figure 2.28)	These are developed by the British and other Europeans. Initial coastal trading ports include Surat, Daman, Goa, Pondicherry. Principal British hubs: Mumbai (Bombay), Chennai (Madras), Kolkata (Calcutta). Modern industrial towns post-1850, e.g., Jamshedpur. Post-independence administrative headquarters include Chandigarh, Bhubaneswar, Gandhinagar, Dispur. **Industrial centres:** Durgapur, Bhilai, Sindri, Barauni. **Satellite towns around metropolitan cities:** Ghaziabad, Rohtak, Gurugram around Delhi.  **Figure 2.28:** A view of Modern City

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Urbanisation in India

- **2011 Data:** Urbanisation level was 31.16% which is low when compared to developed countries.
- **20th Century Trend:** The urban population grew eleven-fold. Factors contributing were enlargement of urban centres and emergence of new towns.
- **Recent Trend:** The growth rate of urbanisation has slowed in the last two decades. **(Refer to Figure 2.29)**

Year	Number of Towns/ UAS	Urban Population (in Thousands	% of Total Population	Decennial Growth (%)
1901	1,827	25,851.9	10.84	——
1911	1,815	25,941.6	10.29	0.35
1921	1,949	28,086.2	11.18	8.27
1931	2,072	33,456.0	11.99	19.12
1941	2,250	44,153.3	13.86	31.97
1951	2,843	62,443.7	17.29	41.42
1961	2,365	78,936.6	17.97	26.41
1971	2,590	1,09,114	19.91	38.23
1981	3,378	1,59,463	23.34	46.14
1991	4,689	2,17,611	25.71	36.47
2001	5,161	2,85,355	27.78	31.13
2011*	7,935	3,77,000	31.16	31.08

Figure 2.29: India – Trends of Urbanisation 1901-2011

Functional Classification of Towns

Table 2.10: Functional classification of towns

Type	Description & Examples
Administrative	Towns hosting higher-order administrative headquarters. E.g., Chandigarh, New Delhi, Bhopal.
Industrial	Dominated by industries. E.g., Mumbai, Jamshedpur, Bhilai.
Transport	Ports or inland transport hubs. E.g., Kandla (port), Agra (inland transport).
Commercial	Specialise in trade and commerce. E.g., Kolkata, Saharanpur.
Mining	Developed in mineral-rich areas. E.g., Raniganj, Jharia.
Garrison Cantonment	Emerged as garrison towns. E.g., Ambala, Jalandhar.
Educational	Centres of education or major campus towns. E.g.,Roorkee, Allahabad.
Religious and Cultural	Known for their religious/cultural significance. E.g., Varanasi, Amritsar.
Tourist	Popular tourist destinations. E.g., Nainital, Shimla, Jodhpur.

Note: Cities, especially the larger ones, tend to be multifunctional. They often evolve and might not fit into a single category due to intertwined functions.

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Smart Cities Mission

- **Objective:** To promote cities offering core infrastructure, sustainable environment, and a decent quality of life.
- **Features**
  - Applying smart solutions to enhance infrastructure and services.
  - Making areas disaster-resistant.
  - Using fewer resources and offering economical services.
  - Emphasis on sustainable and inclusive development.
  - Focus on compact areas to create replicable models for other cities.

Conclusion

As we draw insights from India's evolving demographic fabric, it becomes clear that geography profoundly influences population dynamics, much like the rest of the world. India stands at the crossroads of rapid urbanisation and socio-economic transitions. The intricate interplay of gender roles, work participation, and the emergence of smart cities underlines the country's journey towards achieving balanced and inclusive growth. As the nation grapples with the challenges and opportunities of a growing population, policies like the National Population Policy 2000 and initiatives focusing on gender equality come to the forefront. As we move forward, understanding these shifts and patterns becomes paramount for policymakers, researchers, and students alike.

Glossary:

- **Urbanisation:** The shift of population from rural to urban areas and the expansion of urban areas.
- **Census:** Official enumeration of the population, with details related to demographic, social, and economic aspects.
- **Sex Ratio:** Number of females per 1000 males.
- **Demography:** The statistical study of populations, including the structure, distribution, and trends.
- **UNDP:** United Nations Development Programme, an organisation focusing on sustainable development.
- **Sectoral Shift:** Transition of the primary working force from one sector of the economy to another.
- **Work Participation Rate:** Percentage of the working population to the total population.
- **Human Settlement:** A cluster of dwellings of any type or size where human beings live.
- **Rural Settlement:** Settlements predominant in rural areas, primarily engaged in primary activities.
- **Urban Settlement:** Large and compact settlements engaged primarily in secondary and tertiary activities.
- **Administrative Towns:** Towns primarily hosting administrative headquarters.
- **Industrial Towns:** Towns that are dominated by industries.
- **Transport Towns:** Centres that emerged as ports or crucial transport hubs.
- **Population Density:** Number of individuals living per unit area.
- **Birth Rate:** Number of live births per thousand people in a year.
- **Death Rate:** Number of deaths per thousand people in a year.
- **Migration:** Movement of people from one region to another.
- **Adolescent Population:** Segment of the population aged between 10 and 19 years.
- **Primary Sector:** Economic activities related to extraction and production of natural resources.
- **Secondary Sector:** Economic activities related to processing and manufacturing.
- **Tertiary Sector:** Services-based economic activities.
- **Functional Classification:** Categorization of towns based on their predominant function.
- **Garrison Cantonment:** Towns developed around military establishments.
- **Natural Increase:** The difference between the birth rate and the death rate, indicating the growth of the population.

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3 Primary Activities

Bibliography: This chapter encompasses the summary of **Chapter 4- XII NCERT** (Fundamentals of Human Geography), **Chapter 3- XII NCERT** (India People And Economy), **Chapter 4- X NCERT** (Contemporary India-II), **Chapter 3- VIII NCERT** (Resource and Development).

Introduction

Economic activities, which generate income, fall into primary, secondary, tertiary, and quaternary sectors. Primary activities are directly dependent on Earth's resources like land, water, vegetation, and minerals. This includes hunting, pastoralism, fishing, forestry, agriculture, mining and quarrying. In this chapter, we will focus on these primary activities with special focus on land use patterns and agriculture in India.

Hunting and Gathering

- Hunting was mainly exercised by earliest humans who relied on their immediate environment for survival. They subsisted through hunting animals and gathering edible plants.
- Further, people in very cold and hot climates depended on hunting. Coastal communities practiced fishing, which modernized over time. Illegal hunting (poaching) led to the endangerment of many species. Hence hunting was banned in India for conservation and wildlife protection.

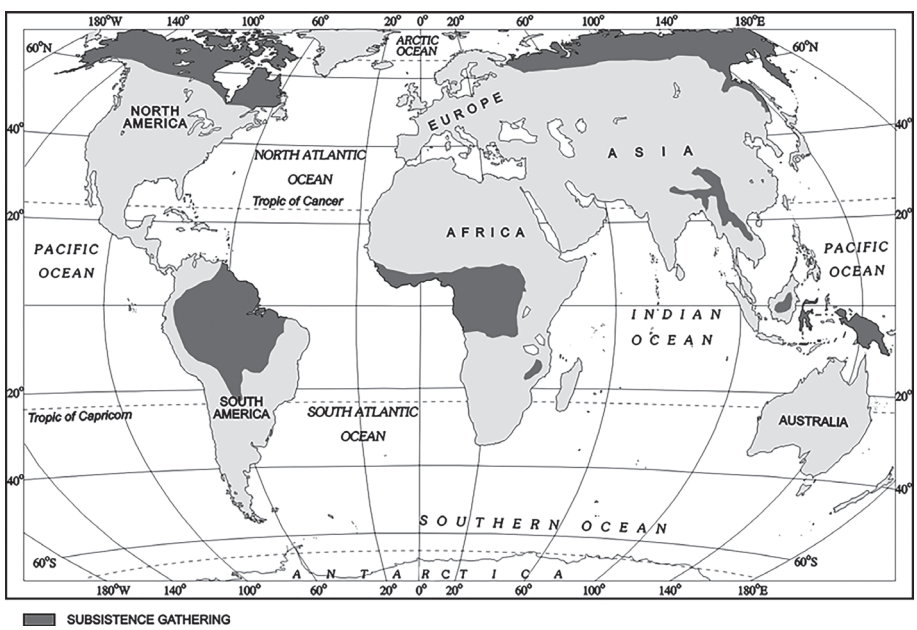

Figure 3.1: Areas of Subsistence Gathering

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- It is practiced in various regions, including **high-latitude zones** (northern Canada, northern Eurasia, southern Chile) and **low-latitude zones** (Amazon Basin, tropical Africa, Northern fringe of Australia, interior parts of Southeast Asia).
- Some gathering activities are **market-oriented**. Gatherers process and sell plants for various products, using various parts of plants such as - **Bark** used for quinine, tannin extract, and cork. **Leave** used to supply materials for beverages, drugs, cosmetics, fibers, thatch, and fabrics. **Nuts** consumed as food and oils. **Tree trunk** yields rubber, balata, gums, and resins.
- Thus, gathering and hunting are the oldest known economic activities, carried out at different levels and orientations.
- However, **limited capital investment** and use of **low technology** causes low yield per person with little or no surplus.
- Gathering has limited global significance and cannot compete in the world market due to synthetic product dominance. Synthetic products offer better quality at lower prices, replacing gatherer-supplied items, especially in tropical forests.

Pastoralism

Pastoralism is a practice of domesticating animals. People in different climatic conditions selected and raised local animals. Animal rearing today is practiced at subsistence or commercial levels, influenced by geography and technology.

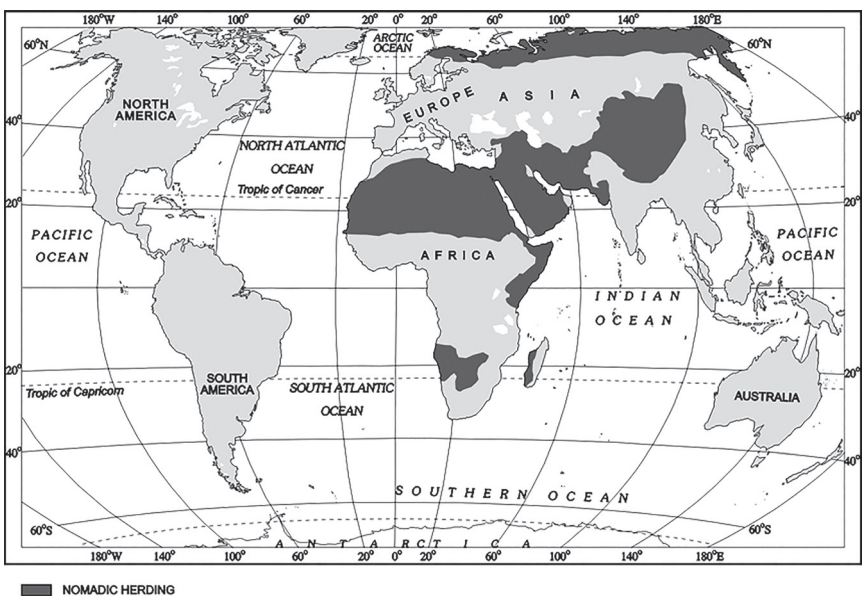

Figure 3.2: Areas of Nomadic Herding

Nomadic Herders

- Nomadic herding, or pastoral nomadism, is a traditional subsistence activity. Herders rely on animals for food, clothing, shelter, tools, and transport. They move with their livestock based on pasture and water availability. Each nomadic community occupies a specific territory as a tradition.
- **Different regions keep various animals.** For example, In **tropical Africa**, cattle are essential. In **Sahara and Asiatic deserts**, sheep, goats, and camels are reared. Mountainous

Figure 3.3: Nomadic Herders

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areas like **Tibet and Andes** keep yaks, llamas, and the **Arctic and sub-Arctic** regions rear reindeer.

- Pastoral nomadism is **prominent in three key regions:** Core region from North Africa to Mongolia and Central China, Eurasian tundra region, Smaller areas in South-west Africa and Madagascar in the southern hemisphere. (Refer figure 3.2)

Migration and Transhumance

- The process of migration from plain areas to pastures on mountains during summers and again from mountain pastures to plain areas during winters is known as **transhumance**.
- Herders migrate horizontally over vast distances or vertically between elevations. For example, **Gujjars, Bakarwals, Gaddis, and Bhotiyas** migrate in the Himalayas.
- The number of pastoral nomads is declining, and their areas are shrinking. This is due to political boundaries and new settlement plans by countries.

Commercial Livestock Rearing

- Commercial livestock rearing is **more organized and capital-intensive** than nomadic herding. It is primarily associated with Western cultures and practiced on **large ranches**.
- Ranches are divided into parcels for controlled grazing. Animals are moved between parcels to manage pastures effectively.

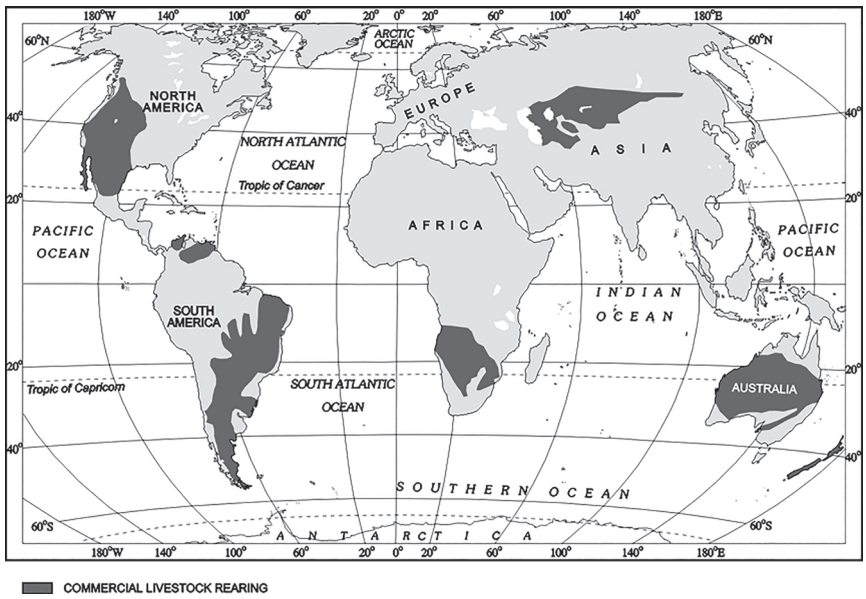

Figure 3.4: Areas of Commercial Livestock Rearing

- Specialization is maintained in rearing a single animal type, such as sheep, cattle, goats, or horses.
- Products like meat, wool, hides, and skin undergo scientific processing and are exported globally.
- Emphasis is laid on **scientific approaches**, including breeding, genetics, disease control, and animal health.
- Prominent countries for commercial livestock rearing include New Zealand, Australia, Argentina, Uruguay, and the United States. (Refer figure 3.4 and 3.5)

Figure 3.5: Commercial Livestock Rearing

PRIMARY ACTIVITIES
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Land Resources and Agriculture

Land is an important resource which is put for different uses. Efficient and sustainable utilization of land resources is essential to optimal growth. Here, we will first study about land resources, classification of land and its changing nature in India. Subsequently, we will analyze the inter relationship between these land resources and agriculture with detailed study of Indian agriculture.

Word Origin

The word **agriculture** is derived from Latin words ager or agri meaning soil and culture meaning, cultivation.

Land Use Categories

Land-use records are managed by the **land revenue department**, and they categorize land for reporting purposes. This reporting area may differ from the geographical area, which is measured by the Survey of India (Refer figure 3.6).

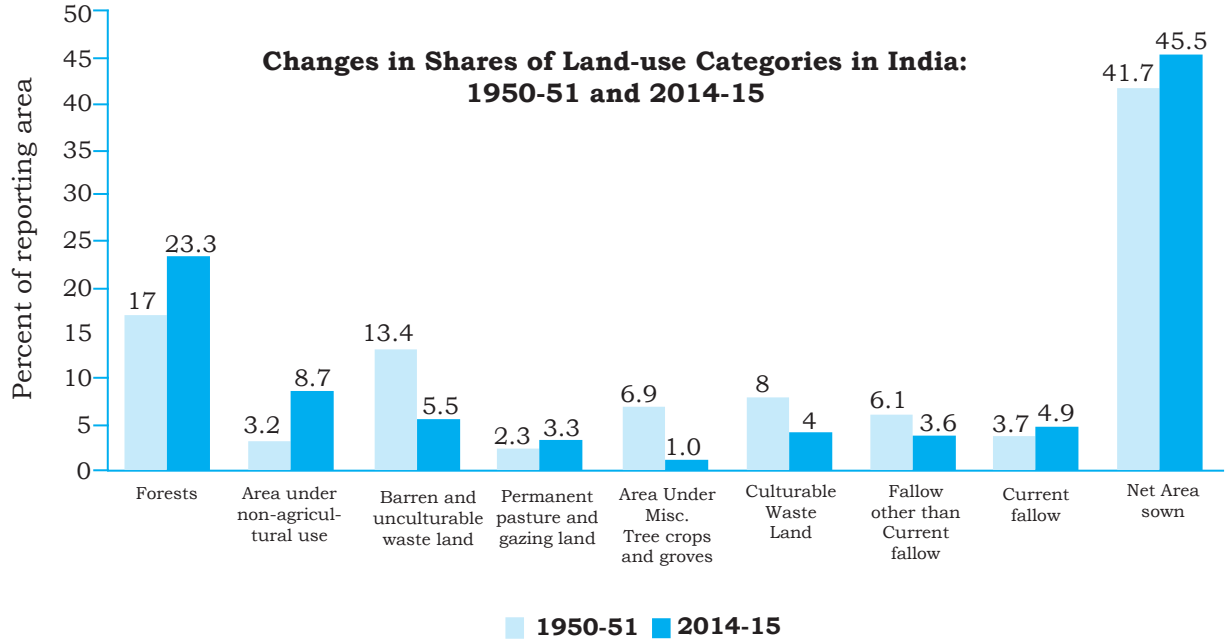

Figure 3.6: Land Use Categories in India

The **land-use categories in Land Revenue Records** are as follows:

1. **Forests:** This category includes areas demarcated for forest growth, which may not necessarily represent actual forest cover.
2. **Barren and Wastelands:** Land classified as wasteland, including barren hilly terrains, desert lands, and ravines, unsuitable for cultivation.
3. **Land put to Non-agricultural Uses:** This category encompasses land used for settlements (rural and urban), infrastructure (roads, canals etc.), industries, and shops.
4. **Area under Permanent Pastures and Grazing Lands:** Typically owned by village 'Panchayats' or the Government, with a small portion in private ownership.
5. **Area under Miscellaneous Tree Crops and Groves (Not included in Net sown Area):** This includes land with orchards and fruit trees, primarily privately owned.
6. **Culturable Wasteland:** Land left fallow (uncultivated) for over five years, can be reclaimed for cultivation.
7. **Current Fallow:** Land left uncultivated for one agricultural year or less, allowing it to regain fertility naturally.

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8. **Fallow other than Current Fallow:** Land uncultivated for more than one year but less than five years; if left uncultivated for over five years, it becomes a culturable wasteland.
9. **Net Area Sown:** The land area where crops are sown and harvested.

The land revenue records reflect these categories, influencing land-use changes and resource management in India.

Factors Causing Land-use Changes

Land-use in a region is mainly influenced by economic activities and agricultural pressure.

- **Economic Growth:** With population increase, rising income levels, and evolving technology, the economy grows, increasing pressure on land. Due to this, marginal lands may come into use.
- **Economic Composition Shift:** The secondary and tertiary sectors grow faster than agriculture, leading to a shift of land from agriculture to non-agricultural uses, especially around urban areas.
- **Continued Agricultural Pressure:** Despite a declining share of GDP, agriculture faces persistent land pressure due to a slow decline in the population dependent on it and an increasing population to feed.

POINTS TO PONDER

Land has always been one of the most prized possessions in the hands of mankind. In this context, conflicts have ensued and persisted till date in many parts of the world. Indian administration post independence has tried to grapple with this challenge through land reforms. The present focus is towards modernisation of land records. Do you think that the present system of Presumptive Titles should be replaced with a system of Conclusive Titles to avoid all issues which breed out of the land?

Changes in India's land-use (1950–51 to 2014–15)

India's land use has experienced many structural changes since independence.

- **Increase in Non-Agricultural Uses:** The highest increase is in non-agricultural land use, driven by the changing economic structure, industrial growth, and urban expansion.
- **Forest Cover Increase:** The increase in forest area is mainly due to the demarcation of forest land, not an actual forest cover increase.
- **Current Fallow Fluctuation:** Current fallow land fluctuates due to rainfall and cropping cycles.
- **Net Area Sown:** Recently, net area sown increased due to culturable wasteland use for agriculture, reversing a slow decline. Declines include barren and wasteland, culturable wasteland, pastures and tree crops, and fallow lands, mainly due to pressure from agriculture and encroachment.

These changes reflect the complex dynamics between economic growth, urbanization, and agricultural practices in India. (Refer figure 3.7)

Agricultural Land-use Categories	As a percentage of Reporting Area		As a percentage of total cultivable land	
	1950-51	2014-15	1950-51	2014-15
Culturable Waste land	8.0	4.0	13.4	6.8
Fallow other than Current Fallow	6.1	3.6	10.2	6.2
Current Fallow	3.7	4.9	6.2	8.4
Net Area Sown	41.7	45.5	70.0	78.4
Total Cultivable Land	59.5	58.0	100.00	100.00

Figure 3.7: Composition of Total cultivable Land

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Management of Common Property Resources

- Common Property Resources (CPRs) are owned by the state and used by the community.
- CPRs provide fodder, fuel, and other resources, vital for the livelihood of landless and marginalized farmers, especially women.
- CPRs include community forests, pasture lands, village water bodies, and public spaces managed collectively.

Thus, land management in India has experienced widespread changes in the last few decades, mainly due to **India's rising population**. Now let's analyze the relationship between these land resources and agriculture in India.

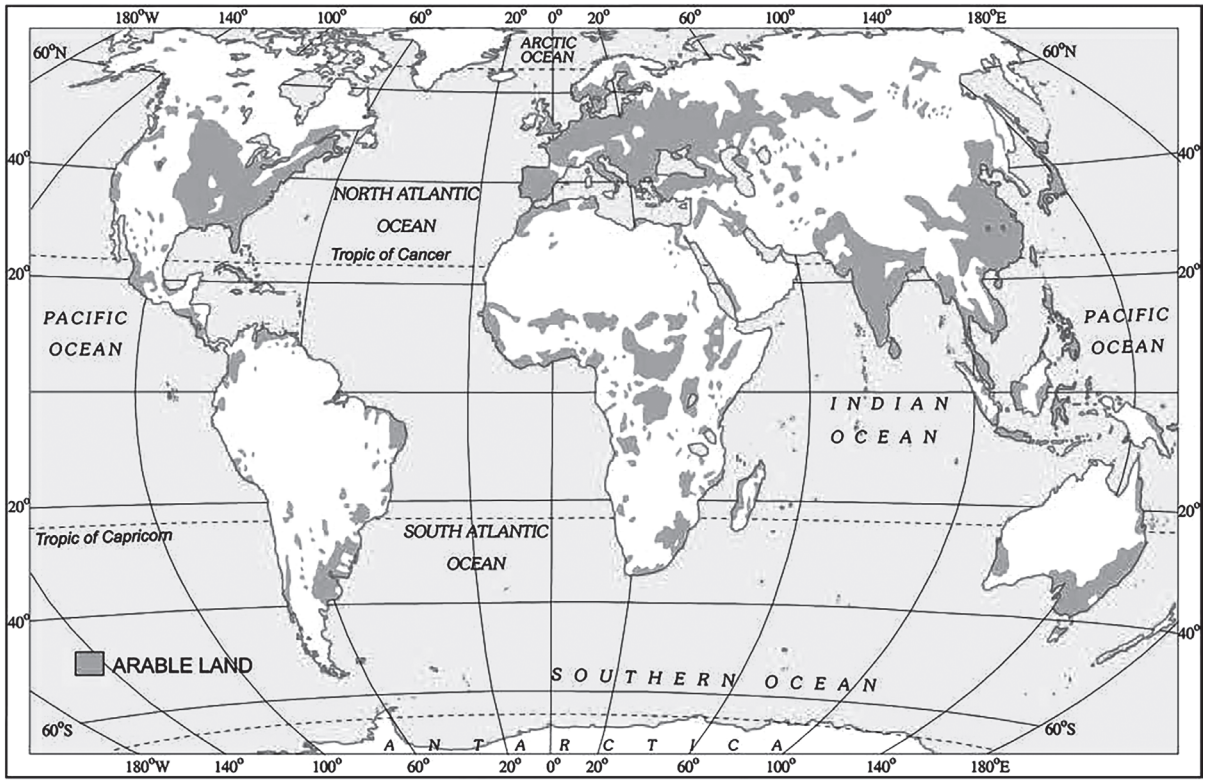

Figure 3.8: Global Distribution of Arable Land

Agricultural Land Use in India

- Agriculture includes growing of crops, fruits, vegetables, flowers and rearing of livestock. In India, around **50 percent of persons** are engaged in agricultural activity.
- Hence, land is critical for agriculture and contributes significantly to rural livelihoods as quality of land directly affects agricultural productivity.
- Land ownership in rural areas has **social value**, serves as security, and enhances social status.
- **Total cultivable land** includes net sown area, fallow lands, and culturable wasteland.
- India faces limitations in expanding net sown area, necessitating land-saving technologies.
- Such technologies aim to increase crop yield per unit area and overall output per unit area, boosting land-use intensity.
- Higher **cropping intensity (CI)** benefits India by utilizing limited land efficiently and reducing rural unemployment.

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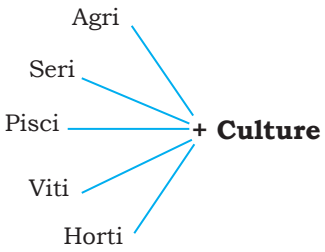
- Cropping Intensity(CI) in percentage = (GCA/NSA) × 100, where GCA means Gross Cropped Area and NSA means Net Sown Area.



Agriculture
The science and art of cultivation on the soil, raising crops and rearing livestock. It is also called farming

Sericulture
Commercial rearing of silk worms. It may supplement the income of the farmer.

Pisciculture
Breeding of fish in specially constructed tanks and ponds

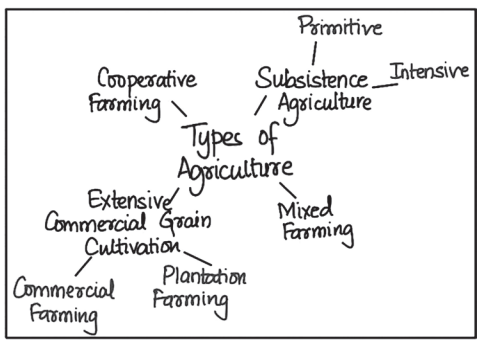
Viticulture
Cultivation of grapes.

Horticulture
Growing vegetables, flowers and fruits for commercial use

Figure 3.9: Different Types of Occupations

Types of Agriculture

Farming can be mainly classified **based on the main source of moisture** for crops as irrigated and rainfed (barani).



- **Irrigated farming** can be either protective or productive, depending on whether its purpose is to protect crops from soil moisture deficiency or to achieve high productivity.
- **Rainfed farming** is primarily dependent on rainfall. It is further classified into dryland and wetland farming.
- **Dryland farming** is prevalent in regions with annual rainfall less than 75 cm and wetland farming in regions with excess rainfall during the rainy season.

Other major types of agriculture are as follows:

Subsistence Agriculture

- This type of farming is practiced to meet the needs of the farmer's family. Traditionally, low levels of technology and household labor are used to produce small output.
- In this, farming areas consume most or all of the locally grown products.
- It is **grouped in two categories** - Primitive Subsistence Agriculture and Intensive Subsistence Agriculture.

1. **Primitive Subsistence Agriculture**
   - This kind of agriculture is common among tribes in the tropics (Africa, South/Central America, Southeast Asia). It involves shifting cultivation (or **slash and burn** agriculture) which requires clearing vegetation with fire, which adds soil fertility. (Refer figure 3.11).
   - It uses primitive tools like sticks and hoes. Soil loses fertility after 3-5 years, leading to shifting.

Figure 3.10: Subsistence Agriculture

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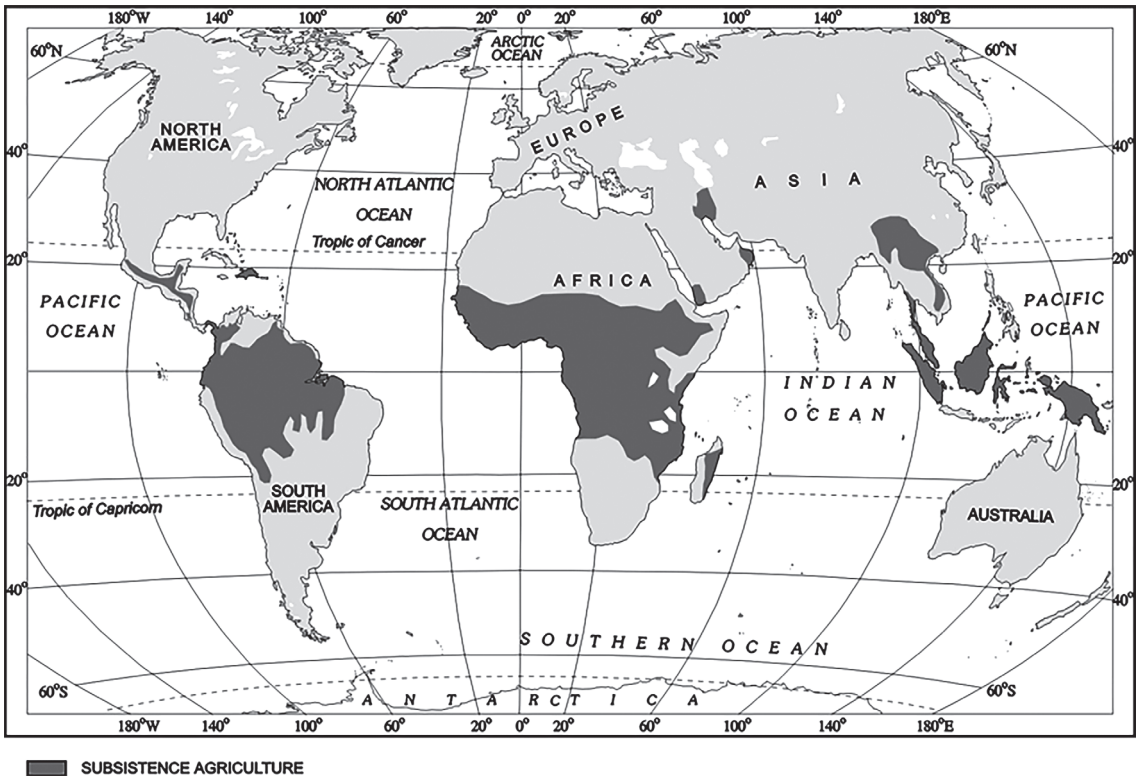

Figure 3.11: Areas of Primitive Subsistence Agriculture

- **Shifting cultivation** is known by different names in India - '**jhumming**' in northeastern states, '**Pamlou**' in Manipur, '**Dipa**' in Bastar district of Chhattisgarh, and in the Andaman and Nicobar Islands." '**Bewar'** or '**Dahiya'** in Madhya Pradesh, **'Podu'** or **'Penda'** in Andhra Pradesh, **'Pama Dabi'** or **'Koman'** or **Bringa'** in Odisha, **'Kumari'** in Western Ghats, **'Valre' or 'Waltre'** in South-eastern Rajasthan, **'Khil'** in the Himalayan belt, **'Kuruwa'** in Jharkhand.
- Further, it is also identified differently at global level - For example, **Milpa** in Central America/Mexico, **Ladang** in Indonesia/Malaysia, **'Conuco'** in Venezuela, 'Roca' in Brazil, **'Masole'** in Central Africa, **'Ray'** in Vietnam etc.

Figure 3.12: Shifting Agriculture

2. Intensive Subsistence Agriculture

This type of farming is practiced in a densely populated regions like India, China, Japan, South East Asian countries etc **(Refer figure 3.13)**. It has two types:

- **Wet paddy dominated:** Characterized by dominance of rice crop, small land holdings due to high population density, use of family labor and limited use of machinery. All this leads to extensive use of land. Further, manure used to maintain soil fertility. In this agriculture, yield per unit area is high but labor productivity is low.
- **Non-Paddy Dominated:** This agriculture is practiced in areas unsuitable for rice. Crops like wheat, soybean, barley, and sorghum are grown. Millets are cultivated similar to wet paddy, but it often requires irrigation.

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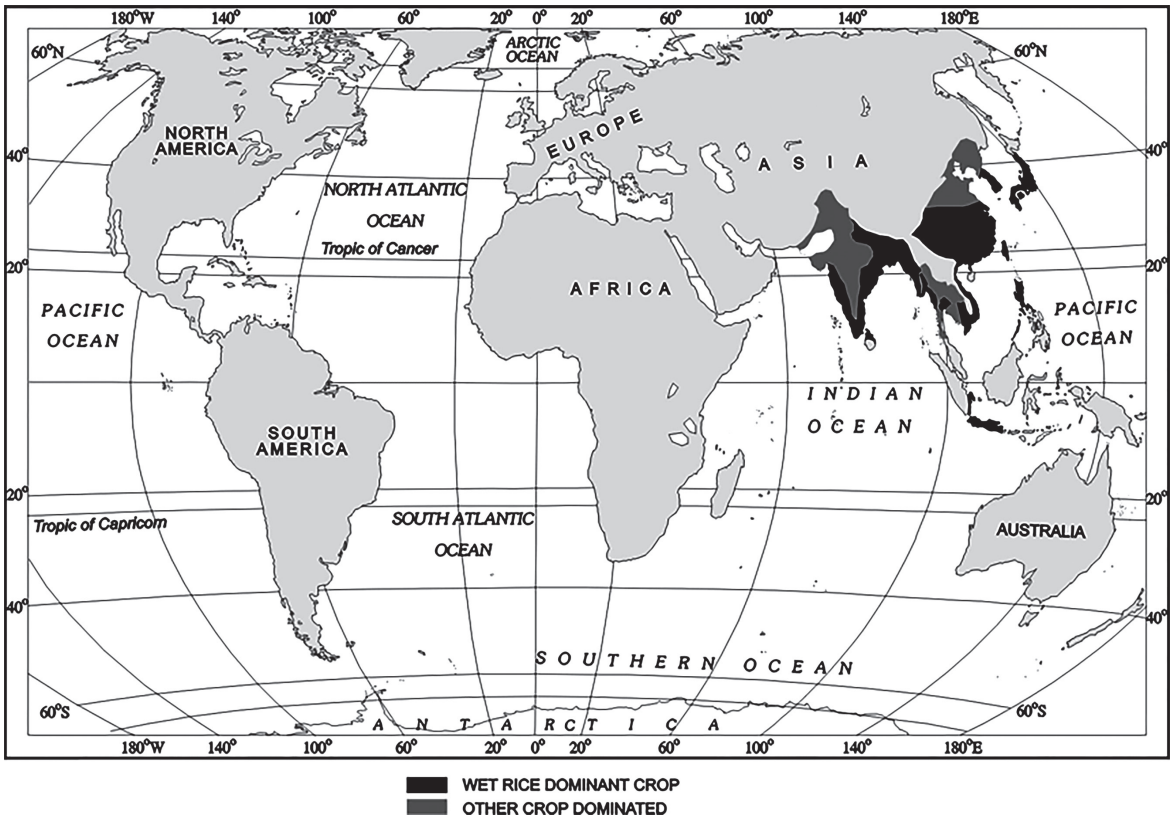

Figure 3.13: Areas of Intensive Subsistence Farming

Intensive agriculture is common in densely populated developing countries, while commercial agriculture dominates larger holdings in the USA, Canada, and Australia.

Extensive Commercial Grain Cultivation

- Europeans introduced other forms of agriculture, which were guided by **profit-oriented motives**. For example, commercial farming, plantation farming etc.
- This form of agriculture thrives in the interior regions of semi-arid lands within the mid-latitudes.
- Wheat is the primary crop, but other grains like corn, barley, oats, and rye are also cultivated.
- The **farms are typically large in size**, which allows for mechanized operations from plowing to harvesting.
- **Mechanization** plays a crucial role in these large-scale operations.
- While the yield per acre is low, the yield per person involved in farming is high due to mechanization and extensive land use.

Figure 3.14: Mechanised Grain Farming

- This mechanized farming **encompasses 2 types**:

1. Commercial Farming

- Commercial farming **relies on modern inputs** like high-yielding seeds, fertilizers, and pesticides for increased productivity.

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- The degree of commercialization varies by region; for example, rice is commercial in Haryana and Punjab but subsistence in Odisha.
- Extensive commercial grain cultivation is best developed in regions such as **Eurasian steppes, the Canadian and American Prairies, the Pampas of Argentina, the Velds of South Africa, the Australian Downs, and the Canterbury Plains of New Zealand.** (Refer figure 3.15)

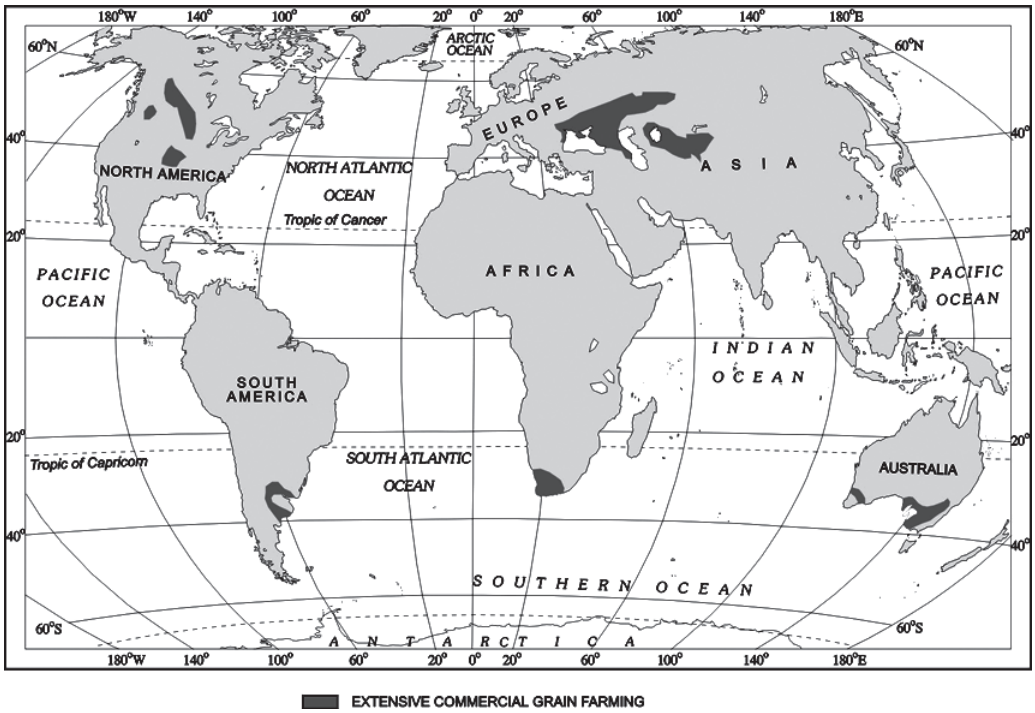

Figure 3.15: Areas of Extensive Commercial Grain Farming

2. Plantation Farming

- This involves **cultivating a single crop on a large scale.**
- Plantations require significant capital and labor, with produce used as raw materials for industries.
- Important plantation crops in India include tea, coffee, rubber, sugarcane, and banana, with regions like Assam, North Bengal, and Karnataka playing key roles.
- A well-developed transport and communication network is crucial for plantation development.

POINTS TO PONDER

Commercialisation of agriculture has been a function of monetisation of the economy. Do you think commercialisation of agriculture has been present from ancient times or is it a product of global capitalist order? Do you think Indian farmers have been benefited from commercialisation or commercial entities have been reaping the benefits?

Mixed Farming

- Mixed Farming is found in highly developed parts of the world, such as **North-western Europe, Eastern North America, parts of Eurasia, and temperate latitudes of Southern continents** (Refer figure 3.16).

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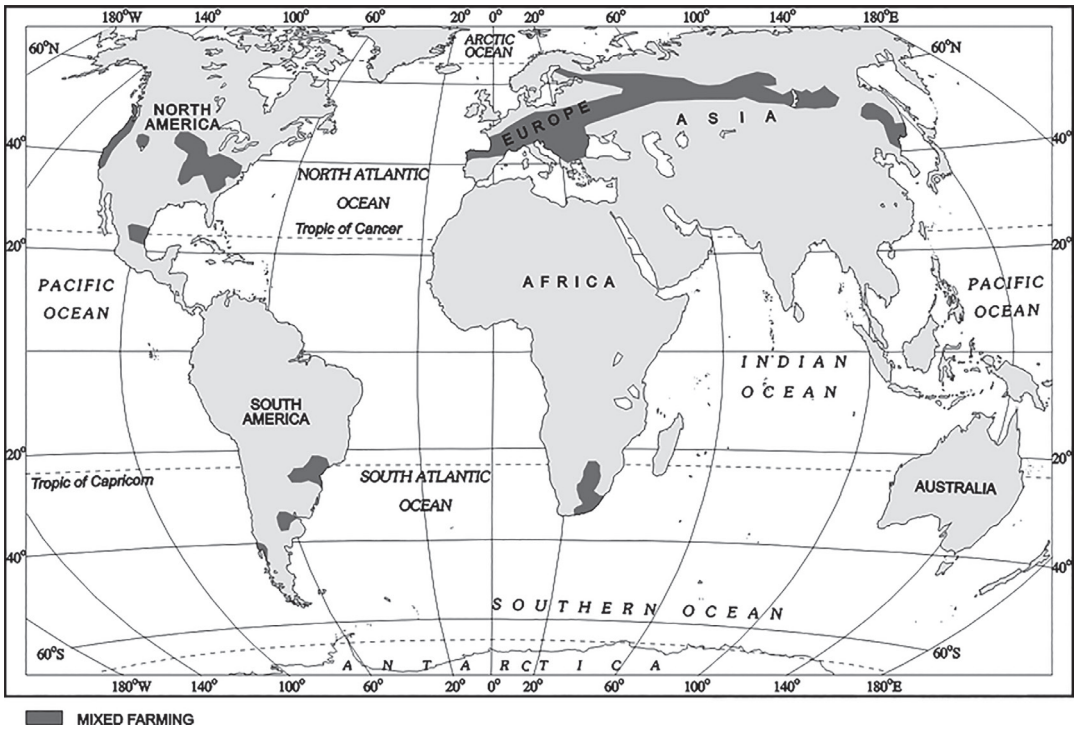

Figure 3.16: Areas of Mixed Farming

- These farms are moderate in size and typically cultivate crops like wheat, barley, oats, rye, maize, fodder, and root crops. Fodder crops are vital for mixed farming, and practices like crop rotation and intercropping help maintain soil fertility. These farms balance crop cultivation and animal husbandry, with cattle, sheep, pigs, and poultry contributing significantly to income.
- Mixed farming involves substantial capital investment in farm machinery and infrastructure, extensive use of chemical fertilizers and green manures, and requires skilled expertise.

Co-operative Farming

- Farming can also be categorized according to the farming organization, which is affected by the way in which farmers own their farms and various policies of the government which help to run these farms.
- Cooperative farming **involves farmers forming a society** to pool resources for more efficient and profitable agriculture. Individual farms remain intact, and this approach promotes cooperation in farming.
- Cooperative societies help farmers procure essential inputs, sell products on favorable terms, and process quality products at lower costs. Originated over a century ago, this movement found success in Western European countries like **Denmark, Netherlands, Belgium, Sweden, and Italy**.

Collective Farming

- The basic principle behind this types of farming is based on social ownership of the means of production and collective labour.
- Collective farming or the model of Kolkhoz was introduced in erstwhile Soviet Union to improve upon the inefficiency of the previous methods of agriculture and to boost agricultural production for self sufficiency.
- The farmers used to pool in all their all resources like land, labour and livestock.

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Cropping Seasons in India

- There are **three distinct crop seasons** in the northern and interior parts of the country: kharif, rabi, and zaid.
- The **kharif season** largely coincides with the Southwest Monsoon that is from June to October, allowing the cultivation of tropical crops like rice, cotton, jute, jowar, bajra, and tur.
- The **rabi season** starts in October-November and ends in March-April, facilitating the cultivation of temperate and subtropical crops such as wheat, gram, and mustard.
- **Zaid** is a short-duration summer cropping season that begins after harvesting the rabi crops. It is used for cultivating watermelons, cucumbers, vegetables, and fodder crops on irrigated lands.

Table 3.1: Cropping Seasons in India

Cropping Season	Major Crops Cultivated	
	Northern States	Southern States
Kharif (June-September)	Rice, Cotton, Bajra, Maize, Jowar, Tur	Rice, Maize, Ragi, Jowar, Groundnut
Rabi (October-March)	Wheat, Gram, Rapeseeds and Mustard, Barley	Rice, Maize, Ragi, Groundnut, Jowar
Zaid (April-June)	Vegetables, Fruits, Fodder	Rice, Vegetables, Fodder

Major Crops in India

- A variety of food and non food crops are grown in different parts of the country depending upon the variations in soil, climate and cultivation practices.
- **Food crops** mainly includes cereals, pulses, oilseeds and **Non food crops** includes cotton, jute etc. Along with these **other plantation crops** such as tea, coffee, sugarcane are also grown.

1. Food Grains

- Foodgrains are dominant in Indian agriculture and occupy about **two-thirds of the total cropped area** in India. Based on the structure of grains, they are classified as **cereals and pulses**.

Cereals

- Cereals occupy about 54% of the total cropped area in India.
- India produces about 11% of the world's cereals and ranks third in production after China and the USA.
- Variety of cereals, including fine grains (rice, wheat) and coarse grains or millets (jowar, bajra, maize, ragi), etc. are produced in India.
- **Fine cereals** like rice, wheat are staple foods of the majority Indian population.

Rice

- Rice or paddy is an important foodgrain crop in India, occupying around **1/4th of total cropped area.**
- India contributes 22.07% of rice production worldwide, ranking second after China in 2018.
- It is a tropical humid area crop and mainly grown as a kharif crop in India.
- Leading rice-producing states include West Bengal, Uttar Pradesh, and Punjab.
- Rice yields are high in **Punjab, Tamil Nadu, Haryana, Andhra Pradesh, Telangana, West Bengal, and Kerala** (Refer figure 3.18).
- In West Bengal farmers grow three crops of rice called **'aus', 'aman' and 'boro'.**

Figure 3.17: Rice Cultivation

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Figure 3.18: Distribution of Rice

Figure 3.19: Distribution of Wheat

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Wheat

- Wheat is a **rabi crop** and the second most important cereal crop in India after rice. India produces about 12.8% of the world's total wheat production (2017).
- About 85% of the total wheat cultivation area is concentrated in the north and central regions of the country.
- Leading wheat-producing states include **Uttar Pradesh, Madhya Pradesh, Punjab, Haryana, and Rajasthan** (Refer figure 3.19).

Figure 3.20: Wheat Harvesting

Coarse Cereals or Millets

- They are also dominant in Indian agriculture. These are **hardy crop** that can be grown in harsh conditions having high nutritional value, for example - **jowar, bajra, and ragi,** etc.

Jowar (Sorghum)

- Jowar accounts for about 16.50% of the total cropped area.
- **Maharashtra** alone produces more than half of the total jowar production of the country.
- Other leading producer states of jowar are **Karnataka, Madhya Pradesh, Andhra Pradesh, and Telangana**.
- It is sown in both kharif and rabi seasons in southern states.
- However, it is mainly a kharif crop in northern India, where it is mostly grown as a fodder crop.
- South of **Vindhyachal,** it is a rainfed crop, and its yield level is relatively low in this region.

Bajra

- Bajra is grown in hot and dry climates in northwestern and western India.
- It is resistant to dry spells and drought and occupies about 5.2% of the total cropped area.
- Leading producers are **Maharashtra, Gujarat, Uttar Pradesh, Rajasthan, and Haryana**.
- Yield is low in Rajasthan but increasing in Haryana and Gujarat due to drought-resistant varieties and expanded irrigation.

Figure 3.21: Bajra Cultivation

Maize

- Maize is mainly a kharif crop but also grown in rabi season in some places like Bihar. It is grown under semi-arid conditions and on inferior soils and occupies about 3.6% of the total cropped area. Cultivated throughout India except Punjab, eastern, and northeastern regions.
- Leading producers are **Karnataka, Madhya Pradesh, Bihar, Andhra Pradesh, Telangana, Rajasthan, and Uttar Pradesh**.
- Higher yield compared to other coarse cereals, especially in southern states. Apart from cereals, the pulses and oilseeds are also important food crops cultivated in India.

Maize is also known as corn. Various colourful varieties of maize are found across the world.

Figure 3.22: Maize Cultivation

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Pulses

- Pulses are legumes, an important source of proteins for vegetarians and improve soil fertility through nitrogen fixation.
- Mainly concentrated in drylands of **Deccan, central plateaus, and northwestern India,** they occupy about 11% of the total cropped area.
- It has low and fluctuating yields due to rainfed cultivation.
- Main pulses cultivated in India are **Gram and Tur (Arhar)**.

Gram

- Gram is cultivated in subtropical areas, mainly during the rabi season in central, western, and northwestern India.
- It requires minimal irrigation and covers about 2.8% of the total cropped area.
- Leading producers are **Madhya Pradesh, Uttar Pradesh, Maharashtra, Andhra Pradesh, Telangana, and Rajasthan**.
- Characterized by low and inconsistent yields, even in irrigated areas.

Tur (Arhar)

- Tur (arhar) is grown on marginal lands under rainfed conditions in the dry areas of central and southern states.
- Occupies about 2% of India's total cropped area. Also known as **red gram or pigeon pea**.
- Leading producer are **Maharashtra**, followed by **Uttar Pradesh, Karnataka, Gujarat, and Madhya Pradesh**.
- It has very low per-hectare output and inconsistent performance.

2. Oilseeds

- The oilseeds are produced for extracting edible oils.
- Oilseeds account for about 14% of total cropped area.
- Main oilseed crops are **Groundnut, soyabean, sunflower, rapeseed and mustard** (Refer figure 3.23).

Groundnut

- As of 2021, China was the largest producer of peanuts worldwide, producing over 18.3 million metric tons of peanuts. India ranked second that year, producing just over ten million metric tons.
- It is a rainfed kharif crop in drylands and rabi season crop in southern India and covers about 3.6% of total cropped area.
- **Gujarat stood first in area coverage with 16.72 lakh ha followed by Rajasthan (7.84 lakh ha), Madhya Pradesh (4.15 lakh ha), Andhra Pradesh (4.07 lakh ha), Karnataka (6.57 lakh ha), and Telangana (0.03 lakh ha).**

Rapeseed and Mustard

- Rapeseed and mustard comprise several oilseeds such as rai, sarson, toria and taramira.
- It is a subtropical crop, cultivated during rabi season.
- It is frost-sensitive, having fluctuations in yield.
- About two-thirds of cultivated area is irrigated and covers about 2.5% of total cropped area. Leading producers are **Rajasthan, Haryana, Madhya Pradesh**.

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Figure 3.23: Groundnut, sunflower and mustard are ready to be harvested in the field

Other Oilseeds

- **Soyabean** is mainly grown in Madhya Pradesh and Maharashtra.
- **Sunflower** is cultivated in Karnataka, Andhra Pradesh, Telangana.

3. Fiber Crops

Fiber crops provide material for cloth, bags, sacks and other fabrics. Main fiber crops are cotton, jute and silk.

Cotton

- Cotton is a tropical crop grown in kharif season in semi-arid areas. India ranks second in global cotton production.
- It occupies about 4.7% of total cropped area. Leading producers are **Gujarat, Maharashtra, Telangana** (Refer figure 3.25).
- It gives high yield under irrigated conditions.

Figure 3.24: Cotton Cultivation

Jute

- Jute is used for making coarse cloth, bags, sacks and decorative items, hence called as **golden fibre.**
- It has about 0.5% of total cropped area, and India produces about 60% of world jute.
- It is a cash crop in **West Bengal** and adjoining eastern parts of the country (Refer figure 3.25).
- Leading producer is West Bengal.

Silk

- While cotton, hemp and jute are derived from the crops grown in the soil, the silk is obtained from cocoons of the silkworms fed on green leaves, especially **mulberry**. Rearing of silk worms for the production of silk fiber is known as **sericulture**.

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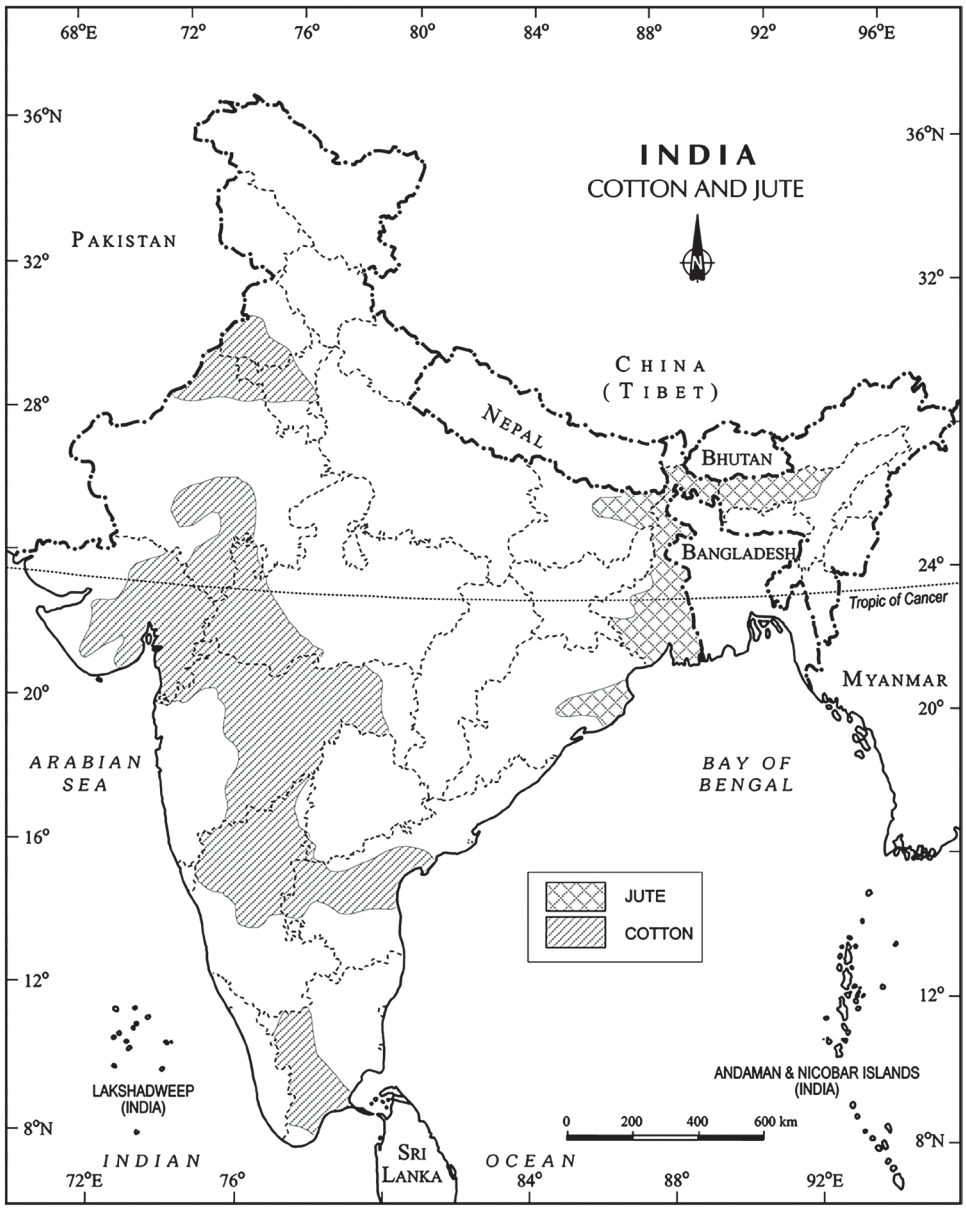

Figure 3.25: India – Distribution of Cotton and Jute

4. Other Crops

Sugarcane

- Sugarcane is a tropical crop, largely cultivated in irrigated areas and covers about 2.4% of total cropped area.
- Cultivated in **Uttar Pradesh, Maharashtra, Karnataka, Tamil Nadu, Telangana, and Andhra Pradesh** with high yields in Maharashtra and southern states (Refer figure 3.27).
- India was the second-largest producer of sugarcane after Brazil in 2022.

Figure 3.26: Sugarcane Plantation

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Figure 3.27: India – Distribution of Sugarcane

Tea

- Tea is a plantation crop used as a beverage. **Black tea** leaves are fermented whereas **green tea** leaves are unfermented.
- It is indigenous to hilly areas.
- India ranks second in global tea production.
- Assam is a major producer, about 53.2% of total tea cropped area is in Assam.
- Leading producers are **Assam, West Bengal, Tamil Nadu** (Refer figure 3.28).

Coffee

- Coffee is a tropical plantation crop. Its seeds are roasted, ground and are used for preparing a beverage.
- There are three varieties of coffee i.e. **arabica, robusta and liberica.**
- It is grown in the highlands of Western Ghats in **Karnataka, Kerala, Tamil Nadu** (Refer figure 3.28).
- India produces about 3.17% of global coffee (2018).
- Karnataka accounts for over two-thirds of total coffee production.
- Superior quality **arabica coffee** is predominant in India.

Discovery of the Coffee Plant

There are different versions about the discovery of coffee. In about AD 850, Kaldi, an Arab goat-herder, who was puzzled by the queer antics of his flock, tasted the berries of the evergreen bush on which the goats were feeding. On experiencing a sense of exhilaration, he proclaimed his discovery to the world.

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Figure 3.28: India – Distribution of Tea and Coffee

Rubber

- Rubber is an important industrial raw material.
- Although rubber is typically grown in equatorial regions, it has also found a place in tropical and subtropical areas of India.
- Ideal conditions for rubber cultivation include a moist and humid climate with over 200 cm of rainfall and temperatures exceeding 25°C.
- Major rubber-producing regions include **Kerala, Tamil Nadu, Karnataka, and Andaman and Nicobar Islands, as well as the Garo Hills of Meghalaya**.

POINTS TO PONDER

Cropping patterns have evolved based on the climatic conditions for different reasons. However, with the genesis of methods like green houses, vertical farming etc. humans have challenged the natural selection of the crops and the associated agricultural patterns. Do you think such endeavours are sustainable or bound to perish in the times to come?

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Allied Activities of Agriculture

Dairy Farming

- Dairy farming is highly capital and **labor-intensive**, focusing on **milch animal rearing**. It involves significant investments in animal sheds, fodder storage, feeding, milking machinery, and veterinary care.
- It operates **year-round**, unlike crop cultivation, and is typically located near urban and industrial areas for easy access to local markets.
- Advances in transportation, refrigeration, pasteurization, and preservation methods have extended the shelf life of dairy products.

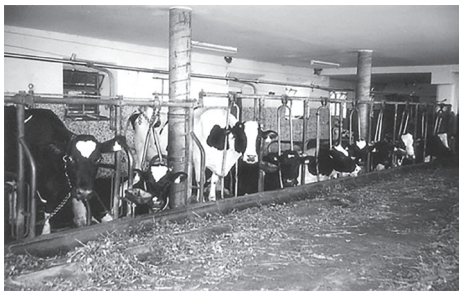

Figure 3.29: A Dairy Farm in Austria

- **Commercial dairy farming is prominent in three main regions:** North Western Europe, Canada, and South Eastern Australia, including New Zealand and Tasmania (Refer figure 3.30).

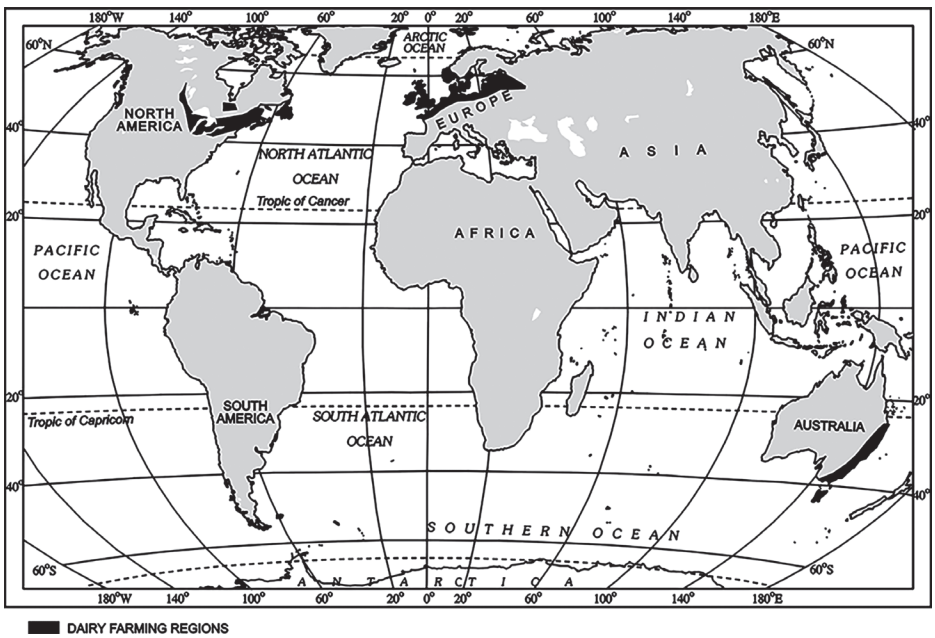

Figure 3.30: Areas Of Dairy Farming

Mediterranean Agriculture

- Mediterranean agriculture is highly specialized commercial farming practiced in **countries around the Mediterranean Sea in Europe and North Africa, extending from Tunisia to the Atlantic Coast**. It's also found in **southern California, central Chile, southwestern South Africa, and parts of Australia**.
- This region is known for producing citrus fruits and excels in **viticulture or grape cultivation**, producing high-quality grapes **(viticulture)** for some of the world's finest wines with unique flavors. Additionally, inferior grapes are dried to make raisins and currants. Mediterranean agriculture also includes the cultivation of olives and figs.
- One advantage of this type of agriculture is the production of valuable crops like fruits and vegetables during the winter, meeting the high demand in European and North American markets.

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Market Gardening and Horticulture

- Horticulture is **cultivation of fruits and vegetables** and India is a major producer. It produces tropical and temperate fruits like **mangoes** of Maharashtra, Andhra Pradesh, Telangana, Uttar Pradesh and West Bengal, **oranges** of Nagpur and Cherrapunjee (Meghalaya), **bananas** of Kerala, Mizoram, Maharashtra and Tamil Nadu, **lichi** and **guava** of Uttar Pradesh and Bihar, **pineapples** of Meghalaya, **grapes** of Andhra Pradesh, Telangana and Maharashtra, **apples**, **pears, apricots and walnuts** of Jammu and Kashmir and Himachal Pradesh. Additionally, India grows various vegetables (Refer figure 3.31).

Figure 3.31: Cultivation of vegetables – peas, cauliflower, tomato and brinjal

- India holds a significant position in the global production of fruits and vegetables, second only to China. The country's diverse topography and climate contribute to the year-round availability of a wide variety of fruits and vegetables. In the agricultural year 2021-22, India achieved substantial production figures, with 204.61 million metric tonnes of vegetables and 107.10 million metric tonnes of fruits.
- The cultivation of fruits covered an expansive area of 7.09 million hectares during the same period, highlighting the substantial scale of fruit farming in the country. Vegetables, being a staple in the Indian diet, were cultivated on an even larger scale, occupying 11.28 million hectares.
- India's agricultural prowess extends to specific crops, where the nation leads the global market. Notably, India stands as the world's top producer of ginger and okra. Additionally, the country boasts leading positions in the production of several popular fruits, including banana, papaya, mango, and guava.
- It requires availability of labor and capital, irrigation, HYV seeds, fertilizers, insecticides, greenhouses, and also requires heating in colder regions.
- Prominent in densely populated industrial areas of **NW Europe, NE USA, and the Mediterranean**. For instance, the Netherlands excels in tulip cultivation for European markets.
- It is also referred as **Truck farming**, which focussed on vegetable production and delivering these vegetables overnight through trucks.
- In industrial regions of western Europe and North America, factory farming is practiced with careful **livestock rearing, breed selection, and scientific breeding**, involving significant capital investment in facilities, machinery, veterinary services, and lighting.

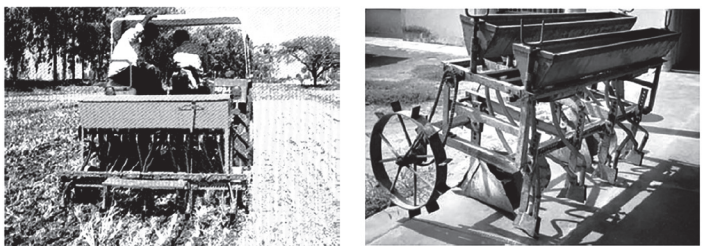

Figure 3.32: Modern Technological Equipments Used in Agriculture

PRIMARY ACTIVITIES
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Agricultural Development in India

- Agricultural development aims to increase farm production to meet rising population demands. It involves expanding cropped areas, crop diversity, irrigation, fertilizers, and mechanization.
- Indian agriculture was primarily subsistence-based before Independence and faced challenges like **droughts and famines** in the first half of the 20th century.
- During partition, a significant portion of irrigated land went to Pakistan, reducing the proportion of irrigated land in Independent India.
- After Independence, the government focused on increasing foodgrain production by switching from cash crops to food crops, intensifying cropping on existing land, and bringing fallow land under cultivation.This strategy initially increased foodgrains production but stagnated in the late 1950s. To address this, **Intensive Agricultural District Programme (IADP) and Intensive Agricultural Area Programme (IAAP)** were launched, but two consecutive mid-1960s droughts led to a food crisis.
- The introduction of high-yielding varieties (HYVs) of wheat and rice, along with chemical fertilizers, in irrigated areas of specific states led to the **Green Revolution**, making India self-reliant in foodgrain production.
- However, the Green Revolution was initially limited to irrigated areas, creating regional disparities.
- In the 1980s, efforts were made to address agriculture in rainfed areas through **agro-climatic planning**.
- Diversification of agriculture and development of dairy farming, poultry, horticulture, livestock rearing, and aquaculture were emphasized.
- The policy of **liberalization and a free-market economy** in the 1990s influenced the direction of Indian agricultural development.

For better understanding of the nature of farming in India, consider the following two examples which compare farming activities of the average farmer in India and USA. (Refer figure 3.33)

Figure 3.33: An agricultural field in India and a farm in USA.

A Farm in India

Small farmer Munna lal in Uttar Pradesh owns 1.5-hectare farmland with fertile soil, utilizes high-yielding seeds with advice of experts and grows wheat, rice, and pulses in his farms and sells them in nearby markets. He rents a tractor for plowing, irrigates from a nearby tubewell. His whole family is involved in farming. He also raises buffaloes and hens and sells milk and is also a member of a cooperative society.

A Farm in USA

The average size of a farm in the USA is much larger than that of an Indian farm. A typical farm size in the USA is about 250 hectares. A farmer named Joe owns a land of 300 hectares in Lowa. He focuses on crops like corn, soybean, wheat, cotton, and sugarbeet, practices precision farming with soil testing and use of technology. Further, he performs mechanized operations with tractors and modern equipment, utilizes chemical fertilizers and pesticides, uses automated grain storage and marketing. Thus Joe operates his farm as a business.

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Growth of Agricultural Output and Technology

- **Increase in Output and Yield:** Over the last five decades, agricultural output and technology have improved significantly. Crops like rice, wheat, sugarcane, oilseeds, and cotton have seen substantial production and yield growth.
- **Role of Irrigation:** The expansion of irrigation has been pivotal in enhancing agricultural output. It paved the way for modern agricultural practices, including the adoption of high-yielding seed varieties, chemical fertilizers, pesticides, and farm machinery. The net irrigated area in the country has also expanded.
- **Rapid Adoption of Technology:** Modern agricultural technology has diffused rapidly across various regions of the country. The use of chemical fertilizers has increased 15-fold since the mid-1960s, contributing to enhanced agricultural productivity.

Problems of Indian Agriculture

Indian agriculture is adversely affected by various issues impacting agricultural productivity and livelihood of farmers.

- **Dependence on Erratic Monsoon:** India's agriculture heavily relies on monsoon rains, with only about 33% of cultivated land under irrigation. Poor monsoons and fluctuations in rainfall patterns in regions like Rajasthan result in both droughts and floods, impacting crop production.
- **Low Productivity:** Indian crop yields, including rice, wheat, cotton, and oilseeds, are lower compared to international standards, partly due to high population pressure on land resources. Rainfed areas, especially drylands, face low yields.

National Mission for Sustainable Agriculture (NMSA)

NMSA is an initiative to make agriculture more productive, sustainable, remunerative and climate resilient by promoting location specific integrated/composite farming systems and to conserve natural resources through appropriate soil and moisture conservation measures. The Government has been promoting organic farming in the country through schemes such as Paramparagat Krishi Vikas Yojana (PKVY) and Rashtriya Krishi Vikas Yojana (RKVY).

- **Financial Constraints and Indebtedness:** Modern agriculture requires expensive inputs, which small and marginal farmers often cannot afford. As a result, many turn to credit from institutions and moneylenders, leading to indebtedness.
- **Lack of Land Reforms:** Unequal land distribution stemming from historical exploitation has persisted due to the ineffective implementation of land reforms, particularly in states with strong landlord lobbies. Among the three revenue systems operational during the British period, i.e., Mahalwari, Ryotwari, and Zamindari, the last one was most exploitative for the peasants.
- **Small Farm Size and Fragmentation:** India has a significant number of small and marginal farmers, and land holdings continue to shrink due to population pressure. Land holdings are often fragmented, making them economically unviable.
- **Limited Commercialization:** A substantial number of farmers produce crops for self-consumption, particularly in rainfed areas. Commercialization and modernization are more prevalent in irrigated regions.
- **Vast Underemployment:** The agricultural sector in India experiences substantial underemployment, especially in unirrigated areas, leading to seasonal unemployment.
- **Degradation of Cultivable Land:** Faulty irrigation and agricultural practices have led to land degradation, particularly in irrigated areas. Issues like alkalization, salinization, waterlogging, and excessive chemical use have compromised soil fertility. Rainfed areas also face soil erosion and degradation due to human activities.

Agricultural Reforms

To address the above problems comprehensively, various technological and Institutional measures has been initiated by the government.

- **Collectivization:** Efforts were made to consolidate land holdings and foster cooperation among farmers.

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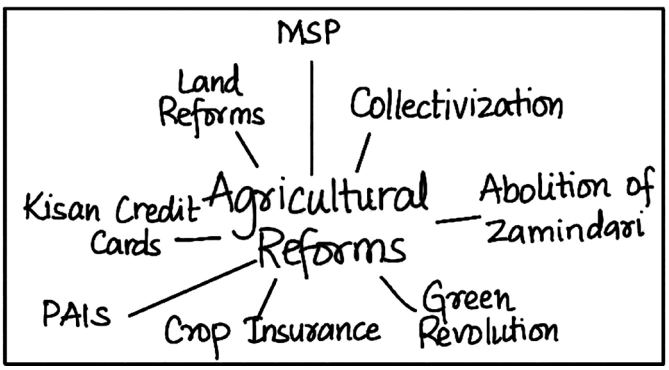
- **Abolition of Zamindari:** The zamindari system was abolished to ensure equitable land distribution.
- **Land Reforms:** Land reform laws were enacted, though their implementation varied.
- **Green Revolution:** The Green Revolution, driven by technology adoption, aimed to boost agricultural productivity.
- **White Revolution:** The White Revolution, or Operation Flood, focused on dairy production and distribution.
- **Comprehensive Land Development:** In the 1980s and 1990s, a comprehensive land development program was initiated, combining institutional and technical reforms.
- **Crop Insurance:** Crop insurance against natural disasters was introduced.
- **Grameen Banks:** Grameen banks and cooperative societies provided farmers with access to loans at lower interest rates.

Bhoodan and Gramdan

Vinoba Bhave, a spiritual heir of Mahatma Gandhi, launched the Bhoodan movement in India. He started this movement from Pochampalli in Andhra Pradesh after some poor landless villagers demanded some land for their economic well-being. As a beginning, Shri Ram Chandra Reddy offered 80 acres of land to be distributed among 80 land-less villagers. This act was known as **'Bhoodan'**. Later he traveled and introduced his ideas widely all over India. Some zamindars, owners of many villages, offered to distribute some villages among the landless. It was known as Gramdan. However, many land-owners chose to provide some part of their land to the poor farmers due to the fear of land ceiling act. This Bhoodan-Gramdan movement initiated by Vinoba Bhave is also known as the **Blood-less Revolution**.

- **Kisan Credit Card (KCC):** The KCC scheme aimed to provide credit to farmers.
- **Personal Accident Insurance Scheme (PAIS)** which aimed to offer insurance coverage to farmers.
- **Weather Bulletins and Agricultural Programs** were introduced on radio and television for better dissemination of information.
- **Minimum Support Price (MSP):** The government announced MSPs for important crops to protect farmers from exploitation by middlemen.



Farmer's Portal of India

The Farmer's Portal is a platform for farmers to seek any information related to agriculture. Detailed information on farmers' insurance, agriculture storage, crops, extension activities, seeds, pesticides, farm machineries, etc. is provided. Details of fertilizers, market prices, package and practices, programmes, welfare schemes are also given. Block level details related to soil fertility, storage, insurance, training, etc. are available in an interactive map. Users can also download farm friendly handbooks, scheme guidelines, etc.

Mining

Mining is a process of extraction of minerals. Human development has witnessed the stages of the Copper Age, Bronze Age, and Iron Age, marking the discovery and utilization of minerals. Initially, minerals were used for crafting tools, utensils, and weapons. However, the true era of mining emerged during the Industrial Revolution, and its significance continues to grow.

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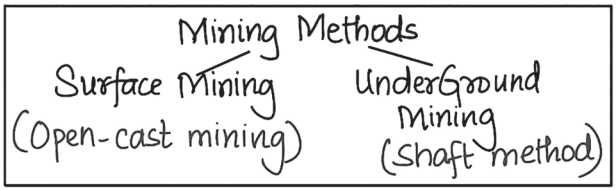
Factors Impacting Mining

*Mining profitability hinges on **two main factors:***

- **Physical factors**, which includes deposit size, grade, and occurrence mode.
- **Economic factors** like mineral demand, technology, infrastructure capital, labor, and transport costs.

Mining Methods

Two types of mining methods are followed which vary in their nature mainly due to mineral ore characteristics.



- **Surface Mining (Open-cast Mining):** Ideal for minerals near the surface, this is a cost-effective method that yields high and quick production.
- **Underground Mining (Shaft Method):** When ore lies deep, this method involves sinking vertical shafts and creating galleries for mineral extraction and transportation. It carries higher risks due to potential hazards like gases, fires, floods, and cave-ins.

Changing Mining Trends

Developed economies are moving away from mining, processing, and refining due to labor cost concerns. Meanwhile, developing countries with ample labor and aspirations for improved living standards are becoming key players. Many African, South American, and Asian nations derive over half their earnings from minerals.

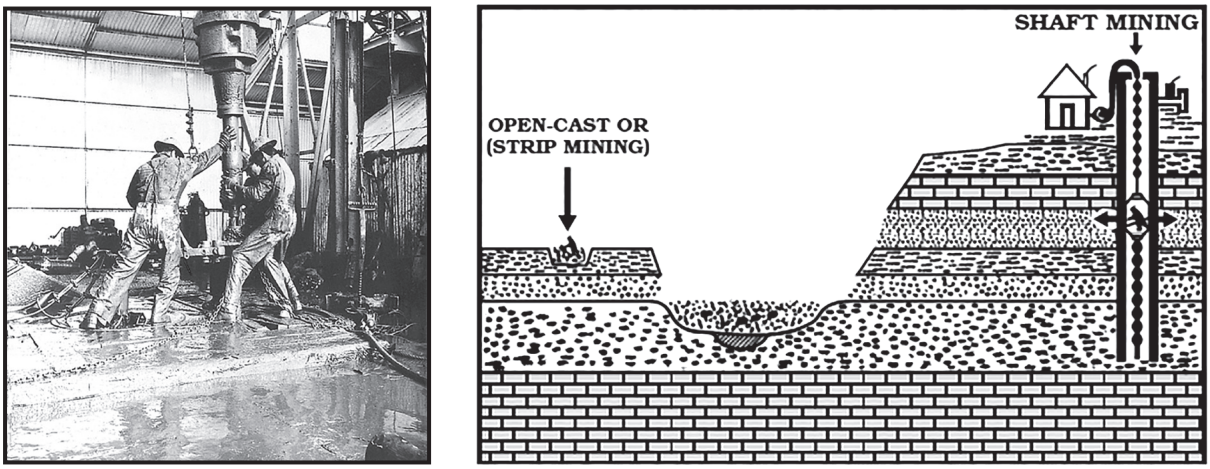


Figure 3.34: Oil Drilling Operation in the Gulf of Mexico And Methods of Mining

Conclusion

Primary activities like hunting , gathering, pastoralism, mining, and mainly agriculture play a crucial role in meeting the demands of a growing population. As the majority of the population in the world is dependent on agriculture, effective land use and modern agricultural practices are essential for ensuring food security and sustainable economic growth in both developing and developed regions.

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Glossary:

- **Red Collar Work:** People engaged in primary activities are called red collar workers due to the outdoor nature of their work.
- **Cropping intensity (CI):** It is defined as the number of crops a farmer grows in a given agricultural year on the same field and is another means for intensification of production from the same plot of land.
- **Golden revolution:** It is related to the tremendous increase in production of honey and horticulture .
- **Truck farming:** The regions where farmers specialize in vegetables only, the farming is known as truck farming. The distance of truck farms from the market is governed by the distance that a truck can cover overnight, hence the name truck farming.
- **Milch animals:** Milk-producing animals are known as "milch animals" e.g. cows, buffaloes, goats and camels.
- **Salinization:** It is an excessive accumulation of water-soluble salts in soil. Typically, it is a table salt, NaCl.
- **Organic Farming:** In this type of farming, organic manure and natural pesticides are used instead of chemicals. No genetic modification is done to increase the yield of the crop.
- **Food security:** It is said to exists when all people, at all times, have access to sufficient, safe and nutritious food to meet their dietary needs and food preferences for an active and healthy life.

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4 Secondary Activities

Bibliography: This chapter encompasses the summary of **Chapter 4** of Class VIII (Resource and Development), **Chapter 6** of Class X (Contemporary India-II), **Chapter 5** of Class XII (Fundamentals of Human Geography) of NCERT.

Introduction

The economic strength of a country is measured by the development of secondary activities which mainly encompasses manufacturing industries. Secondary activities are those activities which **transform raw materials into finished and valuable products.** Hence they add value to natural resources as the raw materials become more valuable and can be used for making finished goods. While all the economic activities like primary, secondary, tertiary and quaternary obtain and utilise resources necessary for our survival, secondary activities specifically deal with **manufacturing, processing and construction (infrastructure) industries.** In this chapter, we will analyse these manufacturing activities in detail.

What is manufacturing?

- Manufacturing literally means **'to make by hand'**. However, now it includes goods **'made by machines'**.
- It is a process which involves transforming raw materials into finished goods of higher value for sale in local or distant markets.

What is the difference between manufacturing and industry?

- An **industry** is a geographically located manufacturing unit maintaining books of accounts and records under a management system. The term industry is also used as synonymous with **'manufacturing'**.
- When the terms like 'steel industry' and 'chemical industry' are used, it is often mentioned as **factories and processes.** However, there are many secondary activities which are not carried on in factories such as the **'entertainment industry'** and **tourism industry**, etc. Hence, the longer expression **'manufacturing industry'** is used.
- All activities such as production from handicrafts to moulding iron and steel and stamping out plastic toys to assembling delicate computer components or space vehicles, all come under manufacturing.

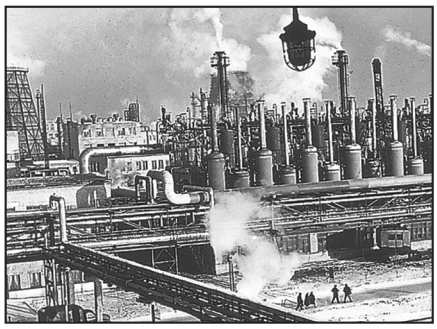

Figure 4.1: Manufacturing Industry

- **Application of power, mass production of products and specialised labour** in factory settings for the production of standardised commodities etc. are some of the common **characteristics** of manufacturing.

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Importance of Manufacturing

- Manufacturing industries play a pivotal role in contributing to the **modernization of agriculture**, which serves as the foundation of our economy.
- It also **decreases the heavy reliance of people on agricultural income** by creating employment opportunities in the secondary and tertiary sectors.
- Industrial progress is essential for addressing the issues of unemployment and poverty in our country. This philosophy has underpinned the **establishment of public sector industries and joint sector ventures in India**, with the objective of **reducing regional disparities** by setting up industries in tribal and backward areas.
- Furthermore, the export of manufactured goods **fosters the expansion of trade and commerce** and **generates foreign exchange**.

POINTS TO PONDER

The process of manufacturing has evolved over time from handmade goods to the use of large-scale machines. Though it has catered to the needs of an ever-increasing population, at the same time, it has resulted in polluted rivers, increasing global temperatures and various health problems. Can you think of some solutions through which we can balance the growth of manufacturing industries without putting pressure on the environment?

Characteristics of Modern Large Scale Manufacturing

Specialisation of Skills/Methods of Production

- The **costs of craft methods are high** as factories **produce only a few pieces** which are made-to-order in nature.
- Mass production involves production of large quantities of standardised parts by each worker performing only one task repeatedly.

Mechanisation

- The mechanisation approach involves the **utilisation of devices to perform tasks**.
- Automation represents the evolved phase of mechanisation, where human cognitive input is not required in the manufacturing process.
- Across the globe, there has been a proliferation of **automated factories equipped with feedback mechanisms and closed-loop computer control systems**, enabling machines to exhibit a form of artificial intelligence.

Technological Innovation

- The implementation of **research and development strategies** to drive technological innovations plays a crucial role in contemporary manufacturing.
- These innovations are instrumental in **enhancing quality control, reducing waste and inefficiencies**, and **addressing environmental pollution concerns** as well.

Organisational Structure and Stratification

Modern manufacturing can be identified by **several organisational characteristics:**

- A complex machine technology;
- Extreme specialisation and division of labour for producing more goods with less effort, and low costs;
- Vast capital;
- Large organisations;
- Executive bureaucracy.

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Uneven Geographic Distribution:

- Significant **clusters of modern manufacturing** have thrived in specific regions, encompassing **less than 10 percent of the Earth's land area.**
- These nations have emerged as **hubs of both economic and political influence.**
- However, in terms of the total area covered, manufacturing facilities **occupy considerably smaller areas compared to agriculture, primarily due to the higher intensity of manufacturing processes.**
- For example, the farms in America employ about 10-20 workers supporting 50-100 persons, while this area could develop large integrated factories and employ thousands of workers.

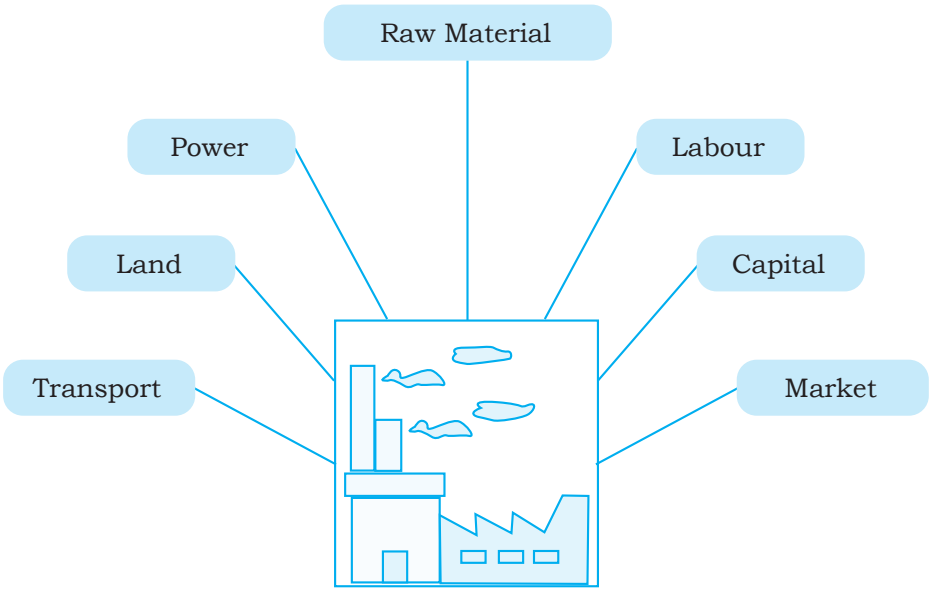

Figure 4.2: Locational Factors for Industries

Factors Influencing Industrial Locations

Industries should be located at **points where the production costs are minimum**. Some of the factors that influence the locations of industries are as follows:

Table 4.1: Factors Influencing Industrial Location

Access to Market	➢ The primary factor in choosing the location of industries is the **presence of a market for manufactured goods.** ➢ A "market" refers to **individuals who both desire these products** and **possess the purchasing power** to buy them from sellers in a given area. ➢ **Remote regions** with sparse populations **offer limited markets**, while **developed areas such as Europe, North America, Japan, and Australia offer extensive global markets** due to the **high purchasing power** of the people. ➢ Likewise, densely populated areas in South and Southeast Asia also present large markets. ➢ Certain industries, such as **aircraft manufacturing**, operate on a global scale, catering to a **worldwide market**. Similarly, the arms industry also serves global markets.

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Access to Raw Material	➢ Industries prefer **raw materials** that are not only **cost-effective** but also **easily transportable**. ➢ Industries based on **cheap, bulky and weight-losing material** are located close to the sources of raw material such as steel, sugar, and cement industries. ➢ **Perishability** also plays a critical role in determining the location of industries. For instance, Industries involved in **agro-processing and dairy products** tend to establish themselves in proximity to the sources of farm produce or milk supply respectively.
Access to Labour Supply	➢ **Labour supply** is an important factor in the location of industries. ➢ Increasing **mechanisation, automation and flexibility** of industrial processes have reduced the dependence of industry upon the labours, however some types of manufacturing still **require skilled labour** such as electronics or defence manufacturing etc.
Access to Sources of Energy	➢ Industries which **use more power** are located close to the source of the energy supply such as the aluminium industry. ➢ Earlier **coal** was the main **source of energy**, today **hydroelectricity** and **petroleum** are also important sources of energy for many industries.
Access to Transportation and Communication Facilities	➢ **Fast and efficient transportation infrastructure** is essential for the growth of industries. It is crucial for transporting raw materials to factories and distributing finished products to markets. ➢ The **cost of transport** plays an important role in the location of industrial units. ➢ Regions like western Europe and eastern North America, have highly advanced transportation systems, which has always induced the **concentration of industries** in these areas. In the modern context, modern industry is closely intertwined with transportation systems. ➢ Improvements in transportation led to integrated economic development and regional specialisation of manufacturing. ➢ Additionally, **effective communication** is another vital requirement for industries. It facilitates the exchange and management of information, enabling businesses to operate efficiently and stay competitive in the global marketplace.
Government Policy	➢ Governments implement "**regional policies**" to promote "**balanced**" **economic development** by strategically establishing industries in specific areas. ➢ These policies are **designed to distribute economic opportunities** more evenly across regions and promote overall economic stability and growth.
Access to Agglomeration Economies/ Links between Industries	➢ Many industries benefit from **proximity to a leader-industry**(such as steel industry) and other industries. These benefits are termed as **agglomeration economies.** ➢ Savings are derived from the **linkages** which exist **between different industries.**

Classification of Manufacturing Industries

Manufacturing industries are classified on the basis of their **size, inputs/raw materials, output/ products and ownership**. Let's analyse this classification of industries (Refer Figure 4.3) in detail.

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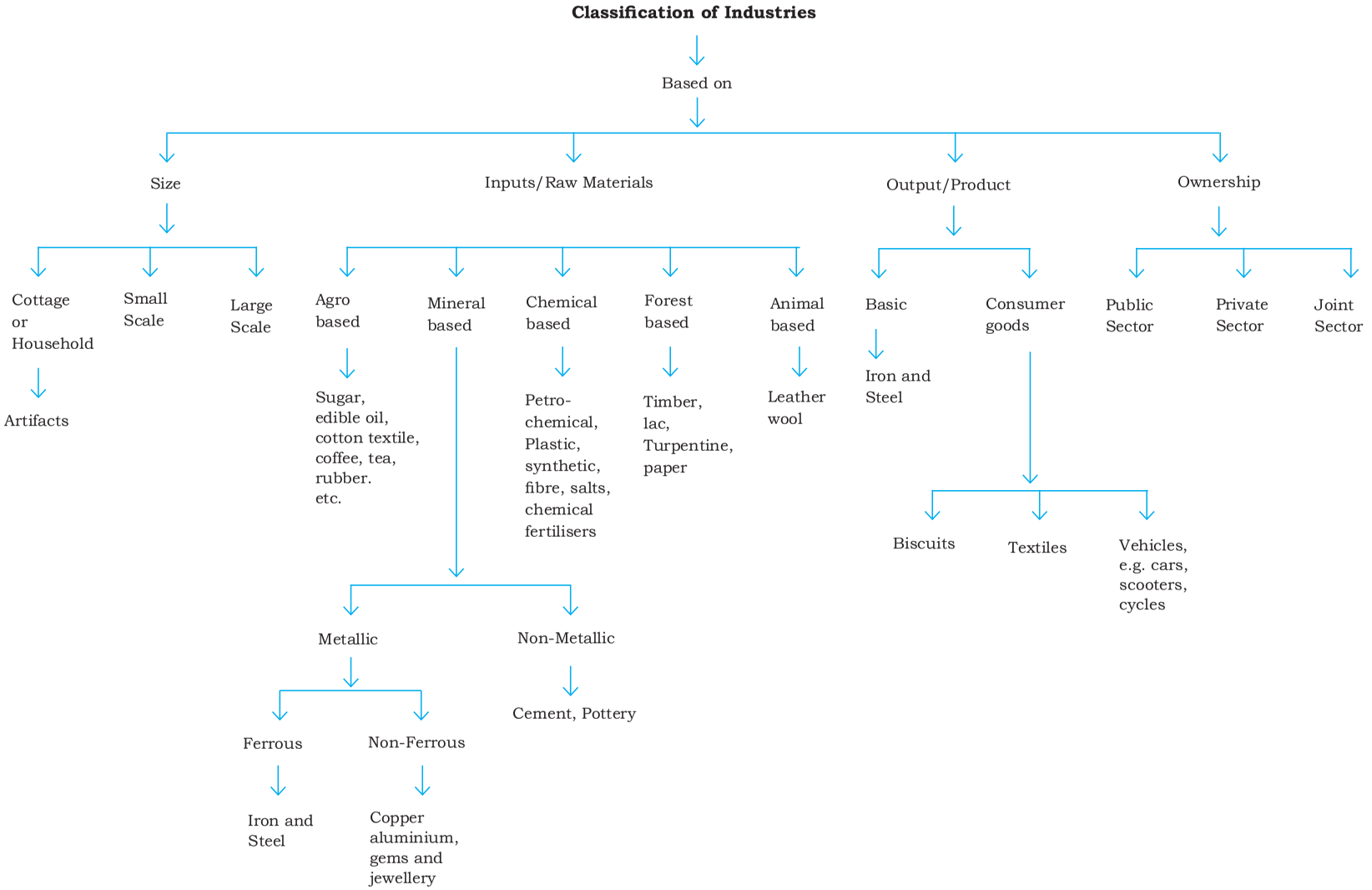

Figure 4.3: Classification of Industries

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Industries based on Size

The **amount of capital** invested, **number of workers** employed and **volume of production** determine the size of industry. Accordingly, industries are classified into household or cottage, small-scale and large-scale industries.

Figure 4.4: Housing Industry in Nagaland

Household industries or Cottage Manufacturing

- This type of manufacturing represents the **smallest-scale production unit**, where artisans utilise **local raw materials and basic tools** to create everyday items within their homes, often with the assistance of family members or occasional part-time labour.
- Finished products may be for **consumption in the same household** or, for **sale in local (village) markets**, or, for **barter**.
- In this form of manufacturing, factors like **capital and transportation have limited influence** because it holds low commercial significance, and most tools are crafted locally.
- Typical products produced within this sector **encompass a range of everyday goods**, including food items, fabrics, mats, containers, tools, furniture, wooden figurines sourced from local woodlots and forests, leather goods such as shoes and thongs, pottery, bricks from locally available clays and stones, and jewellery made from gold, silver, and bronze by skilled goldsmiths.

Foot Loose Industries

Foot loose industries can be located in a wide variety of places. They are not dependent on any specific raw material, weight losing or otherwise.

They largely depend on component parts which can be obtained anywhere. They produce in small quantities and also employ a small labour force. These are generally not polluting industries. The important factor in their location is accessibility by road network.

Small Scale Manufacturing

- Small-scale manufacturing is distinguished from household industries by its **distinct production methods and the location of manufacture**, which typically takes place in **workshops situated outside the home or cottage of the producer**.
- This form of manufacturing **relies on local raw materials**, incorporates basic power-driven machinery, and employs **semi-skilled labour**.
- It plays a crucial role in **generating employment opportunities** and boosting the **local purchasing power** within communities.
- As a result, countries like India, China, Indonesia, Brazil, and others have developed **labour-intensive small-scale manufacturing** as a means to provide jobs for their populations.

Figure 4.5: Products of cottage industry in Assam

Figure 4.6: A motor company in Japan

Large Scale Manufacturing

- Large-scale manufacturing is characterised by several **key features**, such as access to various raw materials, enormous energy, specialised workers, advanced technology, assembly-line mass production and large capital.
- On the basis of the system of large scale manufacturing, the world's major industrial regions may be grouped under **two broad types:**

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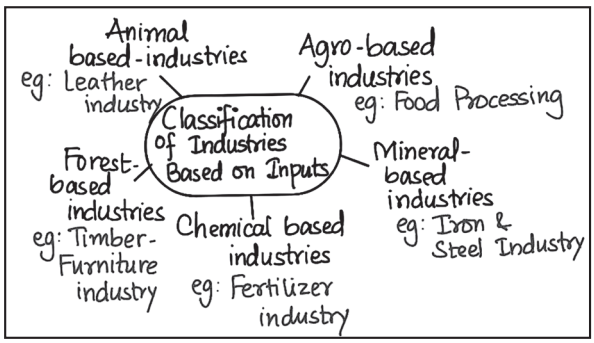
- ✧ **Traditional large-scale industrial regions** which are **thickly clustered** in a few more developed countries.
- ✧ **High-technology large scale industrial regions** which have **diffused** to less developed countries.

Industries based on Inputs/Raw Materials

On the basis of the raw materials used, the industries are classified as:

Agro-based Industries

- ✤ Agro processing involves the **processing of raw materials from the field and the farm** into finished products for rural and urban markets.
- ✤ Major agro-processing industries are **food processing, sugar, pickles, fruits juices, beverages** (tea, coffee and cocoa), **spices and oils, fats and textiles** (cotton, jute, silk), **rubber**, etc.



Let's look into a few of these Agro-based industries.

Food Processing

- ✤ Agro processing includes **canning, producing cream, fruit processing and confectionery**.
- ✤ While some preserving techniques, such as drying, fermenting and pickling, have been known since ancient times, these had limited applications to cater to the pre-Industrial Revolution demands.
- ✤ Nowadays, food processing has become significant with evolving technologies of **food value enrichment, agribusiness etc**.

Agro-factories

Agri-business is commercial farming on an industrial scale often financed by business whose main interests lie outside agriculture, for example, large corporations in tea plantation business. Agri-business farms are mechanised, large in size, highly structured, reliant on chemicals, and may be described as 'agro-factories'.

POINTS TO PONDER

Food processing can be used to add value to the raw products related to agriculture, dairy, poultry, etc. It can be used to counter not only food security challenges but also to increase farmer's income, thereby reducing their suicide rates. Can you identify some challenges that a farmer may face in setting up a food processing industry?

Textile Industry

- ✤ The textile industry contributes significantly to **industrial production, employment generation and foreign exchange earnings.**
- ✤ It is the only industry in the country, which is **self-reliant** and **complete** in the value chain i.e., from raw material to the highest value added products (Refer Figure 4.7).

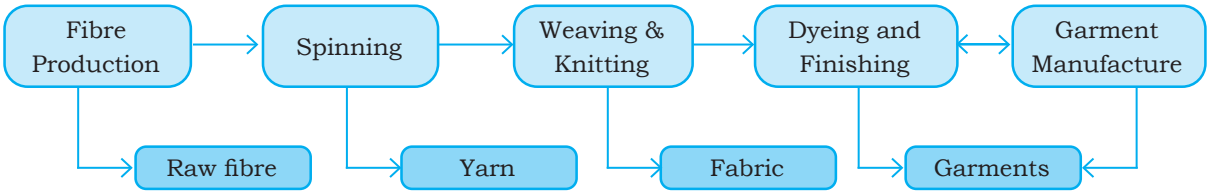


Figure 4.7: Value Addition in Textile Industry

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Cotton Textile

- In ancient India, cotton textiles were crafted through **hand spinning and handloom weaving techniques**. However, after the 18th century, power-looms were introduced. During the colonial period, the traditional industries faced challenges as they couldn't compete with the machine-made cloth from England.
- Initially, the cotton textile industry was concentrated in Maharashtra and Gujarat, where factors like the availability of raw cotton, markets, transportation, labour, and a suitable climate favoured its localization.
- This industry is closely **linked with agriculture** and provides livelihoods to various individuals involved in different stages like **ginning, spinning, weaving, dyeing, designing, packaging, tailoring, and sewing**.
- While **spinning** remains **centralised** in Maharashtra, Gujarat, and Tamil Nadu, **weaving** is highly **decentralised** to incorporate traditional skills and designs in fabrics like cotton, silk, zari, and embroidery. The **handspun khadi industry** provides extensive employment to weavers in their homes as a cottage industry.

Do You Know?
The first successful textile mill was established in Mumbai in 1854.

Do You Know?
The two world wars were fought in Europe and India was a British colony. There was a demand for cloth in U.K. hence, they gave a boost to the development of the cotton textile industry.

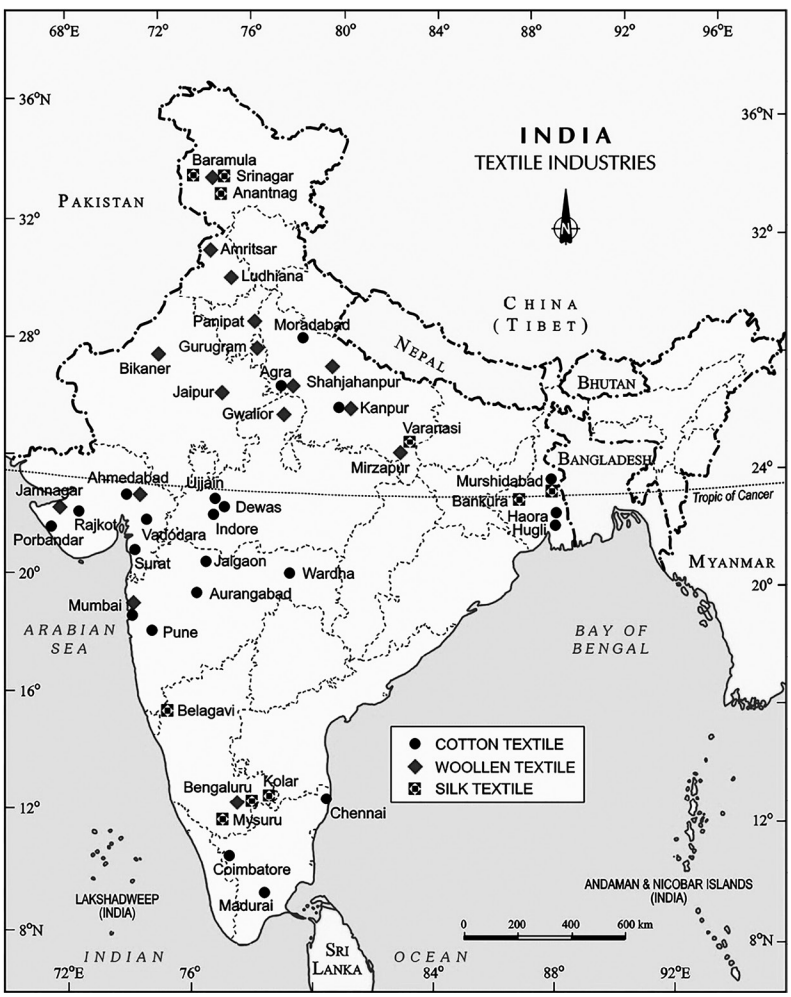

Figure 4.8: Distribution of cotton, woollen and silk industries

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Jute Textiles

- **India is the largest producer of raw jute and jute goods** and stands at **second place as an exporter** after Bangladesh.
- Most of the mills are located in **West Bengal**, mainly along the banks of the Hugli river, in a narrow belt.

Do You Know?
The first jute mill was set up near Kolkata in 1855 at Rishra. After Partition in 1947, the jute mills remained in India but three-fourth of the jute producing area went to Bangladesh (erstwhile East Pakistan).

Sugar Industry

- India ranks second in global sugar production, but it takes the top spot in the production of **gur** and **khandsari**.
- Sugar mills are situated in several states, including Uttar Pradesh, Bihar, Maharashtra, Karnataka, Tamil Nadu, Andhra Pradesh, Gujarat, Punjab, Haryana, and Madhya Pradesh.
- **Uttar Pradesh and Bihar** collectively house about **sixty percent** of these mills.
- In recent years, **the mills have shifted in the southern and western states**, especially in Maharashtra because **the cane produced here has a higher sucrose content**.

Mineral Based Industries

- These industries **use minerals as a raw material**. Some industries use **ferrous metallic minerals** which contain **ferrous (iron)**, such as iron and steel industries but some use **non-ferrous metallic minerals**, such as **aluminium, copper and jewellery** industries.
- Many industries use **non-metallic minerals** such as **cement and pottery** industries.

Iron and Steel Industry

- The iron and steel industry is the basic industry since **all the other industries — heavy, medium and light, depend on it for their machinery**.
- Steel is needed to manufacture a variety of engineering goods, construction material, defence, medical, telephonic, scientific equipment and a variety of consumer goods.
- Production and consumption of steel is **often regarded as the index of a country's development**.
- Iron and steel is a **heavy industry** because all the raw materials as well as finished goods are heavy and bulky entailing heavy transportation costs.
- The **Chota Nagpur plateau** region boasts the **highest concentration of iron and steel industries** (Refer Figure 4.10), primarily due to the relative advantages such as the availability of low-cost iron ore, proximity to high-grade raw materials, access to affordable labour, and significant growth potential within the domestic market.
- Currently, all the **important steel producing centres** such as Bhilai, Durgapur, Burnpur, Jamshedpur, Rourkela, Bokaro are situated in a region that spreads over four states — **West Bengal, Jharkhand, Odisha and Chhattisgarh**.
- Bhadravati and Vijay Nagar in Karnataka, Visakhapatnam in Andhra Pradesh, Salem in Tamil Nadu are other important steel centres utilising local resources.

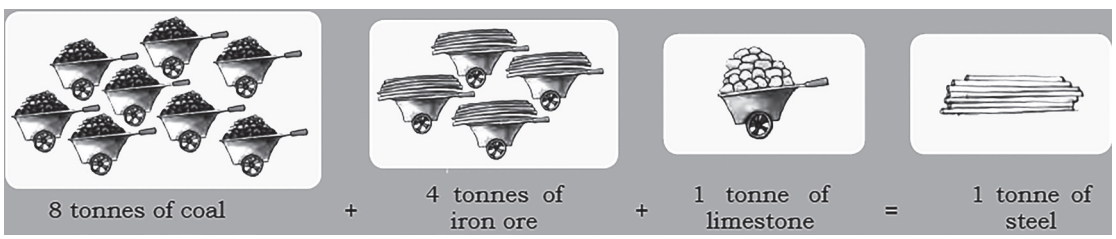

Figure 4.9: Process of obtaining steel

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Figure 4.10: Iron and Steel Plants in India

Changing Location of the Iron and Steel Industry

- Before 1800 A.D, the iron and steel industry was located **where raw materials, power supply and running water were easily available** (Refer Figure 4.11).
- Later the ideal location for the industry was **near coal fields and close to canals and railways**.
- After 1950, the iron and steel industry began to be located on **large areas of flat land near sea ports**. This is because by this time steel works had become very large and iron ore had to be imported from overseas.

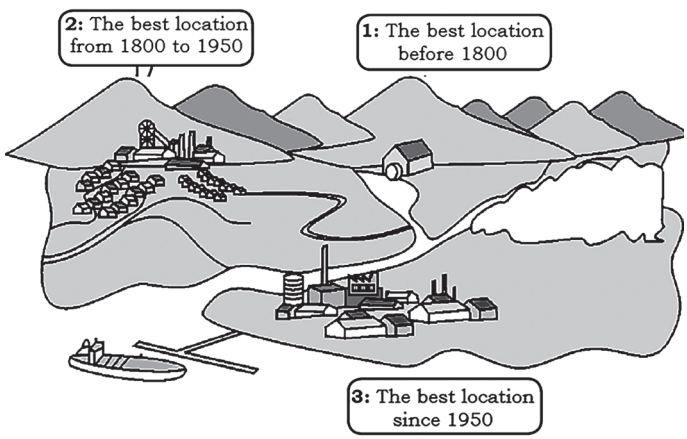

Figure 4.11: Changing location of the iron and steel industry

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Case Study on Jamshedpur and Pittsburg

Jamshedpur

- Before 1947, India had just one iron and steel plant, which was the **Tata Iron and Steel Company Limited (TISCO)** at Sakchi, near the confluence of the Subarnarekha and Kharkai rivers in Jharkhand. Later**, Sakchi was renamed Jamshedpur**.
- Geographically, Jamshedpur was strategically located as the **most convenient iron and steel centre** in the country. After gaining independence, the government took the initiative to establish several iron and steel plants in India.
- Sakchi was chosen to set up a steel plant because it was **closer to the railway line, it was close to iron ore, coal and manganese deposits**, as well as to **Kolkata, which provided a large market**.
- In Jamshedpur, several other industrial plants were set up after TISCO. They produce chemicals, locomotive parts, agricultural equipment, machinery, tinplate, cable and wire.

Pittsburg

- It is an important steel city in the USA, known for its **advantageous location. Some of the essential raw materials**, like **coal**, are readily available locally, while iron ore is sourced from mines in Minnesota, approximately 1500 kms from Pittsburgh.
- Pittsburgh is connected with one of the **world's most cost-effective routes for shipping ore**, the renowned **Great Lakes waterway**. Ore is transported to the Pittsburgh region, and the Ohio, Monongahela, and Allegheny rivers ensure a consistent water supply.
- Today, most large steel mills are **not located directly within Pittsburgh** but are situated in the valleys of the Monongahela and Allegheny rivers above Pittsburgh and along the Ohio River below it. Finished steel products are **transported to the market through a combination of land and water routes.**
- The Pittsburgh area is home to a diverse range of factories beyond steel mills, using steel as a primary raw material to manufacture different products, including railroad equipment, heavy machinery, and rails.
- This industrial diversity **underscores the city's role as a dynamic manufacturing hub**.

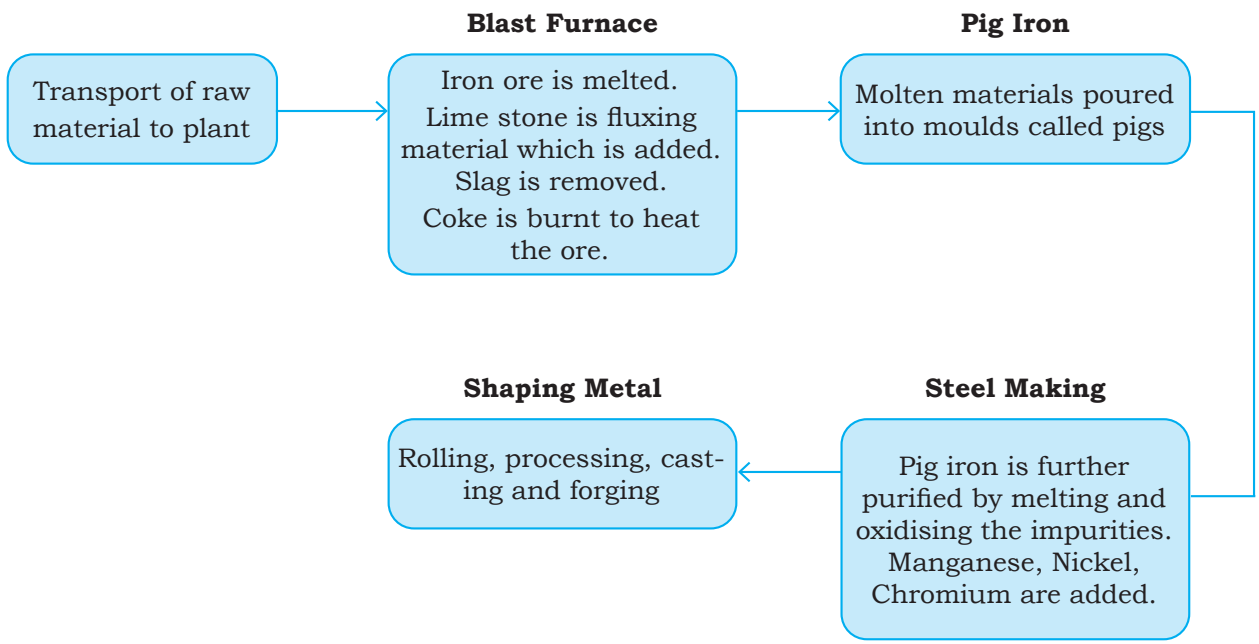

Figure 4.12: Process of Manufacture of Steel

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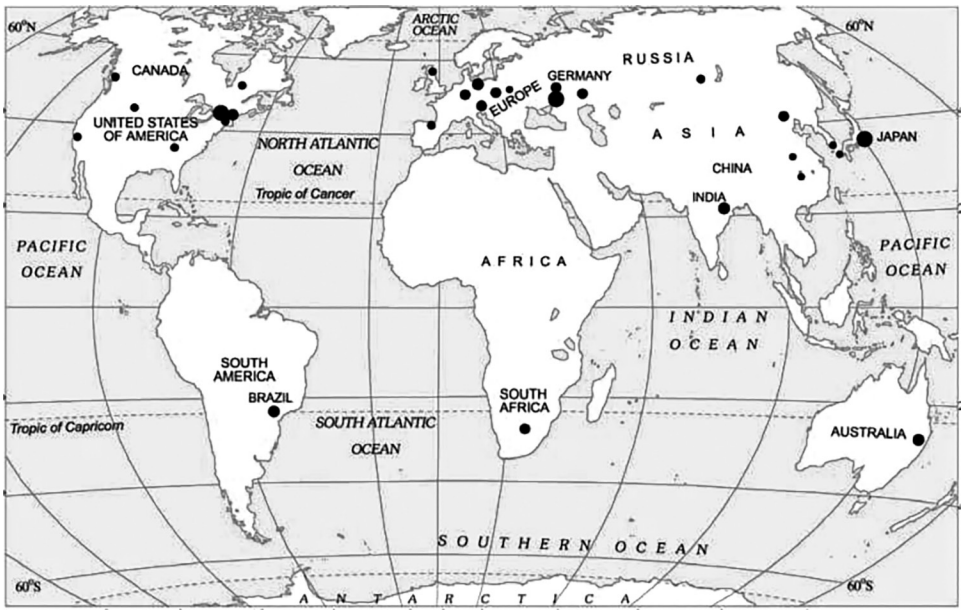

Figure 4.13: World: Major Iron Ore Producing Areas

Aluminium Smelting

- Aluminium smelting is the **second most important metallurgical industry in India**.
- It is light, resistant to corrosion, a good conductor of heat, malleable and becomes strong when it is mixed with other metals.
- It is used to manufacture aircraft, utensils and wires.
- It has gained popularity as a **substitute of steel, copper, zinc and lead** in a number of industries.
- Aluminium smelting plants in India are **located in Odisha, West Bengal, Kerala, Uttar Pradesh, Chhattisgarh, Maharashtra and Tamil Nadu**.

Do You Know?
Bauxite, the raw material used in the smelters during manufacturing Aluminium is a very bulky, dark reddish coloured rock.

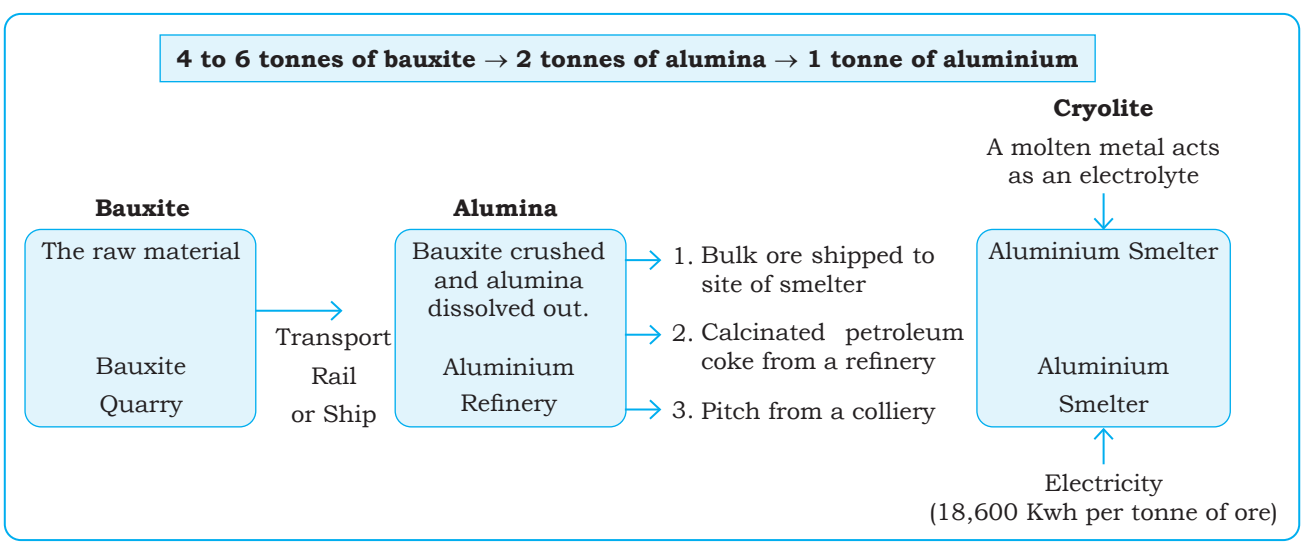

Figure 4.14: Process of Manufacturing in Aluminium Industry

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Chemical Based Industries

- The chemical industry in India is experiencing rapid growth and diversification, **encompassing both large and small-scale manufacturing units**. This expansion is evident in both the **inorganic and organic sectors** of the industry.
- These industries use **natural chemical minerals**, e.g. **mineral-oil** (petroleum) is used in the petrochemical industry.
- **Salts, sulphur and potash industries** also use natural minerals.
- Chemical industries are also based on **raw materials obtained from wood and coal.**
- **Synthetic fibre, plastic**, etc. are other examples of chemical based industries.
- The chemical industry is its **own largest consumer**. Basic chemicals undergo processing to further produce other chemicals that are used for industrial application, agriculture or directly for consumer markets.

Fertiliser Industry

- The fertiliser industry primarily focuses on the production of **nitrogenous fertilisers, mainly urea, phosphatic fertilisers, including ammonium phosphate (DAP)**, and complex fertilisers that combine **nitrogen (N), phosphate (P), and potash (K).** Importantly, potash is entirely imported since the country lacks any reserves of commercially usable potash or potassium compounds in any form.
- Following the Green Revolution, the fertiliser industry expanded to various regions across the country. **Gujarat, Tamil Nadu, Uttar Pradesh, Punjab, and Kerala** collectively contribute to **half of the total fertiliser production.**

Cement Industry

- Cement is **essential for construction activity** such as building houses, factories, bridges, roads, airports, dams and for other commercial establishments.
- This industry requires bulky and heavy **raw materials like limestone, silica and gypsum**.

Forest Based Industries

- The forests provide many major and minor products which are used as raw material.
- For example, **Timber** for the furniture industry, **wood, bamboo and grass** for paper industry, **lac** for lac industries come from forests.

Animal Based Industries

- The **leather** industry sources its raw material, leather, from animals, while the **wool** used in the production of woollen textiles is obtained from sheep.
- Additionally, **ivory** is derived from the tusks of elephants.

Industries Based On Output/Product

- Machines and tools made of iron or steel are produced using raw materials such as iron and steel themselves, making the **iron and steel industry a basic industry**.
- These iron and steel machines and tools are then **used in various sectors**, such as the textile industry, **to manufacture consumer goods**.
- Consumer goods industries produce items that are **directly consumed by consumers**, like bread, biscuits, tea, soaps, toiletries, paper, televisions, and more. These consumer goods industries are **categorised as non-basic industries**.

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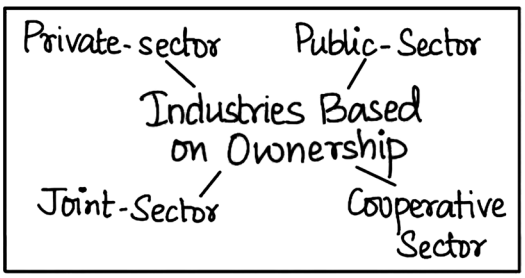
Industries Based On Ownership



Industries that are based on ownership can be categorised as follows:

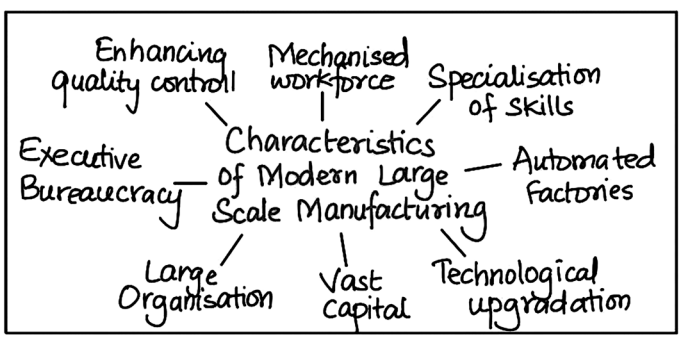
- **Public Sector Industries:** These are **owned and operated by governments**. Socialist countries often have a significant number of state-owned industries. In India, we have a mixed economy, having presence of both Public and Private sector enterprises. For example BHEL, SAIL etc.
- **Private Sector Industries: These are owned by individual investors or private organisations.** In capitalist countries, industries are predominantly privately owned and managed by private entities. For example TISCO, Bajaj Auto Ltd, etc.
- **Joint Sector Industries:** These industries are **managed by joint-stock companies**, and sometimes they involve **collaboration between the private and public sectors**, with both contributing to the establishment and management of these industries. For example, the sugar industry in Maharashtra.
- **Co-operative sector:** These are owned and operated by producers or suppliers of raw materials, workers or both. They pool resources and share profits or losses proportionately. For example, Anand Milk Union Ltd and Sudha Dairy are successful cooperatives.

New Emerging Industries

New high technology industry has evolved worldwide in the last few decades. These technological industries mainly encompass IT, electronics and automobile industry.

Do You Know?
Emerging industries are also known as **'Sunrise Industries'**. These include Information technology, Wellness, Hospitality and Knowledge.

Concept of High Technology Industry



- High technology, often referred to as **high-tech**, represents the **cutting-edge generation of manufacturing activities.**
- It can be best described as the **result of intensive research and development** (R&D) efforts that culminate in the production of products characterised by advanced scientific and engineering qualities.
- In this sector, a significant portion of the workforce consists of **professional or white-collar workers**.
- These **highly skilled specialists** considerably outnumber the actual production workers, often referred to as **blue-collar workers**.

Technopolies
Technopolies include regions like Silicon Valley near San Francisco and Silicon Forest near Seattle. These are known for their concentration of high-tech companies and innovation-driven economies.

- High-tech industries are marked by the **use of robotics** on assembly lines, computer-aided design (CAD) and manufacturing, **electronic controls** for smelting and refining processes, and the continuous development of **new chemical and pharmaceutical products.**
- Neatly spaced, low, modern, dispersed, office-plant-lab buildings rather than massive assembly structures, factories and storage areas mark the high-tech industrial landscape.

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- The development of **planned business parks for high-tech start-ups** has become a part of regional and local development initiatives.
- High-tech industries that are **regionally concentrated** (Refer Figure 4.15), **self-sustaining, and highly specialised** are often referred to as **technopolis**.

Figure 4.15: Some Software Technology Parks in India

Information Technology and Electronics Industries

- The electronics industry encompasses a wide range of products, ranging from transistor sets to televisions, telephones, cellular telecommunications equipment, telephone exchanges, radars, computers etc.
- Bengaluru has emerged as India's electronic hub, often referred to as the "**electronic capital**" of the country.

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- One of the notable impacts of this industry is its role in **generating employment opportunities.** The sustained growth in both hardware and software development is a key factor contributing to the success of the IT industry in India.

Automobile Industry

- Automobiles play a crucial role in providing swift transportation for goods, services, and passengers.
- The **liberalisation of the Indian economy** led to the introduction of new and contemporary vehicle models, sparking increased demand in the market.
- Key **automotive manufacturing hubs** in India include Delhi, Gurugram, Mumbai, Pune, Chennai, Kolkata, Lucknow, Indore, Hyderabad, Jamshedpur, and Bengaluru.

POINTS TO PONDER

"India may have missed being a part of earlier industrial revolutions. But India has the potential to lead the fourth industrial revolution (IR 4.0)." What do you mean by the fourth industrial revolution? Can you name the other three previous industrial revolutions? Mention the factors that prevented India from becoming a leader in the previous industrial revolutions. Also, imagine how IR 4.0 can improve the efficiency of the manufacturing sector.

Global Industrial Regions

- Industrial regions emerge when a **number of industries locate close to each other and share the benefits of their closeness.**
- Major **industrial regions of the world** are eastern North America, western and central Europe, eastern Europe and eastern Asia (Refer Figure 4.16).
- Major industrial regions tend to be located in temperate areas, near sea ports and especially near coal fields.

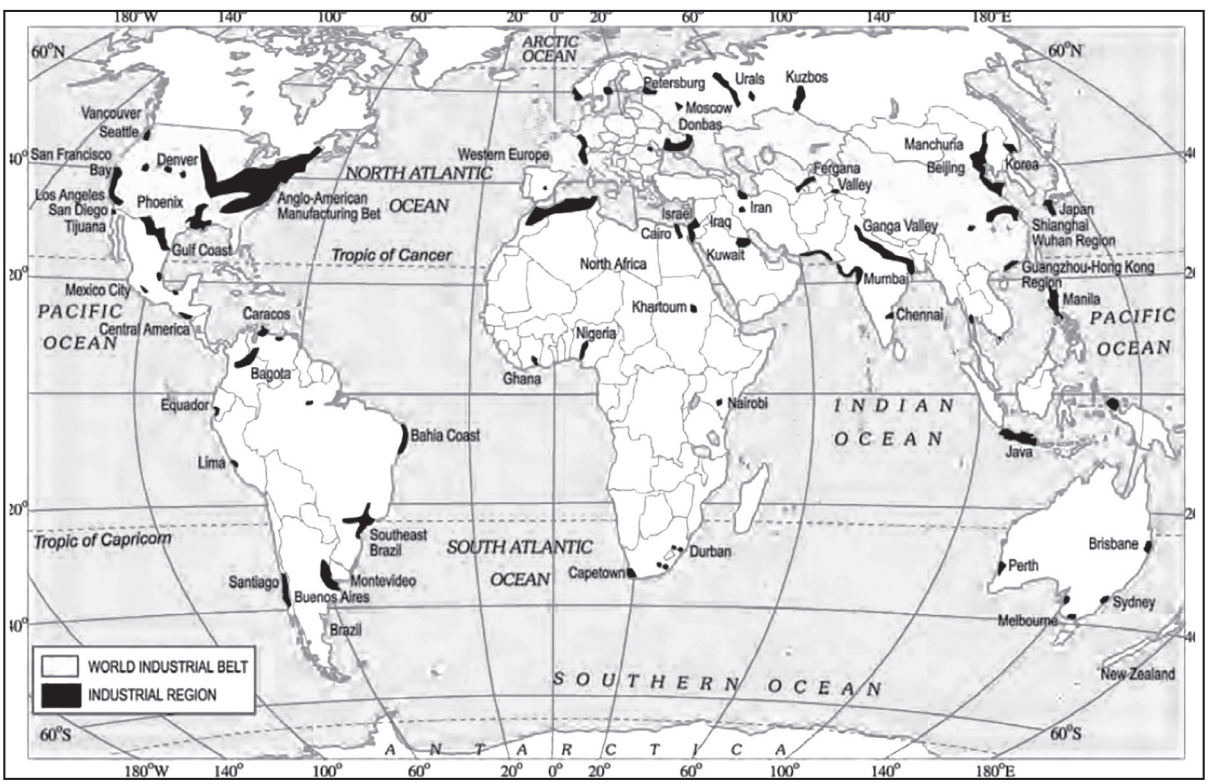

Figure 4.16: World's Industrial Regions

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Industrial Pollution and Environmental Degradation

Table 4.2: Industrial Pollution and Environmental Degradation

Air Pollution	➢ Air pollution is caused by the presence of a **high concentration of undesirable gases** such as sulphur dioxide and carbon monoxide. ➢ **Airborne particulate matter** comprises both solid and liquid particles, such as **dust, sprays, mist, and smoke**. ➢ Smoke is a common emission from various sources, including chemical and paper factories, brick kilns, refineries, smelting plants, and the combustion of fossil fuels in both large and small factories that disregard pollution regulations. ➢ **The Bhopal Gas tragedy** is a notable example of such an incident. ➢ Air pollution has detrimental effects on human health, as well as on animals, plants, buildings, and the overall atmosphere.
Water Pollution	➢ Water pollution is caused by **organic and inorganic industrial wastes and effluents** discharged into rivers. ➢ The main culprits in this regard are **paper, pulp, chemical, textile and dyeing, petroleum refineries, tanneries and electroplating industries** that let out dyes, detergents, acids, salts and heavy metals like lead and mercury pesticides, fertilisers, synthetic chemicals with carbon, plastics and rubber, etc. into the water bodies. ➢ **Fly ash, phospho-gypsum and iron and steel slags** are the major solid wastes in India.
Thermal Pollution	➢ Thermal pollution of water occurs when **hot water from factories and thermal plants is drained into rivers and ponds before cooling.** ➢ Wastes from nuclear power plants, nuclear and weapon production facilities **cause cancers, birth defects and miscarriages.**
Noise Pollution	➢ Noise pollution not only results in irritation and anger, it can also **cause hearing impairment, increased heart rate and blood pressure** among other physiological effects.

Industrial Disaster

- ➢ Accidents and disasters in industries often occur due to **technical failures or irresponsible handling** of hazardous materials.
- ➢ One of the most devastating industrial disasters in history occurred in **Bhopal on December 3, 1984**. This tragic incident was a **result of a technological failure** when **highly poisonous Methyl Isocyanate (MIC) gas**, along with **Hydrogen Cyanide** and other reaction products, **leaked from the pesticide factory** operated by Union Carbide.
- ➢ The official **death toll in 1989** was reported at **3,598** lives lost.
- ➢ However, **thousands of survivors still suffer** from a range of ailments, including **blindness, impaired immune systems, gastrointestinal disorders**, and more.

Control of Environmental Degradation

*Every litre of waste water discharged by our industry pollutes eight times the quantity of freshwater. This industrial pollution can be reduced by following the below **suggestions**:*

- ✤ Minimising water use for processing by **reusing and recycling** it in two or more successive stages.
- ✤ **Rainwater harvesting** to meet water requirements.
- ✤ **Treatment of hot water and effluents before releasing them in rivers and ponds**. This can be done in **three phases:**

Figure 4.17: Sewage treatment plant

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- ✧ **Primary treatment** by mechanical means, which involves screening, grinding, flocculation and sedimentation.
- ✧ **Secondary treatment** by biological process
- ✧ **Tertiary treatment** by biological, chemical and physical processes, which involves recycling of wastewater.

- ✤ **Overdrawing of groundwater** reserves by industry where there is a threat to ground water resources also needs to be regulated legally.
- ✤ Particulate matter in the air can be reduced by **fitting smoke stacks to factories with electrostatic precipitators, fabric filters, scrubbers and inertial separators.**
- ✤ Smoke can be reduced by **using oil or gas instead of coal** in factories.
- ✤ Machinery can be redesigned to **increase energy efficiency and reduce noise.**

NTPC

NTPC (National Thermal Power Corporation) is a **major power providing corporation** in India. It has ISO certification for EMS (Environment Management System) 14001. The corporation has a proactive approach for preserving the natural environment and resources like water, oil and gas and fuels in places where it is setting up power plants. This has been possible through:

1. **Optimum utilisation of equipment** adopting latest techniques and upgrading existing equipment.
2. **Minimising waste generation** by maximising ash utilisation.
3. Providing green belts for **nurturing ecological balance** and addressing the question of special purpose vehicles for afforestation.
4. **Reducing environmental pollution** through ash pond management, ash water recycling system and liquid waste management.
5. **Ecological monitoring**, reviews and online database management for all its power stations.

Conclusion

The various industries in India encompass a wide spectrum, from traditional and labour-intensive sectors to high-tech and rapidly advancing ones. These industries are distributed across the country, each with its unique characteristics and significance. They contribute significantly to the nation's economy, job creation, and technological advancement. However, they also bring challenges, such as environmental concerns, which necessitate responsible and sustainable practices. As India continues to evolve and diversify its industrial landscape, finding a balance between economic growth and environmental stewardship will be critical for its future prosperity.

Glossary:

- ➢ **Mechanisation:** The mechanisation approach involves the utilisation of devices to perform tasks. Automation represents the evolved phase of mechanisation, where human cognitive input is not required in the manufacturing process.
- ➢ **Agglomeration:** Many industries benefit from nearness to a leader-industry and other industries. These benefits are termed as agglomeration economies.
- ➢ **Foot-loose industries:** These are not dependent on any specific raw material such as weight losing or otherwise, but mainly depend on component parts which can be obtained anywhere. They produce in small quantities and also employ a small labour force.
- ➢ **Cottage manufacturing:** This represents the smallest-scale production unit, where artisans utilise local raw materials and basic tools to create everyday items within their homes, often with the assistance of family members or occasional part-time labour.
- ➢ **Synthetic fibre:** They are fibres made by humans through chemical synthesis, as opposed to natural fibres that are directly derived from living organisms, such as plants (like cotton) or fur from animals.

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- **Manufacturing hubs:** The manufacturing hubs idea reflects an emerging consensus among a large number of industry leaders, technology analysts, and economic development professionals that regions are the place to work on technology-based development and that regions need to be anchored by hubs of collaborative R&D where industry can work with academia and government to solve tough problems and foment technology gains.
- **White-collar workers:** A white-collar worker is a person who performs professional service, desk, managerial, or administrative work. White-collar work may be performed in an office or other administrative setting.
- **Smelting:** It is the process in which metals are extracted from their ores by heating beyond the melting point.
- **Technopolis:** A technologically advanced city, or one heavily involved in mechanised manufacture of goods, especially of microelectronics.
- **Environmental degradation:** Environmental degradation is the deterioration of the environment through depletion of resources such as air, water and soil, and the destruction of ecosystems and the extinction of wildlife. It is defined as any change or disturbance to the environment perceived to be deleterious or undesirable.

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5 Tertiary and Quaternary Activities

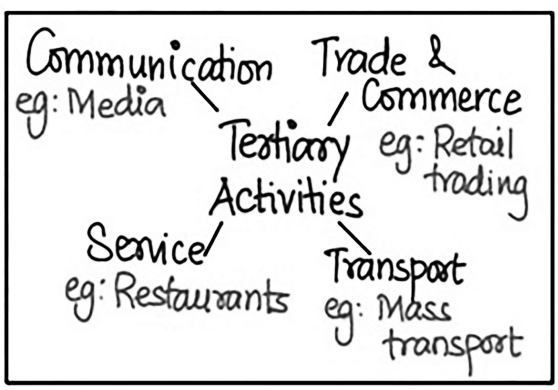
Bibliography: This chapter encompasses the summary of **Chapter 6- XII NCERT** (Fundamentals of Human Geography).

Introduction

Tertiary activities encompass the broad realm of services, provided in exchange for payment and often necessitate specialised skills. As economies develop, there is a noticeable shift from primary to tertiary sectors for employment. Whereas **Quaternary activities** revolve around knowledge-based endeavours like IT and research, requiring specialised expertise, **Quinary activities,** on the other hand, focus on high-level decision-making and human-centric roles such as healthcare and policy-making, which represent the apex of specialised service sectors. However, both highlight the evolution and complexity of modern economies.

Tertiary Activities

- Tertiary activities encompass a range of services (Refer to Figure 5.1) including purchasing books and stationery, using public transport, sending letters, making phone calls, and seeking services like education and healthcare.



Trade and Commerce

- Trade involves the **buying and selling of products** that are produced elsewhere.
- Trade has evolved from simple **barter system** at the local level to complex international monetary exchange, leading to a rise in various trading centres (cities and towns where trading predominantly occurs) and institutions, which act as collection and distribution points.
- The primary motive behind trade and commerce is **profit**.

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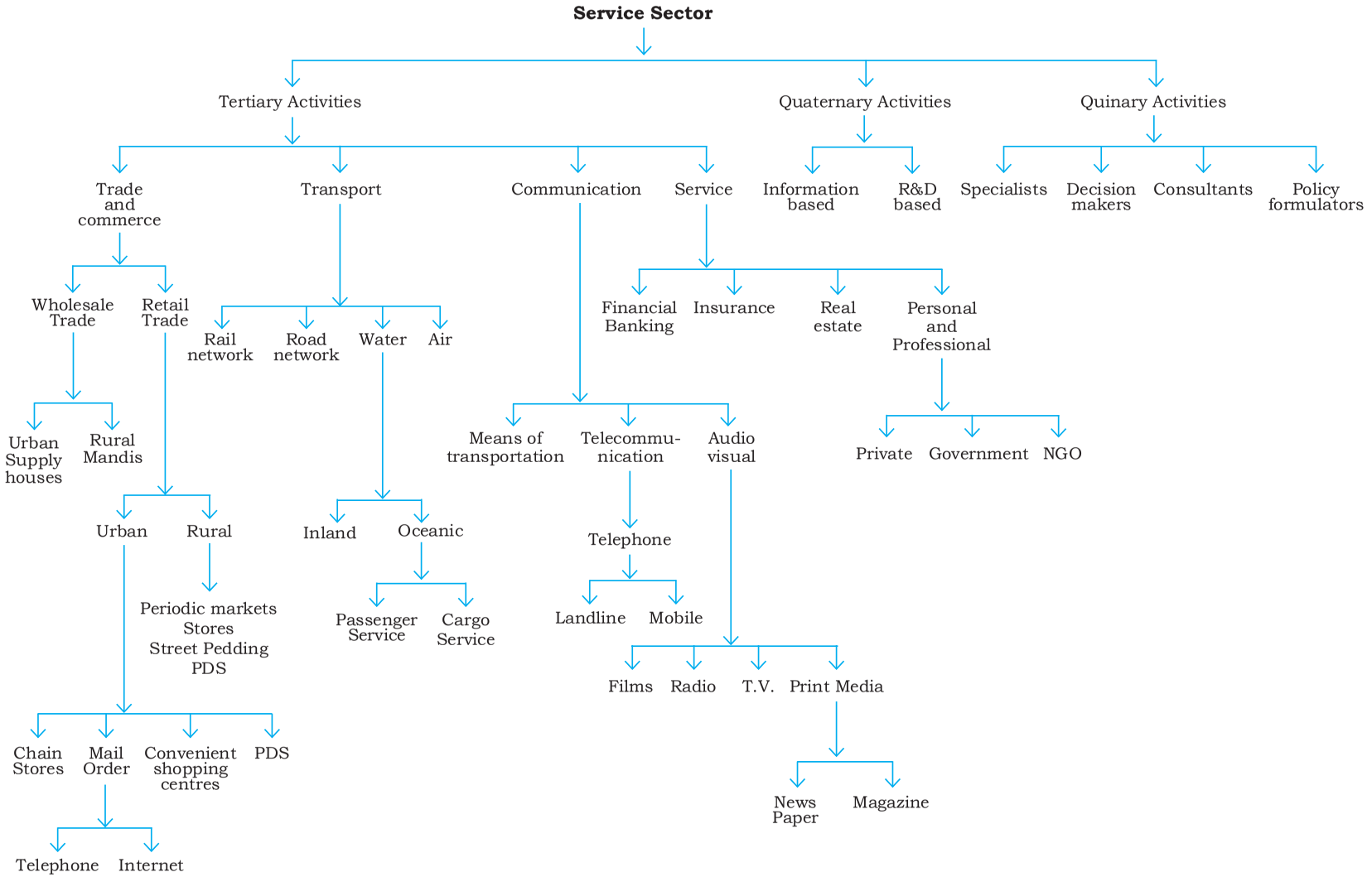

Figure. 5.1: Service Sector

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Types of Trading Centres

- **Rural Marketing Centres:** These are the centres that cater to nearby settlements and are considered **quasi-urban**. They offer **basic trading services** and are the primary collection and distribution points for rural areas.
- **Periodic Markets:** These are the markets that **emerge in areas without regular markets.** These can be **weekly or bi-weekly** and cater to the accumulated demands of the local populace. These markets rotate locations, ensuring shopkeepers remain active and a broader area benefits from their services.
- **Urban Marketing Centres:** These are the centres that offer a broader range of **specialised services**. They not only provide everyday goods but also specialised products. Urban centres present manufactured goods and have specialised markets for various needs, such as labour, housing, and finished products. Additionally, they offer services from educational institutions and professionals like teachers, lawyers, consultants, and healthcare providers.

Retail Trading

- It refers to the business process where **goods are sold directly to end consumers**.
- The majority of retail sales occur in fixed establishments or stores that are exclusively dedicated to selling products.
- Beyond traditional brick-and-mortar stores, there are various non-store retail trading methods. These include street peddling, selling from hand carts or trucks, door-to-door sales, mail-order services, telephone sales, automatic vending machines, and online sales via Internet.

More on Stores

- **Consumer cooperatives** were the first of the large-scale innovations in retailing.
- **Departmental stores** delegate the responsibility and authority to departmental heads for purchasing of commodities and for overseeing the sale in different sections of the stores.
- **Chain stores** are able to purchase merchandise most economically, often going so far as to direct the goods to be manufactured to their specification. They employ highly skilled specialists in many executive tasks. They have the ability to experiment in one store and apply the results to many.

Wholesale Trading

- It refers to the business of selling goods in **large quantities**, primarily to **intermediary merchants and supply houses**, rather than directly to consumers.
- **Connection with Retail:** While some big retail outlets, including chain stores, can buy directly from manufacturers, the majority of retail stores rely on wholesalers for their supplies.
- **The Financial Role of Wholesalers:** An interesting aspect of the wholesale-retail relationship is the financial support wholesalers provide. They often extend credit to retailers, allowing them to operate largely using the wholesaler's capital.

Transport

- It refers to the service or system that **facilitates the movement of people, materials, and manufactured goods** from one place to another.

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Network and Accessibility

As transport systems develop, different places are linked together to form a network. Networks are made up of nodes and links. A **node** is the meeting point of two or more routes, a point of origin, a point of destination or any sizeable town along a route, Every road that joins two nodes is called a **link**. A developed network has many links, which means that places are well-connected.

- It is an organised industry created to satisfy man's basic need for mobility. They play a pivotal role in the production, distribution, and consumption of goods.
- Transport distance can be gauged in two ways viz- **Distance** (The actual length of the route), and **Time** (The duration taken to travel a particular route).
- **Factors Influencing Transport:** Several factors influence the establishment of transport routes:
  - Locations of cities, towns, villages, and industrial hubs;
  - Population size;
  - The trade dynamics between the places;
  - The geographical landscape and topography;
  - Climatic conditions;
  - Financial resources.

Communication

- **Communication services** involve the transmission of **words, messages, facts, and ideas.**
- Originally, the efficacy of communication was intertwined with transportation, as messages were conveyed through means like hand delivery, animals, and various modes of transport.
- Thus, efficient transport networks often mean effective communication. However, innovations like mobile telephony and satellites have made communication increasingly independent from transport. Some of the communication services are discussed below.

Communication Services

- It is deeply intertwined with modern technology and has transformed communication which drastically **reduces message transmission time** from weeks to minutes.
- With innovations like mobile telephony, communication is now immediate and accessible from everywhere.
- **Mass media**, including **radio and television, broadcast news, images, and calls** globally, play crucial roles in entertainment and advertising.
- **Newspapers** provide coverage of worldwide events, while **satellite communication** bridges information gaps on Earth and from space.
- Undoubtedly, the internet has been a monumental force in re-shaping global communication.

Services

- Services cover a wide variety of activities such as trade, hotels, restaurants, transport, storage, communication, financing, and insurance. They vary in nature and can cater to industries, individuals, or both.

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- **Types of services**
  - **Low-order services** such as grocery shops and laundries.
  - **High-order services** or specialised services such as accountants, consultants, and physicians.
  - **Professional Services:** Such as health care, engineering, and law.
  - **Personal Services:** These are the services that facilitate daily life, often provided by migrants seeking employment in urban areas. Notably, Mumbai's renowned Dabbawala service efficiently delivers meals to around 175,000 customers across the city (Refer to Figure 5.2).
  - **Regulation and Supervision:** State and union legislation has led to the formation of corporations to oversee services like transport and telecommunications.

Figure. 5.2: Dabbawala Service in Mumbai

Tertiary Activities and Their Examples

- Currently, the majority of the workforce is engaged in service-related tasks. While all societies have service workers, developed countries have a higher proportion of their workforce in the service sector compared to less developed nations.
- Some crucial **tertiary activities** are given below:

Tourism

- It is primarily driven by recreation rather than business and has emerged as the world's predominant tertiary activity.
- It accounts for a remarkable 250 million jobs and contributes to 40% of global GDP.
- This industry not only employs numerous locals in areas like hospitality and entertainment but also bolsters associated sectors like the retail and craft industries.

Figure. 5.3: Tourists skiing in the snow capped mountain slopes of Switzerland

Tourist Regions

- Popular tourist destinations span various landscapes and interests. Warm places like the **Mediterranean Coast and India's West Coast** are favoured by many.
- Meanwhile, mountainous regions offer enticing winter sports opportunities (Refer to Figure 5.3). Beyond nature, historic towns with their rich monuments, heritage sites, and cultural events draw significant attention from tourists worldwide.

Key Factors Driving Tourist Preferences

- **Climate:** Tourists from colder regions often seek warm, sunny destinations for beach vacations, making the Mediterranean's consistent warmth and sunshine a prime choice. Conversely, some winter vacationers look for either warmer climates or snow-laden areas suitable for skiing.

Do You Know?

The integration of medical treatment and international travel gives rise to the popular phenomenon known as **medical tourism**.

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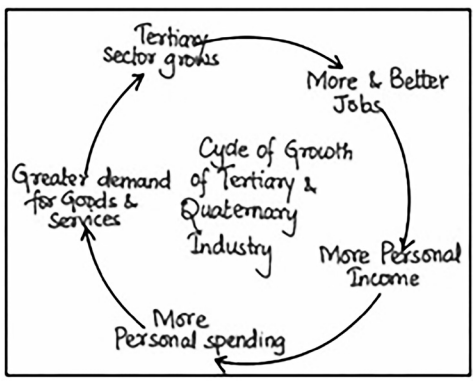
- **Landscape:** Tourists are captivated by breathtaking mountains, serene lakes, majestic sea coasts, and landscapes untouched by urbanisation.
- **History and Art:** Regions rich in history and art captivate many. Ancient towns, archaeological wonders, castles, and places of worship are significant attractions.
- **Culture and Economy:** Authentic local experiences, from ethnic customs to local traditions, intrigue many tourists. Notably, homestays, like those in Goa and Karnataka's Madikere and Coorg, have flourished as cost-effective options for travellers.

Medical Services for Overseas Patients in India

- In 2005, 55,000 U.S. patients sought treatment in India, a leading hub for global medical tourism. While this number is small compared to U.S. surgeries, India's top-tier hospitals have made it a preferred destination.
- Furthermore, medical service outsourcing is expanding, with facilities in **India, Switzerland, and Australia** interpreting various medical images.
- This outsourcing can optimise patient care while prioritising quality and specialisation.

Quaternary Activities



- **Quaternary Activities:** These are the activities that focus on the gathering, creation, and distribution of information.
- This sector is **characterised by research and development** and is seen as an evolved form of service, demanding specialised knowledge and technical expertise.
- The Quaternary Sector along with the Tertiary Sector has replaced most of the primary and secondary employment as the basis for economic growth.
- Developed economies now rely heavily on the 'Knowledge Sector,' with over half of their workforce engaged in it.
- This sector is characterised by a booming demand for information-based services, which can also be outsourced and are not bound by resources, environmental factors, or strict local markets.

Outsourcing

- Outsourcing or contracting out is giving work to an outside agency to improve efficiency and reduce costs.
- When outsourcing involves transferring work to overseas locations, it is described by the term off-shoring.
- Major outsourced works include information technology (IT), human resources, customer support call centre services and at times manufacturing and engineering.
- Many countries from South Asia, East Asia and even from income countries from Africa like Botswana are preferred by Western developed countries for outsourcing.

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Quinary Activities

- These are services (often referred to as gold collar jobs) that focus on the creation, re-arrangement and interpretation of new and existing ideas; data interpretation; and the use and evaluation of new technologies.
- These are performed by top-tier decision-makers and policymakers, distinguishing them from other knowledge-based sectors.
- The rise of outsourcing has led to the establishment of numerous call centres in countries like India, China, and the Philippines, offering job opportunities due to the availability of skilled, yet cost-effective labour.
- An emerging trend in this sector is **Knowledge Processing Outsourcing (KPO)**, distinct from traditional **Business Process Outsourcing (BPO)** due to its reliance on highly skilled professionals. KPO spans fields like R&D, e-learning, and intellectual property research, offering companies new avenues for business growth.

POINTS TO PONDER

COVID-19 affected not only public health but also caused unprecedented disruptions in labour-intensive services sectors due to the mass migration of the labour force in India. Can you establish a link between migration patterns leading to the rise and decline of various service sector industries in India? Also, imagine the dynamic changes the services sector would experience if visa restrictions were revoked all over the world.

The Digital Divide

- The growth opportunities from Information and Communication Technology (ICT) are not uniformly distributed globally, resulting in significant disparities among nations.
- The pace at which a country can offer ICT access to its citizens determines its digital progress.
- Developed nations generally lead in this realm, while developing countries often trail, creating what is termed as the "digital divide".
- This divide is not just global; it is local too. In vast nations like India and Russia, metropolitan areas typically have superior digital connectivity compared to their rural counterparts.

Conclusion

The evolution of economies, with an increasing reliance on specialised skills and services, is illustrated by the progression from primary to tertiary activities. Current economies increasingly dig into knowledge-driven and decision-centric roles with quaternary and quinary activities, highlighting the value of expertise and the complex dynamics of current socio-economic landscapes.

Glossary:

- **Barter system:** It is an act of trading goods or services between two or more parties without the use of money.
- **Homestay:** A stay at a residence by a traveller especially by a visiting foreign student who is hosted by a local family.
- **Urbanization:** It is the process of people moving from rural areas to urban areas, which causes a gradual increase in the proportion of people living in urban areas.
- **Knowledge Process Outsourcing (KPO):** It is a business practice where a company contracts out a specific business task or function to an external service provider.
- **Business Process Outsourcing (BPO):** When a company contracts a third party to handle business functions.

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6 Trade, Transport and Communication

Bibliography: This Chapter encompasses a summary of **Chapter 7 - X NCERT** (Contemporary India-I), **Chapter 7 - XII NCERT** (India, People and Economy), and **Chapter 7 - XII NCERT** (Fundamentals of Human Geography).

Introduction

The world today has been converted into a **global village**. This has been achieved through efficient systems of trade, transport and communication. With the development in science and technology, the area of influence of trade and transport has expanded far and wide. The links between producing centres and consuming centres are established by trade, transport and communication. The trade or the exchange of commodities relies on transportation and communication. Likewise, the high living standards and quality of life depend on efficient transportation, communications and trade. In earlier days, the means of transport and communication were the same. But today both have acquired distinct and specialised forms. We exchange our views, ideas and messages from one place to another or one individual to another while communicating with the help of various means.

Transport

- It is **a service or facility** for the carriage of persons and goods from one place to the other using humans, animals and different kinds of vehicles. Such movements take place over land, water and air.

Transport Network

A transport network refers to several places **(nodes)** joined together by a series of routes **(links)** to form a pattern.

- **Roads** and **railways** form part of land transport, while **shipping** and **waterways** and **airways** are the other two modes. **Pipelines** carry materials like petroleum, natural gas, and ores in liquefied form.
- Transportation is an **organised service industry** created to satisfy the basic needs of society. Efficient transportation promotes co-operation and unity among scattered people.

Modes of Transportation

- The principal modes of world transportation are **land, water, air and pipelines**. These are used for inter-regional and intra-regional transport.
- The significance of a mode depends on the type of goods and services to be transported, costs of transport and the mode available. Various modes of transport complement each other (Refer Figure 6.1).

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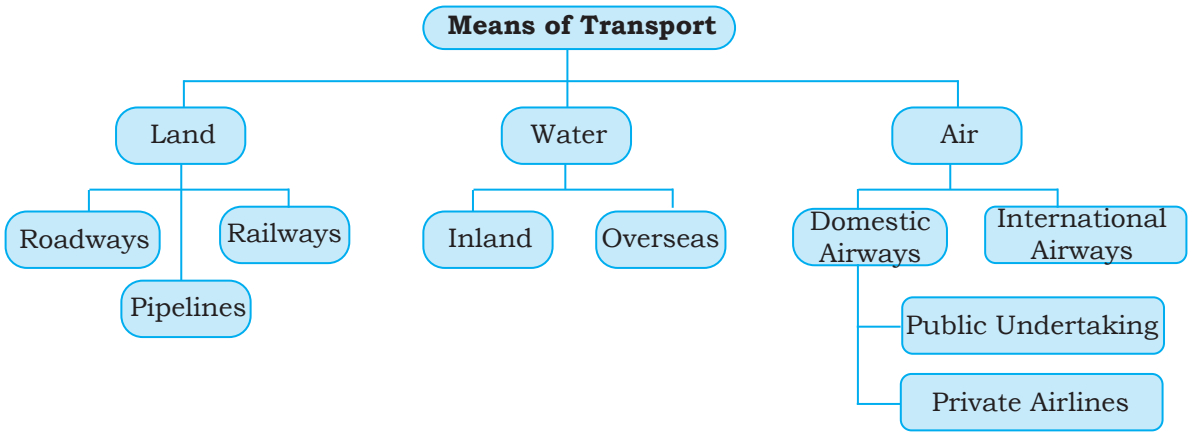

Figure 6.1: Modes of Transportation

Land Transport

- In early days, humans themselves were carriers. For example, brides were carried in palanquins (doli/palki) by four persons (called Kahars in North India). Later animals were being used for transport.
- In the densely populated districts of India and China, overland transport still takes place by human porters or carts drawn or pushed by humans.

Do You Know?

- The Indian Railways is the largest public sector undertaking in the country.
- The first train steamed off from Mumbai to Thane in 1853, covering a distance of 34 km.

- With the **invention of the wheel**, the use of carts and wagons became important. And the **invention of the steam engine in the eighteenth century** revolutionised transportation forever.
- The first public railway line was opened in 1825 between **Stockton and Darlington in northern England**. It opened up continental interiors for commercial grain farming, mining and manufacturing in the U.S.A.
- The **invention of the internal combustion engine** revolutionised road transport in terms of road quality and vehicles plying over them. Among the newer developments in land transportation are **pipelines, ropeways and cableways**.

Road Transport

- Roads play a vital role in a nation's trade and commerce and for promoting tourism.
- Road transport is the most **economical for short distances**, freight transport by road also offers door-to-door service.
- But unmetalled roads are not effective and serviceable for all seasons. During the rainy season these become unmotorable and even the metalled ones become impaired during floods or very heavy rainfalls.
- Urban cities also face the problem of **road congestion and heavy traffic** flows during peak hours.
- Road construction and maintenance requires **heavy expenditure**.
- The world's total motorable road length is only about 15 million km, of which North America accounts for 33 percent. The highest road density and the highest number of vehicles are also registered in this continent.

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Reasons Why Roads are Preferred Over Railways

- Road transport has an edge over railways because of the ease with which they can be built and maintained. The growing importance of road transport vis-à-vis rail transport is rooted in the following **reasons**:
  - Construction **cost of roads is much lower** than that of railway lines,
  - Roads can traverse comparatively more dissected and undulated topography,
  - Roads can **negotiate higher gradients of slopes** and can pass over mountains such as the Himalayas,
  - Road transport is **economical** in transportation of few persons and relatively smaller amount of goods over short distances,
  - It also **provides door-to-door service**, thus the cost of loading and unloading is much lower,
  - Road transport is also used as a feeder to other modes of transport as they provide a link between railway stations, air and sea port.

Do You Know?

Sher Shah Suri built the Shahi (Royal) road to strengthen and consolidate his empire from the Indus Valley to the Sonar Valley in Bengal. This road was renamed the **Grand Trunk (GT)** Road during the British period, connecting Calcutta and Peshawar. At present, it extends from Amritsar to Kolkata.

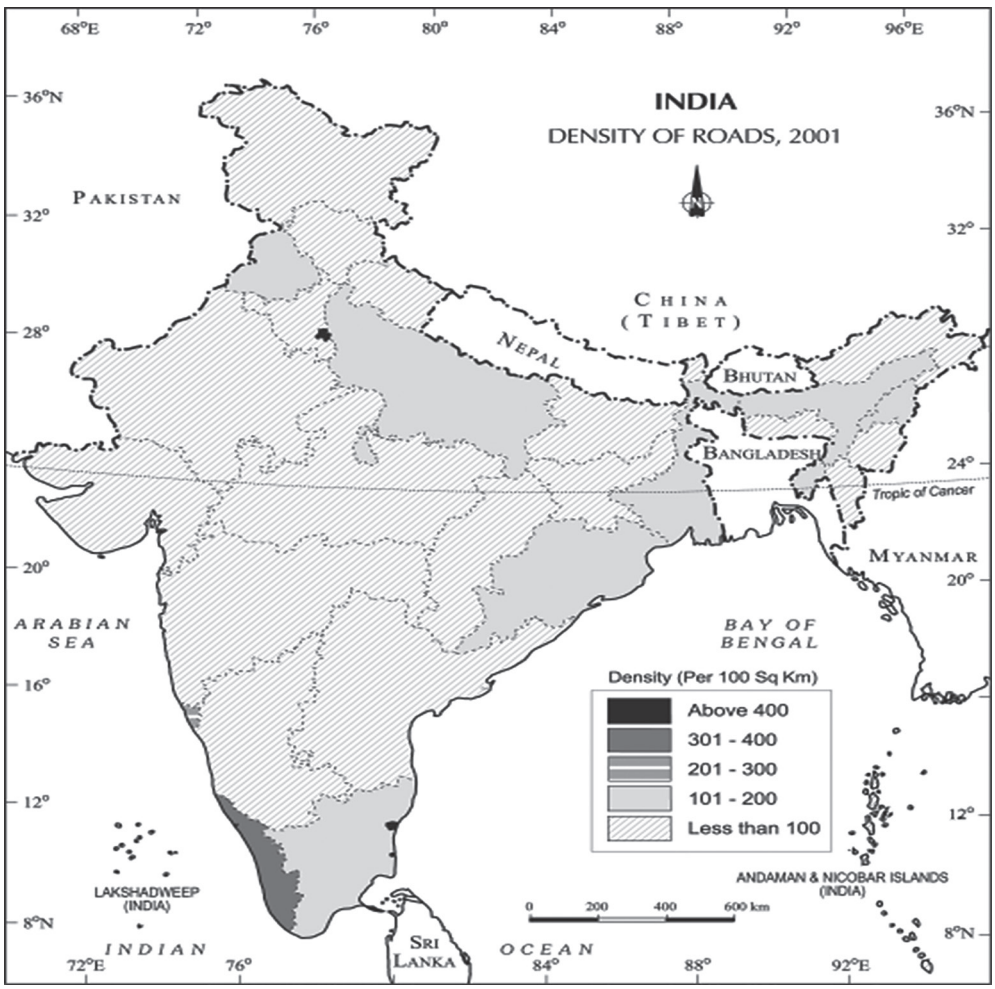

Figure 6.2: India- Density of Roads (2001)

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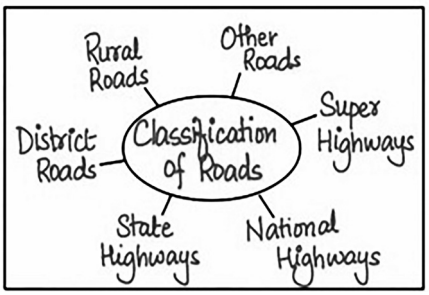
Road Transport in India

- India has the **second largest road networks** in the world with a total length of about **63.73 lakh km** (PIB, 2023). About 85 percent of passenger and 70 percent of freight traffic are carried by roads every year.
- Road transport in the modern sense was very limited in India before World War-II. The first serious attempt was made in 1943 when **'Nagpur Plan'** was drawn. But this plan could not be implemented because of lack of co-ordination between British India and princely states.
- **Twenty-year Road Plan (1961)** was introduced to improve the conditions of roads in India. However, roads continue to concentrate in and around urban centres. Rural and remote areas had the least connectivity by road.

Road Density:

- It is the **length of road per 100 sq. km** of area and it varies across the country (Refer Figure 6.2).
- Density of all roads varies from only 12.14 km in Jammu & Kashmir to 517.77 km in Kerala with the national average of 142 km (2011).



Classification of Roads in India:

Roads are classified into ***6 major categories:***

1. Golden Quadrilateral Super Highways

- The government launched a major road development project, linking Delhi-Kolkata-Chennai-Mumbai by six lane Super Highways.
  - The **North-South Corridor** linking Srinagar (Jammu & Kashmir) and Kanyakumari (Tamil Nadu), and **East-West Corridor** connecting Silcher (Assam) and Porbandar (Gujarat) are part of this project.
- The major objective of these Super Highways is to reduce the time and distance between the mega cities of India. These highway projects are being **implemented by the National Highway Authority of India (NHAI).** The National Highways Authority of India (NHAI) was operationalised in 1995. It is an autonomous body under the Ministry of Road Transport and Highways (MoRTH).

Do You Know?

NH44 which runs from Srinagar in Jammu and Kashmir to Kanyakumari in the southern state of Tamil Nadu, is the **longest highway of India**. It covers a total distance of approximately 3745 kms and is a major north-south corridor that passes through Jammu and Kashmir, Punjab, Haryana, Delhi, Uttar Pradesh, Madhya Pradesh, Maharashtra, Telangana, Andhra Pradesh and Tamil Nadu.

2. National Highways

- The main roads which are **constructed and maintained by the Central Government** are known as the National Highways. These roads are meant for inter-state transport and movement of defence men and material in strategic areas.
- National Highways link extreme parts of the country. These are the primary road systems. A number of major National Highways run in North-South and East-West directions.
- The length of the National Highways has increased from 19,700 km in 1951 to 1,44,634 km in 2022 (According to PIB). **They constitute only about 2 percent** of the total road length but carry 40 percent of the road traffic.

3. State Highways

- These are **constructed and maintained by state governments**. They join the state capitals with district headquarters and other important towns.
- These **constitute 4 percent** of total road length in the country. Roads linking a state capital with different district headquarters are known as State Highways.

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4. District Roads

- These roads are the connecting link between District Headquarters and the other important nodes in the district.
- These roads are **maintained by the Zila Parishad**.
- They **account for 14 percent** of the total road length of the country. These roads connect the district headquarters with other places of the district.

5. Rural Roads

- These roads are vital for providing links in the rural areas. About **80 percent** of the total road length in India are categorised as rural roads.
- These roads received special impetus under the **Pradhan Mantri Grameen Sadak Yojana**. Under this scheme, special provisions are made so that every village in the country is linked to a major town in the country by an all season motorable road.

6. Other Roads

- Other roads include **Border Roads** and **International Highways**.
- Roads laid along international boundaries are called **border roads**. They play an important role in integrating people in remote areas with major cities and providing defence. They are developed and maintained by the **Border Roads Organisation (BRO)**.

Border Roads Organisation (BRO)

It is **a Government of India Undertaking**. It was established in **May 1960** for accelerating economic development and strengthening defence preparedness through rapid and coordinated improvement of strategically important roads on the northern and north-eastern boundary of the country. It has constructed roads in high altitude mountainous terrain joining Chandigarh with Manali (Himachal Pradesh) and Leh (Ladakh). This road runs at an average altitude of 4,270 metres above the mean sea level. It also undertakes snow clearance in high altitude areas. The **world's longest highway tunnel- Atal Tunnel (9.02 km)** is also built by BRO.

- The **international highways** are meant to promote the harmonious relationship with the neighbouring countries by providing effective links with India.

Table 6.1: India Road Network 2022 (Source: MoRTH annual report 2022-23)

S. No	Road Category	Length (in kms)
1.	National Highways	1,44,955
2.	State Highways	1,67,078
3.	Other Roads	60,19,757
	TOTAL	63,31,791

Highways

- They are metalled roads connecting distant places, constructed for **unobstructed vehicular movement.** These are mostly 80 m wide, with separate traffic lanes, bridges, flyovers and dual carriageways to facilitate uninterrupted traffic flow.
- The **Trans-Canadian Highway** links Vancouver in British Columbia (west coast) to St. John's City in Newfoundland (east coast) and the Alaskan Highway links Edmonton (Canada) to Anchorage (Alaska).
- **The Trans-Continental Stuart Highway** connects Darwin (north coast) and Melbourne via Tennant Creek and Alice Springs in Australia.
- Europe has a large number of vehicles and a well-developed highway network. But highways face a lot of competition from railways and waterways.
- Due to the vast geographical area, **highways in Russia are not as important as railways.** In China, highways criss-cross the country connecting all major cities such as Tsungtso (near Vietnam boundary), Shanghai (central China), Guangzhou (south) and Beijing (north).

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- In India, there are many highways linking the major towns and cities. For example, Golden Quadrilateral (GQ) or Super Expressway (Refer Figure 6.3).
- In Africa, a highway joins Algiers in the north to Conakry in Guinea. Similarly, Cairo is also connected to Cape Town through highways.

National Highways Development Projects

NHAI has taken up some major projects in the country under different phases:

Golden Quadrilateral: It comprises construction of 5,846-km long 4/6 lane, high density traffic corridor, to connect India's four big metro cities of Delhi-Mumbai-Chennai-Kolkata. With the construction of Golden Quadrilateral, the time, distance and cost of movement among the mega cities of India will be considerably minimised.

North-South and East-West Corridors: North-South corridor aims at connecting Srinagar in Jammu and Kashmir with Kanyakumari in Tamil Nadu (including Kochchi-Salem Spur) with 4,076-km long road. The East-West Corridor has been planned to connect Silchar in Assam with the port town of Porbandar in Gujarat with 3,640-km of road length.

Figure 6.3: National Highways of India (old numbering)

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Railways

- Railways are a mode of land transport for bulky goods and passengers over long distances.
- The railway gauges vary in different countries and are roughly classified **as broad (more than 1.5 m), standard (1.44 m), metre gauge (1 m) and smaller gauge.**
- **Commuter trains** are very popular in the U.K., U.S.A, Japan and India. These carry millions of passengers daily to and fro in the city.
- Europe has one of the most dense rail networks in the world. The important rail heads are London, Paris, Brussels, Milan, Berlin and Warsaw.
- **Underground railways** are important in London and Paris.
- **In Russia**, railways account for about 90 per cent of the country's total transport with a very dense network west of the Urals.
- **North America** has one of the most extensive rail networks accounting for nearly 40 per cent of the world's total.
- In **Canada**, railways are in the public sector and distributed all over the sparsely populated areas.
- In **South America**, the rail network is the most dense in two regions, namely, the Pampas of Argentina and the coffee growing region of **Brazil which together account for 40 per cent of South America's total route length**. There is only one trans-continental rail route linking Buenos Aires (Argentina) with Valparaiso (Chile) across the Andes Mountains through the Uspallata Pass located at a height of 3,900 m.

Mahatma Gandhi said the Indian railways "...brought people of diverse cultures together to contribute to India's freedom struggle".

Bharatmala is an umbrella scheme for:

- **Development of State roads along coastal border areas** including connectivity of non-major ports;
- Backward areas religious and tourist places connectivity programme;
- **Setu Bharatam Pariyojana**, which is for the construction of about 1500 major bridges and 200 rail over bridges rail under bridges;
- **District Headquarters connectivity Scheme** for the development of about 9000 km newly declared National Highways.

Konkan Railway

One of the important achievements of Indian Railways has been the construction of **Konkan Railway in 1998**. It is 760 km long rail route connecting Roha in Maharashtra to Mangalore in Karnataka. It is considered an engineering marvel. It crosses 146 rivers, streams, nearly 2000 bridges and 91 tunnels. **Asia's largest tunnel which is nearly 6.5 km** long, also lies on this route. The states of **Maharashtra, Goa and Karnataka** are partners in this undertaking.

Railways in India

- The Indian Railways network is **one of the longest in the world** and also the **largest government undertaking** in the country. It facilitates the movement of both freight and passengers and contributes to the growth of the economy. (Refer Figure 6.5)
- It was **first introduced in 1853, from Bombay to Thane (34 kms)**. It was introduced by the British with the intention to connect the hinterland to main urban centres. The motive was exploitation of resources, i.e. export of raw materials and import of British goods.
- In India, the railway system has been divided into 19 zones. (Refer Figure 6.4)
- Indian Railways has launched an extensive programme to convert the metre and narrow gauges to broad gauge. Moreover, steam engines have been replaced by diesel and electric engines. This has increased the speed and the haulage capacity of the trains.

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- Metro rail has revolutionised the urban transport system in India, making travel easier, safer and quicker.
- The distribution pattern of the Railway network in the country has been largely influenced by physiographic, economic and administrative factors. The northern plains with their vast level land, high population density and rich agricultural resources provided the most favourable condition for their growth.
- In the hilly terrains of the peninsular region, railway tracks are laid through low hills, gaps or tunnels. The Himalayan mountainous regions also are unfavourable for the construction of railway lines due to high relief, sparse population and lack of economic opportunities.
- Some challenges that plague Indian railways are: Thefts and damage of railway property; unnecessary pulling of chains, causing train delays; passengers travelling without tickets etc.

Do You Know?

On the basis of the width of track of the Indian Railways, three categories have been made:

- **Broad gauge:** The distance between rails in broad gauge is 1.676 metre. The total length of broad gauge lines was 63950 km (2019-20).
- **Metre gauge:** The distance between rails is one metre. Its total length was 2402 km (2019-20).
- **Narrow gauge:** The distance between the rails in this case is 0.762 metre or 0.610 metre. The total length of narrow gauge was 1604 km (2019-20).

Railway Zone	Headquarters
Central	Mumbai CST
Eastern	Kolkata
East Central	Hajipur
East Coast	Bhubaneswar
Northern	New Delhi
North Central	Allahabad
North Eastern	Gorakhpur
North East Frontier	Maligaon (Guwahati)
North Western	Jaipur
Southern	Chennai
South Central	Secunderabad
South Eastern	Kolkata
South East Central	Bilaspur
South Western	Hubli
Western	Mumbai (Church Gate)
West Central	Jabalpur
Konkan	Navi Mumbai
Metro	Kolkata
South Coast	Visakhapatnam

Figure 6.4: Indian Railways- Zones and Headquarters

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Figure 6.5: Indian Railway Lines

Trans-Continental Railway Lines

- Trans–continental railways run across the continent and link its two ends. They were **constructed for economic and political reasons.**

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Following are the most important Trans-continental railway lines:

- **Trans–Siberian Railway :** This is a major rail route of Russia running from St. Petersburg in the west to Vladivostok on the Pacific Coast in the east passing through Moscow, Ufa, Novosibirsk, Irkutsk, Chita and Khabarovsk. It is the most important route in Asia and the longest (9332 km), double-tracked and electrified trans–continental railway in the world. It opened up the Asian region to European markets. It runs across the **Ural Mountains, Ob and Yenisei rivers**. Chita is an important agrocentre and Irkutsk, a fur centre. There are connecting links to the south, namely, to Odessa (Ukraine), Baku on the Caspian Coast, Tashkent (Uzbekistan), Ulan Bator (Mongolia), and Shenyang (Mukden) and Beijing in China. (Refer Figure 6.6)
- **Trans–Canadian Railways:** This 7,050 km long rail-line in Canada runs from Halifax in the east to Vancouver on the Pacific Coast passing through **Montreal, Ottawa, Winnipeg and Calgary**. It was constructed in 1886. This line is the economic artery of Canada. Wheat and meat are the important exports on this route. (Refer Figure 6.7)
- **The Union and Pacific Railway:** This rail-line connects New York on the Atlantic Coast to San Francisco on the Pacific Coast. The most valuable exports on this route are ores, grain, paper, chemicals and machinery.
- **The Australian Trans–Continental Railway:** This rail-line runs west-east across the southern part of the continent from Perth on the west coast, to Sydney on the east coast passing through Kalgoorlie, Broken Hill and Port Augusta..
- **The Orient Express:** This line runs from Paris to Istanbul. The journey time from London to Istanbul by this Express is now reduced to 96 hours as against 10 days by the sea-route. The chief exports are cheese, bacon, oats, wine, fruits, and machinery.

Figure 6.6: Trans-Siberian Railway

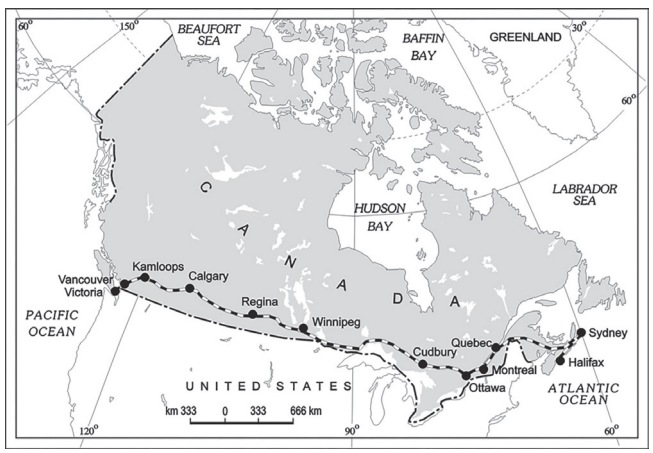

Figure 6.7: Trans-Canadian Railway

Pipelines

- Pipelines are used extensively to transport **liquids and gases** such as water, petroleum and natural gas for an uninterrupted flow. Pipelines are the most convenient and efficient mode of transporting liquids and gases over long distances. Even **solids** can also be transported by pipelines after converting them into slurry.
- In New Zealand, milk is being supplied through pipelines from farms to factories. About 17 percent of all freight per tonne-km is carried through pipelines in the U.S.A.

Figure 6.8: Pipelines Transporting natural gas in Ukraine

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- In Europe, Russia, West Asia and India pipelines are used to connect oil wells to refineries, and to ports or domestic markets.

Pipelines in India

- **Oil India Limited (OIL)** under the administrative set up of the Ministry of Petroleum and Natural Gas is engaged in the exploration, production and transportation of crude oil and natural gas. It was incorporated in 1959 as a company. Asia's first cross country pipeline covering a distance of 1,157 km was constructed by OIL from Naharkatiya oilfield in Assam to Barauni refinery in Bihar. It was further extended up to Kanpur in 1966.
- **Gas Authority of India Ltd (GAIL)** was set up in 1984 as a public sector undertaking to transport, process and market natural gas for its economic use.
- Pipeline transport network is a new arrival on the transportation map of India. The far inland locations of refineries like Barauni, Mathura, Panipat and gas based fertiliser plants could be thought of only because of pipelines.
- Initial cost of laying pipelines is high but subsequent running costs are minimal. It rules out trans-shipment losses or delays.
- There are **three important networks** of pipeline transportation in the country:
  1. From oil field in **Upper Assam to Kanpur** (Uttar Pradesh), via Guwahati, Barauni and Allahabad
  2. From **Salaya in Gujarat to Jalandhar in Punjab**, via Viramgam, Mathura, Delhi and Sonipat.
  3. The first 1,700 km long **Hazira-Vijaipur-Jagdishpur (HVJ)** cross country gas pipeline, from Mumbai High to Bassein gas fields with various fertiliser, power and industrial complexes in western and northern India. It was constructed by GAIL.

Water Transport

- Since the ancient period, India was **one of the seafaring countries**. One of the great advantages of water transportation is that it does not require route construction. It is **much cheaper** because the friction of water is far less than that of land. The energy cost of water transportation is lower. They are most suitable for carrying heavy and bulky goods. It is **fuel-efficient and environment friendly**.
- Waterways is an important mode of transport for both **passenger and cargo traffic** in India. It is the cheapest means of transport and is most suitable for carrying heavy and bulky material. It is a fuel-efficient and **eco-friendly** mode of transport. **The water transport is of two types–** (a) Oceanic waterways, and (b) Inland waterways.

Oceanic Waterways/Sea Routes

- The oceans offer a smooth highway traversable in all directions with no maintenance costs. It is a cheaper means of haulage (carrying of load) of bulky material over long distances from one continent to another. The development of refrigerated chambers for perishable goods, tankers and specialised ships have improved cargo transport.
- India has a vast **coastline of approximately 7,517 km**, including islands. **12 major and 200 notified minor ports** provide infrastructural support to these routes.
- Oceanic routes play an important role in the transport sector of India's economy. Approximately **95 percent of India's foreign trade by volume and 70 percent by value** moves through ocean routes. Apart from international trade, these are also used for the purpose of transportation between the islands and the rest of the country.

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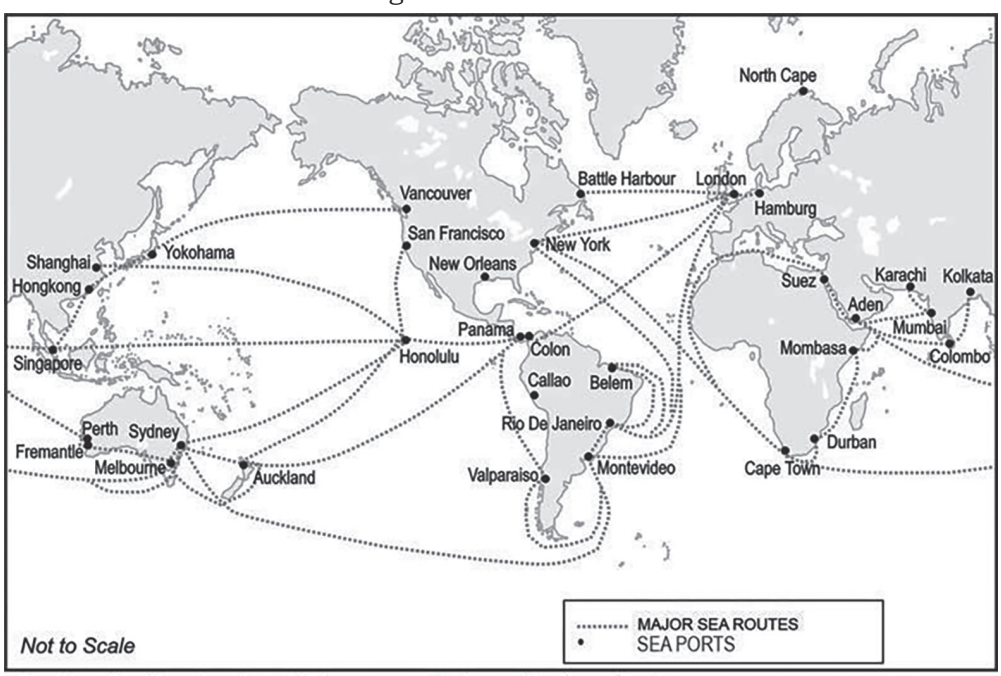
Important Sea Routes

- **The Northern Atlantic Sea Route:** This links North-eastern U.S.A. and Northwestern Europe(Refer Figure 6.9). The foreign trade over this route is greater than that of the rest of the world combined. One fourth of the world's foreign trade moves on this route. It is, therefore, the busiest in the world and also called the **'Big Trunk Route'**.
- **The Mediterranean–Indian Ocean Sea Route:** This sea route serves more countries and people than any other route. Port Said, Aden, Mumbai, Colombo and Singapore are some of the important ports on this route. The construction of the **Suez Canal** has greatly reduced the distance and time on this route.
- **The Cape of Good Hope Sea Route:** This trade route connects the industrialised Western European region with West Africa, South Africa, South-east Asia and the commercial agriculture and livestock economies of Australia and New Zealand.
  - Trade across the vast North Pacific Ocean moves by several routes which converge at Honolulu. The direct route on **the Great Circle** links Vancouver and Yokohama and reduces the travelling distance (2,480 km) by half.
- **The North Pacific Sea Route:** This sea route links the ports on the west-coast of North America with those of Asia. These are Vancouver, Seattle, Portland, San Francisco and Los Angeles on the American side and Yokohama, Kobe, Shanghai, Hong Kong, Manila and Singapore on the Asian side.
- **The South Pacific Sea Route:** This sea route connects Western Europe and North America with Australia, New Zealand and the scattered Pacific islands via the **Panama Canal**. This route is also used for reaching Hong Kong, Philippines and Indonesia. The distance covered between Panama and Sydney is 12,000 km. Honolulu is an important port on this route.
- **The Southern Atlantic Sea Route:** South American nations get connected with West African and West European regions via this sea route. The sparse population and poor development of African and South American countries are the reasons behind the low traffic on this route. The traffic is less between Cape Town and Rio De Janeiro because both Africa and South America have similar natural resources and goods to offer.



The International Boundary shown in this map may not to be considered as authentic

Figure 6.9: Major Sea Routes and Ports in the World

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Gateways of International Trade: Ports

Types of Ports

✤ *Based on the types of traffic they handle*

(i) **Industrial Ports:** These ports specialise in bulk cargo like grains, sugar, ore, oil, chemicals and similar materials.

(ii) **Commercial Ports:** These ports handle general cargo-packaged products and manufactured goods. These ports also handle passenger traffic.

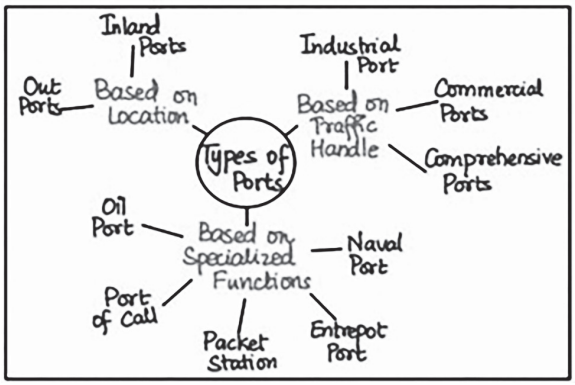
(iii) **Comprehensive Ports:** Such ports handle bulk and general cargo in large volumes. Most of the world's great ports are classified as comprehensive ports.

Figure 6.10: San Francisco, the largest land-locked harbour in the world.

✤ **Based on location**

(i) **Inland Ports:** These ports are located away from the sea coast. They are linked to the sea through a river or a canal. Such ports are accessible to flat bottom ships or barges. For example, Manchester is linked with a canal; and Kolkata is located on the river Hooghly, a branch of the river Ganga.

(ii) **Out Ports:** These are deep water ports built away from the actual ports. These serve the parent ports by receiving those ships which are unable to approach them due to their large size. For example, Athens and its out port Piraeus in Greece.



✤ **Based on specialised functions**

(i) **Oil Ports:** These ports deal in the processing and shipping of oil. Some of these are tanker ports and some are refinery ports. Maracaibo in Venezuela, Esskhira in Tunisia, Tripoli in Lebanon are tanker ports. Abadan on the Gulf of Persia is a refinery port.

(ii) **Ports of Call:** Ports where ships stop for refuelling, watering and taking food items. They have developed into commercial ports. Aden, Honolulu and Singapore are examples.

(iii) **Packet Station:** These are also known as ferry ports. They transport passengers and mail across water bodies covering short distances. Example: Dover in England and Calais in France across the English Channel.

(iv) **Entrepot Ports:** These are collection centres where the goods are brought from different countries for export. Singapore is an entrepôt for Asia. Rotterdam for Europe, and Copenhagen for the Baltic region.

(v) **Naval Ports:** These are ports which have only strategic importance. These ports serve warships and have repair workshops for them. Kochi and Karwar are examples of such ports in India.

Major Sea Ports of India

✤ With a long coastline of 7,516.6 km, India is dotted with 12 major (Refer Figure 6.12) and 200 notified minor ports. These major ports handle 95 per cent of India's foreign trade.

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- **Kandla in Kachchh**, was the first port developed soon after Independence to ease the volume of trade on the Mumbai port. Kandla, also known as the **Deendayal Port**, is a tidal port. It caters to the convenient handling of exports and imports of highly productive granary and industrial belt stretching across UT of Jammu and Kashmir, and the states of Himachal Pradesh, Punjab, Haryana, Rajasthan and Gujarat. This port is specially designed to receive large quantities of petroleum and petroleum products and fertilisers.
- **Mumbai** is the biggest port with a spacious natural and well-sheltered harbour. It has the country's largest oil terminal. It is situated closer to the general routes from the countries of the Middle East, Mediterranean countries, North Africa, North America and Europe.
- **The Jawaharlal Nehru port at Nhava Sheva** was developed as a satellite port and was planned to decongest the Mumbai port and serve as a hub port for this region.
- **Mormugao port**, situated at the entrance of the Zuari estuary, is a natural harbour in Goa. It is the premier iron ore exporting port of the country. This port accounts for about fifty percent of India's iron ore export.
- **New Mangalore port**, located in Karnataka caters to the export of iron ore concentrates from Kudremukh mines.
- **Kochchi** is the extreme south-western port, situated at the head of Vembanad Kayal. It is popularly known as the **'Queen of the Arabian Sea'**, and is a natural harbour. It has an advantageous location being close to the Suez-Colombo route.
- **The port of Tuticorin** in Tamil Nadu has a natural harbour and rich hinterland. It deals with a variety of cargo, including coal, salt, food grains, edible oils, sugar, chemicals and petroleum products. (Refer Figure 6.11)

Figure 6.11: Handling of cargo at Tuticorin Port

- **Chennai** is one of the oldest artificial ports of the country. It is ranked next to Mumbai in terms of the volume of trade and cargo.
- **Ennore**, a newly developed port in Tamil Nadu, has been constructed to relieve the pressure at Chennai port.
- **Visakhapatnam** is the deepest landlocked and well-protected port.
- **Paradip port** located in Odisha in the Mahanadi delta, specialises in the export of iron ore. It has the deepest harbour specially suited to handle very large vessels.
- **Kolkata** is an inland riverine port. Being a tidal port, it requires constant dredging of Hooghly river. It is confronted with the problem of silt accumulation in the Hooghly river.
- **Haldia port** was developed as a subsidiary port, in order to relieve growing pressure on the Kolkata port.

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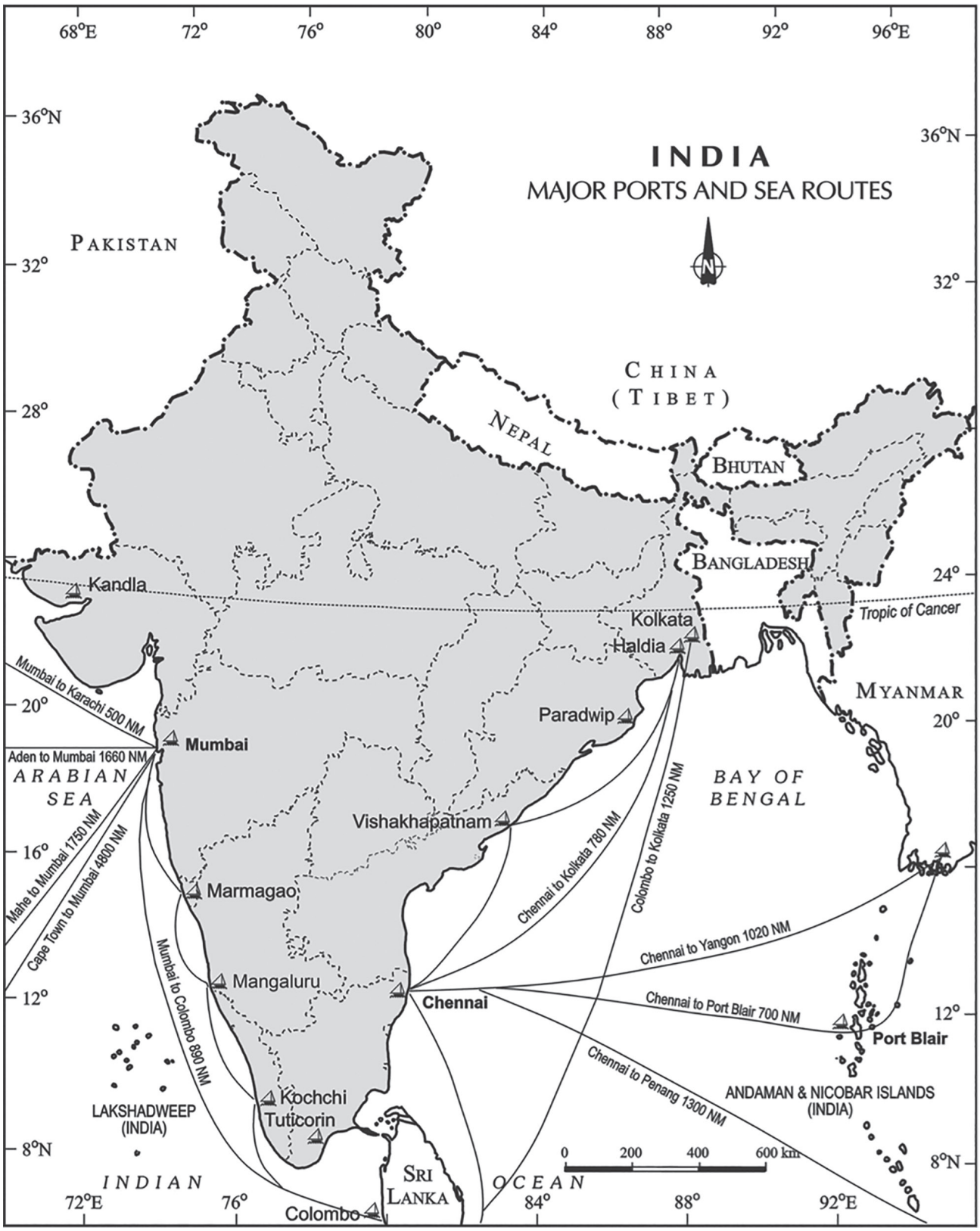

Figure 6.12: India- Major Ports and Sea Routes

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Coastal Shipping

- While oceanic routes connect different countries, coastal shipping is a convenient mode of transportation with long coastlines, e.g. U.S.A, China and India. If properly developed, coastal shipping can reduce the congestion on the land routes.

Shipping Canals

- **The Suez Canal:** This canal was constructed in 1869 in Egypt between Port Said in the north and Port Suez in the south linking the Mediterranean Sea and the Red Sea. It gave Europe a new gateway to the Indian Ocean and reduced direct sea-route distance between Liverpool and Colombo compared to the Cape of Good Hope route. The tolls are very heavy here. (Refer figure 6.13)
- **The Panama Canal:** This canal connects the Atlantic Ocean in the east to the Pacific Ocean in the west. It shortens the distance between New York and San Francisco by 13,000 km by sea. The economic significance of this Canal is relatively less than that of the Suez. However, it is vital to the economies of Latin America. (Refer figure 6.14)

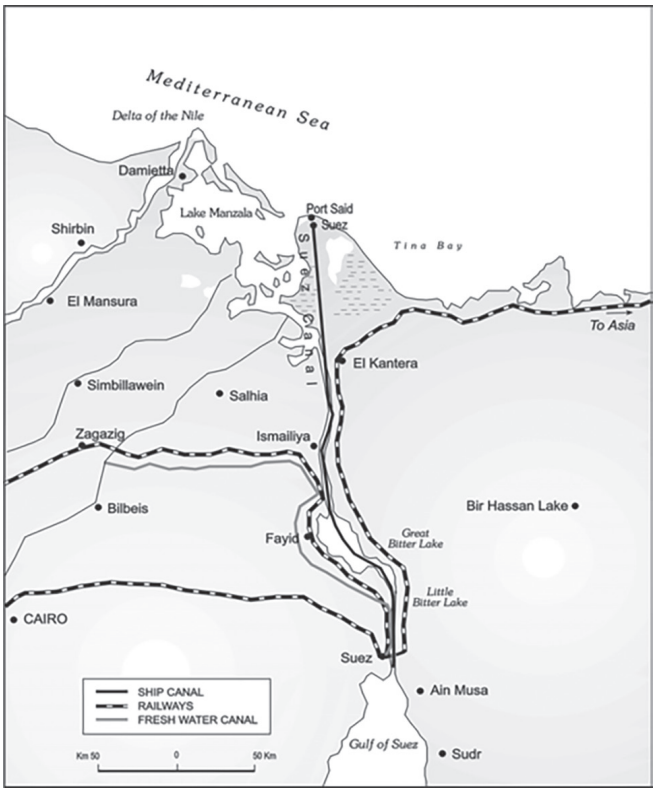

Figure 6.13: Suez Canal

Inland Waterways

- Rivers, canals, lakes and coastal areas have been important waterways since time immemorial. The development of inland waterways is dependent on the navigability width and depth of the channel, continuity in the water flow, and transport technology in use. Rivers are the only means of transport in dense forests.
- In ancient times, riverways were the main highways of transportation but they lost importance because of competition from railways, lack of water due to diversion for irrigation, and their poor maintenance.
- *The following river waterways are some of the world's important highways of commerce.*
  - **The Rhine Waterways:** The Rhine flows through Germany and the Netherlands. It is navigable for 700 km from Rotterdam, at its mouth in the Netherlands to Basel in Switzerland. The Ruhr river joins the Rhine from the east. It flows through a

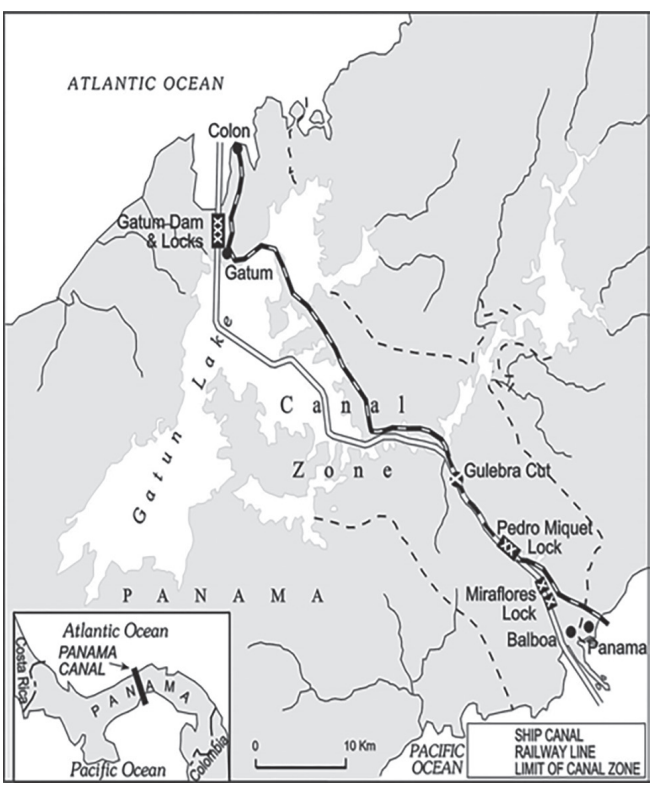

Figure 6.14: Panama Canal

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rich coalfield and the whole basin has become a prosperous manufacturing area. This waterway is the world's most heavily used. It connects the industrial areas of Switzerland, Germany, France, Belgium and the Netherlands with the North Atlantic Sea Route. (Refer figure 6.15)

- ✧ **The Danube Waterway:** This important inland waterway serves Eastern Europe. The Danube river rises in the Black Forest and flows eastwards through many countries. It is navigable up to Taurna Severin. The chief export items are wheat, maize, timber, and machinery.
- ✧ **The Volga Waterway:** Russia has a large number of developed waterways, of which the Volga is one of the most important. It provides a navigable waterway of 11,200 km and drains into the Caspian Sea. The Volga-Moscow Canal connects it with the Moscow region and the Volga-Don Canal with the Black Sea.
- ✧ **The Great Lakes – St. Lawrence Seaway:** The Great Lakes of North America Superior, Huron Erie and Ontario are connected by Soo Canal and Welland Canal to form an inland waterway.

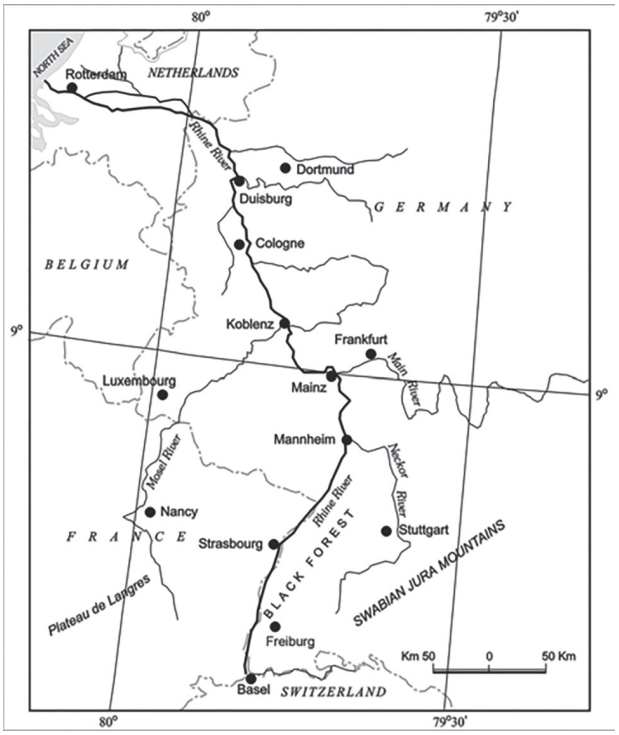

Figure 6.15: Rhine Waterway

- ✧ **The Mississippi Waterway:** The Mississippi-Ohio waterway connects the interior part of the U.S.A. with the Gulf of Mexico in the south.

Inland Waterways in India

- ✤ It was the chief mode of transport before the advent of railways. Diversion of river water for irrigation purposes made the inland waterways non-navigable.
- ✤ India has approximately **14,500 km of navigable waterways**, contributing about one percent to the country's transportation. It comprises rivers, canals, backwaters, creeks, etc. At present, 5,685 km of major rivers are navigable by mechanised flat bottom vessels.
- ✤ For the development, maintenance and regulation of national waterways in the country, the **Inland Waterways Authority was set up in 1986**.
- ✤ The backwaters **(Kadal)** of Kerala have special significance in the Inland Waterways. Apart from providing cheap means of transport, they also attract a large number of tourists in Kerala. The famous **Nehru Trophy Boat Race (Vallamkali)** is also held in the backwaters.

POINTS TO PONDER

Waterways are the cheapest mode of transport, being fuel-efficient and environment friendly. Though there are many rivers and canals in India, we still have a very limited number of operational waterway routes. Can identify various rivers and canals on a map that can be used to connect our major manufacturing areas with their markets in the major and minor cities so that we can reduce our dependence on railways and highways.

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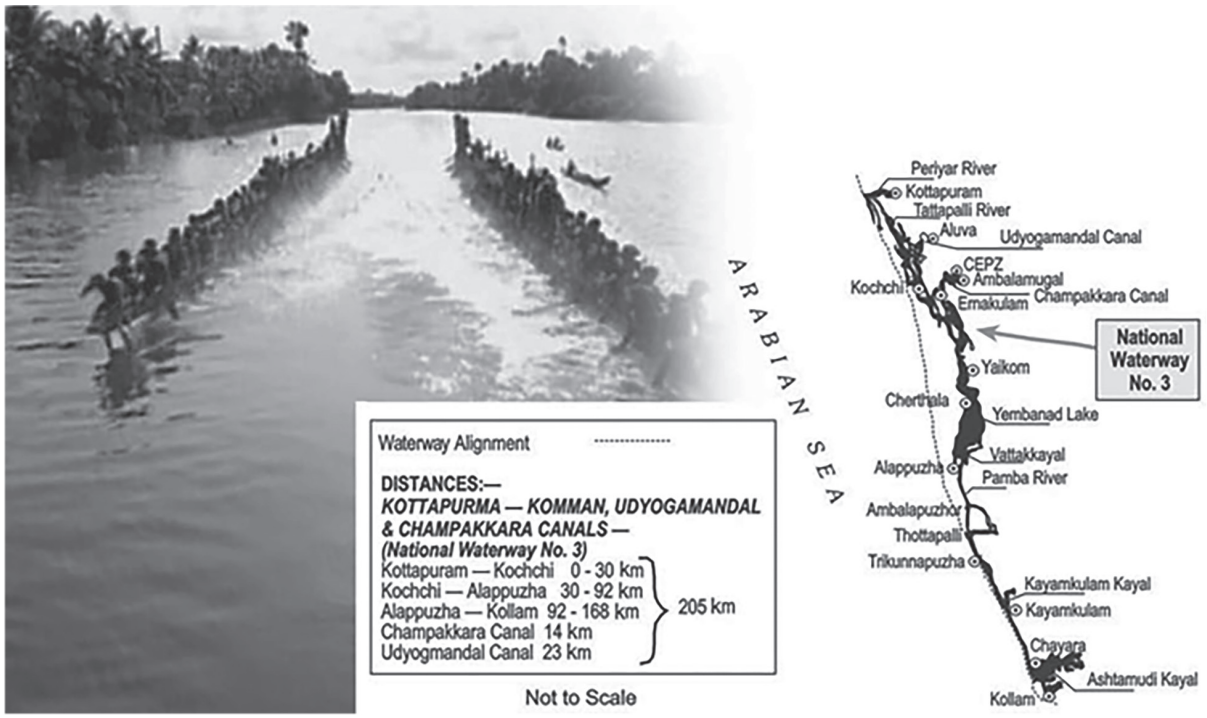

Figure 6.16: National Waterway 3

Waterways	Stretch	Specification
NW 1	Allahabad-Haldia stretch (1,620 km)	It is one of the most important waterways in India, which is navigable by mechanical boats up to Patna and by ordinary boats up to Haridwar. It is divided into three parts for developmental purposes- (i) Haldia-Farakka (560 km), (ii) Farakka-Patna (460 km), (iii) Patna- Allahabad (600 km).
NW 2	Sadiya-Dhubri stretch (891 km)	Brahmaputra is navigable by steamers up to Dibrugarh (1,384 km) which is shared by India and Bangladesh
NW 3	Kottapuram-Kollam stretch (205 km)	It includes 168 km of west coast canal along with Champakara canal (14 km) and Udyogmandal canal (23 km).
NW 4	Specified stretches of Godavari and Krishna rivers along with Kakinada Puducherry stretch of canals (1078 km)	
NW 5	Specified stretches of river Brahmani along with Matai River, delta channels of Mahanadi and Brahmani rivers and East Coast canals (588 km).	

Figure 6.17: National Waterways of India

Air Transport

- Air transport has brought about a **connectivity revolution** in the world. Air transport is the **fastest** means of transportation, but it is **very costly**. It is preferred by passengers for long-distance travel. Valuable cargo can be moved rapidly on a world-wide scale.
- It is often the only means to reach inaccessible areas. In the Himalayan region, the routes are often obstructed due to landslides, avalanches or heavy snowfall. At such times, air travel is the only alternative to reach a place. At present, no place in the world is more than 35 hours away.

Open Sky Policy

To help the Indian exporters and make their export more competitive, the government had introduced an Open Sky Policy for cargo in April 1992. Under this policy, foreign airlines or association of exporters can bring any freighters to the country.

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- Airways also have great strategic importance. The **airstrikes** by countries for defence purposes are of crucial importance.

Inter-Continental Air Routes

- In the Northern Hemisphere, there is a distinct East-West belt of inter-continental air routes. Dense networks exist in Eastern U.S.A., Western Europe and Southeast Asia. The U.S.A. alone accounts for 60 percent of the airways of the world.

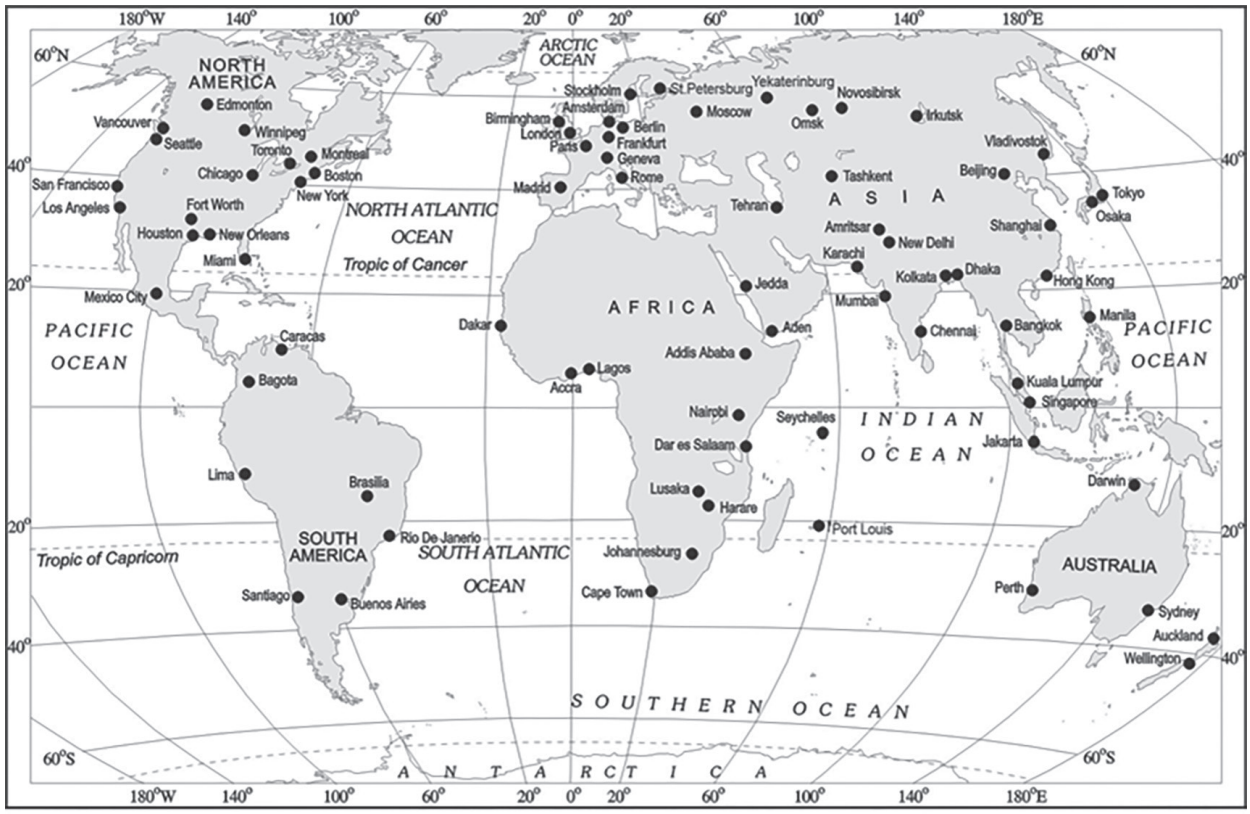

Figure 6.18: Major Airports

- New York, London, Paris, Amsterdam, Frankfurt, Rome, Moscow, Karachi, New Delhi, Mumbai, Bangkok, Singapore, Tokyo, San Francisco, Los Angeles and Chicago are the nodal points where air routes converge or radiate to all continents.
- Africa, Asiatic part of Russia and South America lack air services. There are limited air services between 10-35 latitudes in the Southern hemisphere due to sparser population, limited landmass and economic development.

Air Transport in India

- Air transport in India made a beginning in **1911** when airmail operation commenced over a little distance of 10 km between Allahabad and Naini (Prayagraj, U.P.). **The air transport was nationalised in 1953**.
- **Airport Authority of India (AAI)** is responsible for providing safe, efficient air traffic and aeronautical communication services in the Indian Air Space. The authority manages 137 airports.
- **Pawan Hans** is the helicopter service operating in hilly areas and is widely used by tourists in the north-eastern sector. It also provides helicopter services to the petroleum sector and for tourism.

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History of Indian Airlines

1911 – Air transport in India was launched between Allahabad and Naini.

1947 – Air transport was provided by four major companies namely Indian National Airways, Tata Sons Limited, Air Services of India and Deccan Airways.

1951 – Four more companies joined the services, Bharat Airways, Himalayan Aviation Limited, Airways India and Kalinga Airlines.

1953 – Air transport was nationalised and two Corporations, Air India International and Indian Airlines were formed.

Communication

- Human beings have evolved different methods of communication over time. In earlier times, the messages were delivered by beating the drum or hollow tree trunks.
- Initially, the means of communication were also the means of transportation. Invention of **post office, telegraph, printing press, telephone, satellite**, etc. has made communication much faster and easier.
- Today there is a phenomenal pace in communication development. The first major breakthrough is the use of **Optic Fibre Cables (OFC).**
- People use different modes of communication to convey the messages. On the basis of scale and quality, the **mode of communication can be divided into following categories:** (Refer figure 6.19)

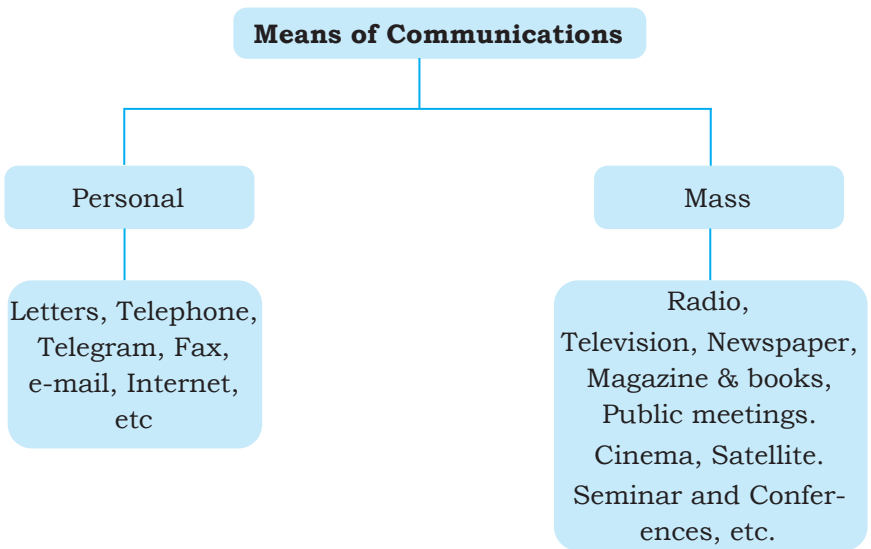

Figure 6.19: Means of Communication

Personal Communication System

- The **telegraph** was instrumental in the colonisation of the American West and the telephone became a critical factor in the urbanisation of America. Even today, the telephone is the most commonly used mode. In developing countries, the use of cell phones, made possible by satellites, is important for rural connectivity.
- Among all the personal communication systems, the internet is the most effective and advanced one. It is widely used in urban areas.
- It is increasingly used for e-commerce and carrying out money transactions. The internet is like a huge central warehouse of data. The **internet** and **e-mail** provide efficient access to information at a comparatively low cost.

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Mass Communication System

- This communication method is used to disseminate information at a large scale, to spread awareness and to educate and entertain.
- **Radio broadcasting started in India in 1923 by the Radio Club of Bombay** and changed the socio-cultural life of people. Government brought this popular mode of communication under its control in 1930 under the **Indian Broadcasting System**. It was changed to **All India Radio** in 1936 and to **Akashwani** in 1957.
- Television broadcasting has emerged as the most effective audio-visual medium for disseminating information and educating masses. In 1976, TV was delinked from All India Radio (AIR) and got a separate identity as **Doordarshan** (DD).
- The **Indian Postal Network** is the largest in the world. Cards and envelopes are considered first-class mail and are airlifted between stations covering both land and air. The second-class mail includes book packets, registered newspapers and periodicals. They are carried by surface mail, covering land and water transport.
- **Six mail channels** have been introduced in India, to facilitate quick delivery of mail in large towns and cities. They are called Rajdhani Channel, Metro Channel, Green Channel, Business Channel, Bulk Mail Channel and Periodical Channel.

Digital India is an umbrella programme to prepare India for a knowledge based transformation. The focus of Digital India Programme is on being transformative to realise – IT (Indian Talent) + IT (Information Technology)=IT (India Tomorrow) and is on making technology central to enabling change.

Satellite Communication

- Satellites are modes of communication in themselves as well as they regulate the use of other means of communication. Communication through satellites emerged as a new area in communication technology in the **1970s** after the U.S.A. and former U.S.S.R. pioneered space research.
- **Artificial satellites**, now, have rendered the unit cost and time of communication invariant in terms of distance.
- Satellites are important for economic and strategic reasons. Satellite images can be used for the weather forecast, monitoring of natural calamities, surveillance of border areas, etc.
- India has also made great strides in satellite development. **Aryabhata** was launched on 19 April 1979, **Bhaskar-I** in 1979 and **Rohini** in 1980. On 18 June 1981, **APPLE** (Ariane Passenger Payload Experiment) was launched through an Ariane rocket. Bhaskar, Challenger and INSAT I-B have made long distance communication, television and radio very effective. Today weather forecasting through television is a boon.
- Satellite systems in India can be grouped into two: **Indian National Satellite System (INSAT) and Indian Remote Sensing Satellite System (IRS)**. The INSAT, which was established in 1983, is a multi-purpose satellite system for telecommunication, meteorological observation and for various other data and programmes. The IRS satellite system became operational with the launch of IRS-IA in March 1988 from Vaikanour in Russia.
- The **National Remote Sensing Centre (NRSC) at Hyderabad** provides facilities for acquisition of data and its processing.

Communication Networks in India

- India has one of the largest telecom networks in Asia. Excluding urban places, more than two-thirds of the villages in India have already been covered with **Subscriber Trunk Dialling (STD) telephone facility**.

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- There is a uniform rate of STD facilities all over India. It has been made possible by integrating the development in space technology with communication technology.
- Doordarshan, the national television channel, broadcasts a variety of programmes from entertainment, educational to sports, etc.
- India publishes a large number of newspapers and periodicals annually. They are of different types depending upon their periodicity. Newspapers are published in about 100 languages and dialects.
- India is the largest producer of feature films in the world. It produces short films; video feature films and video short films. **The Central Board of Film Certification** is the authority to certify both Indian and foreign films.

Internet Revolution

- The Internet is a revolutionary modern system of communication that has transformed the way people and devices connect, share information, and communicate globally.
- The cyberspace has enhanced global connectivity, and has offered various services at unprecedented speeds like, e-commerce, e-learning, video conferencing, email etc.
- India had a rapidly growing internet user base, and it was estimated that around 34-40% of the country's population had internet access.
- In the United States, the percentage of internet users was much higher, with an estimated 87-89% of the population having internet access.

Trade

- Trade refers to the **voluntary exchange of goods and services**. Two parties are needed for this exchange and it should be mutually beneficial.
- The initial form of trade in primitive societies was the barter system, where direct exchange of goods took place. The difficulties of the barter system were overcome by the introduction of money.
- Trade between two countries is called **international trade**. It may take place through sea, air or land routes.
- Advancement of international trade of a country is a mark of its economic prosperity. Therefore, it is considered the economic barometer for a country.
- No country can survive on its own as resources are limited. Hence export and import become important.
- The **Balance of Trade (BoT)** of a country is the difference between its export and import. It can be positive (Exports > Imports) or negative (Imports > Exports). It can have serious implications for a country's economy.
- The commodities exported from India to other countries include gems and jewellery, chemicals and related products, agriculture and allied products, etc.
- The commodities imported to India include petroleum crude and products, gems and jewellery, chemicals and related products, base metals, electronic items, machinery, agriculture and allied products.
- India also earns huge foreign exchange through the export of information technology (IT).

History of International Trade

- In ancient times, transporting goods over long distances was risky, hence trade was restricted to local markets. The **Silk Route** is an early example of long distance trade connecting Rome to China – along the 6,000 km route.

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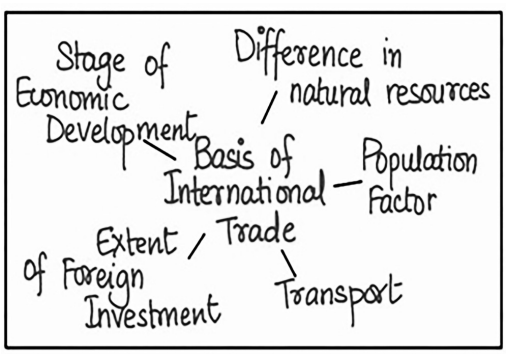
- European commerce grew during the twelfth and thirteenth century with the development of ocean going warships trade between Europe and Asia grew and the Americas were discovered.
- Fifteenth century onwards, the European colonialism began and a new form of trade emerged which was called **slave trade**. The Portuguese, Dutch, Spaniards, and British captured African natives and forcefully transported them to the newly discovered Americas for their labour in the plantations. Slave trade was abolished in Denmark in 1792, Great Britain in 1807 and United States in 1808.
- With the coming of the **Industrial Revolution**, regions producing raw materials became less important than regions exporting finished goods. Industrial nations became linked to each other via international trade.

Reasons why International Trade Exists

International trade is a result of specialisation in production and division of labour in the production of commodities. It is based on the principle of comparative advantage, complementarity and transferability of goods and services and in principle, should be mutually beneficial to the trading partners. In modern times, trade is the basis of the world's economic organisation and is related to the foreign policy of nations.

Basis of International Trade

- **Difference in natural resources**
  - **Geological structure:** It determines the mineral resource base and topographical differences to ensure diversity of crops and animals raised. For example: Lowlands have greater agricultural potential. Mountains attract tourists and promote tourism.
  - **Mineral resources:** They are unevenly distributed the world over. The availability of mineral resources provides the basis for industrial development.
  - **Climate:** It influences the type of flora and fauna, and also ensures diversity in the range of various products. For example: wool production can take place in cold regions, bananas, rubber and cocoa can grow in tropical regions.



- **Population factors**
  - **Cultural factors:** Distinctive forms of art and craft develop in certain cultures which are valued the world over. *For example: China produces the finest porcelain and brocades. Carpets of Iran are famous while North African leather work and Indonesian batik cloth are prized handicrafts.*
  - **Size of population:** Densely populated countries have a large volume of internal trade but little external trade because most of the agricultural and industrial production is consumed in the local markets. Standard of living of the population determines the demand for better quality imported products.
- **Stage of economic development**
  - In agriculturally important countries, agro products are exchanged for manufactured goods whereas industrialised nations export machinery and finished products and import food grains and other raw materials.

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- **Extent of foreign investment**
  - Foreign investment can boost trade in developing countries which lack the capital required for the development. The industrial nations ensure import of foodstuffs, minerals and create markets for their finished products in those developing countries.
- **Transport**
  - With expansions of rail, ocean and air transport, better means of refrigeration and preservation, trade has experienced spatial expansion.

Types of International Trade

- **Bilateral Trade:** It is done between two countries by signing a specified agreement to trade specified commodities.
- **Multilateral Trade:** It is conducted with many trading countries. The status of Most Favoured Nation (MFN) is also granted to some partners.

Free Trade

- The act of opening up economies for trading is known as **free trade or trade liberalisation**. This is done by bringing down trade barriers like tariffs.
- Trade liberalisation allows goods and services from everywhere to compete with domestic products and services.

Dumping

The practice of selling a commodity in two countries at a price that differs for reasons not related to costs is called dumping.

- **LPG (Liberalisation, Privatisation and Globalisation) reforms** along with free trade can adversely affect the economies of developing countries by not giving equal playing field by imposing unfavourable conditions.
- Free trade has allowed rich countries to get richer and to penetrate in the markets of the developed countries.
- Dumping of goods has also become a cause of concern for developing nations as influx of cheaper goods harms the domestic producers.

World Trade Organization

- The World Trade Organization (WTO) is an international organisation established to regulate and facilitate international trade among its member countries. It was officially established on **January 1, 1995**, and is headquartered in Geneva, Switzerland. The WTO evolved from the **General Agreement on Tariffs and Trade (GATT)**, which was in place since 1948.

Do You Know?

WTO headquarters are located in Geneva, Switzerland. India has been one of the founding members of WTO. 164 countries are members of WTO currently.

- WTO is the only international organisation dealing with the global rules of trade between nations. It also covers trade in services, such as telecommunication and banking, and other issues such as intellectual rights.
- It has been opposed by those who are worried about the effects of free trade and economic globalisation on developing and poorer nations. They argue that WTO is actually widening the gulf between rich and poor.
- Many developed countries have not fully opened their markets to products from developing countries. It is also argued that issues of health, worker's rights, child labour and environment are ignored.

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Regional Trade Blocs

- Regional Trade Blocs have come up in order to encourage trade between countries with geographical proximity, similarity and complementarities in trading items and to curb restrictions on trade of the developing world. Today, 120 regional trade blocs generate 52 percent of the world trade.
- These agreements are designed to reduce trade barriers, enhance economic integration, and foster closer political and economic ties among member countries.

Concerns related to International Trade

- International trade is mutually beneficial to nations if it leads to regional specialisation, higher level of production, better standard of living, worldwide availability of goods and services, equalisation of prices and wages and diffusion of knowledge and culture.
- It is detrimental to nations if it leads to dependence on other countries, uneven levels of development, exploitation, and commercial rivalry leading to wars.
- Global trade affects many aspects of life; it can **impact everything from the environment to health** and well-being of the people around the world.
- With consumer needs increasing manifold, production and trade has seen unprecedented levels. Due to this marine life is depleting, forests are being cut down and river basins sold off to private drinking water companies.
- Multinational corporations, in the pursuit of beneficial business are following **unethical and unsustainable trade and production practices**.

Tourism as Trade

- Tourism in India is a significant industry that contributes substantially to the country's economy. India offers a diverse range of attractions, including historical monuments, natural landscapes, cultural heritage, and religious sites.
- More than 15 million people are directly engaged in the tourism industry. Tourism also promotes national integration, provides support to local handicrafts and cultural pursuits.
- It also helps in the development of **international understanding about our culture and heritage**. Foreign tourists visit India for heritage tourism, eco tourism, adventure tourism, cultural tourism, medical tourism and business tourism.
- Government has initiated various schemes in order to promote the tourism industry. Examples: **Swadesh Darshan scheme, PRASAD (Pilgrimage Rejuvenation and Spirituality Augmentation Drive) scheme** etc.

Conclusion

The pace of development of a country depends upon the production of goods and services as well as their movement over space. Therefore, efficient means of transport are prerequisites for fast development. Transport has been able to achieve this with the help of an equally developed communication system. Therefore, transport, communication and trade are complementary to each other. Today, India is well-linked with the rest of the world despite its vast size, diversity and linguistic and socio-cultural plurality. Railways, airways, waterways, newspapers, radio, television, cinema and internet, etc. have been contributing to its socio-economic progress in many ways. The trades from local to international levels have added to the vitality of India's economy. In communication, the Internet has become an integral part of modern life, affecting nearly every aspect of how individuals and organisations communicate, collaborate, and access information. Its continued evolution is likely to bring further advancements in communication and connectivity.

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Glossary:

- **Freight:** Goods or cargo transported from one place to another, typically by a commercial carrier.
- **Haulage Capacity:** The maximum load or weight that a vehicle or transport system can carry or haul safely and efficiently.
- **Metalled Road:** A road with a hard, durable surface, typically made of asphalt or concrete, designed for vehicular traffic.
- **Unmetalled Road:** A road with a rough, unpaved surface, often consisting of gravel or dirt, used for transportation but lacking a sealed top layer.
- **Slurry:** A thick, liquid mixture of a solid substance (usually fine particles) suspended in a liquid.
- **Cargo:** Goods or merchandise being transported by ship, aircraft, truck, or other means of conveyance.
- **Natural Harbour:** A naturally formed sheltered area of water along a coastline that provides a safe anchorage for ships.
- **Backwaters:** A network of interconnected rivers, lakes, and lagoons, often found in coastal regions, characterised by slow-moving or stagnant water flow.
- **Optic Fibre Cables:** Thin strands of glass or plastic fibres that transmit data using light signals, commonly used in telecommunications and high-speed internet infrastructure.
- **Pradhan Mantri Gram Sadak Yojana:** It is an Indian government scheme that aims to provide all-weather road connectivity to rural areas, improving access to essential services and promoting rural development.

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7 Resources

Bibliography: This Chapter encompasses a summary of **Chapters 1 and 2 - VIII NCERT** (Resources and Development), **Chapters 1, 2, 3 and 5 - X NCERT** (Contemporary India-II) and **Chapters 4 and 5 - XII NCERT** (India, People and Economy).

Introduction

Broadly, a resource is anything that can be used to satisfy the needs of humans. It can be natural such as land, water, soil etc. or man-made such as rickshaw, books, etc. Anything that we use has some value. Thus, utility or usability is what makes an object or substance a resource and its use or utility gives it a value. In this chapter we will look into the classification of resources and its conservation. Further, we will learn about resource planning which is essential for the sustainable existence of all forms of life.

Resources

- Everything available in our environment which can be used to satisfy our needs, provided it is technologically accessible, economically feasible and culturally acceptable can be termed as a **'Resource'**.
- **Time and technology** are two important factors that can change substances into resources. For example, home remedies which have no commercial value today. But if they are patented and sold by a medical firm tomorrow, they could become economically valuable.
- The process of transformation of things available in our environment involves an inter- dependent relationship between nature, technology and institutions. Human beings interact with nature through technology and create institutions to accelerate their economic development.

Classification of Resources

(A) Classification on the basis of nature and human - Natural, Human made and Human

- Resources are generally classified into natural, human made and human (Refer Figure 7.1).

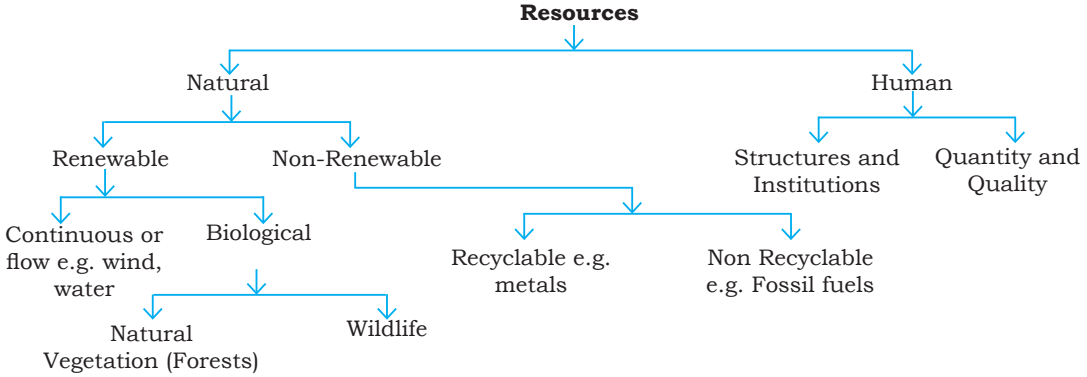

Figure 7.1: Classification of Resources

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(i) Natural Resources

- Resources that are drawn from nature and used without much modification are called natural resources. These resources are free gifts of nature such as the air we breathe, the water in our rivers and lakes, the soils, minerals.
- In some cases tools and technology may be needed to use a natural resource in the best possible way.
  - For Example: Silk from silkworms that are bred on Mulberry trees.
- The distribution of natural resources is unequal because it depends upon a number of physical factors like terrain, climate and altitude.

Natural Vegetation and Wildlife

- Vegetation and wildlife are valuable natural resources. They exist only in the narrow zone of contact between the lithosphere, hydrosphere and atmosphere that is **biosphere**.
- In the biosphere, living beings are inter-related and inter-dependent on each other for survival. This life supporting system is known as the **ecosystem**.
- Plants provide us with timber, give shelter to animals, produce oxygen, protect soils, act as shelter belts, help in storage of underground water, give us fruits, latex, turpentine oil, medicinal plants, the paper essential for our studies etc.
- Wildlife includes animals, birds, insects as well as aquatic life forms that provide us with milk, meat, hides and wool. **Bees** provide us with honey, help in pollination of flowers and have an important role to play as **decomposers in the ecosystem**. The birds feed on insects and act as decomposers as well. **Vultures** feed on dead livestock is a scavenger and considered a **vital cleanser of the environment**. Therefore, all animals, big or small, are integral to maintaining balance in the ecosystem.

Do You Know?

Vultures in the Indian subcontinent were dying of kidney failure shortly after scavenging livestock treated with **diclofenac**, a painkiller that is similar to aspirin or ibuprofen. Efforts are on to ban the drug for livestock use and breed vultures in captivity.

Flora and Fauna in India

- Other than us this planet has millions of other living beings from microorganisms to blue whales.
- This entire habitat has immense biodiversity in which all living organisms form a complex web of ecological systems and forests being primary producers play a key role in the ecological system on which all other living beings depend.
- India is one of the world's richest countries in terms of its vast array of biological diversity, and has nearly **8% of the total number of species in the world** (estimated to be 1.6 million).
- Some estimates suggest that at least 10% of India's recorded wild flora and 20% of its mammals are on the threatened list and many of these would now be categorised as 'critical', i.e on the verge of extinction like the **cheetah, pink-headed duck, mountain quail, forest spotted owlet, and plants like madhuca insignis (a wild variety of mahua) and hubbardia heptaneuron,** (a species of grass).

Figure 7.2: Vanishing Forests

Natural vegetation and wildlife

- The dimensions of deforestation in India are staggering.
- According to the State of Forest Report (2021), the forest cover in the country is estimated at 713,789 sq km, which is 21.71% of the total geographical area. (Dense forest 9.33%; Open forest 9.34%; and Mangrove 0.15%).
- The dense forest cover has increased by 501 sq km since 2019.

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The negative factors that cause depletion of the flora and fauna

- We have depleted our forests and wildlife by transforming nature into a resource obtained directly and indirectly from the forests and wildlife.
- During the colonial period Indian forests were damaged due to the expansion of the railways, agriculture, commercial and scientific forestry and mining activities.
- Even after Independence, **agricultural expansion** continues to be one of the major causes of depletion of forest resources. Between 1951 and 1980, according to the Forest Survey of India, over 26,200 sq. km. of forest area was converted into agricultural land all over India. Substantial parts of the tribal belts, especially in the northeastern and central India, have been deforested or degraded by shifting cultivation **(jhum**), a **type of 'slash and burn' agriculture.**
- **Large-scale development projects** have also contributed significantly to the loss of forests. Since 1951, over 5,000 sq km of forest has been cleared for river valley **projects** and is still continuing with projects like the **Narmada Sagar Project in Madhya Pradesh.**
- **Mining** is another important factor behind deforestation. The **Buxa Tiger Reserve (West Bengal)** is seriously threatened by the ongoing **dolomite mining**. It has disturbed the natural habitat of many species and blocked the migration route of several others, including the great Indian elephant.
- Other factors behind the depletion of forest resources and decline in India's biodiversity are grazing, fuel-wood collection, habitat destruction, hunting, poaching, over-exploitation, environmental pollution, poisoning and forest fires.
- Unequal access, inequitable consumption of resources and differential sharing of responsibility for environmental well-being are other factors.
- Overpopulation in third world countries is another cause of environmental degradation. However, an average American consumes 40 times more resources than an average Somalian. Similarly, the richest 5% of Indian society probably causes more ecological damage than the poorest 25% but the former shares minimum responsibilities for environmental well-being.
- The destruction of forests and wildlife is not just a biological issue but the loss of cultural diversity. Such losses have increasingly marginalised and impoverished many indigenous and other forest-dependent communities, who directly depend on various components of the forest and wildlife for food, drink, medicine, culture, spirituality, etc. Within the

Do You Know?

- Over 81,000 species of fauna and 47,000 species of flora are found in India so far.
- Of the estimated 47,000 plant species, about 15,000 flowering species are endemic (indigenous) to India.
- Among the larger animals in India, 79 species of mammals, 44 of birds, 15 of reptiles, and 3 of amphibians are threatened and nearly 1,500 plant species are considered endangered.
- Flowering plants and vertebrate animals have recently become extinct at a rate estimated to be 50 to 100 times the average expected natural rate.

Colonial forest policies

The promotion of a few favoured species, in many parts of India, has been carried through the ironically-termed **"enrichment plantation"**, in which a single commercially valuable species was extensively planted and other species eliminated. For Ex:, teak monoculture has damaged the natural forest in South India and Chir Pine (Pinus roxburghii) plantations in the Himalayas have replaced the Himalayan oak (Quercius spp.) and Rhododendron forests.

The Himalayan Yew

- The Himalayan Yew **(Taxus wallachiana)** is a medicinal plant found in various parts of Himachal Pradesh and Arunachal Pradesh.
- A chemical compound called **'taxol'** is extracted from the bark, needles, twigs and roots of this tree, and it has been successfully used to treat some cancers – the drug is now the biggest selling anti-cancer drug in the world.
- The species is under great threat due to over-exploitation.
- In the last one decade, thousands of yew trees have dried up.

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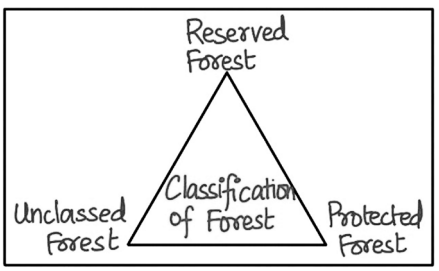
poor, women are affected more than men because women bear the major responsibility of collection of fuel, fodder, water and other basic subsistence needs. This increases the drudgery of women and causes serious health problems for women and negligence of home and children. The indirect impact of degradation such as severe drought or deforestation-induced floods, etc. also hits the poor the hardest.

Types and Distribution of Natural Vegetation and Wildlife Resources

- The growth of vegetation depends primarily on temperature and moisture. The major vegetation types of the world are grouped as forests, grasslands, scrubs and tundra.
- In areas of heavy rainfall, huge trees may thrive. As the amount of moisture decreases the size of trees and their density reduces.
- Short stunted trees and grasses grow in the regions of moderate rainfall forming the grasslands.
- Thorny shrubs and scrubs grow in dry areas of low rainfall. In such areas plants have deep roots and leaves with thorny and waxy surfaces reduce loss of moisture through transpiration.
- Tundra vegetation of cold Polar Regions comprises of mosses and lichens.
- The conservation of our vast forest and wildlife resources is difficult to manage, control and regulate. In India, much of its forest and wildlife resources are either owned or managed by the government through the Forest Department or other government departments. These are classified under the following categories.

Do You Know?

Over half of India's natural forests are gone, 1/3rd of its wetlands drained out, 70% of its surface water bodies polluted, 40% of its mangroves wiped out, and with continued hunting and trade of wild animals and commercially valuable plants, thousands of plant and animal species are heading towards extinction.



1. **Reserved Forests:** More than half of the total forest land has been declared reserved forests and are regarded as the most valuable as far as the conservation of forest and wildlife resources are concerned. Jammu and Kashmir, Andhra Pradesh, Uttarakhand, Kerala, Tamil Nadu, West Bengal, and Maharashtra have large percentages of reserved forests of its total forest area.
2. **Protected Forests:** Almost 1/3rd of the total forest area is protected forest, as declared by the Forest Department. This forest land is protected from any further depletion. Bihar, Haryana, Punjab, Himachal Pradesh, Orissa and Rajasthan have protected forests.
3. **Unclassed Forests:** These are other forests and wastelands belonging to both government and private individuals and communities. All North-eastern states and parts of Gujarat have a very high percentage of unclassed forests managed by local communities.
   - ✧ Reserved and protected forests are also referred to as permanent forest estates maintained for the purpose of producing timber and other forest produce, and for protective reasons. Madhya Pradesh has the largest area under permanent forests, constituting 75% of its total forest area.

Conservation of Natural Vegetation and Wildlife

- Conservation not only preserves ecological diversity and our life support systems – Water, air and soil but also preserves the genetic diversity of plants and animals for better growth of species and breeding. For example, in agriculture, we are still dependent on traditional crop varieties. Conservation of creeks, lakes, and wetlands is necessary to save the precious resource from depletion. Fisheries too are heavily dependent on the maintenance of aquatic biodiversity.

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- **Human interference** in several parts of the world have disturbed the natural habitats of many species. Due to indiscriminate killings, several birds and animals have either become extinct or are on the verge of extinction. One of the major concerns is poaching. The animals such as tiger, lion, elephant, deer, black buck, crocodile, rhinoceros, snow leopard, ostrich and peacock are poached for collection and illegal trade of hides, skins, nails, teeth, horns as well as feathers.
- Changes in climate, deforestation, soil erosion, constructional activities, forest fires, tsunami and landslides are some of the human and natural factors which accelerate the process of extinction of these resources.
- To conserve the vegetation and wildlife, awareness programmes like **social forestry and Vanamahotsava** should be encouraged at the regional and community level. Also school children should be encouraged to **bird watch and visit nature camps.**
- Many countries have passed laws against the trade as well as the killing of birds and animals. In India also, killing lions, tigers, deers, great Indian bustards and peacocks is illegal.

Do You Know?

- **CITES** (the Convention on International Trade in Endangered Species of Wild Fauna and Flora) is an international agreement between governments.
- **Aim:** To ensure that international trade in specimens of wild animals and plants does not threaten their survival.
- Roughly 6610 species of animals and 34,310 species of plants are protected. For example, Bears, Dolphins, Cacti, Corals, Orchids and Aloes.

POINTS TO PONDER

Ecological niche is a unique place that a species occupies in the interdependent structure of the ecosystem. Think about the ways in which the extinction of species creates an ecological vacuum in the flow of energy and material within an ecosystem.

- An international convention **CITES lists** several species of animals and birds in which trade is prohibited.
- **The Indian Wildlife (Protection) Act** was implemented in 1972, to protect the remaining population of certain endangered species by banning hunting, giving legal protection to their habitats, and restricting trade in wildlife with various provisions for protecting habitats also, an all-India list of protected species was published.
- Many State Governments and the Central Government has established National parks, wildlife sanctuaries, biosphere reserves for the same.
- Several projects are also announced for protecting specific animals, which are gravely threatened, including the tiger, the one horned rhinoceros, the Kashmir stag or hangul, three types of crocodiles - freshwater crocodile, saltwater crocodile and the Gharial, the Asiatic lion, Indian elephant, black buck (chinkara), the great Indian bustard (godawan) and the snow leopard, etc.
- The conservation projects are now focusing on biodiversity rather than on a few of its components. Even insects are beginning to find a place in conservation planning. In the notification under **Wildlife Act of 1980 and 1986,** several hundred butterflies, moths, beetles, and one dragonfly have been added to the list of protected species. In 1991, for the first time plants were also added to the list, starting with six species.

Community and Conservation

- In India, forests are home to some of the traditional communities. These local communities are struggling to conserve these habitats along with government officials, to secure their own long-term livelihood. For example, in **Sariska Tiger Reserve, Rajasthan,** villagers have fought against mining by citing the Wildlife Protection Act. The inhabitants of five villages in the Alwar district of Rajasthan have declared 1,200 hectares of forest as **the Bhairodev Dakav 'Sonchuri',** declaring their own set of rules and regulations which do not allow hunting, and are protecting the wildlife against any outside encroachments.

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- The famous **Chipko movement** in the Himalayas has not only successfully resisted deforestation in several areas but has also shown that community afforestation with indigenous species can be enormously successful.
- Attempts to revive the traditional conservation methods or developing new methods of ecological farming are now widespread. Farmers and citizen's groups like the **Beej Bachao Andolan in Tehri and Navdanya** have shown that adequate levels of diversified crop production without the use of synthetic chemicals are possible and economically viable.
- In India **Joint Forest Management (JFM) programme has existed since 1988** furnishes a good example for involving local communities in the management and restoration of degraded forests. JFM depends on the formation of local (village) institutions that undertake protection activities mostly on degraded forest land managed by the forest department. In return, the members of these communities are entitled to intermediary benefits like non-timber forest produce and share in the timber harvested by 'successful protection'.

Sacred Groves - A Wealth of Diverse and Rare Species

- Nature worship is an age-old tribal belief based on the premise that all creations of nature have to be protected. Such beliefs have preserved several virgin forests in pristine form called **Sacred Groves (the forests of God and Goddesses).** These patches of forest or parts of large forests have been left untouched by the local people and any interference with them is banned.
- Certain societies revere a particular tree which they have preserved from time immemorial. The **Mundas and the Santhal of Chhota Nagpur region** worship mahua (Bassia latifolia) and kadamba (Anthocephalus cadamba) trees, and the tribals of Orissa and Bihar worship the tamarind (Tamarindus indica) and mango (Mangifera indica) trees during weddings. To many of us, peepal and banyan trees are considered sacred.
- Indian society comprises several cultures, each with its own set of traditional methods of conserving nature and its creations. Sacred qualities are often ascribed to springs, mountain peaks, plants and animals which are closely protected. You will find troops of macaques and langurs around many temples. They are fed daily and treated as a part of temple devotees. In and around Bishnoi villages in Rajasthan, herds of blackbuck, (chinkara), nilgai and peacocks can be seen as an integral part of the community and nobody harms them.

(ii) Human Made Resources

- Sometimes, natural substances become resources only when their original form has been changed. For example, Iron ore was not a resource until people learnt to extract iron from it. People use natural resources to make buildings, bridges, roads, machinery and vehicles, which are known as human made resources. Technology is also a human made resource (Refer Figure 7.3).

(iii) Human Resources

- Human Resource refers to the number (quantity) and abilities (mental and physical) of the people.
- People themselves are essential components of resources. It is their ideas, knowledge, skills, inventions and discoveries that lead to the creation of more resources. Each discovery or invention leads to many others. For Example: The discovery of fire led to the practice of cooking and other processes while the invention of the wheel ultimately resulted in development of newer modes of transport.
- **Human resource development:** Improving the quality of people's skills so that they are able to create more resources is known as human resource development. Education and health help in making people a valuable resource.

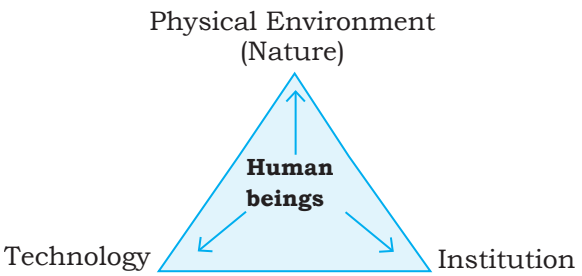

Figure 7.3: Interdependent relationship between nature, technology and institutions

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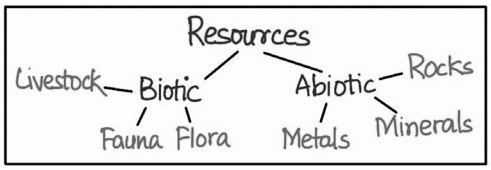
Resources can further be classified in the following ways:

(B) Classification on the Basis of Origin – Biotic and Abiotic

(i) Biotic Resources

- These are obtained from the biosphere and have life such as human beings, flora and fauna, fisheries, livestock etc.



(ii) Abiotic Resources

- All those things which are composed of non-living things are called abiotic resources such as rocks, minerals and metals.

Toothpaste and minerals

- ➢ Toothpaste contain abrasive minerals like silica, limestone, aluminium oxide and various phosphate minerals that cleans our teeth.
- ➢ Fluoride which is used to reduce cavities, comes from a mineral fluorite.
- ➢ Most toothpaste are made white with titanium oxide, which comes from minerals called rutile, ilmenite and anatase.
- ➢ The sparkle in some toothpastes comes from mica.
- ➢ The toothbrush and tube containing the paste are made of plastics from petroleum.

Minerals

- Our earth's crust is made up of different minerals embedded in the rocks and various metals are extracted from these minerals after proper refinement.
- Life processes cannot occur without minerals. Although our mineral intake represents only about 0.3% of our total intake of nutrients, they are so potent and so important that without them we would not be able to utilise the other 99.7% of foodstuffs.
- India is endowed with a rich variety of mineral resources due to its varied geological structure. Bulk of the valuable minerals are products of pre-paleozoic age and are mainly associated with metamorphic and igneous rocks of peninsular India. The vast alluvial plain tract of north India is devoid of minerals of economic use. The mineral resources provide the country with the necessary base for industrial development.
- These are **"homogenous, naturally occurring substances with a definable internal structure."** Minerals are found in varied forms in nature, ranging from the hardest diamond to the softest talc.

Mode of Occurrence of Minerals

- Minerals are usually found in the form of "ores" which is an accumulation of any mineral mixed with other elements. The mineral content of the ore must be in sufficient concentration to make its extraction commercially viable. The type of formation or structure in which they are found determines the relative ease with which mineral ores may be mined and also determines the cost of extraction. Minerals generally occur in these forms:

1. In **Igneous and Metamorphic Rocks, minerals** may occur in the cracks, crevices, faults or joints. The smaller occurrences are called veins and the larger are called lodes. In most cases, they are formed when minerals in liquid/molten and gaseous forms are forced upward through cavities towards the earth's surface. They cool and solidify as they rise. Major metallic minerals like tin, copper, zinc and lead etc. are obtained from veins and lodes.
2. In **Sedimentary Rocks** a number of minerals occur in beds or layers. They have been formed as a result of deposition, accumulation and concentration in horizontal strata. Coal and some forms of iron ore have been concentrated as a result of long periods under great heat and pressure. Another group of sedimentary minerals include gypsum, potash salt and sodium salt. These are formed as a result of evaporation especially in arid regions.

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3. Another is **decomposition of surface rocks**, and the removal of soluble constituents, leaving a residual mass of weathered material containing ores. Bauxite is formed in this manner.
4. Certain minerals may occur as alluvial deposits in sands of valley floors and the base of hills. These deposits are called **'placer deposits'** and generally contain minerals, which are not corroded by water. For example, Gold, silver, tin and platinum.
5. The ocean waters contain vast quantities of minerals, but most of these are too widely diffused to be of economic significance. However, common salt, magnesium and bromine are largely derived from ocean waters. The ocean beds, too, are rich in manganese nodules.

Rat-Hole Mining: Most of the minerals in India are nationalised and their extraction is possible only after obtaining due permission from the government. But in most of the tribal areas of north-east India, minerals are owned by individuals or communities. In Meghalaya, there are large deposits of coal, iron ore, limestone and dolomite etc. Coal mining in Jowai and Cherapunjee is done by family members in the form of a long narrow tunnel, known as 'Rat hole' mining.

Types of Mineral Resources

- A particular mineral that will be formed from a certain combination of elements depends upon the physical and chemical conditions under which the material forms. This, in turn, results in a wide range of colours, hardness, crystal forms, lustre and density that a particular mineral possesses. For general and commercial purposes minerals can be classified as under: (Refer Figure 7.4)
- **Metallic minerals** are the sources of metals. Iron ore, copper, gold produce metal and are included in this category. They are further divided into ferrous and non-ferrous metallic minerals.
- **Non-metallic minerals** are either organic in origin such as fossil fuels also known as mineral fuels which are derived from the buried animal and plant life such as coal and petroleum or inorganic in origin such as mica, limestone and graphite, etc.

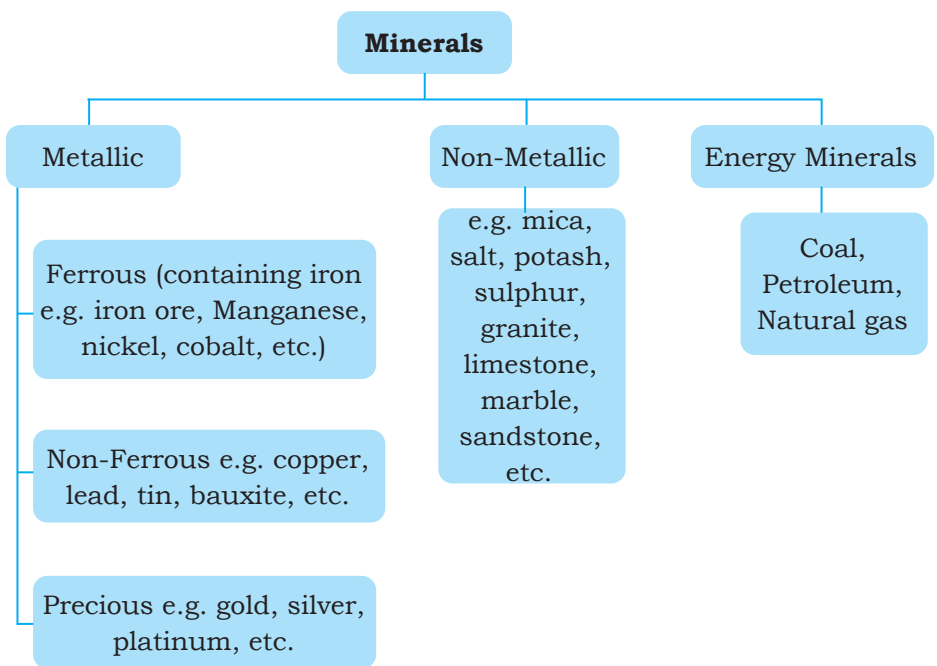

Figure 7.4: Classification of Minerals

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Global Distribution of Minerals

- **Asia:** India has the largest reserves of Iron ore. China, Malaysia and Indonesia are the leading producers of tin. China also leads in production of iron ore, lead, antimony and tungsten. The continent has deposits of manganese, bauxite, nickel, zinc and copper and produces more than half of the world's tin.
- **Europe:** Russia, Ukraine, Sweden and France have large deposits of iron ore. Deposits of copper, lead, zinc, manganese and nickel are also found in eastern Europe and European Russia.
- **North America:** The mineral deposits in North America are located in three zones:
  - The **Canadian region**, north of the Great Lakes, has deposits of Iron ore, nickel, gold, uranium and copper.
  - The **Appalachian region** has coal.
  - The **mountain ranges of the west** have vast deposits of copper, lead, zinc, gold and silver.
- **South America:** Brazil is the largest producer of high grade iron-ore in the world. Brazil and Bolivia are among the world's largest producers of tin whereas Chile and Peru are leading producers of copper. The continent has large deposits of gold, silver, zinc, chromium, manganese, bauxite, mica, platinum, asbestos and diamond. Mineral oil is also found in Venezuela, Argentina, Chile, Peru and Columbia (Refer Figure 7.5).

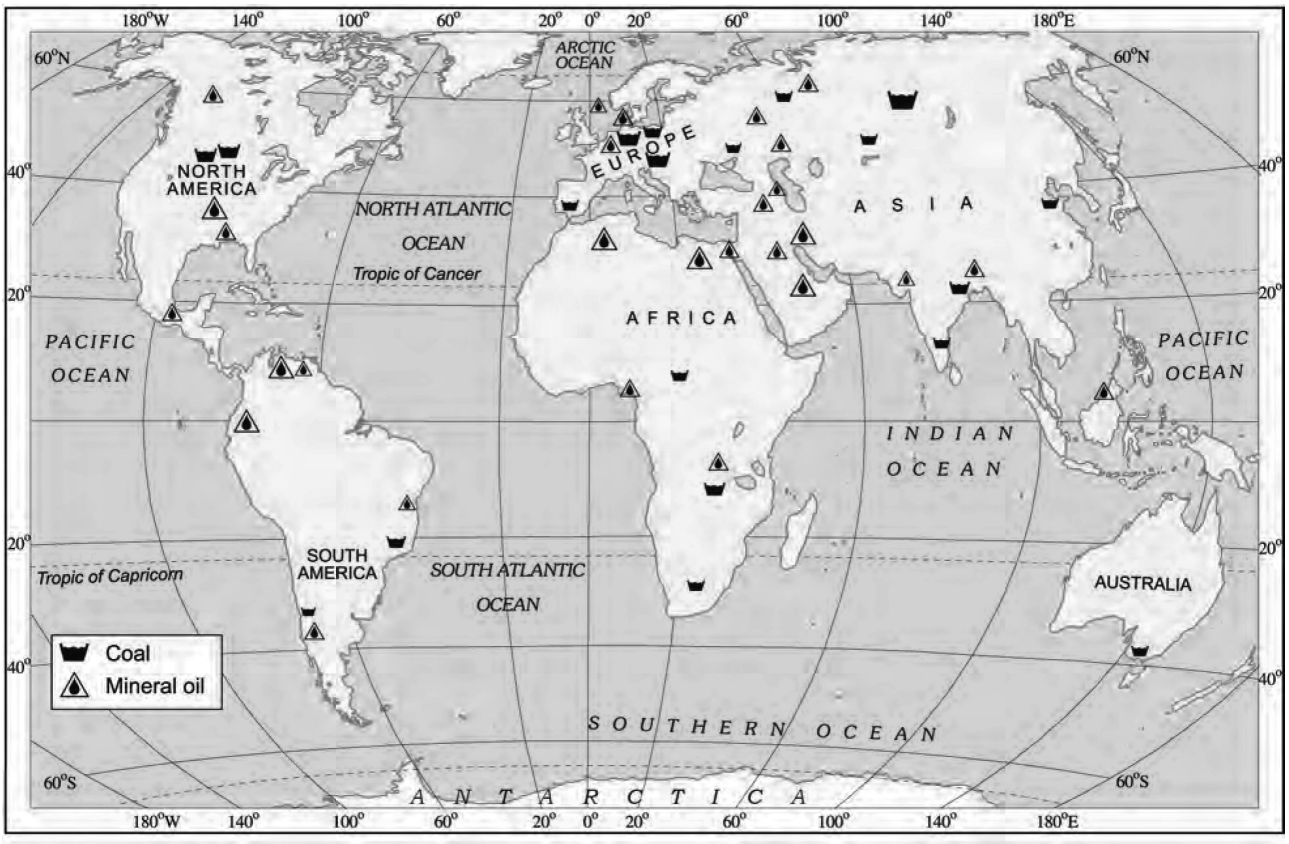

Figure 7.5: World Distribution of Mineral Oil and Coal

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- **Africa:** Africa is the world's largest producer of diamonds, gold and platinum. South Africa, Zimbabwe and Zaire produce a large portion of the world's gold. Copper, iron ore, chromium, uranium, cobalt and bauxite are also found. Oil is found in Nigeria, Libya and Angola.

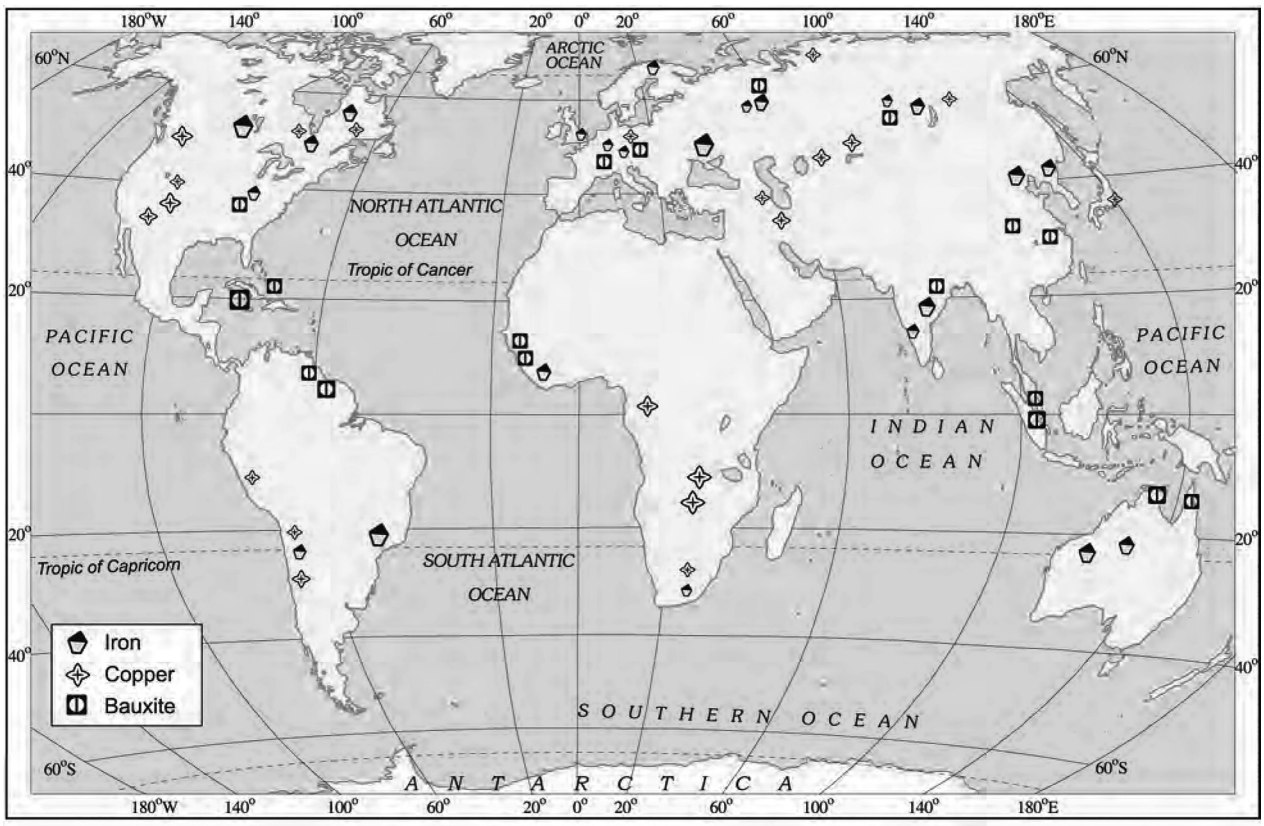

Figure 7.6: World Distribution of Iron, Copper and Bauxite

- **Australia:** Australia is the largest producer of bauxite in the world. It is a leading producer of gold, diamond, iron ore, tin and nickel. Copper, lead, zinc and manganese are also found. Kalgoorlie and Coolgardie areas have the largest deposits of gold.
- **Antarctica:** Deposits of coal in the Trans-antarctic Mountains and iron near the Prince Charles Mountains of East Antarctica is forecasted. Iron ore, gold, silver and oil are also present in commercial quantities.

Do You Know?

- A green diamond is the rarest diamond.
- The oldest rocks in the world are in Western Australia. They date from 4,300 million years ago, only 300 million years after the earth was formed.

Distribution of Minerals in India

- India is fortunate to have fairly rich and varied mineral resources, however, these are unevenly distributed (Refer Figure 7.7). Peninsular rocks contain reserves of coal, metallic minerals, mica and many other non-metallic minerals. Sedimentary rocks on the western and eastern flanks of the peninsula, in Gujarat and Assam, off-shore-areas near Mumbai Coast (Mumbai High) have most of the petroleum deposits. The vast alluvial plains of north India are almost devoid of economic minerals. These variations exist largely because of the differences in the geological structure, processes and time involved in the formation of minerals.

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Figure 7.7: India Distribution of important Minerals

- Minerals are generally concentrated in three broad belts in India. These belts are :
  a. **The North-Eastern Plateau Region:** This belt covers Chotanagpur (Jharkhand), Orissa Plateau, West Bengal and parts of Chhattisgarh. Over 97% of coal reserves occur in the valleys of Damodar, Sone, Mahanadi and Godavari. It has a variety of minerals viz. iron ore, coal, manganese, bauxite, mica. Thus major iron and steel industries are located in this region.
  b. **The South-Western Plateau Region:** This belt extends over Karnataka, Goa and contiguous Tamil Nadu uplands and Kerala. This belt is rich in ferrous metals and bauxite. It also contains high grade iron ore, manganese and limestone. This belt packs in coal deposits except Neyveli lignite. This belt does not have as diversified mineral deposits as the north-eastern belt. Kerala has deposits of monazite and thorium, bauxite clay and Goa has iron ore deposits.

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c. **The North-Western Region:** This belt extends along Aravali in Rajasthan and part of Gujarat and minerals are associated with the Dharwar system of rocks. Rajasthan has reserves of many non-ferrous minerals such as copper, zinc. Rajasthan is rich in building stones i.e. sandstone, granite, marble. Gypsum and Fuller's earth deposits are also extensive. Dolomite and limestone provide raw materials for the cement industry. Gujarat is known for its petroleum deposits. Both Gujarat and Rajasthan have rich sources of salt.

d. **The Himalayan belt:** Copper, lead, zinc, cobalt and tungsten occur in both the eastern and western parts. Assam valley has mineral oil deposits.

- The concentration of minerals in the ore, the ease of extraction and closeness to the market play an important role in affecting the economic viability of a reserve. Thus, to meet the demand, a choice has to be made between a number of possible options. When this is done a mineral 'deposit' or 'reserve' turns into a mine. The spatial pattern of some of the important minerals are given below:

(a) Metallic Minerals

(i) Ferrous Minerals

- All those minerals which have iron content are ferrous such as iron ore, manganese, chromite, etc.. These account for about 3/4th of the total value of the production of metallic minerals. They provide a strong base for the development of metallurgical industries.
- Our country is well-placed in respect of ferrous minerals both in reserves and production. It exports substantial quantities of ferrous minerals after meeting her internal demands (Refer Figure 7.8).

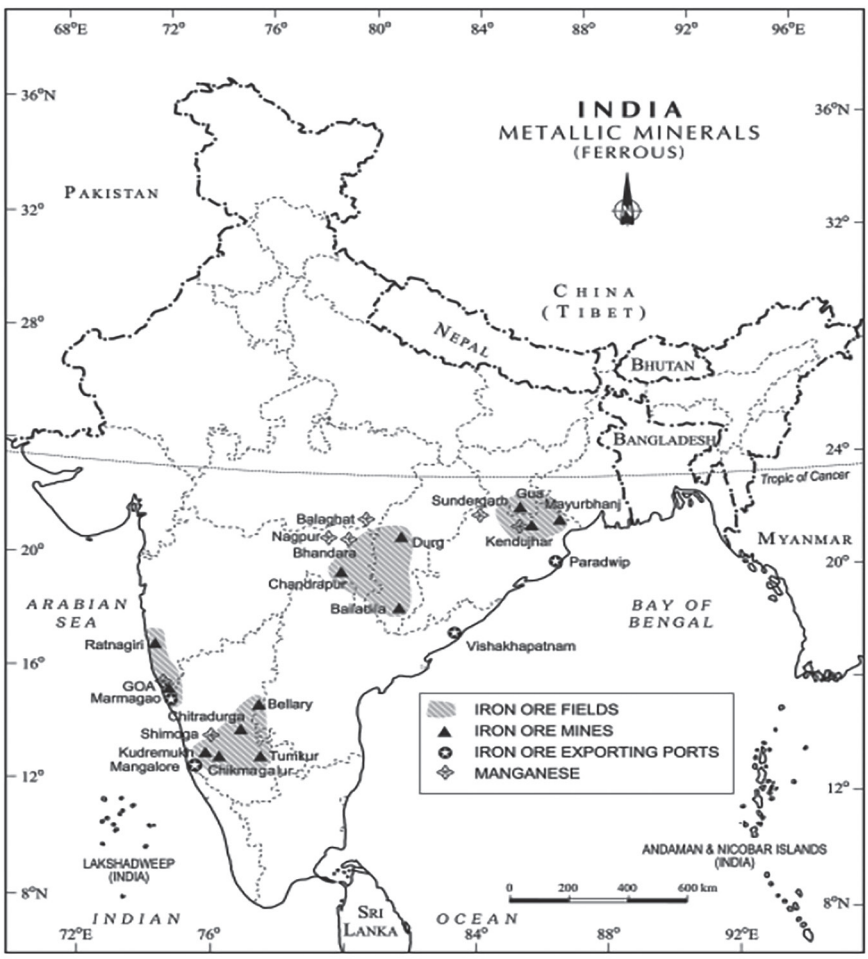

Figure 7.8: India-Metallic Minerals (Ferrous)

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Iron Ore

- Iron ore is the basic mineral and the backbone of industrial development. The total reserves of iron ore in the country were about 22,487 million tonnes in the year 2015.
- The two main types of ore found in our country are **haematite and magnetite**. The iron ore mines occur in close proximity to the coal fields in the north-eastern plateau region of the country which adds to their advantage.
  1. **Magnetite** is the finest iron ore with a very high content of iron up to 70%. It has excellent magnetic qualities, especially valuable in the electrical industry.
  2. **Hematite** ore is the most important industrial iron ore in terms of the quantity used, but has a slightly lower iron content than magnetite (about 50-60%).
- **The major iron ore belts in India are:**
  a. **Orissa-Jharkhand belt:** In Orissa high grade hematite ore is found in Badampahar mines in the Mayurbhanj and Keonjhar districts. In the adjoining Singhbhum district of Jharkhand haematite iron ore is mined in Gua and Noamundi. Jharkhand has some of the oldest iron ore mines and most of the iron and steel plants are located around them.

  b. **Durg-Bastar-Chandrapur belt** lies in Chhattisgarh and Maharashtra. Very high grade hematites are found in the Bailadila range of hills in the Bastar district of Chhattisgarh. The range of hills comprises 14 deposits of super high grade hematite iron ore. It has the best physical properties needed for steel making. Iron ore from these mines is exported to Japan and South Korea via Vishakapatnam port. Dalli, and Rajhara in Durg are also the important mines of iron ore.

  c. **Bellary-Chitradurga-Chikmagalur-Tumkur** belt in Karnataka has large reserves of iron ore. The Kudermukh mines, one of the largest deposits in the world located in the Western Ghats of Karnataka are a 100% export unit. The ore is transported as slurry through a pipeline to a port near Mangalore.

  d. **Maharashtra-Goa belt** includes the state of Goa and Ratnagiri district of Maharashtra. Though, the ores are not of very high quality, yet they are efficiently exploited. Iron ore is exported through Mormugao port.

Agencies Involved in the Exploration of Minerals:

In India, systematic surveying, prospecting and exploration for minerals is undertaken by:

- Geological Survey of India (GSI),
- Oil and Natural Gas Commission (ONGC),
- Mineral Exploration Corporation Ltd. (MECL),
- National Mineral Development Corporation (NMDC),
- Indian Bureau of Mines (IBM),
- Bharat Gold Mines Ltd. (BGML),
- Hindustan Copper Ltd. (HCL),
- National Aluminium Company Ltd. (NALCO),
- Departments of Mining and Geology

Manganese

- Manganese is an important raw material for smelting of iron ore and also used for manufacturing ferro-manganese alloys. Nearly 10 kg of manganese is required to manufacture one tonne of steel. It is also used in manufacturing bleaching powder, insecticides and paints.
- Manganese deposits are found in almost all geological formations, however, it is mainly associated with the Dharwar system. Producers are:
  a. **Madhya Pradesh** is the largest producer of manganese ores in India. It accounted for 33% of the country's total production in 2018-19. The manganese belt of Madhya Pradesh extends in a belt in Balaghat-Chhindwara-Nimar-Mandla and Jhabua districts.

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b. **Orissa** is another largest producer of manganese ores in India. It accounted for 18% of the country's total production in 2018-19. Major mines in Orissa are located in the central part of the iron ore belt of India, particularly in Bonai, Kendujhar, Sundergarh, Gangpur, Koraput, Kalahandi and Bolangir.

c. **Karnataka** is another major producer and here the mines are located in Dharwad, Bellary, Belgaum, North Canara, Chikmagalur, Shimoga, Chitradurg and Tumkur.

d. **Maharashtra** is also an important producer of manganese which is mined in Nagpur, Bhandara and Ratnagiri districts. The disadvantage to these mines is that they are located far from steel plants.

e. **Andhra Pradesh**, **Goa, and Jharkhand** are other minor producers of manganese.

(ii) Non-Ferrous Minerals

✤ Those which do not have iron content are non-ferrous such as copper, bauxite, lead, zinc, gold etc. India's reserves and production of these minerals is not very satisfactory except for Bauxite. However, these minerals play a vital role in a number of metallurgical, engineering and electrical industries (Refer Figure 7.9).

Figure 7.9: India – Minerals (Non-Ferrous)

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Copper

- India is critically deficient in Copper production and reserves. Being malleable, ductile and a good conductor, copper is mainly used in electrical cables, electronics and chemical industries. It is also mixed with gold to provide strength to jewellery.
- **Distribution:** The deposits mainly occur in Singhbhum district in Jharkhand, Balaghat district in Madhya Pradesh (produce 52% per cent of India's copper) and Jhunjhunu and Alwar districts in Rajasthan. Minor producers of Copper are Agnigundala in Guntur District (Andhra Pradesh), Chitradurga and Hasan districts (Karnataka) and South Arcot district (Tamil Nadu).

Bauxite

- Bauxite deposits are formed by the decomposition of a wide variety of rocks rich in aluminium silicates.
- It is from bauxite, a clay-like substance that alumina and later aluminium is obtained from.
- Aluminium is an important metal because it combines the strength of metals such as iron, with extreme lightness and also with good conductivity and great malleability.
- **Distribution:** Bauxite is found mainly in tertiary deposits and is associated with laterite rocks occurring extensively either on the plateau or hill ranges of peninsular India and also in the coastal tracts of the country.
  - Odisha happens to be the largest producer of Bauxite. Kalahandi and Sambalpur are the leading producers. The other two areas which have been increasing their production are Bolangir and Koraput.
  - The patlands of Jharkhand in Lohardaga, Bhavnagar, Jamnagar in Gujarat, Amarkantak plateau in Chhattisgarh, Katni-Jabalpur area and Balaghat in Madhya Pradesh and Kolaba, Thane, Ratnagiri, Satara, Pune and Kolhapur in Maharashtra are important producer of bauxite.

Do You Know?

After the discovery of aluminium, Emperor Napoleon III wore buttons and hooks on his clothes made of aluminium and served food to his more illustrious guests in aluminium utensils and the less honourable ones were served in gold and silver utensils. Thirty years after this incident, aluminium bowls were most common with the beggars in Paris.

(b) Non-metallic Minerals

- Among the non-metallic minerals produced in India, mica is the important one. The other minerals extracted for local consumption are limestone, dolomite and phosphate.

Mica

- Due to its excellent di-electric strength, low power loss factor, insulating properties and resistance to high voltage, mica is one of the most indispensable minerals used in electric and electronic industries. Made up of a series of plates or leaves, splits easily into thin sheets which are tough and flexible. It can be clear, black, green, red, yellow or brown.
- **Distribution:** Deposits are found in the northern edge of the Chota Nagpur plateau. Mica in India is produced in Jharkhand (Koderma - Gaya - Hazaribagh belt), Andhra Pradesh (Nellore mica belt) and Rajasthan (around Ajmer) followed by Tamil Nadu, West Bengal and Madhya Pradesh. Its deposits also occur in Mysore and Hasan districts of Karnataka, Coimbatore, Tiruchirapalli, Madurai and Kanyakumari in Tamil Nadu, Alleppey in Kerala, Ratnagiri in Maharashtra, Purulia and Bankura in West bengal.

Hazards of Mining

- The dust and noxious fumes inhaled by miners make them vulnerable to pulmonary diseases.
- The risk of collapsing mine roofs, inundation and fires in coal mines are a constant threat to miners.
- The water sources in the region get contaminated due to mining.
- Dumping of waste and slurry leads to degradation of land, soil, and increase in stream and river pollution.

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Limestone

- It is found in association with rocks composed of calcium carbonates or calcium and magnesium carbonates. It is found in sedimentary rocks of most geological formations. It is the basic raw material for the cement industry and essential for smelting iron ore in the blast furnace.
- Stricter safety regulations and implementation of environmental laws are essential to prevent mining from becoming a **"killer industry"**.

Conservation of Mineral Resources

- Mineral resources are finite and non-renewable. A concerted effort has to be made in order to use our mineral resources in a planned and sustainable manner.
- Improved technologies need to be constantly evolved to allow use of low grade ores at low costs.
- Recycling of metals, using scrap metals and other substitutes are steps in conserving our mineral resources for the future.

(C) Classification on the Basis of Exhaustibility – Renewable and Non-renewable

(i) Renewable Resources

- The resources which can be renewed or reproduced by physical, chemical or mechanical processes are known as renewable or replenishable or non-conventional resources. Some of these are unlimited and are not affected by human activities, such as solar and wind energy. Yet careless use of certain renewable resources like water, soil and forest can affect their stock. The renewable resource may further be divided into continuous or flow.

(a) Soil

- Soil is the most important renewable natural resource. The thin layer of grainy substance with covers the surface of the earth is called soil. It is closely linked to land and is a living system. Landforms determine the type of soil. It is made up of organic matter (humus), minerals and weathered rocks found on the earth. (Refer Figure 7.10) This happens through the process of weathering. The right mix of minerals and organic matter make the soil fertile. It is the medium of plant growth and supports different types of living organisms on the earth.

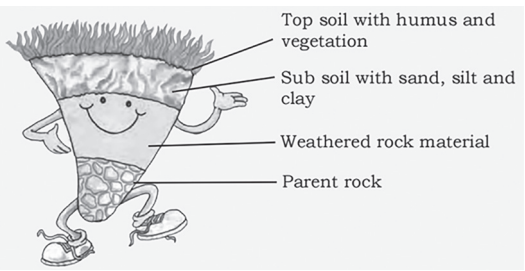

Figure 7.10: Soil Profile

Factors of Soil Formation

- It takes hundreds of years to make just one centimetre of soil. The major factors of soil formation are Relief, parent rock or bedrock, climate, vegetation and other forms of life and time. All these differ from place to place. Various forces of nature such as change in temperature, actions of running water, wind and glaciers, activities of decomposers etc. contribute to the formation of soil. Chemical and organic changes which take place in the soil are equally important (Refer Figure 7.11).

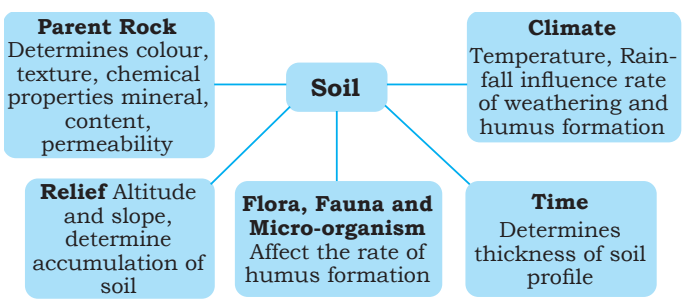

Figure 7.11: Factor affecting soil formation

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Classification of Soils

- On the basis of the factors responsible for soil formation, colour, thickness, texture, age, chemical and physical properties, the soils of India can be classified in different types (Refer Figure 7.12).
- **Alluvial Soils:** Alluvial soils as a whole are very fertile. These soils contain an adequate proportion of potash, phosphoric acid and lime which are ideal for the growth of sugarcane, paddy, wheat and other cereal and pulse crops. Soils in the drier areas are more alkaline and can be productive after proper treatment and irrigation.
  - **Distribution:** The entire northern plains are made of alluvial soil extending in Rajasthan and Gujarat through a narrow corridor. The plains have been deposited by three important Himalayan river systems – the Indus, the Ganga and the Brahmaputra. These are also found in the eastern coastal plains particularly in the deltas of the Mahanadi, the Godavari, the Krishna and the Kaveri rivers. The soil consists of various proportions of sand, silt and clay. In the upper reaches of the river valley i.e. near the place of the break of slope, the soils are coarse. Such soils are more common in piedmont plains such as Duars, Chos and Terai.
  - **Classification:** Apart from the size of their grains or components, they are also described on the basis of their age. According to their age alluvial soils can be classified as old alluvial **(Bangar)** has higher concentration of kanker nodules and new alluvial **(Khadar)** has more fine particles and is more fertile than the bangar.

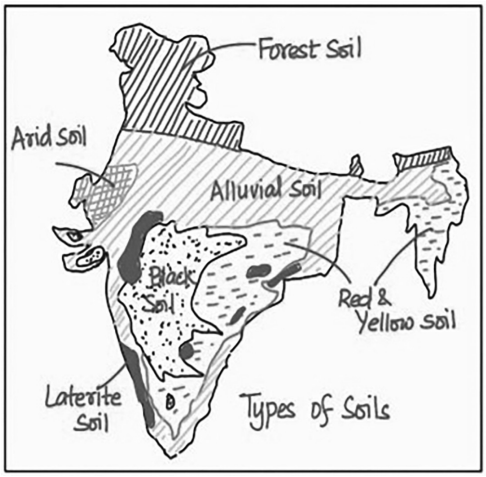

Figure 7.12: Major soil types

- **Black Soil or Regur Soil:** These soils are black in colour and ideal for growing cotton thus also known as **black cotton soil**. Climatic condition along with the parent rock material are the important factors for the formation of black soil. They are made up of extremely fine i.e. clayey material and are well-known for their capacity to hold moisture. In addition, they are rich in soil nutrients, such as calcium carbonate, magnesium, potash and lime but poor in phosphoric contents. They develop deep cracks during hot weather, which helps in the proper aeration of the soil. These soils are sticky when wet and difficult to work on unless tilled immediately after the first shower or during the pre-monsoon period.
  - Distribution: This type of soil is spread over the northwest Deccan plateau and is made up of lava flows. They cover the plateaus of Maharashtra, Saurashtra, Malwa, Madhya Pradesh and Chhattisgarh and extend in the south east direction along the Godavari and the Krishna valleys.
- **Red and Yellow Soils:** These soils develop a reddish colour due to diffusion of iron in crystalline and metamorphic rocks. It looks yellow when it occurs in a hydrated form.
  - **Distribution:** It develops on crystalline igneous rocks in areas of low rainfall in the eastern and southern parts of the Deccan plateau. These are also found in parts of Orissa, Chhattisgarh, southern parts of the middle Ganga plain and along the piedmont zone of the Western Ghats.
- **Laterite Soil:** Laterite has been derived from the Latin word 'later' which means brick. The soil develops in areas with high temperature and heavy rainfall. This is the result of intense leaching due to heavy rain. Humus content of the soil is low because most of the microorganisms,

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particularly the decomposers, like bacteria, get destroyed due to high temperature. Laterite soils are suitable for cultivation with adequate doses of manures and fertilisers.

- ✧ **Distribution:** Mainly found in Karnataka, Kerala, Tamil Nadu, Madhya Pradesh, and the hilly areas of Orissa and Assam. After adopting appropriate soil conservation techniques particularly in the hilly areas of Karnataka, Kerala and Tamil Nadu, this soil is very useful for growing tea and coffee. Red laterite soils in Tamil Nadu, Andhra Pradesh and Kerala are more suitable for crops like cashew nuts.

- ✤ **Arid Soils:** Range from red to brown in colour, are generally sandy in texture and saline in nature. In some areas the salt content is very high and common salt is obtained by evaporating the water. Due to the dry climate, high temperature, evaporation is faster and the soil lacks humus and moisture. The lower horizons of the soil are occupied by Kankar because of the increasing calcium content downwards. The Kankar layer formations restrict the infiltration of water. After proper irrigation these soils become cultivable as has been in the case of western Rajasthan.
- ✤ **Forest Soils:** These soils are found in the hilly and mountainous areas where sufficient rain forests are available. The soil texture varies according to the mountain environment where they are formed. They are loamy and silty in valley sides and coarse grained in the upper slopes. In the snow covered areas of Himalayas, these soils experience denudation and are acidic with low humus content.
  - ✧ **Distribution:** The soils found in the lower parts of the valleys particularly on the river terraces and alluvial fans are fertile.

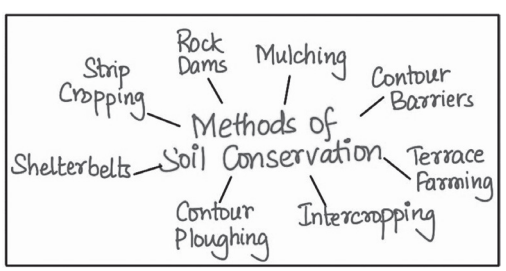
Soil Erosion

- ✤ The denudation of the soil cover and subsequent washing down is described as soil erosion. The processes of soil formation and erosion go on simultaneously and generally there is a balance between the two. Both human and natural factors can lead to degradation of soils. Factors which lead to soil degradation are deforestation, overgrazing, construction and mining, overuse of chemical fertilisers or pesticides, rain wash, landslides and floods.
- ✤ **Various form of soil erosion are:**
  - ✧ **Gullies:** The running water cuts through the clayey soils and makes deep channels as gullies. Thus, the land becomes unfit for cultivation and is known as bad land. In the Chambal basin such lands are called ravines.
  - ✧ **Sheet Erosion:** Sometimes water flows as a sheet over large areas down a slope. In such cases the top soil is washed away. This type of erosion is known as sheet erosion.
  - ✧ **Wind Erosion:** Wind blows loose soil off flat or sloping land known as wind erosion.

Figure. 7.13: Terrace Farming

Some methods of soil conservation

- ✤ **Mulching:** The bare ground between plants is covered with a layer of organic matter like straw. It helps to retain soil moisture.
- ✤ **Contour barriers:** Stones, grass, soil are used to build barriers along contours. Trenches are made in front of the barriers to collect water.
- ✤ **Rock dam:** Rocks are piled up to slow down the flow of water. This prevents gullies and further soil loss.



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- **Terrace farming:** Broad flat steps or terraces are made on the steep slopes so that flat surfaces are available to grow crops. They reduce surface runoff and soil erosion. Western and central Himalayas have well developed terrace farming. (Refer Figure 7.13).
- **Intercropping:** Different crops are grown in alternate rows and are sown at different times to protect the soil from rain wash.
- **Contour ploughing:** Soil erosion is also caused due to defective methods of farming. Ploughing in a wrong way i.e. up and down the slope form channels for the quick flow of water leading to soil erosion. Ploughing parallel to the contours of a hill slope to form a natural barrier for water to flow down the slope. This is called contour ploughing. (Refer Figure 7.14)

Figure. 7.14: Contour Ploughing

- **Strip Cropping:** Large fields can be divided into strips. Strips of grass are left to grow between the crops. This breaks up the force of the wind. This method is known as strip cropping.
- **Shelterbelts:** Planting lines of trees to create shelter are called shelter belts. These shelter belts have contributed significantly to the stabilisation of sand dunes and in stabilising the desert in western India (Refer Figure 7.15).

Figure. 7.15: Shelter Belts

(b) Water

- Water is a vital renewable natural resource. The planet Earth is called the 'water planet' because 3/4th of the earth's surface is covered with water. Almost 3.5 billion years ago, life began in the primitive oceans. Even today, the oceans cover 2/3rd of the earth's surface and support a rich variety of plant and animal life. The ocean water is however saline and not fit for human consumption. Humans use huge amounts of water not only for drinking and washing but also in the process of production.

Water Scarcity and the Need for Water Conservation and Management

- Increasing population, industries, generating electricity through reservoirs of dams, rising demands for food and cash crops, increasing urbanisation and rising standards of living are some of the major factors leading to shortages in supply of fresh water either due to drying up of water sources or water pollution.
- Of all the freshwater sources, only 1% of the water is available to us in the form of freshwater lakes, rivers, and groundwater, which is fit for human use.
- Water can neither be added nor subtracted from the earth. Its total volume remains constant. Its abundance only seems to vary because it is in constant motion, cycling through the oceans, the air, the land and back again, through the processes of evaporation, precipitation and run-off known as the **'water cycle'.**

Water: Some facts and figures

- 96.5% of the total volume of world's water is estimated to exist as oceans and only 2.5% as freshwater. Nearly 70 per cent of this freshwater occurs as ice sheets and glaciers in Antarctica, Greenland and the mountainous region of the world, while a little less than 30% is stored as groundwater in the world's aquifers.
- India receives nearly 4% of the global precipitation and ranks 133 in the world in terms of water availability per person per annum.
- The total renewable water resources of India are estimated at 1,897 sq km per annum.
- **By 2025, it is predicted that large parts of India will join countries or regions having absolute water scarcity.**

Source: The UN World Water Development Report, 2003

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- There is scarcity of water in most of Africa, West Asia, South Asia, parts of western USA, north-west Mexico, parts of South America and entire Australia.
- Water shortage is a consequence of variation in seasonal or annual precipitation and water scarcity is caused by overexploitation, excessive use, unequal access to water among different social groups and contamination of water sources.
- Access to clean and adequate water sources is a major problem facing the world today.

Do You Know?

- In 1975, the consumption of water for human use was **3850 cu km/year**. It soared to more than 6000 cu km/year in the year 2000.
- A dripping tap wastes 1200 litres of water in a year.
- **Water market:** Amreli city in Saurastra region with a population of 1.45 lakhs is completely dependent on purchasing water from the nearby talukas.

According to Falken Mark, a Swedish expert, water stress occurs when **water availability** is less than 1,000 cubic metre per person per day.

Steps have to be taken to conserve water

Over exploitation and mismanagement of water resources will impoverish this resource and cause ecological crises that may have profound impact on our lives. Some steps can be taken such as:

India's rivers, especially the smaller ones, have all turned into toxic streams. And even the big ones like the Ganga and Yamuna are far from being pure. The assault on India's rivers – from population growth, agricultural modernisation, urbanisation and industrialisation – is enormous and growing by the day..... This entire life stands threatened.

Source: The Citizens' Fifth Report, CSE, 1999.

1. **Preventing deterioration of Water Quality:** Water quality refers to purity of water, or water without unwanted foreign substances. Discharge of untreated or partially treated sewage, agricultural chemicals and industrial effluents in water bodies contaminates water with nitrates, metals and pesticides thus, making it hazardous for human use. This results in pollution of water whereby quality of water deteriorates affecting aquatic systems. Sometimes, they also seep down and pollute groundwater. The Ganga and the Yamuna are the two highly polluted rivers in the country (Refer Figure 7.16). Water pollution can be controlled by treating these effluents suitably before releasing them in water bodies.
2. **Prevention of Water Pollution:** The major rivers of the country generally retain better water quality in less densely populated upper stretches in hilly areas. In plains, drains carrying agricultural (fertilisers and insecticides), domestic (solid and liquid wastes), and industrial effluents join the rivers. The concentration of pollutants in rivers, especially remains very high during the summer season when flow of water is low.
   - The **Central Pollution Control Board (CPCB)** in collaboration with **State Pollution Control Boards** has been monitoring water quality of national aquatic resources at 507 stations. The data obtained from these show that organic and bacterial contamination continues to be the main source of pollution in rivers. The Yamuna river is the most polluted river in the country between Delhi and Etawah. Other severely polluted rivers are: the Sabarmati at Ahmedabad, the Gomti at Lucknow, the Kali, the Adyar, the Cooum (entire stretches), the Vaigai at Madurai and the Musi of Hyderabad and the Ganga at Kanpur and Varanasi.
   - The **legislative provisions such as the Water (Prevention and Control of Pollution) Act 1974,** and **Environment Protection Act 1986** should be implemented effectively.

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✧ The **Water Cess Act, 1977**, meant to reduce pollution has also made marginal impacts. There is a strong need to generate public awareness about the importance of water and impacts of water pollution.

Figure. 7.16: The Ganga and its Tributaries

3. Forest and other vegetation cover slows the surface runoff and replenishes underground water.
4. The canals used for irrigating fields should be properly lined to minimise losses by water seepage. Sprinklers should be used.
5. In dry regions with high rates of evaporation, drip or trickle irrigation is very useful.
6. The issue of desalination of water particularly in coastal and arid and semi-arid areas, transfer of water from water surplus areas to water deficit areas through inter linking of rivers can be important remedies for solving water problem in India.
7. **Recycle and Reuse of Water:** Use of water of lesser quality such as reclaimed waste-water would be an attractive option for industries for cooling and fire fighting to reduce their water cost. Similarly, in urban areas water after bathing, washing utensils and washing vehicles can be used for gardening. This would conserve better quality of water for drinking purposes. There is enormous scope for replenishing water through recycling.
8. **Watershed Management:** It refers to efficient management and conservation of surface and groundwater resources. It involves prevention of runoff and storage and recharge of groundwater through various methods like percolation tanks, recharge wells, etc. However, it includes conservation, regeneration and judicious use of all resources – natural (like land, water, plants and animals) and humans within a watershed. It aims at bringing about balance between natural resources on the one hand and society on the other.

RESOURCES
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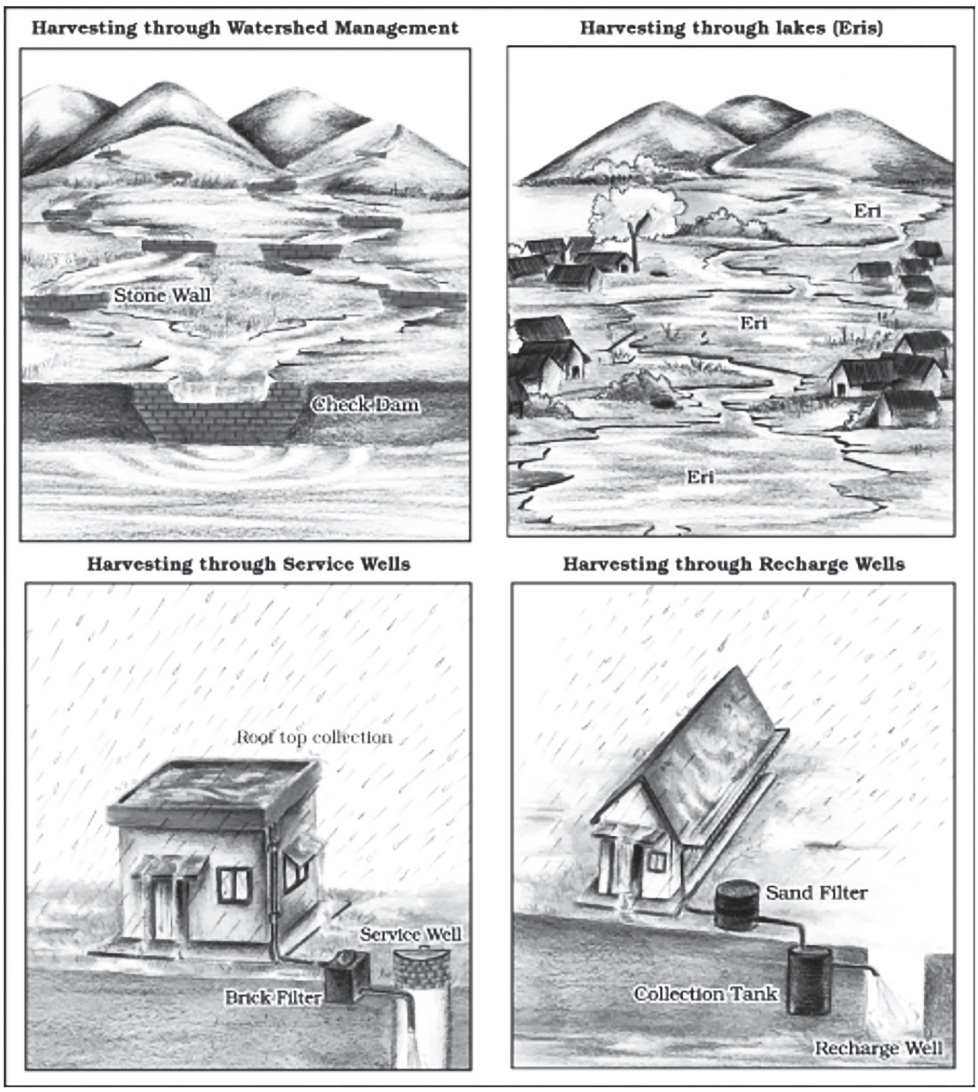

Figure 7.17: Various Methods of Rainwater Harvesting

- The success of watershed development largely depends upon community participation.
- **Haryali** is a watershed development project sponsored by the Central Government which aims at enabling the rural population to conserve water for drinking, irrigation, fisheries and afforestation. The Project is being executed by Gram Panchayats with people's participation.
- **Neeru-Meeru** (Water and You) programme (in Andhra Pradesh) and **Arvary Pani Sansad** (in Alwar, Rajasthan) have taken up constructions of various water-harvesting structures such as percolation tanks, dug out ponds (Johad), check dams, etc. through people's participation.

Roof top rainwater harvesting is the most common practice in Shillong, Meghalaya. Cherapunjee and Mawsynram situated at a distance of 55 km. from Shillong receive the highest rainfall in the world, yet the state capital Shillong faces acute shortage of water. Nearly 15-25% of the total water requirement of the household comes from roof top water harvesting.

Tamil Nadu is the first and the only state in India which has made roof top rainwater harvesting structure compulsory to all the houses across the state. There are legal provisions to punish the defaulters.

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- There is a need to generate awareness regarding benefits of watershed development and management among people in the country, and through this integrated water resource management approach water availability can be ensured on a sustainable basis.

9. **Rain Water harvesting:** Rain water harvesting is a low cost and eco-friendly method to capture and store rainwater for various uses. It is also used to recharge groundwater aquifers. It increases water availability, checks the declining groundwater table, improves the quality of groundwater through dilution of contaminants like fluoride and nitrates, prevents soil erosion, and flooding and arrests salt water intrusion in coastal areas if used to recharge aquifers (Refer Figure 7.17). It also decreases the community dependence on groundwater for domestic use. Besides bridging the demand supply gap, it can also save energy to pump groundwater as recharge leads to rise in groundwater table.

Bamboo Drip Irrigation System: In Meghalaya, a 200-year-old system of tapping stream and spring water by using bamboo pipes, is prevalent. About 18-20 litres of water enters the bamboo pipe system, gets transported over hundreds of metres, and finally reduces to 20-80 drops per minute ate the site of the plant.

Hydraulic Structures in Ancient India

- In the 1st century B.C., Sringaverapura near Allahabad had sophisticated water harvesting system channelling the flood water of the river Ganga.
- During the time of Chandragupta Maurya, dams, lakes and irrigation systems were extensively built.
- Evidences of sophisticated irrigation works have also been found in Kalinga, (Orissa), Nagarjunakonda (Andhra Pradesh), Bennur (Karnataka), Kolhapur (Maharashtra), etc.
- In the 11th Century, Bhopal Lake, one of the largest artificial lakes of its time was built.
- In the 14th Century, the tank in Hauz Khas, Delhi was constructed by Iltutmish for supplying water to Siri Fort area.

Source: Dying Wisdom, CSE, 1997.

- Traditional rain water harvesting in rural areas is done by using surface storage bodies like lakes, ponds, irrigation tanks, etc.
- In hill and mountainous regions, people built diversion channels like the 'guls' or 'kuls' of the Western Himalayas for agriculture. A kul leads to a circular village tank, from which water is released as and when required.
- In arid and semi-arid regions, agricultural fields were converted into rain fed storage structures that allowed the water to stand and moisten the soil like the 'khadins' in Jaisalmer and 'Johads' in other parts of Rajasthan. In the semi-arid and arid regions of Rajasthan, particularly in Bikaner, Phalodi and Barmer, rainwater harvesting structures locally known as Kund or Tanka (a covered underground tank) are constructed near or in the house or village. Rainwater, or palar pani, as commonly referred to in these parts, is considered the purest form of natural water. Many houses constructed underground rooms adjoining the 'tanka' to beat the summer heat as it would keep the room cool.

10. **Multi-Purpose River Projects And Integrated Water Resources Management:**

- **Dams: Dams were traditionally built to impound rivers and rainwater that could be used later to** irrigate agricultural fields. Dams are now referred to as multi-purpose projects. For example, in the Sutlej-Beas river basin, the Bhakra – **Nangal project water is** being used both for hydel power production and irrigation; the **Hirakud project** in the Mahanadi basin integrates conservation of water with flood control (Refer Figure 7.18).
- Multi-purpose projects, launched after Independence with their integrated water resources management approach, were thought of as the vehicle that would lead the nation to development and progress, overcoming the handicap of its colonial past. Jawaharlal Nehru proudly proclaimed the dams as the **'temples of modern India'.**

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Figure 7.18: Major Rivers and Dams

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Dam

- A dam is a barrier across flowing water that obstructs, directs or retards the flow, often creating a reservoir, lake or impoundment.
- "Dam" refers to the reservoir rather than the structure.
- Most dams have a section called a spillway or weir over which or through which it is intended that water will flow either intermittently or continuously.
- Dams are classified according to structure, intended purpose or height.
- Based on structure and the materials used, dams are classified as timber dams, embankment dams or masonry dams, with several subtypes.
- According to the height, dams can be categorised as large dams and major dams or alternatively as low dams, medium height dams and high dams.

In recent years, multi-purpose projects and large dams have come under great scrutiny and opposition for a variety of reasons.

1. Regulating and damming of rivers affect their natural flow causing poor sediment flow and excessive sedimentation at the bottom of the reservoir, resulting in rockier stream beds and poorer habitats for the rivers' aquatic life.
2. Dams also fragment rivers making it difficult for aquatic fauna to migrate, especially for spawning.
3. The reservoirs created on the floodplains also submerge the existing vegetation and soil leading to its decomposition over a period of time.
4. They have also been the cause of many new social movements like the **'Narmada Bachao Andolan' and the 'Tehri Dam Andolan'** etc. Resistance to these projects has primarily been due to the large-scale displacement of local communities.
5. Irrigation has also changed the cropping pattern of many regions with farmers shifting to water intensive and commercial crops. This has great ecological consequences like salinisation of the soil. At the same time, it has transformed the social landscape i.e. increasing the social gap between the richer landowners and the landless poor.
6. Inter-state water disputes are also becoming common with regard to sharing the costs and benefits of the multi-purpose project.
7. Ironically, the dams that were constructed to control floods have triggered floods due to sedimentation in the reservoir. The floods have not only devastated life and property but also caused extensive soil erosion. Sedimentation also meant that the flood plains were deprived of silt, a natural fertiliser, further adding on to the problem of land degradation.
8. The multi-purpose projects have induced earthquakes, caused water borne diseases and pests and pollution resulting from excessive use of water.

Narmada Bachao Andolan or Save Narmada Movement is a Non Governmental Organisation (NGO) that mobilised tribal people, farmers, environmentalists and human rights activists against the Sardar Sarovar Dam being built across the Narmada river in Gujarat. It originally focused on the environmental issues related to trees that would be submerged under the dam water. Recently it has re-focused the aim to enable poor citizens, especially the oustees (displaced people) to get full rehabilitation facilities from the government.

Do You Know?

The Krishna-Godavari dispute is due to the objections raised by Karnataka and Andhra Pradesh governments. It is regarding the diversion of more water at Koyna by the Maharashtra government for a multipurpose project. This would reduce downstream flow in their states with adverse consequences for agriculture and industry.

Water Resources of India

- India accounts for about 2.45% of the world's surface area, 4% of the world's water resources and about 16% of the world's population. The total water available from precipitation in the country in a year is about 4,000 cubic km.

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- **Surface Water Resources:** There are four major sources of surface water. These are rivers, lakes, ponds, and tanks. The mean annual flow in all the river basins in India is estimated to be 1,869 cubic km. However, due to topographical, hydrological and other constraints, only about 690 cubic km (32%) of the available surface water can be utilised. Water flow in a river depends on the size of its catchment area or river basin and rainfall within its catchment area. Precipitation in India has very high spatial variation, and it is mainly concentrated in the Monsoon season. Some of the rivers in the country like the Ganga, the Brahmaputra, and the Indus have huge catchment areas. These rivers, although account for only about 1/3rd of the total area in the country, have 60% of the total surface water resources. Much of the annual water flow in south Indian rivers like the Godavari, the Krishna, and the Kaveri has been harnessed, but it is yet to be done in the Brahmaputra and the Ganga basins (Refer Figure 7.19).
- **Groundwater Resources:** The groundwater utilisation is very high in the states of Punjab, Haryana, Rajasthan, and Tamil Nadu. However, states like Chhattisgarh, Orissa, Kerala, etc., utilise only a small proportion of their groundwater potentials(Refer Table 7.1). If the present trend continues, the demands for water would need the supplies. And such a situation, will be detrimental to development, and can cause social upheaval and disruptions.

Table 7.1: Basin wise Ground water Potential and Utilisation in India (Cubic Km/Year)

S. NO.	Name of Basin Ground Water Resources	Total Replenishable Utilisation (%)	Level of Groundwater
1.	Brahmani with Baitarni	4.05	8.45
2.	Brahmaputra	26.5	3.37
3.	Chambal Composite	7.19	40.09
4.	Kaveri	12.3	55.33
5.	Ganga	170.99	33.52
6.	Godavari	40.65	19.53
7.	Indus	26.49	77.71
8.	Krishna	26.41	30.39
9.	Kuchchh and Saurashtra including river Luni	11.23	51.14
10.	Chennai and South Tamil Nadu	18.22	57.68
11.	Mahanadi	16.46	6.95
12.	Meghna (Barak & Others)	8.52	3.94
13.	Narmada	10.83	21.74
14.	Northeast Composite	18.84	17.2
15.	Pennar	4.93	36.6
16.	Subarnrekha	1.82	9.57
17.	Tapi	8.27	33.05
18.	Western Ghat	17.69	22.8

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Figure 7.19: River Basins of India

- **Lagoons and Backwaters:** India has a vast coastline and the coast is very indented in some states. Due to this, a number of lagoons and lakes have formed.
  - The States like Kerala, Orissa and West Bengal have vast surface water resources in these lagoons and lakes.
  - Although, water is generally brackish in these water-bodies, it is used for fishing and irrigating certain varieties of paddy crops, coconut, etc.

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Water Demand and Utilisation

- About 2/3rd of India's population is dependent on agriculture. Hence, development of irrigation to increase agricultural production has been assigned a very high priority in the Five Year Plans, and multipurpose river valleys projects like the Bhakra-Nangal, Hirakud, Damodar Valley, Nagarjuna Sagar, Indira Gandhi Canal Project, etc. have been taken up. In fact, India's water demand at present is dominated by irrigational needs. (Refer Figure 7.20). However, in the future, the shares of industrial and domestic sectors in the country are likely to increase.

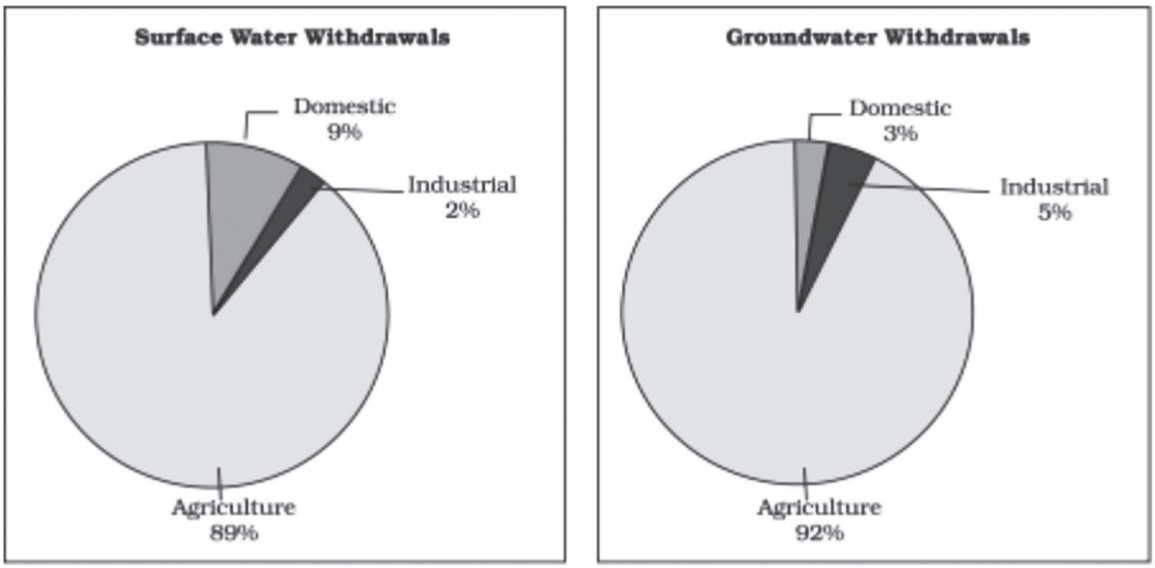

Figure 7.20: Sectoral Usage of Surface and Ground Water

- **Demand of Water for Irrigation:** Irrigation is needed in agriculture because of spatio-temporal variability in rainfall in the country.
  - The large tracts of the country are deficient in rainfall and are drought prone such as north-western India and Deccan plateau.
  - Water needs of certain crops such as rice, sugarcane, jute, etc. also makes irrigation necessary. It has been found that irrigated lands have higher agricultural productivity than unirrigated land.
  - Further, the high yielding varieties of crops need regular moisture supply, which is made possible only by developed irrigation systems. That is why **the Green Revolution** has been successful in Punjab, Haryana and western Uttar Pradesh. In these states more than 85% of their net sown area is under irrigation. Wheat and rice are grown mainly with the help of irrigation in these states.
  - Of the total net irrigated area 76.1% in Punjab and 51.3% in Haryana are irrigated through wells and tube wells which has led to **decline in ground water table in these states.**
  - In fact, over withdrawals in some states like Rajasthan, and Maharashtra has increased **fluoride concentration in ground-water,** and this practice has led to increase in concentration of arsenic in parts of West Bengal and Bihar.

(ii) Non-Conventional Renewable Sources of Energy

- Non-conventional sources include solar, wind, tidal, geothermal, biogas and atomic energy. These energy sources are more equitably distributed and eco-friendly cheaper energy.

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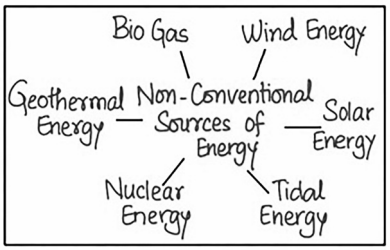
Solar Energy



- India is a tropical country and has enormous possibilities of tapping solar energy. Sun rays tapped in **photovoltaic cells** can be converted into energy, known as solar energy (Refer Figure 7.21). The two effective processes considered to be very effective to tap solar energy are **photovoltaics and solar thermal technology.**
- It is cost competitive, environment friendly and easy to construct, generally used more in appliances like heaters, crop dryers, cookers, etc.
- Solar energy is fast becoming popular in rural and remote areas as it is 7% more effective than coal or oil based plants and 10% more effective than nuclear plants.
- The western part of India has greater potential for the development of solar energy in Gujarat and Rajasthan.

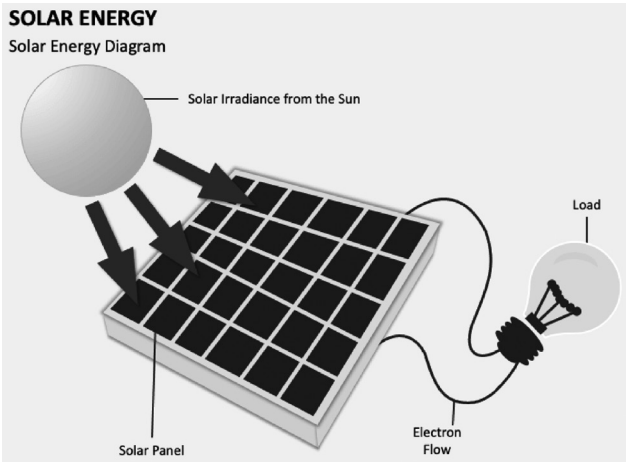


Figure 7.21: Solar energy

Wind Energy

- Wind energy is an absolutely pollution free, inexhaustible source of energy. The mechanism of **converting kinetic energy of wind**, through turbines, **into electrical energy** is simple.
- The permanent wind systems such as the **trade winds, westerlies and seasonal wind like monsoon** have been used as a source of energy. Besides these, local winds, land and sea breezes can also be used to produce electricity.
- The Government, through National Institute of Wind Energy (NIWE), has installed over 900 wind-monitoring stations all over the country and issued wind potential maps at 50 m, 80 m and 100 m and presently, in the process of assessing wind potential at 120 m above ground level. The latest assessment indicates gross wind power potential of 302 GW in the country at 100 metres above ground level.
- The Ministry of New and Renewable Energy is developing wind energy in India to lessen the burden of oil import bills.
- The country's potential of wind power generation exceeds 200 gigawatts. India now ranks as a **"wind super power"** in the world.
- Wind power plant at Lamba in Gujarat in Kachchh is the largest in Asia. The largest wind farm cluster is located in TamilNadu from Nagarcoil to Madurai. Apart from these, Andhra Pradesh, Karnataka, Gujarat, Kerala, Maharashtra and Lakshadweep have important wind farms. Nagarcoil and Jaisalmer are well known for effective use of wind energy in the country.
- Wind farms are found in the Netherlands, Germany, Denmark, UK, USA and Spain are noted for their wind energy production.

Tidal and Wave Energy

- Ocean currents are the store-house of infinite energy. Since the beginning of the 17th & 18th century, persistent efforts have been made to create a more efficient energy system from the ceaseless tidal waves and ocean currents.

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- Oceanic tides can be used to generate electricity.
- India has great potential for the development of tidal energy along the west coast of India.
  - In India, the Gulf of Kachchh, provides ideal conditions for utilising tidal energy. A 900 MW tidal energy power plant is set up here by the National Hydropower Corporation.

Geothermal Energy

- Geothermal energy refers to the heat and electricity produced by using the heat from the interior of the Earth. When the magma from the interior of earth, comes out on the surface, tremendous heat is released. This heat energy can successfully be tapped and converted to electrical energy.
- Geothermal energy exists because the Earth grows progressively hotter with increasing depth. Where the geothermal gradient is high, high temperatures are found at shallow depths. Groundwater in such areas absorbs heat from the rocks and becomes hot. The hot water that gushes out through the geyser wells is used to drive turbines and generate electricity.
- There are several hundred hot springs in India also, a geothermal energy plant has been commissioned at **Manikaran in Himachal Pradesh** and in the **Puga Valley, Ladakh.**
- The hot springs and geysers have been used since the mediaeval period. The first successful (1890) attempt to tap the underground heat was made in the city of Boise, Idaho (U.S.A.), where a hot water pipe network was built to give heat to the surrounding buildings. This plant is still working.

Bio-energy

- Bio-energy refers to energy derived from biological products which includes agricultural residues, municipal, industrial and other wastes. It can be converted into electrical energy, heat energy or gas for cooking.
- Decomposition of organic matter yields gas, which has higher thermal efficiency in comparison to kerosene, dung cake and charcoal.
- Biogas plants are set up at municipal, cooperative and individual levels. The plants using cattle dung are known as **'Gobar gas plants'** in rural India provide twin benefits to the farmer in the form of energy and improved quality of manure.
- Biogas is by far the most efficient use of cattle dung. It improves the quality of manure and also prevents the loss of trees and manure due to burning of fuel wood and cow dung cakes.
- It also improves the economic life of rural areas in developing countries, reduces environmental pollution, enhances self-reliance and reduces pressure on fuel wood. One such project converting municipal waste into energy is Okhla in Delhi.

(iii) Conventional Sources of Energy

- Non-renewable resources have a limited stock. Once the stocks are exhausted it may take thousands of years to be renewed or replenished. Minerals and fossil fuels such as coal, petroleum and natural gas are examples of such resources. Mineral fuels are essential for generation of power, required by agriculture, industry, transport and other sectors of the economy. Fuels like coal, petroleum and natural gas, firewood, cattle dung cake, nuclear energy minerals, electricity (both hydel and thermal) are the **conventional sources** of energy and are exhaustible resources (Refer Figure 7.22).

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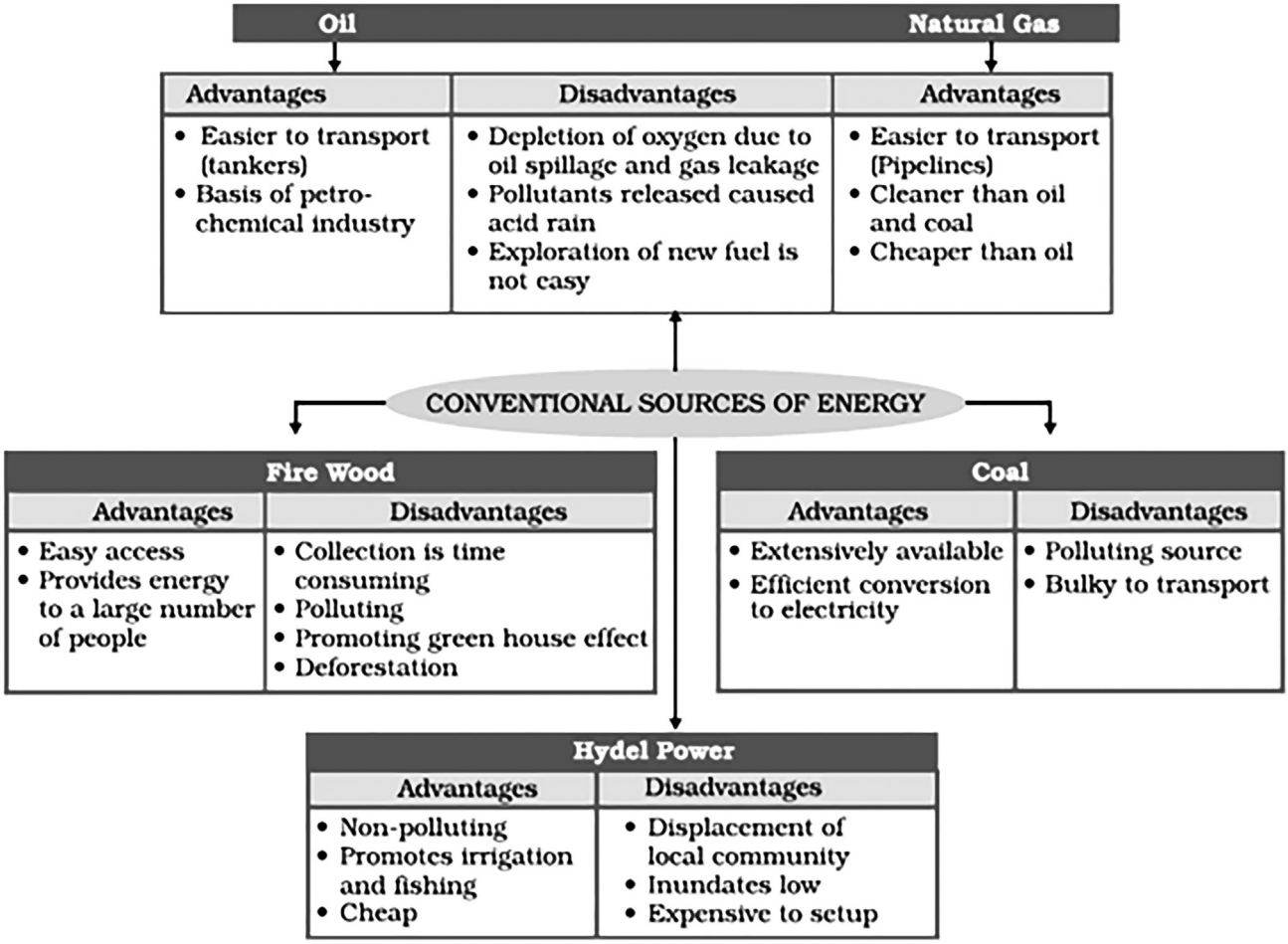

Figure 7.22: Conventional Source of Energy

Coal

- In India, coal is the most abundantly available fossil fuel which is mainly used in the generation of thermal power to supply energy to industry as well as for domestic needs and smelting of iron ore. India is highly dependent on coal for meeting its commercial energy requirements.
- It occurs in rock sequences mainly belonging to two geological ages, namely Gondwana a little over 200 million years in age and tertiary deposits about 55 million years old.
- It is formed due the compression of plant material over millions of years, therefore, is found in a variety of forms depending on the degrees of compression and the depth and time of burial.
- Decaying plants in swamps produce peat which has a low carbon and high moisture contents and low heating capacity.
- **Lignite** is a low grade brown coal, which is soft with high moisture content. The principal lignite reserves are in Neyveli in Tamil Nadu and are used for generation of electricity.
- Coal that has been buried deep and subjected to increased temperatures is bituminous coal. It is the most popular coal in commercial use. **Metallurgical coal** is high grade bituminous coal which has a special value for **smelting iron in blast furnaces**. About 80% of the coal deposits in India is of bituminous type and is of non-coking grade.
- **Anthracite** is the highest quality hard coal.

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Figure 7.23: Distribution of Conventional Energy Resource

- **Distribution:** The most important **Gondwana coal** fields of India are located in **Damodar Valley** which lie in **Jharkhand-Bengal coal belt** and the important coal fields in this region are Raniganj, Jharia, Bokaro, Giridih, Karanpura. Jharia is the largest coal field followed by Raniganj.
  - The Godavari, Mahanadi, Singrauli in Madhya Pradesh (part of Singrauli coal field lies in Uttar Pradesh), Korba in Chhattisgarh, Talcher and Rampur in Orissa, Chanda–Wardha, Kamptee and Bander in Maharashtra and Singareni and Pandur in Andhra Pradesh are other fields.

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- ✧ Tertiary coals occur in Assam, Arunachal Pradesh, Meghalaya and Nagaland. It is extracted from Darangiri, Cherrapunji, Mewlong and Langrin (Meghalaya); Makum, Jaipur and Nazira in upper Assam, Namchik – Namphuk (Arunachal Pradesh) and Kalakot (Jammu and Kashmir).
- ✧ Besides, the brown coal or lignite occurs in the coastal areas of Tamil Nadu, Pondicherry, Gujarat and Jammu and Kashmir (Refer Figure 7.23).

- ✤ Coal is a bulky material, which loses weight on use as it is reduced to ash. Hence, heavy industries and thermal power stations are located on or near the coalfields.

POINTS TO PONDER

Marked absence of coal in the African Continent that falls within the tropical region with Evergreen forest is contrasted with rich coal fields of Applachians (North America) and Pennines (Europe) that fall in the mid latitude region. Can you establish the link between the distribution of coal resources and theories of Continental Drift and Plate Tectonics. Try to find your answers in the ancient continent of Gondwanaland.

Natural Gas

- ✤ Natural gas is an important clean energy resource found in association with or without petroleum. It is used as a source of energy as well as an industrial raw material in the petrochemical industry. It is considered an environmentally friendly fuel because of low carbon dioxide emissions and is, therefore, the fuel for the present century.
- ✤ The **Gas Authority of India Limited** was set up in 1984 as a public sector undertaking to transport and market natural gas.
- ✤ The 1700 km long Hazira-Vijaipur Jagdishpur cross country gas pipeline links Mumbai High and Bassein with the fertiliser, power and industrial complexes in western and northern India. This artery has provided an impetus to India's gas production.
- ✤ The power and fertiliser industries are the key users of natural gas.
- ✤ **Distribution:** Large reserves of natural gas have been discovered in the Krishna- Godavari basin. Andaman and Nicobar islands are also important areas having large reserves of natural gas. It is obtained along with oil in all the oil fields but exclusive reserves have been located along the eastern coast as well as Tripura, Rajasthan and off-shore wells in Gujarat and Maharashtra.

Nuclear Energy Resources

- ✤ Nuclear or Atomic Energy is obtained by altering the structure of atoms and when alteration is done energy is released in the form of heat. This heat is used to generate electric power.
- ✤ Important minerals used for the generation of nuclear energy are uranium and thorium.
- ✤ Uranium deposits occur in the Dharwar rocks. Geographically, uranium ores are known to occur in several locations along the Singhbhum Copper belt, in Udaipur, Alwar and Jhunjhunu districts of Rajasthan, Durg district of Chhattisgarh, Bhandara district of Maharashtra and Kullu district of Himachal Pradesh.
- ✤ **Thorium** is mainly obtained from **monazite and ilmenite** in the beach sands along the coast of Kerala and Tamil Nadu.
- ✤ World's richest monazite deposits occur in Palakkad and Kollam districts of Kerala, near Visakhapatnam in Andhra Pradesh and Mahanadi river delta in Orissa.
- ✤ The **Atomic Energy Commission** was established in 1948, but progress could be made only after the establishment of the **Atomic Energy Institute at Trombay** in 1954 which was renamed as the **Bhabha Atomic Research Centre in 1967.**

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✤ The important **nuclear power projects** are Tarapur (Maharashtra), Rawatbhata near Kota (Rajasthan), Kalpakkam (Tamil Nadu), Narora (Uttar Pradesh), Kaiga (Karnataka) and Kakarapara (Gujarat) (Refer Figure 7.24).

Figure 7.24: India: Distribution of Nuclear and Thermal Power Plants

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Petroleum

- Occurrences of the petroleum in India are associated with anticlines and fault traps in the sedimentary rock formations of the tertiary age. In regions of folding, anticlines or domes, it occurs where oil is trapped in the crest of the upfold. The oil bearing layer is a porous limestone or sandstone through which oil may flow. The oil is prevented from rising or sinking by intervening non-porous layers. Petroleum is also found in fault traps between porous and non-porous rocks. Gas, being lighter, usually occurs above the oil.

Figure 7.25: India – Oil Refineries

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- It consists of hydrocarbons of liquid and gaseous states varying in chemical composition, colour and specific gravity.
- It provides fuel for heat and lighting, lubricants for machinery and raw materials for all internal combustion engines in automobiles, railways and aircraft.
- Its numerous by-products are processed in petrochemical industries such as fertiliser, synthetic rubber, synthetic fibre, medicines, vaseline, lubricants, wax, soap and cosmetics.
- Petroleum is referred to as liquid gold because of its scarcity and diversified uses.
- Oil exploration and production was systematically taken up after the Oil and Natural Gas Commission was set up in 1956. Till then, the Digboi in Assam was the only oil producing region.
- **Distribution:** In recent years, new oil deposits have been found at the extreme western and eastern parts of the country. In Assam (produces about 16% of India's petroleum production), Digboi, Naharkatiya and Moran are important oil producing areas. The major oil fields of Gujarat (about 18% of India's petroleum production) are Ankaleshwar, Kalol, Mehsana, Nawagam, Kosamba and Lunej. Mumbai High which lies 160 km off Mumbai was discovered in 1973 and production commenced in 1976 produces about 63% of India's petroleum production.
- Oil and natural gas have been found in exploratory wells in Krishna-Godavari and Kaveri basin on the east coast. Oil extracted from the wells is crude oil and contains many impurities and cannot be used directly. It needs to be refined. Petroleum refineries act as a "nodal industry" for synthetic textile, fertiliser and numerous chemical industries (Refer Figure 7.25). There are two types of refineries in India: (a) field based, for example, Digboi and (b) market based, for example, Barauni.

Electricity

Electricity has such a wide range of applications in today's world that its per capita consumption is considered as an index of development. It is generated mainly in two ways:

- By running water which drives hydro turbines to generate hydro electricity;
  - **Hydro electricity** is generated by fast flowing water, which is a renewable resource. India has a number of multi-purpose projects like the Bhakra Nangal, Damodar Valley corporation, the Kopili Hydel Project etc. producing hydroelectric power.
- By burning other fuels such as coal, petroleum and natural gas to drive turbines to produce thermal power.
  - **Thermal electricity** is generated by using coal, petroleum and natural gas. The thermal power stations use non-renewable fossil fuels for generating electricity. There are over 269 thermal power plants in India.

Conservation of Energy Resources

- Energy is a basic requirement for economic development. Every sector of the national economy – Agriculture, industry, transport, commercial and domestic – needs inputs of energy.
- The economic development plans implemented since independence necessarily required increasing amounts of energy to remain operational. As a result, consumption of energy in all forms has been steadily rising all over the country. In this background, there is an urgent need to develop a sustainable path of energy development.
- Promotion of energy conservation and increased use of renewable energy sources are the twin planks of sustainable energy.
- India is presently one of the least energy efficient countries in the world. The growing consumption of energy has resulted in the country becoming increasingly dependent on fossil fuels such as coal, oil and gas.

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- Rising prices of oil and gas and their potential shortages have raised uncertainties about the security of energy supply in future, which in turn has serious repercussions on the growth of the national economy.
- We have to adopt a cautious approach for the judicious use of our limited energy resources. For example, as concerned citizens we can use public transport systems instead of individual vehicles; switching off electricity when not in use etc. After all, **"energy saved is energy produced".**
- Moreover, increasing use of fossil fuels also causes serious environmental problems. Hence, there is a pressing need to use renewable energy sources like solar energy, wind, tide, biomass and energy from waste material.

(D) On the basis of Ownership – Individual, Community, National and International

(i) **Individual Resources**

- **These are owned privately** by individuals. Many farmers own land which is allotted to them by the government against the payment of revenue. Urban people own plots, houses and other property. Plantation, pasture lands, ponds, water in wells etc. are some of the examples of resources owned by an individual.

(ii) **Community Owned Resources**

- There are resources which are accessible to all the members of the community. Village commons (grazing grounds, burial grounds, village ponds, etc.) public parks, picnic spots, playgrounds in urban areas are de facto accessible to all the people living there.

(iii) **National Resources**

- Technically, all the resources belong to the nation. The country has legal powers to acquire even private property for public good such as roads, canals, railways being constructed on fields owned by some individuals. Urban Development Authorities get empowered by the government to acquire land. All the minerals, water resources, forests, wildlife, land within the political boundaries and oceanic area up to 12 nautical miles (22.22 km) from the coast termed as territorial water and resources therein belong to the nation.

Do You Know?

India has got the right to mine manganese nodules from the bed of the Indian Ocean which lies beyond the exclusive economic zone.

POINTS TO PONDER

Control and ownership of resources has been a point of contention at individual, societal and global level. It led to the rise of the political philosophy of Marxism. Even in the cold war era, energy resources' ownership was a point of contention between the major powers. Do you think that the contemporary geopolitical scenario and International relations are still driven by the ownership of resources. Try to identify the resources which are driving the current geopolitical cooperation, competition and conflict.

(iv) **International Resources**

- There are international institutions which regulate some resources. The oceanic resources beyond 200 km of the **Exclusive Economic Zone (EEZ)** belong to the open ocean and no individual country can utilise these without the concurrence of international institutions.

Land

- Land is among the most important natural resources. It covers only about 30% of the total area of the earth's surface and all parts of this small percentage are not habitable (Refer Figure 7.26).

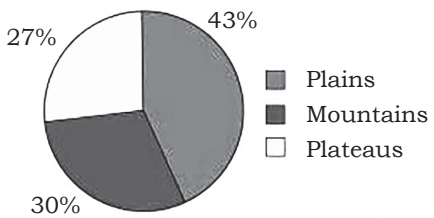

Figure 7.26: India : Land Under Important Relief Features

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- The uneven distribution of population in different parts of the world is mainly due to varied characteristics of land and climate.
- The rugged topography, steep slopes of the mountains, low-lying areas susceptible to water logging, desert areas, thick forested areas are normally sparsely populated or uninhabited. Plains and river valleys offer suitable land for agriculture. Hence, these are the densely populated areas of the world.
- It supports natural vegetation, wild life, human life, economic activities, transport and communication systems. However, land is an asset of a finite magnitude, therefore, it is important to use the available land for various purposes with careful planning.
- India has land under a variety of relief features, namely; mountains which account for 30% of the total surface area of the country and ensure perennial flow of some rivers, provide facilities for tourism and ecological aspects; about 27% of the area of the country is the plateau region, possesses rich reserves of minerals, fossil fuels and forests; about 43% of the land area is plain, which provides facilities for agriculture and industry; and islands.

Land Use

- Land is used for different purposes such as agriculture, forestry, mining, building houses, roads and setting up of industries commonly termed as Land use.

Do You Know?

90% of the world population occupies only 30% of land area. The remaining 70% of the land is either sparsely populated or uninhabited.

- It can also be classified on the basis of ownership as **– private land and community land.** Private land is owned by individuals whereas, community land also called **common property resources is** owned by the community for common uses like collection of fodder, fruits, nuts or medicinal herbs.
- People and their demands are ever growing but the availability of land is limited, also the quality of land differs from place to place.
- Today the vast changes in the land use pattern also reflect the cultural changes in our society. Land degradation, landslides, soil erosion, desertification are the major threats to the environment because of the expansion of agriculture and construction activities.

Landslides

Landslides are simply defined as the mass movement of rock, debris or earth down a slope. They often take place in conjunction with earthquakes, floods and volcanoes. A prolonged spell of rainfall can cause heavy landslide that can block the flow of river for quite some time. In the hilly terrain landslides have been a major and widely spread natural disaster that often strike life and property and occupy a position of major concern.

Mitigation Mechanism

Some broad mitigation techniques of landslide are as follows:

- Hazard mapping to locate areas prone to landslides. Hence, such areas can be avoided for building settlements.
- Construction of retention wall to stop land from slipping.
- Increase in the vegetation cover to arrest landslide.
- The surface drainage control works to control the movement of landslide along with rain water and spring flows.

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Land resources are used for the following purposes:

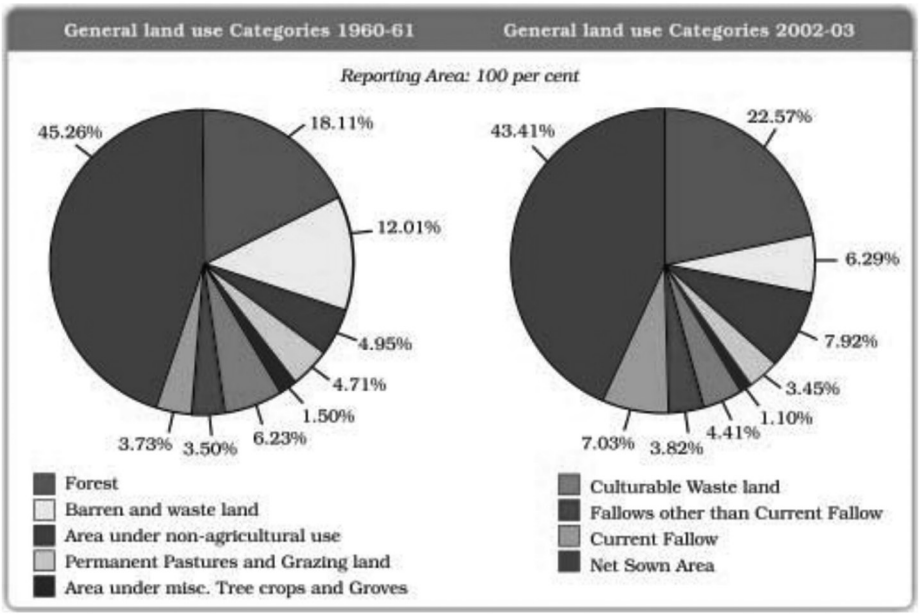

Figure 7.27: General Land Use Pattern

1. Forests
2. Land not available for cultivation
   a. Barren and waste land
   b. Land put to non-agricultural uses, e.g. buildings, roads, factories, etc.
3. Other uncultivated land (excluding fallow land)
   a. Permanent pastures and grazing land
   b. Land under miscellaneous tree crops groves (not included in net sown area),
   c. Cultruable waste land (left uncultivated for more than 5 agricultural years).
4. Fallow lands
   a. Current fallow-(left without cultivation for one or less than one agricultural year),
   b. Other than current fallow-(left uncultivated for the past 1 to 5 agricultural years).
5. Net sown area - Area sown more than once in an agricultural year plus net sown area is known as gross cropped area.

State of India's Environment

- ➢ The village of Sukhomajri and the district of Jhabua reversed land degradation. Tree density in Sukhomajri increased from 13 per hectare in 1976 to 1,272 per hectare in 1992;
- ➢ Regeneration of the environment leads to economic well-being, as a result of greater resource availability, improved agriculture and animal care, and consequently, increased incomes.
- ➢ People's management is essential for ecological restoration. With people being made the decision-makers by the Madhya Pradesh government, 2.9 million hectares or about 1% of India's land area, are being greened across the state through watershed management.

Land Use Pattern in India

- ✤ The use of land is determined both by physical factors such as topography, climate, soil types as well as human factors such as population density, technological capability and culture and traditions etc. Total geographical area of India is 3.28 million sq km. Land use data, however, is available only for 93% of the total area.

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- The land under permanent pasture has decreased (Refer Figure 7.27). Other than current fallow lands, most of the land is either of poor quality or the cost of cultivation of such land is very high. Hence, these lands are cultivated once or twice in about 2-3 years and if these are included in the net sown area then the percentage of NSA in India comes to about 54% of the total reporting area. The pattern of net sown area varies greatly from one state to another. It is over 80% of the total area in Punjab and Haryana and less than 10% in Arunachal Pradesh, Mizoram, Manipur and Andaman Nicobar Islands.
- Forest area in the country is far lower than the desired 33% of geographical area, as it was outlined in the **National Forest Policy (1952).**
- A part of the land is termed as waste land and land put to other non-agricultural uses. Waste land includes rocky, arid and desert areas and land put to other non-agricultural uses includes settlements, roads, railways, industry etc.

The land-use categories as maintained in the Land Revenue Records:

(i) **Forests:** It is important to note that the area under actual forest cover is different from the area classified as forest. The latter is the area which the Government has identified and demarcated for forest growth. The land revenue records are consistent with the latter definition. Thus, there may be an increase in this category without any increase in the actual forest cover.

(ii) **Land put to Non-agricultural Uses:** Land under settlements (rural and urban), infrastructure (roads, canals, etc.), industries, shops, etc. are included in this category. An expansion in the secondary and tertiary activities would lead to an increase in this category of land-use.

(iii) **Barren and Wastelands:** The land which may be classified as a wasteland such as barren hilly terrains, desert lands, ravines, etc. normally cannot be brought under cultivation with the available technology .

(iv) **Area under Permanent Pastures and Grazing Lands:** Most of this type land is owned by the village 'Panchayat' or the Government. Only a small proportion of this land is privately owned. The land owned by the village panchayat comes under 'Common Property Resources'.

(v) **Area under Miscellaneous Tree Crops and Groves (Not included is Net sown Area):** The land under orchards and fruit trees are included in this category. Much of this land is privately owned.

(vi) **Culturable Waste-Land:** Any land which is left fallow (uncultivated) for more than five years is included in this category. It can be brought under cultivation after improving it through reclamation practices.

(vii) **Current Fallow:** This is the land which is left without cultivation for one or less than one agricultural year. Following is a cultural practice adopted for giving the land rest. The land recoups the lost fertility through natural processes.

(viii) **Fallow other than Current Fallow:** This is also a cultivable land which is left uncultivated for more than a year but less than five years. If the land is left uncultivated for more than five years, it would be categorised as culturable wasteland.

(ix) **Net Area Sown:** The physical extent of land on which crops are sown and harvested is known as net sown area.

Land Degradation and Conservation Measures

- Continuous use of land over a long period of time without taking appropriate measures to conserve and manage it, has resulted in land degradation. This, in turn, has serious repercussions on society and the environment.
- 95% of our basic needs for food, shelter and clothing are obtained from land.
- Human activities have not only brought about degradation of land but have also aggravated the pace of natural forces to cause damage to land.

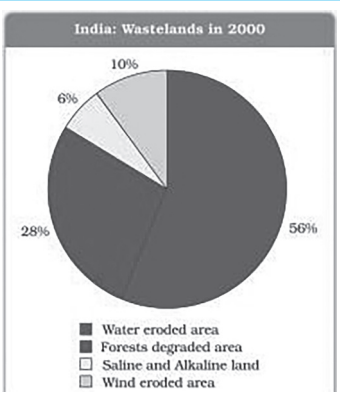

Figure 7.28: Wasteland in India

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- At present, there are about 130 million hectares of degraded land in India. Approximately, 28% of it belongs to the category of forest degraded area, 56% of it is water eroded area and the rest is affected by saline and alkaline deposits(Refer Figure 7.28).
- In states like Jharkhand, Chhattisgarh, Madhya Pradesh and Orissa deforestation due to mining have caused severe land degradation.
- In states like Gujarat, Rajasthan, Madhya Pradesh and Maharashtra overgrazing is one of the main reasons for land degradation.
- In the states of Punjab, Haryana, western Uttar Pradesh, over irrigation is responsible for land degradation due to water logging leading to increase in salinity and alkalinity in the soil.
- The mineral processing like grinding of limestone for cement industry and calcite and soapstone for ceramic industry generate huge quantities of dust in the atmosphere. It retards the process of infiltration of water into the soil after it settles down on the land.
- In recent years, industrial effluents as waste have become a major source of land and water pollution in many parts of the country.
- **Conservation:** Afforestation, land reclamation, regulated use of chemical pesticide and fertilisers, checks on overgrazing, stabilisation of sand dunes by growing thorny bushes are some of the common methods used to conserve land resources. Proper management of waste lands, control of mining activities, proper discharge and disposal of industrial effluents and wastes after treatment can reduce land and water degradation in industrial and suburban areas.

(E) Classification on the basis of Status of Development – Potential, Developed, Stock and Reserves

(i) Potential Resources

- Resources which are found in a region, but have not been utilised. For example, the western parts of India particularly Rajasthan and Gujarat have enormous potential for the development of wind and solar energy, but so far these have not been developed properly.

(ii) Developed Resources

- Resources which are surveyed and their quality and quantity have been determined for utilisation are developed resources. The development of resources depends on technology and level of their feasibility.

(iii) Stock

- Materials in the environment which have the potential to satisfy human needs but human beings do not have the appropriate technology to access these, are included among stock. For example, water is a compound of two inflammable gases; hydrogen and oxygen, which can be used as a rich source of energy. But we do not have the required technical 'know-how' to use them for this purpose.

(iv) Reserves

- These are the subset of the stock, which can be put into use with the help of existing technical 'know-how' but their use has not been started. These can be used for meeting future requirements. For example, river water can be used for generating hydroelectric power but presently, it is being utilised only to a limited extent. Thus, the water in the dams, forests etc is a reserve which can be used in the future. Development of Resources.

POINTS TO PONDER

The idea of resources is itself dependent on the domain of knowledge and development of technology. The resources that are considered non conventional were unimaginable in the past. Can you identify any such resource that presently seems impossible to extract but in the coming future can decide the destiny of humankind.

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- Resources are vital for human survival as well as for maintaining the quality of life. An equitable distribution of resources has become essential for a sustained quality of life and global peace. If the present trend of resource depletion by a few individuals and countries continues, the future of our planet is in danger. Indiscriminate use has led to the following major problems:
  - Depletion of resources for satisfying the greed of few individuals.
  - Accumulation of resources in few hands, which, in turn, divided the society into two segments i.e. haves and have nots or rich and poor.
  - Indiscriminate exploitation of resources has led to global ecological crises such as, global warming, ozone layer depletion, environmental pollution and land degradation.

Some Principles of Sustainable Development

- Respect and care for all forms of life
- Improve the quality of human life
- Conserve the earth's vitality and diversity
- Minimise the depletion of natural resources
- Change personal attitude and practices towards the environment
- Enable communities to care for their own environment.

- Balancing the need to use resources and also conserve them for the future is called sustainable development.
- The future of our planet and its people is linked with our ability to maintain and preserve the life support system that nature provides. Each person can contribute by reducing consumption, recycling and reusing things. Therefore it is our duty to ensure that :
  - All uses of renewable resources are sustainable.
  - The diversity of life on the earth is conserved.
  - The damage to the natural environmental system is minimised.

Rio de Janeiro Earth Summit, 1992

In June 1992, more than 100 heads of states met in Rio de Janeiro in Brazil, for **the first International Earth Summit**. The Summit was convened for addressing urgent problems of environmental protection and socio-economic development at the global level. The assembled leaders signed the Declaration on **Global Climatic Change and Biological Diversity.** The Convention endorsed the global Forest Principles and adopted Agenda 21 for achieving Sustainable Development in the 21st century.

Agenda 21

It is the declaration signed by world leaders in 1992 at the **United Nations Conference on Environment and Development (UNCED),** which took place at Rio de Janeiro, Brazil. It aims at achieving **global sustainable development.** It is an agenda to combat environmental damage, poverty, disease through global co-operation on common interests, mutual needs and shared responsibilities. One major objective of the Agenda 21 is that every local government should draw its own local Agenda 21.

Resource Planning

- Resource planning is essential for the sustainable existence of all forms of life. Sustainable existence is a component of sustainable development.
- Planning is the widely accepted strategy for judicious use of resources. It has importance in a country like India, which has enormous diversity in the availability of resources.
- There are regions which are rich in certain types of resources but are deficient in some other resources. There are some regions which can be considered self sufficient in terms of the availability of resources and there are some regions which have acute shortage of some vital resources.

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- For example, Arunachal Pradesh has an abundance of water resources but lacks infrastructural development. The state of Rajasthan is very well endowed with solar and wind energy but lacks in water resources. The cold desert of Ladakh is relatively isolated from the rest of the country. It has a very rich cultural heritage but it is deficient in water, infrastructure and some vital minerals. This calls for balanced resource planning at the national, state, regional and local levels.

Resource Planning in India

- Resource planning is a complex process which involves:
  - Identification and inventory of resources across the regions of the country which involves surveying, mapping and qualitative and quantitative estimation and measurement of the resources.
  - Evolving a planning structure endowed with appropriate technology, skill and institutional set up for implementing resource development plans.
  - Matching the resource development plans with overall national development plans.
- India has made concerted efforts for achieving the goals of resource planning right from the First Five Year Plan launched after Independence.
- The history of colonisation reveals that rich resources in colonies were the main attractions for the foreign invaders. It was primarily the higher level of technological development of the colonising countries that helped them to exploit resources of other regions and establish their supremacy over the colonies. Therefore, resources can contribute to development only when they are accompanied by appropriate technological development and institutional changes.
- India has experienced all this in different phases of colonisation. Therefore, in India, development, in general, and resource development in particular does not only involve the availability of resources, but also the technology, quality of human resources and the historical experiences of the people.

Conservation of Resources

- Resources are vital for any developmental activity. Using resources carefully and giving them time to get renewed is called **resource conservation.**
- But irrational consumption and over-utilisation of resources may lead to socio-economic and environmental problems. It can become very scarce and the non-renewable ones.
- To overcome these problems, resource conservation at various levels is important. This had been the main concern of the leaders and thinkers in the past. Gandhiji was very concerned about resource conservation and said: **"There is enough for everybody's need and not for anybody's greed."**

POINTS TO PONDER

The balance between resource extraction and conservation as an idea has gained prominence in contemporary times. Try to trace the evolution of the concept of "Sustainable Development" and ponder over the idea that the need for economic development can ever be balanced with the conservation of nature with emerging problems of climate change and devastating disasters.

- The alternative energy sources like solar power, wind, wave, geothermal energy are inexhaustible resources. These should be developed to replace the exhaustible resources.
- In case of metallic minerals, use of scrap metals will enable recycling of metals. Use of substitutes for scarce metals may also reduce their consumption. Export of strategic and scarce minerals must be reduced, so that the existing reserve may be used for a longer period.

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Conclusion

The planet earth contains the extent and variety of forest and wildlife resources. These diverse flora and fauna are so well integrated in our daily life that we take these for granted. Today, there are many more people in the world than there were two centuries back. To feed the growing numbers, large areas of forests have been cleared to grow crops. There is an urgent need to conserve this valuable resource. Conservation of plants and animals is an ethical duty of every citizen. There is a balance in the environment if the relative number of species is not disturbed. The clear lesson from the dynamics of both environmental destruction and reconstruction is that local communities everywhere have to be involved in some kind of natural resource management. Accept only those economic or developmental activities which are people centric, environment-friendly and economically rewarding. Otherwise, what exists today will not continue to be so, and the future would be different in some respects. The societies will witness demographic transition, geographical shift of population, technological advancement, degradation of environment and water scarcity. Thus , it is our duty to maintain and preserve the life support system that nature provides.

Glossary:

- **Patent:** It means the exclusive right over any idea or invention.
- **Stock of Resource:** It is the amount of resources available for use.
- **Sustainable Development:** Carefully utilising resources so that besides meeting the requirements of the present, also takes care of future generations.
- **Weathering:** The breaking up and decay of exposed rocks, by temperature changes, frost action, plants, animals and human activity.
- **National Park:** A natural area designated to protect the ecological integrity of one or more ecosystems for the present and the future generations.
- **Biodiversity:** Biodiversity or Biological Diversity is immensely rich in wildlife and cultivated species, diverse in form and function but closely integrated in a system through multiple networks of interdependencies.
- **Rain water harvesting:** It is the process of collecting rainwater from roof tops and directing it to an appropriate location where it is stored for future use. On an average, one spell of rain for two hours is enough to save 8,000 litres of Water
- **Biosphere Reserves:** Series of protected areas linked through a global network, intended to demonstrate the relationship between conservation and development.
- **Mineral:** A mineral is a natural substance of organic or inorganic origin with definite chemical and physical properties.

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