B.A / B.Sc. GE (N)- 222

Regional Development & Disparities Spatial Reference to Himalayan State

B.A. B. Sc. V Semester



Department of Geography and Natural Resource Management School of Earth and Environmental Science Uttarakhand Open University

(Teenpani Bypass, Behind Transport Nagar, Haldwani (Nainital), Uttarakhand, India)

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AND NATURAL RESOURCE MANAGEMENT

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BLOCK 1: THEORETICAL FRAMEWORK AND CONCEPTS

UNIT 1: REGIONAL DEVELOPMENT-CONCEPT AND DIMENSIONS

1.*1 OBJECTIVES*

1.2 INTRODUCTION

1.3 REGIONAL DEVELOPMENT-CONCEPT AND DIMENSIONS

1.4 SUMMARY

1.5 GLOSSARY

1.6 ANSWERS TO CHECK YOUR PROGRESS

1.7 REFERENCES

1.8 TERMINAL QUESTIONS

1.1 OBJECTIVES

- Identify the key dimensions-economic, social, environmental, spatial, institutional, and cultural—that shape regional development.
- Analyze regional disparities and their causes using spatial and socio-economic indicators.
- Evaluate planning strategies adopted at various levels (national, state, district) to promote balanced regional growth.
- Appreciate the role of sustainability and environmental considerations in regional development.
- Integrate interdisciplinary approaches, including geography, economics, and governance, in understanding regional planning.

1.2 INTRODUCTION

In an increasingly interconnected world, the disparities between regions—whether economic, social, or environmental—pose significant challenges to equitable growth. **Regional development** emerges as a strategic response to these imbalances, aiming to foster inclusive progress across diverse geographic areas. It is a multidisciplinary field that integrates geography, economics, sociology, and planning to understand and address the unique needs of different regions.

A region, in this context, is more than just a physical space—it is a functional unit defined by shared characteristics, interactions, and developmental potential. Regional development, therefore, is not limited to economic expansion but encompasses improvements in infrastructure, education, healthcare, governance, and environmental sustainability.

This unit introduces learners to the core concepts and dimensions of regional development. It explores how spatial planning, institutional frameworks, and cultural identity contribute to shaping regional trajectories. By examining both theoretical models and real-world applications, the unit equips learners with the tools to analyze regional disparities and design strategies for balanced and sustainable development.

1.3 REGIONAL DEVELOPMENT-CONCEPT AND DIMENSIONS

1.3.1 Definition and scope of regional development

Concept of Regional Development

Regional development refers to the strategic process of improving the economic, social, environmental, and institutional conditions of specific geographic areas—often with the goal of reducing disparities between regions and promoting balanced, inclusive growth.

It is a multidisciplinary concept, drawing from geography, economics, sociology, political science, and environmental studies. The idea is not just to boost economic output, but to ensure that development is spatially equitable, socially inclusive, and environmentally sustainable.

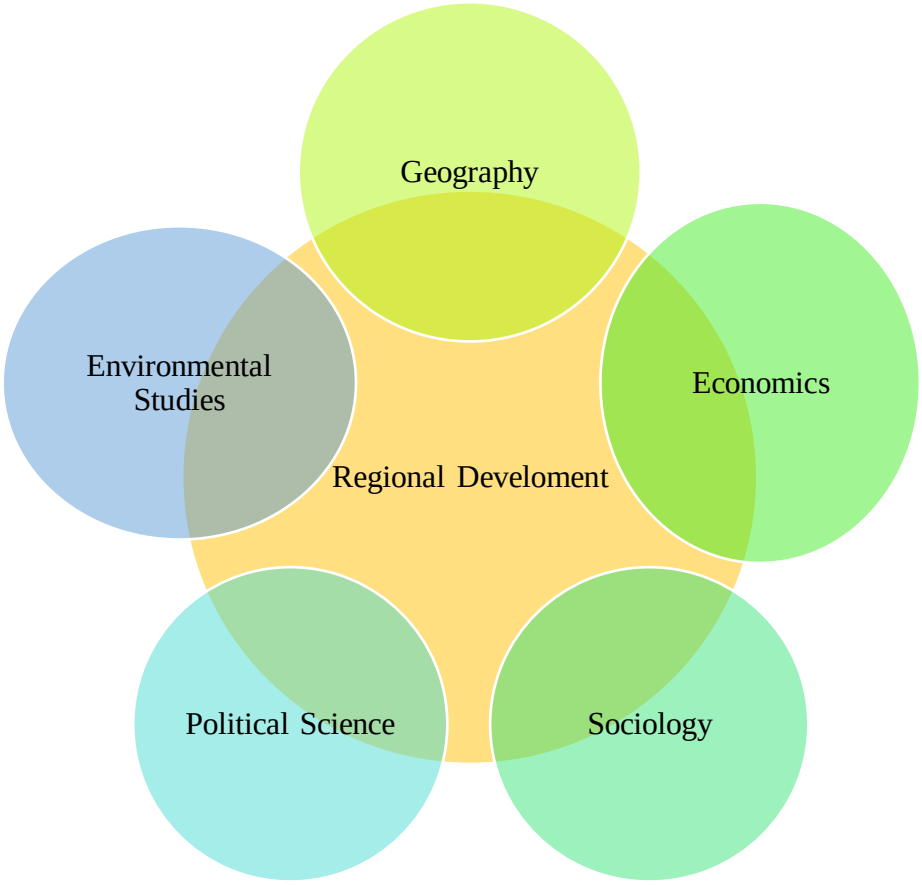


Fig1.1: Multidisciplinary concept of Regional Development

Regional development is a broad term but can be seen as a general effort to reduce regional disparities by supporting (employment and wealth-generating) economic activities in regions. In the past, regional development policy tended to try to achieve these objectives by

means of large-scale infrastructure development and by attracting inward investment (OECD, 2020). A large number of international organizations such as the OECD, UN, IMF and many more that provide assistance on economic, environmental and social issues to the less economically developed regions. Regional development can be pursued within a single nation to reduce internal disparities or involve international cooperation and support for less developed regions globally. Therefore, the implications and scope of regional development may vary according to the definition of a region and how the region and its boundaries are perceived internally and externally.

According to the Organization for Economic Co-operation and Development (OECD), regional development includes "a broad category of policies aimed at reducing regional disparities within an economy or across economies by devoting resources to underdeveloped areas".

It can be domestic (within a country) or international, depending on the scale of planning and cooperation.

Regional development includes a wide spectrum of policy instruments and actions, such as: Infrastructure development (transportation, energy, communication), promotion of innovation and entrepreneurship, human capital development through education and skill-building programs, implementing green economy practices and sustainable development initiatives, addressing social inequalities and exclusion, fostering collaborative governance and partnerships between various stakeholders.

In essence, regional development is a dynamic process aiming to foster progress and well-being in all regions, ensuring a balanced and sustainable path for the entire society.

Key aspects of regional development:

- **Focus on Underdeveloped Areas:** A primary aim is to allocate resources and support economic activities in less developed regions to bridge the gap with more developed ones.
- **Multidimensional Approach:** Regional development recognizes the interconnectedness of various factors and adopts a comprehensive approach, considering economic, social, environmental, political, and cultural aspects of a region.
- **Enhancing Living Standards:** It strives to improve the quality of life for residents through economic growth, employment generation, better access to services, infrastructure development, and environmental sustainability.

- **Sustainable and Equitable Development:** Contemporary approaches emphasize striking a balance between economic advancement, social inclusion, and environmental protection, ensuring that the benefits are shared across all sections of society and over the long term.
- **Tailoring Strategies to Local Contexts:** Effective regional development recognizes the unique characteristics, challenges, and opportunities of each region and adapts policies and interventions accordingly.
- **Stakeholder Engagement and Participation:** It emphasizes the involvement of local communities, businesses, civil society organizations, and various levels of government in the planning and implementation process to foster ownership and accountability.

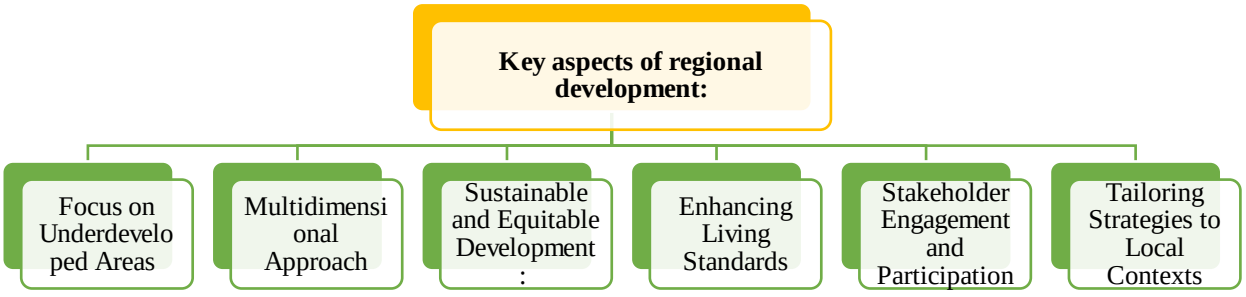


Fig1.2: Key aspects of regional development:

Why It Matters

i. Prevents overconcentration of development in a few urban centers.
ii. Enhances national cohesion by uplifting lagging regions.
iii. Supports sustainable use of local resources.
iv. Encourages decentralized governance and participatory planning.

Scope of Regional Development: The scope refers to the boundaries and extent of what will be covered. It helps define the focus, depth, and limitations of the content so learners know what to expect.

The scope of regional development is multidimensional and interdisciplinary, encompassing:

i. **Economic Growth:** Promoting industrialization, employment, and income generation in backward regions.
ii. **Social Equity:** Enhancing access to education, healthcare, housing, and social services.
iii. **Environmental Sustainability:** Managing natural resources and reducing ecological degradation.
iv. **Spatial Planning:** Improving urban-rural linkages, infrastructure, and land use.
v. **Governance and Policy:** Strengthening institutional frameworks and decentralization.
vi. **Cultural Integration:** Preserving local identity, traditions, and community participation.



Fig 1.3: Scope of regional development

1.3.2 Economic, Social and Environmental Aspects of Regional Development

Regional development is shaped by the interplay of economic, social, and environmental dimensions. Economically, it involves strengthening local industries, improving infrastructure, and creating employment opportunities to drive prosperity. Socially, it aims to promote equity, enhance access to education and healthcare, and improve overall quality of life for communities. Environmentally, it focuses on sustainable resource management, ecological conservation, and building resilience against climate change to safeguard natural assets. Together, these aspects ensure balanced and inclusive growth across regions.

The aspects of regional development refer to the key areas that must be addressed to ensure balanced, inclusive, and sustainable growth across different regions.

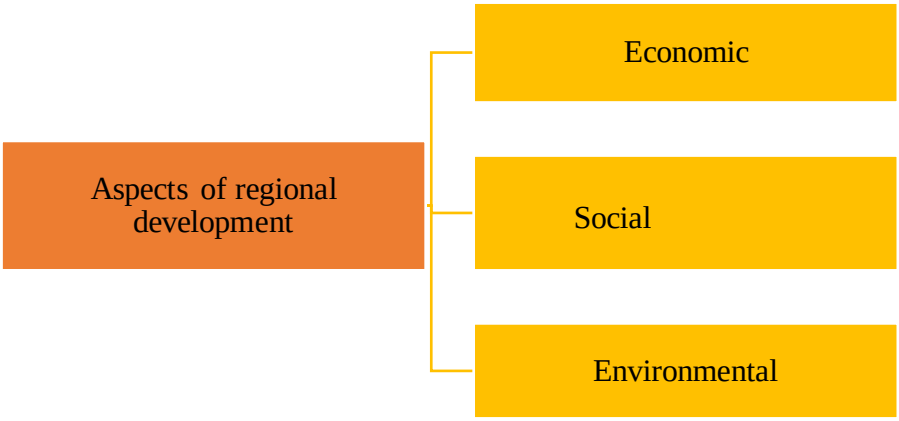


Fig1.4: Aspects of regional development

a. **Economic Aspects**

These focus on improving the material well-being of a region through:

i. Industrialization and entrepreneurship: Encouraging local industries, MSMEs, and innovation hubs.
ii. Employment generation: Creating jobs through infrastructure projects, tourism, and service sectors.
iii. Infrastructure development: Roads, power, transport, and digital connectivity to attract investment.
iv. Balanced resource allocation: Ensuring backward regions receive targeted financial support (e.g. Backward Region Grant Fund in India).
v. Reducing regional disparities: Promoting inclusive growth across urban and rural areas.

b. **Social Aspects**

These aim to enhance the quality of life and human development:

i. Education and literacy: Expanding access to schools, vocational training, and digital learning.
ii. Healthcare access: Building hospitals, mobile clinics, and health insurance schemes (e.g., Ayushman Bharat).
iii. Housing and sanitation: Affordable housing, clean drinking water, and sanitation facilities.
iv. Social equity: Addressing gender, caste, and minority-based inequalities.
v. Community participation: Empowering local governance through Panchayati Raj and self-help groups.

c. **Environmental Aspects**

These ensure that development is ecologically sustainable:

i. Natural resource management: Watershed development, afforestation, and soil conservation.

ii. Pollution control: Monitoring air, water, and land pollution through regulatory frameworks.

iii. Climate resilience: Adapting to climate change via green infrastructure and disaster preparedness.

iv. Eco-sensitive planning: Protecting biodiversity hotspots and fragile ecosystems.

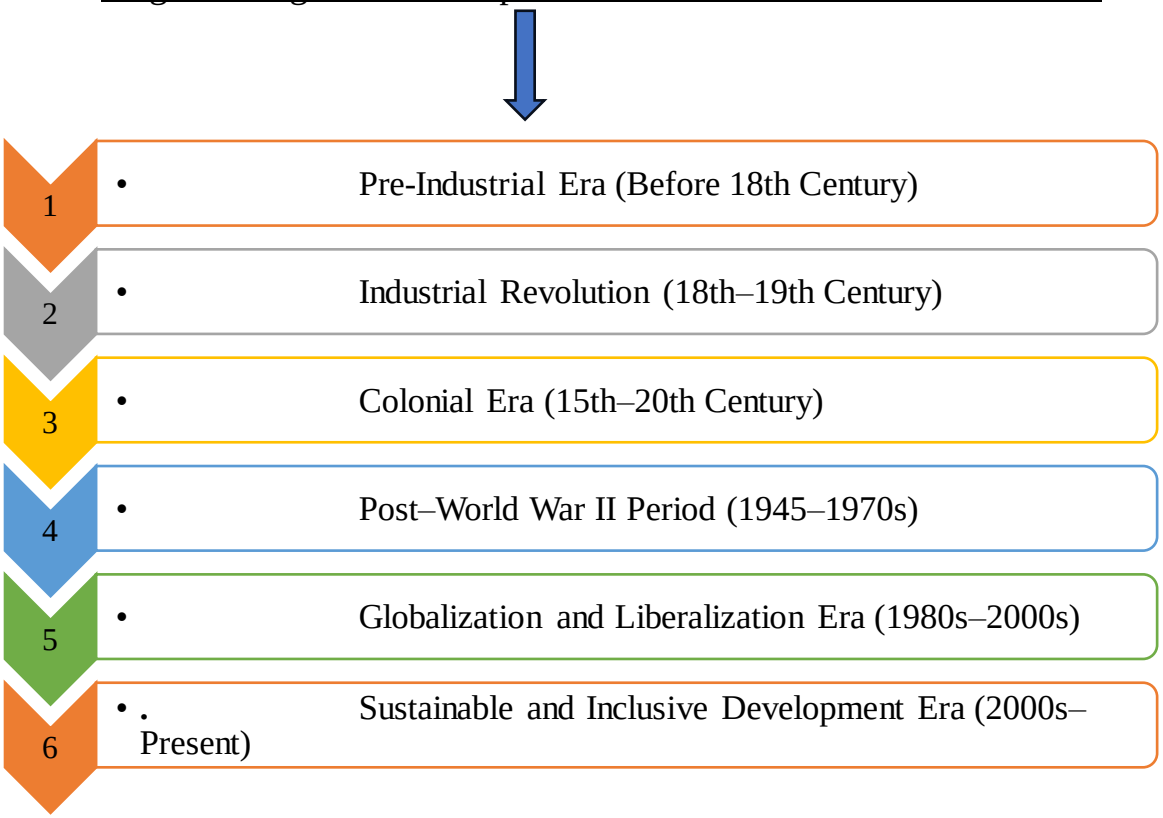
v. Sustainable urbanization: Promoting green buildings, public transport, and waste management.

These three aspects are deeply interconnected—economic growth must be inclusive (social) and sustainable (environmental) to truly qualify as regional development.

1.3.3 Historical Perspectives on Regional Development

Regional development refers to the process of improving the economic well-being, infrastructure, and quality of life in specific geographic areas, often focusing on reducing disparities between regions. Its historical perspectives have evolved in response to changing economic theories, political ideologies, and global conditions:

Stages of Regional Development from Pre-industrial era to Present



Now we discuss these stages one by one in detail:

1. Pre-Industrial Era (Before 18th Century)

- Development was largely localized and tied to agriculture and natural resources.
- Trade routes, river valleys, and fertile plains determined prosperous regions.
- Power was concentrated in feudal systems or small kingdoms, and development was uneven and dependent on political control.



Fig: 1.5:Pre-Industrial Era, Source: Google

2. Industrial Revolution (18th–19th Century)

- Rapid industrialization led to the emergence of industrial hubs and urban centers.
- Regions with access to coal, iron, and transportation networks grew faster (e.g., Britain's Midlands, Ruhr Valley in Germany).
- Rural–urban migration intensified, creating disparities between industrialized regions and lagging rural areas.



Fig: 1.6:Industrial Revolution Era, Source: Google

3. **Colonial Era (15th–20th Century)**

- Colonizing powers extracted resources from colonies, developing port cities and mining regions while neglecting hinterlands.
- Economic structures were shaped to serve colonial trade needs, leading to dual economies—modern export sectors coexisting with underdeveloped traditional sectors.



Fig: 1.7: Colonial Era, Source: Google

4. Post–World War II Period (1945–1970s)

- Regional development became a policy priority in many countries to reduce inequalities.
- Theories like Growth Pole Theory (Perroux) and Cumulative Causation (Myrdal) guided planning.
- Large infrastructure projects, industrial zones, and regional development authorities emerged.
- In developing countries, modernization theories dominated, promoting industrialization as the key to growth.

5. Globalization and Liberalization Era (1980s–2000s)

- Market-oriented reforms shifted focus from state-led planning to private sector and global integration.
- Regions connected to global trade and investment networks prospered (e.g., IT hubs, export processing zones).
- Regional disparities often widened as global capital concentrated in already competitive areas.



Fig: 1.8: Globalization and Liberalization Era, Source: Google

6. Sustainable and Inclusive Development Era (2000s–Present)

- Shift toward balanced growth, environmental sustainability, and community participation.
- Emphasis on regional innovation systems, smart cities, eco-friendly infrastructure, and rural–urban linkages.
- UN Sustainable Development Goals (SDGs) encourage equitable growth that addresses social, environmental, and economic dimensions.



Fig: 1.9: Sustainable and Inclusive Development Era, Source: Google

1.3.4 Development vs. Growth: Qualitative Indicators

Development and growth, though often used interchangeably, differ significantly in focus. Growth refers to the increase in economic output, typically measured by indicators like GDP or income levels. In contrast, development emphasizes qualitative improvements in people's lives—such as better health, education, gender equality, and environmental sustainability. While growth can be rapid and uneven, true development ensures inclusive progress that enhances overall well-being and social equity.

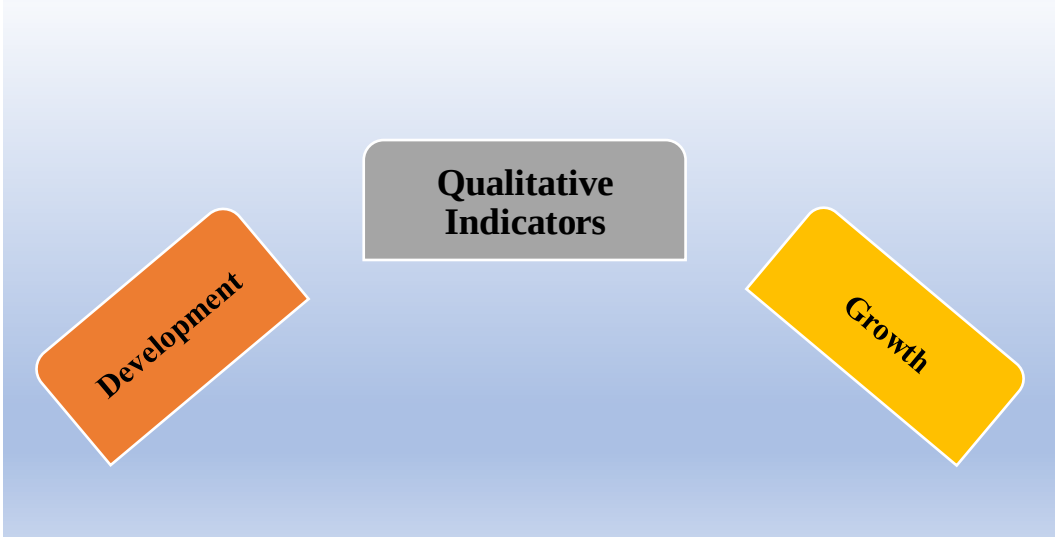


Fig: 1.10: Development vs. Growth: Qualitative Indicators

Economic Development

i. Refers to a qualitative improvement in the standard of living, economic structure, and overall well-being.

ii. Goes beyond output to consider how wealth is distributed and how lives improve.

iii. Indicators (Qualitative):

- Health: Life expectancy, infant mortality rates, access to healthcare
- Education: Literacy rate, school enrollment, quality of education
- Equity: Income distribution (Gini coefficient), poverty reduction
- Employment: Quality of jobs, working conditions, unemployment rate
- Social Inclusion: Gender equality, minority rights, political participation
- Quality of Life: Access to clean water, sanitation, housing quality, personal safety

- Environmental Sustainability: Air/water quality, renewable energy use, biodiversity protection

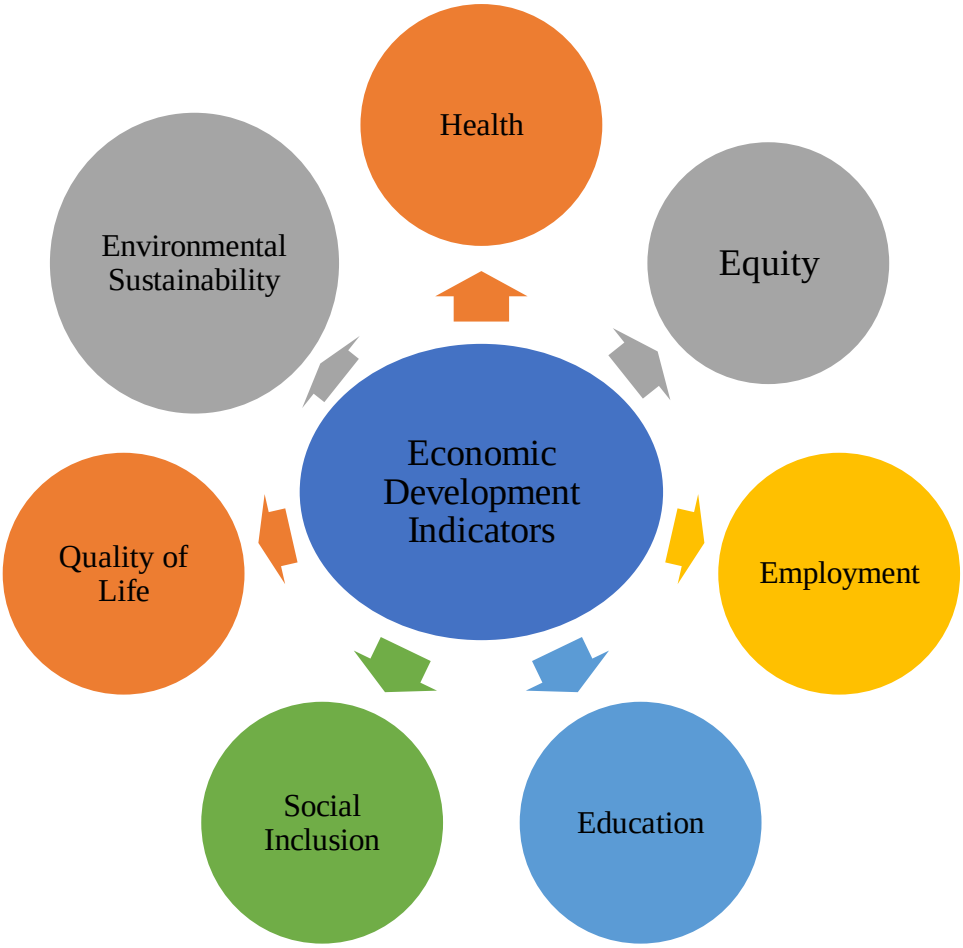


Fig1.11: Economic Indicators of Development

Economic Growth

i. Refers to the quantitative increase in a country's economic output, usually measured by GDP or GNP.

ii. Focuses on numbers—how much the economy produces.

iii. Indicators (Quantitative):

- GDP per capita
- Industrial output
- Export–import volumes
- Investment levels

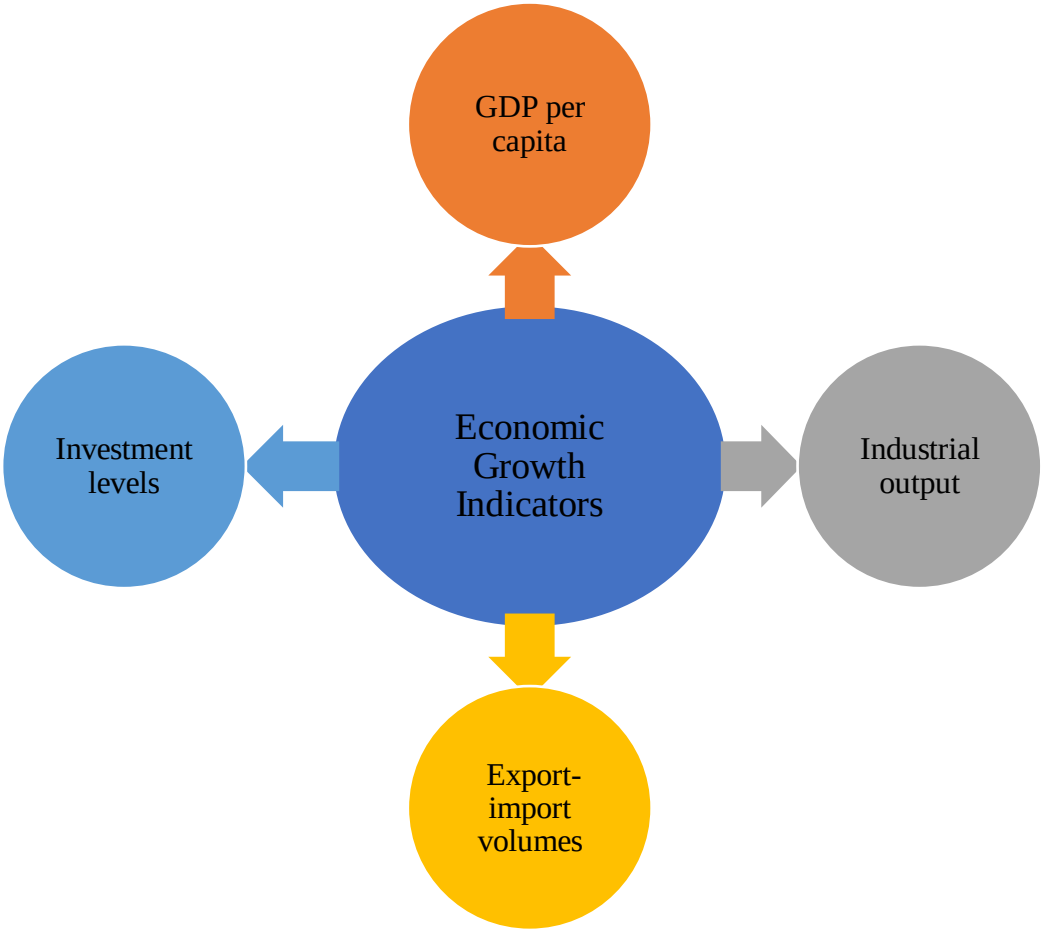


Fig1.12: Economic Indicators of Growth

Key Difference:

a. Growth tells us how big the pie is getting.
b. Development tells us how the pie is shared and how it improves people's lives.

Growth vs. Development: Core Differences

Aspect	Growth (Quantitative)	Development (Qualitative)
Definition	Increase in measurable outputs like GDP, income	Improvement in quality of life, equity, sustainability
Nature	Quantitative	Qualitative
Focus	Economic expansion	Human well-being and societal progress
Indicators	GDP, per capita income, production volume	Literacy, health, gender equity, environmental quality
Timeframe	Often short- to medium-term	Long-term and sustainable
Scope	Narrow (economic)	Broad (economic + social + environmental)

1.4 SUMMARY

The concept, the scope and dimensions, historical development of regional development is dealt with in this unit with emphasis on the role of regional development in reducing imbalances and promoting balanced growth. Regional development is defined as a multi-disciplinary strategic process who's aim is to transform the economic, social, environmental and institutional form of a region by enhancing geographical areas. It's more than just economic growth, but also social equity, environmental sustainability, cultural value, and good governance. It is ambitious in its reach, encompassing state and national planning, infrastructure investment, human capital development, innovation, and environmental management, and with an emphasis on stakeholder engagement. The main dimensions are economic dimensions indicators such as industrialisation, employment generation, inequality, and equitable resource distribution, social dimensions indicators such as education, health, housing, sanitation, gender equality; and environmental aspects indicators that focus on resource management, environment protection, prevention of pollution, climate change, and eco-friendly planning.

Historically, regional development has evolved from localized, agriculture-based economies in the pre-industrial era to the industrial revolution's urban-industrial hubs, the colonial era's resource extraction, post–World War II's state-led development strategies, globalization's market reforms, and the current sustainable development era emphasizing balanced growth under frameworks like the UN SDGs. The unit also differentiates economic growth, which is quantitative and measured by GDP or output, from economic development, which is qualitative and focused on improving quality of life, equity, and sustainability. Overall, it presents regional development as a dynamic process requiring integrated approaches tailored to the unique needs of each region for long-term inclusive progress.

1.5 GLOSSARY

Industrial Revolution: The Industrial Revolution, which began in Great Britain in the late 18th century and later extended around the world, was a time of tremendous scientific innovation and social transformation that turned rural economies into industrial ones.

Sustainable Development Goals (SDGs): The United Nations approved the Sustainable Development Goals (SDGs), sometimes referred to as the Global Goals, in 2015 as a global call to action to eradicate poverty, safeguard the environment, and guarantee that everyone lives in peace and prosperity by 2030.

Climate resilience: Climate resilience is the capacity of ecological, social, and economic systems to predict, manage, recover from, and adjust to long-term climate changes and dangerous climate events. It includes steps to retain vital services like food, energy, and water security and reduce harm from climate consequences. In essence, it's about developing the ability to endure, adjust to, and even flourish in the face of climate change.

Industrialization: The process of turning an economy that relies heavily on agriculture or natural resources into one that is centred on industry and manufacturing is known as industrialisation. Large-scale, automated production was introduced during this transition, which had a profound impact on the economy, society, and technology. Although it can sometimes bring difficulties like labour disputes and environmental problems, it frequently leads to urbanisation, higher productivity, and better living standards for individuals.

Stakeholders: Any person, group, or organisation with an interest in a project, company, or organisation that has the potential to influence or be influenced by its decisions is considered a stakeholder. Stakeholders might be external, like suppliers, consumers, and the community, or internal, such management and staff. Their assistance is frequently essential to a project's or company's success.

8.6 ANSWERS TO CHECK YOUR PROGRESS

- Did you know that the total revenue generated by all completed goods and services produced inside a country's borders over a specific period of time, typically a year or quarter, is known as the Gross Domestic Product (GDP)?
- Did you know that in 2015, the Sustainable Development Goals (SDGs), also known as the worldwide Goals, were endorsed by the UN as a worldwide call to action to end poverty, protect the environment, and ensure that everyone lives in peace and prosperity by 2030?

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1.8 TERMINAL QUESTIO*NS*

A-Long Questions

1. Explain the concept and dimensions of regional development.

2. Discuss the historical perspectives on regional development from the Pre-Industrial Era to the present.

3. Differentiate between economic growth and economic development using qualitative indicators.

3. Define the economic, social and environmental aspects of regional development with examples.

B-Short Questions

1. What do you mean by regional development?
2. Write down any two organisations that support regional development at global level?
3. What is the main aim of regional development policies?
4. List two examples of infrastructure development in regional planning.
5. What do you mean by spatial planning in regional development?
6. Mention one key feature of the Industrial Revolution's impact on regional development.
7. Give one example of an environmental sustainability measure in regional development.
8. What does "economic growth" measure?
9. What does "economic development" focus on?
10. Write down the differences between growth and development?

C-Multiple Choice Questions

1. Which of the following best describe regional development?

A) Only economic growth
B) Improving living standards in specific regions
C) Expanding trade routes
D) Increasing military power

2. Which of these is not a part of regional development?

A) Economic
B) Environmental
C) Astrological
D) Social

3. The Industrial Revolution led to:

A) Decline in urbanization
B) Emergence of industrial hubs
C) Decrease in trade
D) Elimination of rural–urban migration

4. The OECD defines regional development as policies aimed at:

A) Maximizing global exports

B) Reducing regional disparities

C) Promoting only rural areas

D) Increasing military spending

5. Which era focuses on colonial resource extraction?

A) Pre- industrial

B) Industrial Revolution

C) Colonial

D) Globalization

6. Which option is the example of a social aspect of regional development?

A) Employment generation

B) Pollution control

C) Healthcare access

D) Industrialization

7. Which option is the example of quantitative?

A) Literacy rate

B) GDP per capita

C) Gender equality

D) Quality of jobs

8. Sustainable regional development focuses on:

A) Short-term profit maximization

B) Balancing economic, social, and environmental needs

C) Eliminating all industries

D) Reducing trade

9. Which program in India aims to support backward regions?

A) BRGF

B) GST

C) MGNREGA

D) PMAY

10. Which of the following is a qualitative indicator?

A) Industrial output
B) Export–import volumes
C) Life expectancy
D) Investment levels

11. The term "dual economy" became common during which era or period?

A) Colonial
B) Industrial Revolution
C) Post–World War II
D) Globalization

12. In the globalization era, regional disparities often:

A) Disappeared
B) Widened
C) Remained unchanged
D) Were controlled completely

13. Which UN initiative promotes balanced growth and sustainability?

A) SDGs
B) IMF loans
C) WTO
D) Kyoto Protocol

14. Which aspect involves protecting biodiversity hotspots?

A) Economic
B) Social
C) Environmental
D) Political

15. "Growth means the cake is getting bigger, development means everyone gets a fair slice" refers to:

A) Difference between GDP and GNP

B) Difference between growth and development

C) Difference between income and wealth

D) Difference between trade and commerce

Answer: 1.b, 2.c, 3.b, 4.b, 5.c, 6.c, 7.b, 8.b, 9.a, 10. C, 11.a, 12.b, 13. A, 14.c, 15.b

UNIT 2: THEORIES AND MODELS OF REGIONAL DEVELOPMENT

2.1 OBJECTIVES

2.2 INTRODUCTION

2.3THEORIES AND MODELS OF REGIONAL DEVELOPMENT

2.4 SUMMARY

2.5 GLOSSARY

2.6 ANSWERS TO CHECK YOUR PROGRESS

2.7 REFERENCES

2.8 TERMINAL QUESTIONS

2.1 OBJECTIVES

- Understand key concepts of regional development like growth poles, core-periphery, and spatial interaction.
- Differentiate between various development theories including Friedmann, Perroux, Myrdal, and Hirschman.
- Analyze location theories proposed by Weber and Lösch in the context of spatial economics.
- Evaluate the applicability of these models to the unique socio-economic landscape of the Himalayas.
- Apply spatial interaction models to real-world regional planning scenarios.
- Explore how cumulative causation influences economic disparities in mountain regions.
- Critically assess strengths and limitations of each theory in guiding Himalayan development strategies.

2.2 INTRODUCTION

Regional development is a multidimensional process that seeks to balance economic growth, social equity, and environmental sustainability across diverse geographical areas. Over time, various theories and models—ranging from classical growth pole theory to contemporary sustainable development frameworks—have emerged to explain the spatial dynamics of development and disparities among regions. These conceptual tools help planners and policymakers understand how resources, infrastructure, and human capital interact to shape regional progress.

In the Himalayan context, the relevance of these theories becomes particularly significant due to the region's unique topography, ecological sensitivity, and socio-economic challenges. The Himalayas face issues such as limited connectivity, fragile ecosystems, and uneven development, which demand tailored approaches grounded in both theoretical insight and practical adaptability. By examining these models through the lens of Himalayan realities, this unit aims to foster a deeper understanding of spatial planning, sustainable development, and inclusive growth strategies suited to mountainous regions.

2.3 CORE-PERIPHERY MODEL (FRIEDMANN), GROWTH POLE THEORY (PERROUX), MYRDAL'S CUMULATIVE CAUSATION, HIRSCHMAN'S THEORY

2.3.1 Core-Periphery Model (Friedmann), Growth Pole Theory (Perroux)

i. Core-Periphery Model by John Friedmann (1966)

John Friedmann, an urban theorist and a founding member of the Department of Urban Planning at the UCLA Luskin School of Public Affairs, introduced the Core-Periphery Model of regional development in 1966. This model illustrates how economic growth and urban development unfold across time and space. As one of the key frameworks in regional development theory, Friedmann's Core-Periphery Model explains that economic activities often concentrate in specific areas known as the "core," while surrounding regions—the "periphery"—remain less developed. Over time, this dynamic leads to spatial inequalities and uneven patterns of growth.

Key Concepts:

i. **Core:** Urban, industrialized, economically dominant regions with high levels of infrastructure, innovation, and investment.
ii. **Periphery:** Rural, underdeveloped, or resource-dependent areas with limited access to capital, services, and opportunities.
iii. **Spatial Inequality:** The uneven distribution of development across regions due to the concentration of resources in the core.
iv. **Upward-Transition Regions:** Areas near the core with potential for growth.
v. **Downward-Transition Regions:** Stagnant or declining areas losing population and investment.
vi. **Resource Frontier Regions:** Newly exploited areas with untapped natural resources.

Friedmann outlined a dynamic process through four stages of development:

i. **Pre-industrial Stage:** Scattered settlements with minimal economic differentiation.
ii. **Transitional Stage:** Emergence of a dominant core due to industrialization and capital accumulation.
iii. **Industrial Stage:** Growth spreads to secondary centers; transport and infrastructure improve.

iv. **Post-industrial Stage:** A fully integrated urban system with reduced spatial disparities and functional interdependence.



Fig:2.1: Four Stages of Development by John Friedmann

Now we will discuss these 4 stages in detail:

a. **Stage 1 (Pre-industrial)**:In the pre-industrial (agricultural) stage, societies were characterized by localized economies and small, scattered settlements. Each community functioned in relative isolation, with limited interaction and low mobility. Economic activities were spread out, and there were only minor differences in the level of development between different regions or settlements.

b. **Stage 2 (Transitional)**: Economic concentration in the core city begins with innovation, capital accumulation, and industrial growth. While the exact reasons for this concentration are not always clear, location advantages—such as better accessibility—often play an important role. What is evident, however, is that a dominant center eventually emerges within the urban system, acting as a growth pole. Trade and mobility expand, though still largely shaped by the influence of the core, even if overall movement remains limited. Examples of this phase include the early industrialization of Great Britain in the late 18th century, as well as the initial stages of colonial integration in Latin America, Africa, and Asia.

c. **Stage 3 (Industrial)**: As economic growth spreads, new growth centers begin to emerge beyond the core. This process of de-concentration is largely driven by rising input costs in the core, particularly labour and land. The spread of development is also supported by stronger interactions within the urban system and the expansion of transportation infrastructure, which makes it easier for activities and opportunities to diffuse into surrounding areas.

d. **Stage 4 (Post-industrial)**: The urban system becomes fully integrated, and spatial inequalities are reduced significantly. The distribution of economic activities creates a specialization and a division of labour linked with intense flows along high-capacity transport corridors. The factors that have favoured spatial inequalities in the previous

phases of development have structured dominant poles of the urban system and favoured the setting of a large commercial gateway, usually a world city.

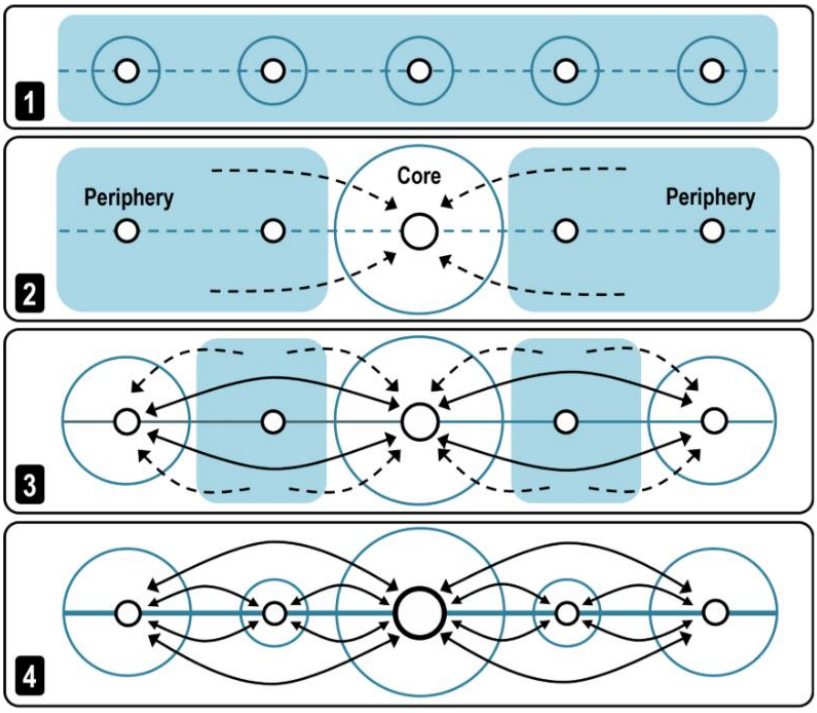


Fig:2.2: Core Periphery Stages of Development in an Urban System by Friedmann, Source: Google

Applications

a. Useful for analyzing regional planning, urbanization, and global development disparities.
b. Applied at local, national, and international scales, including case studies like Brazil's "golden triangle" vs. the Amazon region.

Criticisms

a. Oversimplifies complex regional dynamics.
b. Doesn't fully account for cultural, historical, or global influences.
c. May underestimate the agency of peripheral regions to drive their own development.

Relevance: John Friedmann's Core-Periphery Model in the Himalayan context: The Core-Periphery Model, proposed by John Friedmann, explains how economic development tends to be spatially concentrated in a core region, leaving outlying peripheral areas relatively underdeveloped. This model is highly relevant in the Himalayan context, where a clear divide exists between well-connected urban centers (such as Dehradun, Haldwani, Shimla or other Himalayan region) and the remote mountain villages and rural hill districts. The core areas typically have better infrastructure, administrative importance, access to markets, educational

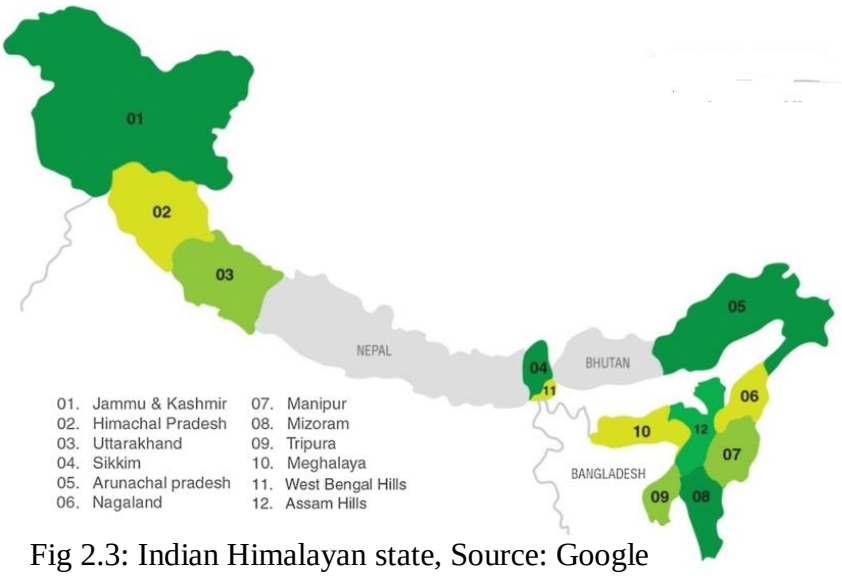


Fig 2.3: Indian Himalayan state, Source: Google

institutions, and healthcare facilities, attracting investment, jobs, and migration. In contrast, peripheral regions in the higher Himalayas often face inadequate connectivity, limited economic opportunities, harsh climatic conditions, and outmigration, especially of the youth, in search of better livelihoods. The model effectively highlights how such uneven development leads to dependency of the periphery on the core, often resulting in resource extraction from peripheral areas without equivalent benefits flowing back. In the Himalayas, this can be seen in the exploitation of natural resources like forests, water, and tourism potential, which are managed or profited from mainly by core areas.

Recognizing this core-periphery dynamic is crucial for promoting balanced regional development policies, such as developing small urban hubs in peripheral areas, investing in rural infrastructure, encouraging local entrepreneurship, and ensuring sustainable use of natural resources. By applying Friedmann's model, planners and policymakers can better understand the structural causes of regional inequality and work toward more inclusive and resilient development strategies in the Himalayan region.

ii. François Perroux's Growth Pole Theory

François Perroux, a French economist, developed the concept of Growth Poles in 1949 (later elaborated on in 1955). The theory suggests that economic development does not happen uniformly across a region but tends to concentrate in specific areas or focal points, known as "**growth poles**" or "**growth centers**" and then spreads outward to other regions. He said A growth pole is a central location (like a city, industry, or firm) around which economic growth takes place and it has dynamic industries (**called propulsive industries**) that stimulate growth in surrounding areas. Propulsive Industries are large, innovative and fast-growing industries with strong forward and backward linkages and their growth pulls other sectors along and drives the regional economy.



Example:Bangalore, India – Acts as a growth pole for IT and software development, influencing nearby districts through job creation, real estate development, and service sector growth.Perroux's Growth Pole Theory remains influential in regional planning and development policy, emphasizing that strategic investment in key sectors or areas can stimulate broader economic growth.

Fig2. 4: Bangalore, India IT hub of India, Source: Google

How It Works:

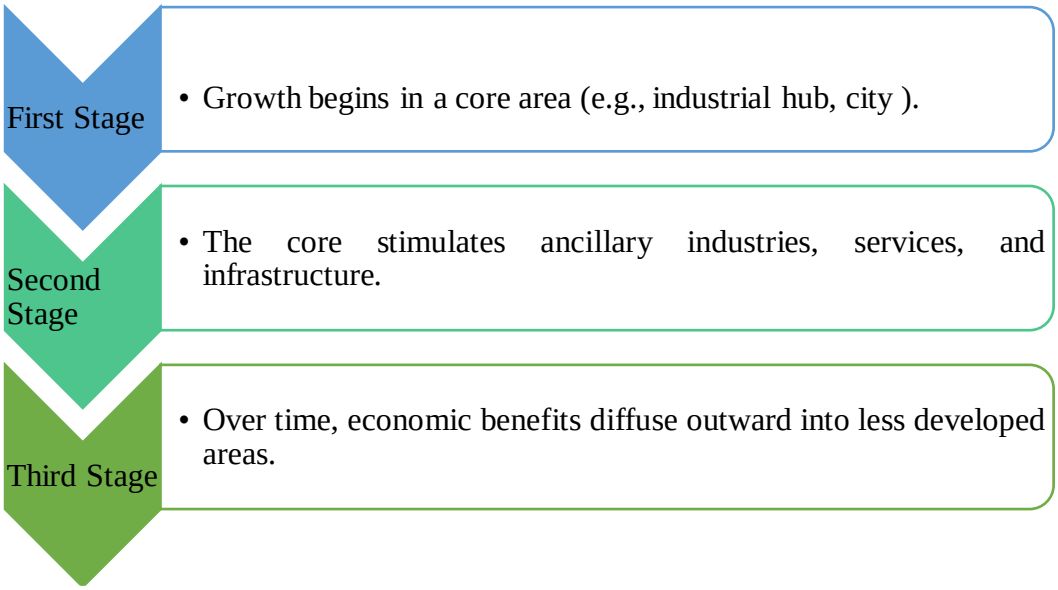


Fig 2.5: Growth pole theory stages by François Perroux's

Key aspects of Perroux's Growth Pole Theory:

- **Uneven Development:** Growth is seen as a discontinuous process, not spread evenly across a region, but occurring at specific points of development with varying intensities.
- **Core Industries and Linkages:** A growth pole typically centres around a "propulsive" or "core" industry that drives economic growth. This core industry stimulates the development of other linked industries through input-output relationships (e.g., buying from suppliers and selling to customers).
- **Concentration and Agglomeration:** Growth poles attract and concentrate economic activities, leading to agglomeration economies and the formation of industrial

clusters. This concentration can lead to the dominance of the growth pole over surrounding areas due to its scale and operations.

- **Spread and Backwash Effects:** Growth poles generate "spread effects," a positive impactwhere the economic benefits and innovations diffuse outwards to surrounding areas (hinterland/periphery). However, there is also the risk of "backwash" or "polarization" effects, where the growth pole might attract resources (labour, capital) from the surrounding regions, hindering their development or creating imbalance.

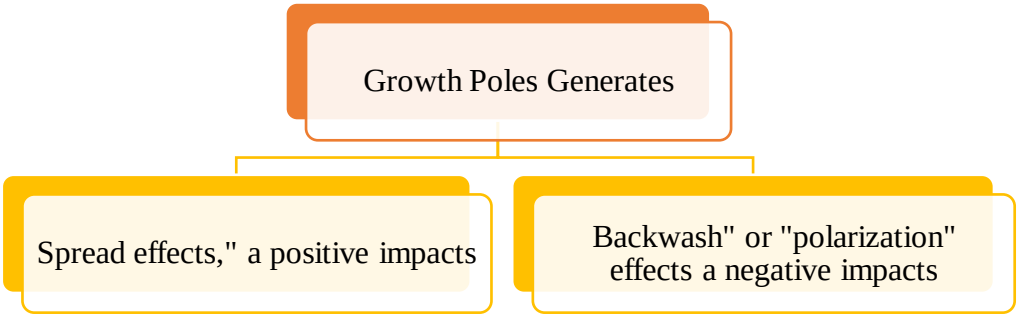


Fig 2.6: Spread and Backwash Effects by François Perroux's

- **Innovation and Development:** Perroux emphasized the role of innovation as a driver of development within growth poles. New ideas, processes, and technologies are often adopted first within these key nodes, contributing to their growth and then spreading outwards.

- **Economic Space vs. Geographic Space:** Perroux initially conceived of growth poles in an abstract "economic space" rather than a purely geographic one. This "economic space" is seen as a field of forces with centres attracting and radiating economic activity. However, later interpretations and applications of the theory often consider growth poles in a geographic context.

- **Policy Implications:** The Growth Pole Theory provides a framework for policymakers and planners to identify key sectors and locations for investment to stimulate regional development. It can be used to promote balanced regional development by concentrating resources in areas with high growth potential.

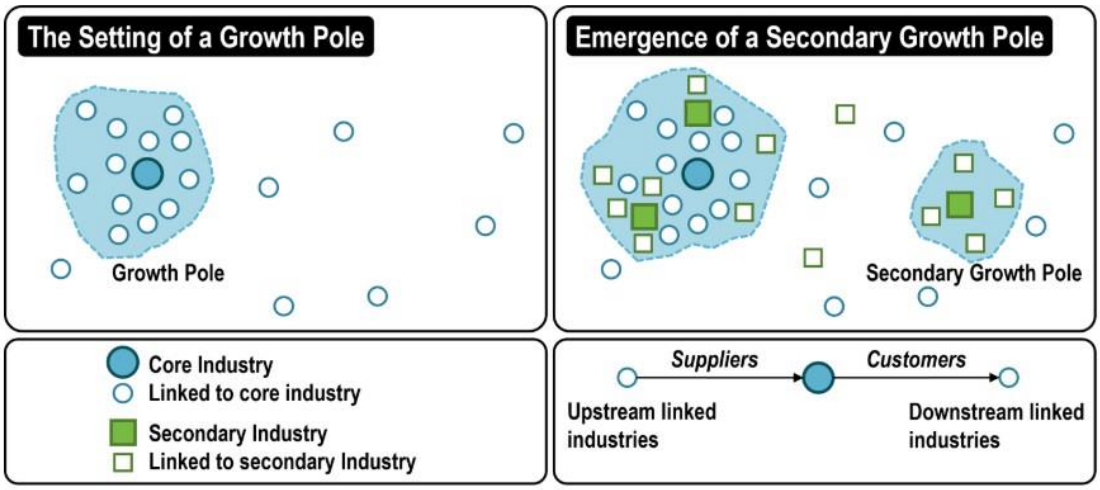


Fig 2.7: Growth Pole Theory by François Perroux, Source: Google

Criticism:

i. May widen regional disparities if benefits do not spread equally.

ii. Focus on a few regions may lead to neglect of rural or peripheral areas.

Relevance of François Perroux's Growth Pole Theory in the Himalayan Context

In the Himalayan region, where mountainous terrain, scattered populations, and infrastructural constraints make uniform development difficult, François Perroux's Growth Pole Theory provides a realistic and strategic framework for regional planning.

Several towns and cities—such as Dehradun, Shimla, Gangtok, Darjeeling, and Leh—already function as natural growth poles due to their administrative importance, educational institutions, connectivity, and economic potential. These centers can stimulate development in surrounding rural and peripheral areas by creating jobs, expanding markets, improving transport links, and attracting investment.

Alongside urban hubs, certain sectors can also act as sectoral growth poles. Industries such as eco-tourism, herbal medicine, horticulture, hydropower, and handicrafts are well-suited to the Himalayan context, encouraging decentralized but focused growth that respects the region's ecological and cultural diversity.

However, the application of the growth pole model in the Himalayas requires careful adaptation to local realities. Given the region's environmental fragility and social diversity, growth poles must be promoted in ways that are inclusive, balanced, and ecologically

sustainable. Development efforts should ensure broad sharing of benefits and active participation of local communities to prevent marginalization.

In this way, Perroux's theory holds strong relevance for the Himalayas, offering a targeted and effective strategy to foster regional integration, reduce disparities, and achieve sustainable development in a challenging yet opportunity-rich landscape.

2.3.2 Myrdal's Cumulative Causation Theory and Hirschman's Theory

i. Gunnar Myrdal's Cumulative Causation Theory (1957)

Gunnar Myrdal, a Swedish economist, introduced the Cumulative Causation Theory in 1957. The theory explains how even small initial advantages or disadvantages in a region or group can become self-reinforcing over time, ultimately leading to widening disparities. By challenging traditional equilibrium-based economic models, Myrdal highlighted the importance of historical context and institutional factors in shaping patterns of economic development and inequality.

Core Idea

Economic growth and development are neither automatic nor evenly distributed. Instead, they are shaped by two types of forces:

Spread Effects (Positive): Growth in one region or sector stimulates development in surrounding areas.

Backwash Effects (Negative): Growth in one region draws away resources, capital, and talent from others, reinforcing underdevelopment elsewhere.

The essence of cumulative causation is that a change in one factor triggers a chain of reinforcing changes, leading to either:

- Virtuous Cycles of growth, where spread effects dominate.
- Vicious Cycles of decline, where backwash effects prevail.

Key Insight

Myrdal stressed that inequality tends to deepen unless actively addressed. Without government intervention, richer regions continue to accumulate wealth and opportunities, while poorer regions are left behind. This perspective makes his theory particularly significant for balanced regional development policies.

Example (India): In India, metropolitan cities such as Delhi and Mumbai have grown rapidly due to early advantages in infrastructure, capital, and talent. In contrast, many rural or remote regions, lacking these initial advantages, continue to struggle with underdevelopment, reflecting the dynamics of cumulative causation.

Key Concepts:

Spread Effects: Spread effects refer to the positive impacts that growth in one region or sector can generate for others. For instance, a rapidly developing city may increase demand for agricultural goods, handicrafts, or raw materials from nearby rural areas. This rising demand can stimulate higher incomes, job opportunities, and further development in those surrounding regions. In this way, the growth of one hub can act as a driver of wider regional progress.

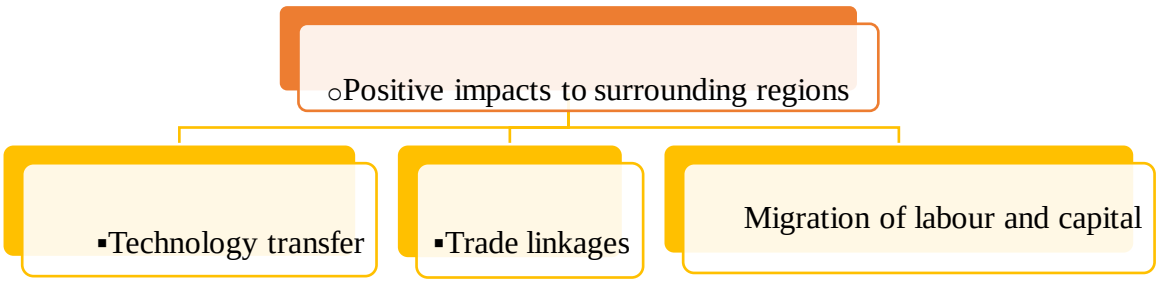


Fig 2.8: Spread Effects by Myrdal's

Myrdal argues these effects are often not strong enough to reverse regional decline.

Backwash Effects: Backwash effects refer to the negative impacts that growth in one region or sector can have on others. For example, when a city or industrial hub experiences rapid growth, it often attracts skilled labour, capital, and resources from nearby rural or less developed areas. While the booming region benefits, the surrounding areas may suffer from declining investment, talent drain, and reduced opportunities, which can further widen regional disparities.

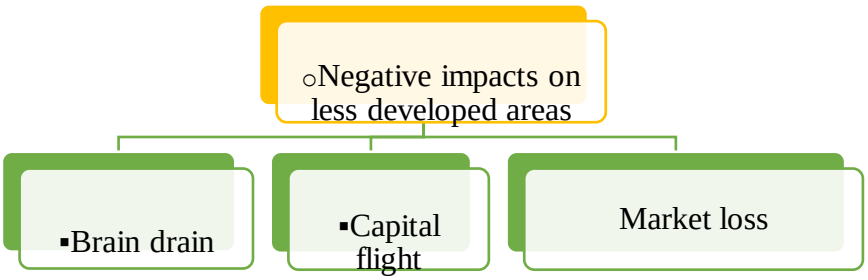


Fig 2.9: Spread Effects by Myrdal's

These regions get trapped in underdevelopment.

Initial Advantage/Disadvantage: Myrdal emphasized that even small starting differences between regions or groups can become magnified over time. For instance, a region with slightly better infrastructure or a more skilled workforce may attract greater investment, which further strengthens its infrastructure and human capital. Conversely, a region with weaker infrastructure or limited skills may find it difficult to draw investment, leading to a cycle of continued stagnation or decline.

Interdependence: The theory highlights the strong interconnectedness of economic and social factors. A change in one area—such as investment, education, or infrastructure—can set off ripple effects across the entire system. These interactions often lead to outcomes that are unexpected and sometimes unintended, showing how development processes are complex and dynamic.

Non-Equilibrium: Myrdal directly challenged the neoclassical belief in a natural tendency toward equilibrium. Instead, he argued that economies are often marked by disequilibrium and instability. Through cumulative causation, advantages and disadvantages tend to reinforce themselves, causing regions to diverge rather than converge in terms of development.

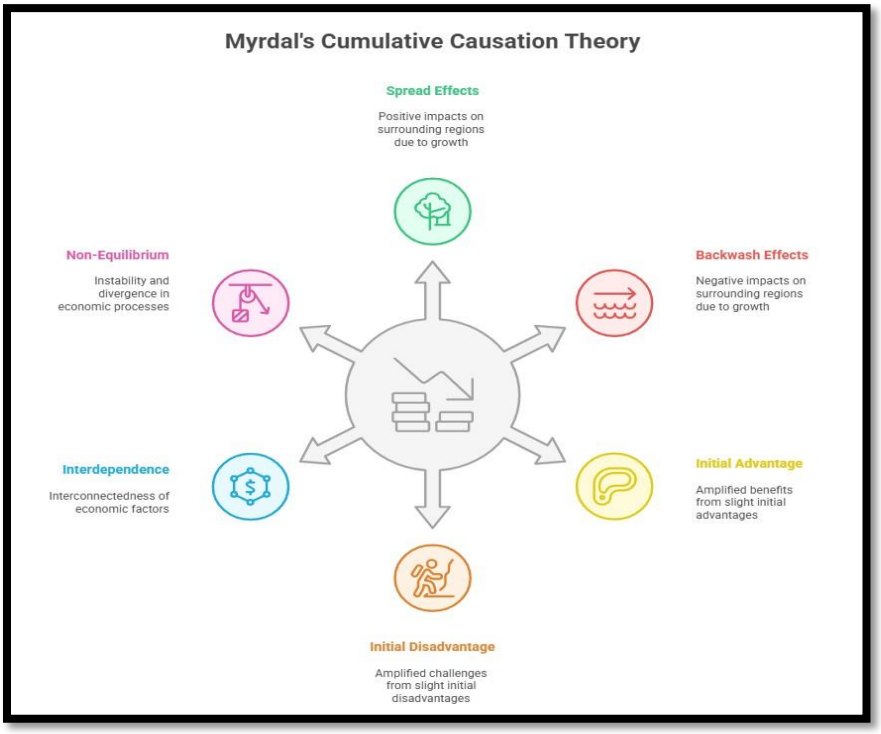


Fig 2.10: Myrdal's Cumulative Causation Theory, Source: Napkin AI

How Cumulative Causation Works:

Imagine two regions, A and B,that are initially similar in terms of economic development. However, region A has a slightly better infrastructure than region B. This small initial advantage can trigger a series of cumulative changes:

1. **Increased Investment**	• The better infrastructure in region A attracts more investment from businesses.
2. **Job Creation**	• The increased investment leads to the creation of more jobs in region A.
3. **Migration**	• People from region B migrate to region A in search of better job opportunities.
4. **Increased Demand** B	• The increased population in region A leads to increased demand for goods and services.
5. **Further Investment**	• The increased demand attracts even more investment to region A.
6. **Decline in Region B**	• As people and capital leave region B, its economy declines, leading to further out-migration and decline.

This process continues, with region A becoming increasingly prosperous and region B becoming increasingly impoverished. The initial small advantage in infrastructure has been amplified over time through cumulative causation, leading to a significant disparity between the two regions.

Policy Implications of Myrdal's Cumulative Causation Theory

Myrdal's theory carries significant implications for policymakers aiming to reduce regional and social inequalities. It argues that relying solely on market forces to bring about convergence is unrealistic, as markets often reinforce existing disparities. Instead, active state intervention is necessary to counter the self-reinforcing dynamics of cumulative causation.

Some key policy measures include:

1. **Infrastructure Development in Lagging Regions:** Building transport, communication, and energy infrastructure to attract investment and generate employment opportunities.
2. **Education and Skill Training:** Enhancing the human capital of workers in underdeveloped areas to improve employability and productivity.

3. **Financial Support for Local Businesses:** Offering subsidies, credit, or incentives to help enterprises in less developed regions expand and create jobs.
4. **Redistributive Policies:** Implementing income and resource transfers from wealthier to poorer regions to narrow inequalities and improve living standards.
5. **Institutional Reforms:** Tackling systemic barriers such as discrimination, corruption, and weak governance, which limit participation of disadvantaged regions and groups in the development process.

Overall, Myrdal's framework underscores that sustained and equitable development requires proactive policies to break cycles of decline and to create conditions for inclusive growth.

Criticisms of Myrdal's Cumulative Causation Theory

While Myrdal's Cumulative Causation Theory has been highly influential in understanding regional development and inequalities, it has also faced several criticisms:

Overly Deterministic: Critics argue that the theory portrays development as a self-reinforcing cycle of either growth or decline, leaving little room for the role of individual agency, innovation, or policy interventions in altering outcomes.

Narrow Focus on Regional Inequality: The theory places heavy emphasis on spatial and regional disparities, but does not sufficiently account for other critical dimensions of inequality, such as gender, caste, or racial disparities.

Empirical Challenges: Testing the theory in practice is difficult, as the concepts of cumulative processes and circular causation are complex and often lack precise measurable indicators.

Relevance of Myrdal's Cumulative Causation Theory in the Himalayan context: Gunnar The Cumulative Causation Model of Myrdal reflects the idea of advantage begetting advantage, as the benefits of development enriched by favourable initial circumstances in some regions tends to increase due to the positive feedback, and regional disparities intensify. If economic growth is not self-levelling, it is in fact self-reinforcing - growth creates growth - and the places that are growing will attract more of the resources, investments, educated labour and infrastructure, while underdeveloped areas will be held back further. This is readily relevant for the Himalaya, where most development has occurred in easy to reach urban centres and foothill towns like Dehradun, Shimla or Gangtok, but where the more distant hill villages have often suffered from neglect, under-investment and outmigration.

The concept of "backwash effects" is clearly evident in the Himalayas. Many rural and high-altitude communities see their young people and skilled workers leaving for better opportunities in towns and cities. This outmigration reduces the local workforce, weakens

village economies, and leads to the decline of traditional livelihoods. On the other hand, the "spread effects"—which suggest that growth in developed areas will eventually benefit nearby regions—are minimal here, largely due to poor transport links, difficult terrain, and a lack of strong policy support.

Myrdal's theory points to the widening gap between urban centers and rural peripheral areas in the Himalayas. To address this challenge, policymakers need to prioritize inclusive regional development by strengthening rural infrastructure, improving access to education and healthcare, and supporting small-scale enterprises. Ensuring that the benefits of development extend to even the most remote communities is essential. In this sense, Myrdal's framework offers a valuable perspective for understanding and tackling the structural roots of uneven development in the fragile Himalayan region.

ii.Hirschman's Theory of Regional Development

Albert O. Hirschman, a German-American economist, introduced the Unbalanced Growth Theory in the 1950s, making a major contribution to regional development and economic planning, particularly in the context of developing nations. This theory suggests that creating deliberate imbalances in an economy can serve as a strategic tool to stimulate growth, especially in underdeveloped countries.

Unlike the Balanced Growth Theory, which emphasizes simultaneous investments across all sectors, Hirschman argued that such an approach is often impractical for resource-constrained economies. Instead, by focusing investment in select sectors or regions, development can be triggered through backward and forward linkages, spreading benefits to other parts of the economy.

Hirschman elaborated on this idea in his landmark book The Strategy of Economic Development (1958). In it, he challenged the classical belief that balanced growth was the most desirable path, proposing instead that strategically targeted imbalances could act as catalysts for broader economic transformation. His theory remains highly influential in development studies and continues to guide policies in regions facing structural and resource challenges.

Core Idea of Hirschman's Theory: Hirschman challenged the traditional notion of balanced growth, which promotes uniform development across all sectors and regions. Instead, he argued that growth should be concentrated in select key sectors or regions that have the

potential to generate wider economic progress through backward and forward linkages. According to him, these purposeful imbalances or disparities are not obstacles but rather drivers of further development, as they create pressures and incentives that stimulate investment and expansion in other areas of the economy.

Key Concepts of Hirschman's Theory

a. **Imbalance as a Strategy**

i. Development should be deliberately concentrated in selected regions or industries rather than spread evenly.

ii. These initial imbalances create pressure and new demands in other sectors, which in turn encourage further investment and expansion.

b. **Linkage Effects**

Hirschman highlighted the role of linkages as critical mechanisms for spreading development from one sector to another. He emphasized two major types of linkages that stimulate economic growth:

b. Linkage Effects: Hirschman emphasized two types of linkages that drive development.

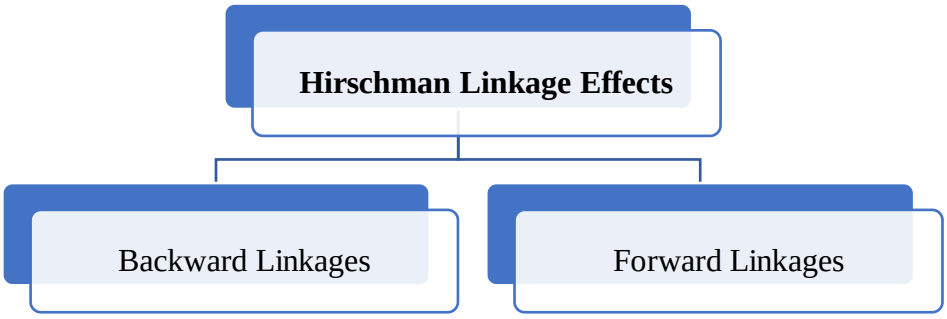


Fig 2.11 Hirshman Linkages Effects

i. **Backward Linkages:** Growth in one sector leads to demand for inputs from upstream industries. Example: A steel plant boosts demand for iron ore and machinery

ii. **Forward Linkages:** Growth leads to increased supply of goods/services to downstream industries. Example: A cement factory supports construction and infrastructure

These linkages create multiplier effects, spreading development beyond the initial investment zone.

c. Growth Poles and Regional Spread

i. Development begins in growth poles—regions with high economic potential.

ii. Over time, benefits diffuse to peripheral areas through infrastructure, migration, and market expansion**.**

- Certain "growth poles" or leading industries are targeted for investment.
- These poles will grow rapidly and create "spread effects" to surrounding areas (e.g., infrastructure, employment, markets).
- Eventually, these poles reduce regional disparities by uplifting neighbouring regions.

Some areas (e.g., urban-industrial centers) act as growth poles, triggering development in surrounding areas via economic spillover effects.

d. Trickle-Down Mechanism: Initial investment in core sectors/regions causes secondary effects that eventually benefit other regions.

Relevance of Hirschman's Theory in the Himalayan Context: Hirschman's Theory of Regional Development, also known as the Unbalanced Growth Theory, holds strong relevance for the Himalayan region due to its distinct geographical and socio-economic challenges. The theory emphasizes targeted investments in selected sectors or areas, referred to as growth poles, which can stimulate development in surrounding regions through backward and forward linkages.

In the Himalayan context, where natural resources are limited and the terrain is difficult, focusing on high-potential sectors such as eco-tourism, organic farming, hydropower, and handicrafts can create multiplier effects across the economy. Urban centers like Dehradun and Nainital may serve as hubs for infrastructure and services, helping to gradually integrate remote mountain communities into the broader development process.

However, the approach must be ecologically sensitive and disaster-resilient, ensuring that growth does not undermine the fragile mountain environment or threaten local livelihoods. When applied with care and sustainability, Hirschman's model provides a practical and strategic framework for fostering inclusive development in the Himalayas.

Key Aspects of Relevance in the Himalayas

- Growth Pole Strategy: Invest in urban hubs such as Dehradun or Nainital to drive regional development.
- Sectoral Focus: Prioritize tourism, hydropower, organic farming, and handicrafts for their strong linkages and potential.

- Infrastructure Development: Enhance road networks and digital connectivity to reduce isolation and attract further investment.
- Sustainability Considerations: Ensure development is environmentally sensitive and disaster-resilient to protect the fragile ecosystem.

2.3.3 Location Theory (Weber, Losch) and Spatial Interaction Models

Location theory examines the spatial distribution of economic activities, particularly industrial and service locations. Two prominent figures, Alfred Weber and August Losch, offered distinct perspectives on this phenomenon:

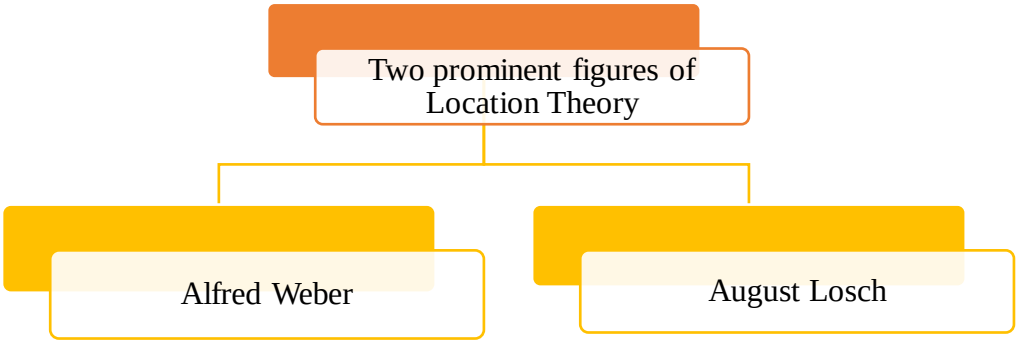


Fig 2.12: Two prominent figures of location theory

i. Location theory by Alfred Weber

Alfred Weber, a German economist, was the first to present a scientific explanation of the theory of location, filling the theoretical gap left by classical economists. In 1909, he introduced his well-known industrial location theory in his German-language book Über den Standort der Industrien. The work was later translated into English and published in 1929 as The Theory of the Location of Industries. Since its publication, Weber's work on industrial location has been widely reviewed and praised.

Weber developed this theory to determine the most efficient location for industries, focusing on minimizing production costs. His model was built on the Least Cost Principle, which sought to identify the optimal location where the combined costs of transportation, labor, and agglomeration could be minimized.

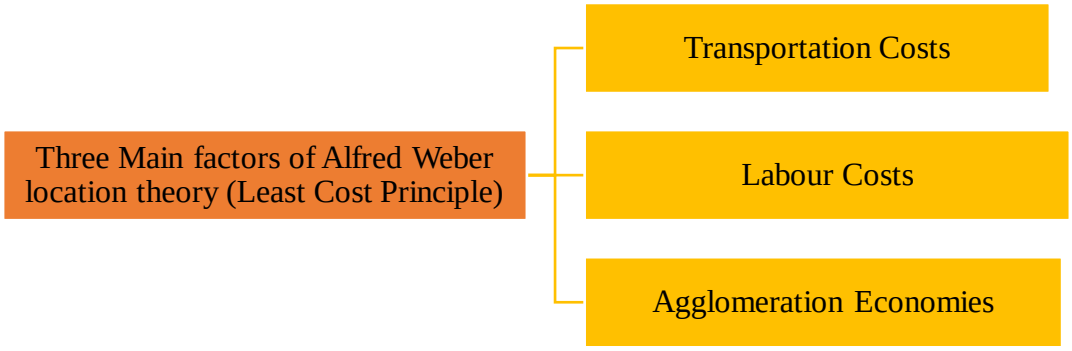


Fig 2.13 Three main factors of location theory by Alfred Weber

WeberClassifiedthefactorsaffecting location ofindustriesintotwobroadgroups:

a) Regional factors or primary causes of regional distribution of industries.

b) Agglomerative and deglomerative factors or secondary causes responsible for redistribution of industry.

Now we will discuss these factors in detail:

a) Regional factors: According to Weber, there are two general regional factors which affect the cost of production-

i. Transportation costs

ii. Labour costs

b) Agglomerative and deglomerative

Factors: Agglomerative factors make industries centralize at a particular place. Such factors may include banking and insurance facilities, external economies and the like.

Deglomerative factors are those which decentralize the location of industries. Examples of such factors are local taxes, cost of land, residence, labour costs and transportation costs.

i.Role of transportation costs

1.One market (M) and one raw material (R1) lead to three possible situations:

a) Raw material available everywhere: In this case, the ideal location is at the market itself, since this completely removes transportation costs for the manufacturing unit.

b) Raw material fixed and pure: Here, the manufacturing unit can be placed either at the market or at the raw material source, since transportation costs would be the same in both cases.

c) Raw material fixed and gross (loses weight during processing): In this situation, the most efficient location is at the source, because it avoids transporting bulky raw materials and reduces costs.

2.One market (M) and two raw materials (R1, R2) create four possible situations:

a) **Both R1 and R2 are ubiquitous:** If both raw materials are available everywhere, the most efficient location is at the market itself, since this minimizes transportation costs.

b) **R1 is fixed, R2 is ubiquitous, both are pure:** In this case, the industry should locate near the market, because transportation costs would only apply to R1.

c) **Both R1 and R2 are fixed and gross**: This creates a more complex scenario, which Weber explained using the Locational Triangle. Here, the two raw materials (R1 and R2) and the market (M) form the three corners of the triangle. The industrial location is influenced by the "pull" from each of these points, with transportation charges determined by both the weight of the material and the distance it must travel.

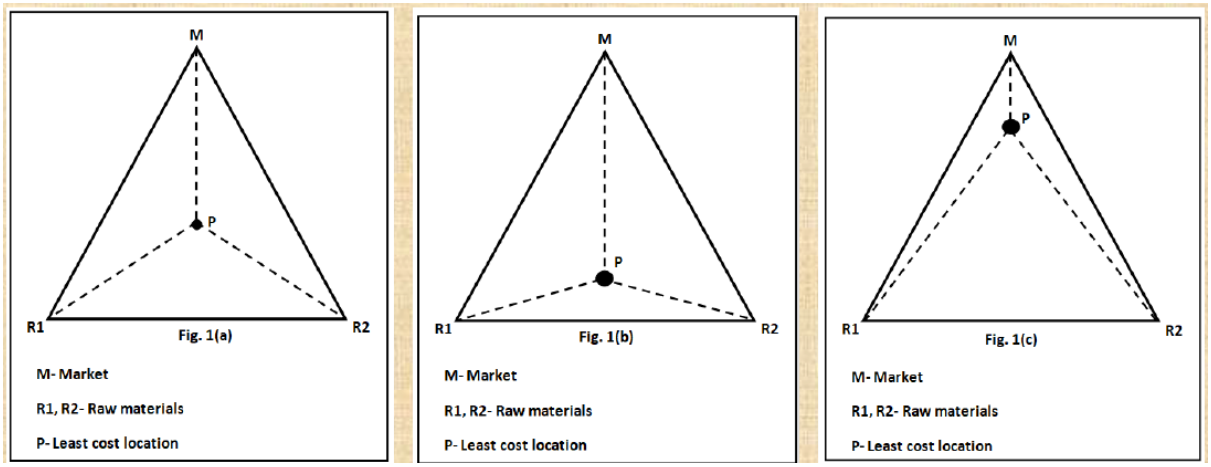


Fig: 2.14: Locational Triangle, Source: Google

Transportation Costs: Weber placed strong emphasis on transport costs, arguing that the location of industries depends on whether raw materials lose or gain weight during production. To explain this, he introduced the Locational Triangle, which helps determine the most cost-efficient position between raw material sources and the market.

i. **Weight-losing materials:** For industries using raw materials that become lighter during processing (such as steel or sugar), it is cheaper to locate near the raw material source to avoid transporting bulky inputs.

ii. **Weight-gaining materials:** For industries where the final product is heavier than the raw material (such as beverages or certain machinery), locating closer to the market reduces the cost of moving finished goods.

iii. **Ubiquitous raw materials:** For industries that rely on resources available everywhere (like water), it is more efficient to be near the market, since minimizing the transport of finished goods becomes the main priority.

Role of labour costs: When cheaper labour is available at a certain location, it can make up for the burden of higher transportation costs. To study how the distribution of labour affects industrial location, Weber placed the locational triangle within concentric zones, where transport costs rise as you move outward from the centre. The assumption is that the labour force is spread outward, and greater distance from the centre reflects greater potential savings in labour costs. At a certain point (L), these labour savings outweigh the added transport costs, making it a more profitable site than point (P), which otherwise represents the lowest transport cost location. To explain this, Weber applied the isodapane method.

In short, Weber explained industrial location using a geometric model called the Locational Triangle. In this model:

i. Two points represent the sources of raw materials.

ii. One point represents the market.

iii. The ideal location for an industry lies somewhere within this triangle, where total transport costs are minimized.

Isodapane: An isodapane is a contour line that connects all points with the same total transport costs, taking into account both the supply of inputs at the industrial site and the distribution of finished products. In simple terms, it represents locations where the extra cost of transportation is offset by the savings gained from labour movement.

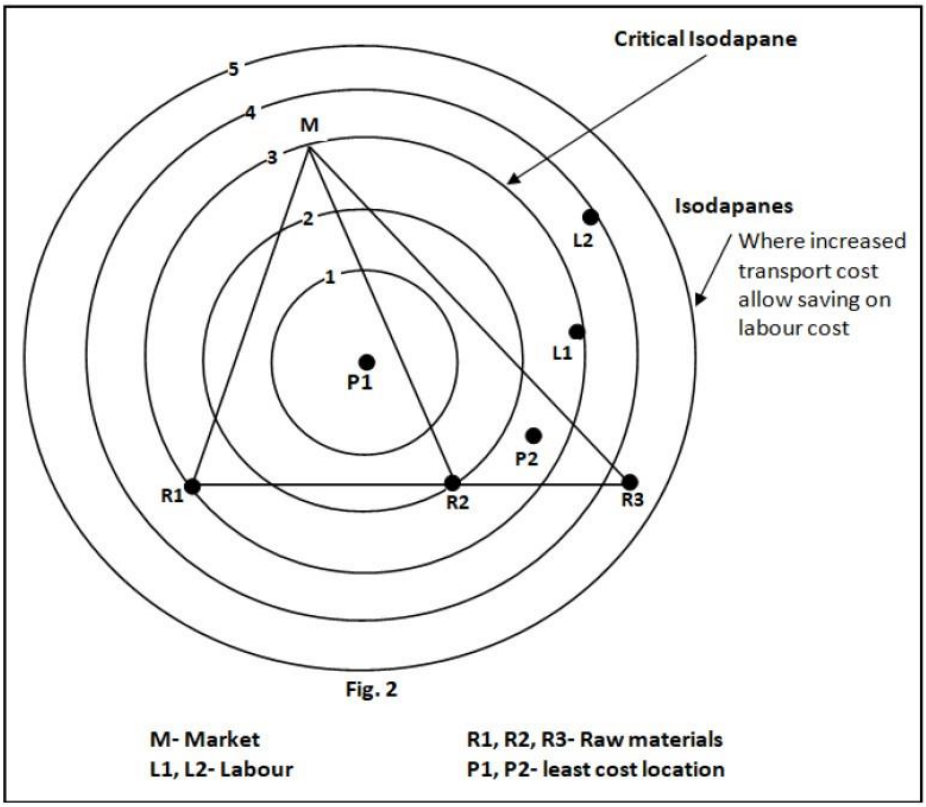


Fig: 2.15: Locational Triangle, Source: Google

Role of agglomeration: The role of agglomeration lies in reducing production costs when multiple industries operate within the same location. Industrial agglomeration happens when different enterprises choose to cluster their plants in close proximity. By doing so, they benefit from shared resources and services, leading to cost savings. These agglomeration economies arise because companies can make collective use of financial services, public utilities, supporting industries, and other common facilities.**OR**

Agglomeration Economies: Agglomeration economies describe the advantages that come from clustering industries within a specific location. This concentration allows businesses to share infrastructure, access a pool of specialized workers, and reduce costs in various ways. According to Weber, these benefits can be strong enough to draw industries to certain regions, even when transportation or labour expenses are somewhat higher.

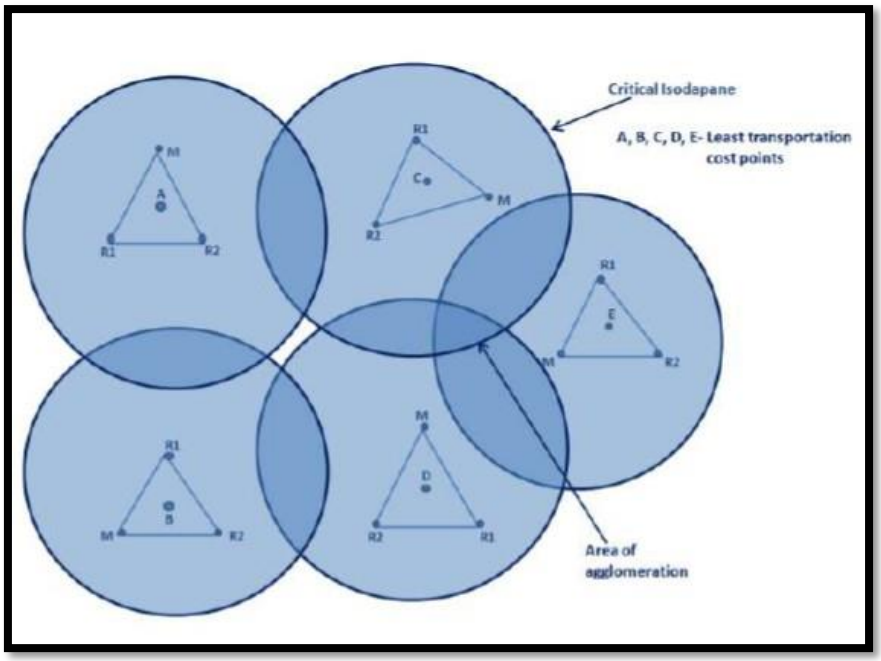


Fig 2.16: Role of agglomeration

Relevance: Weber's theory is foundational in economic geography and regional planning, helping explain why industries cluster in certain areas and how cost factors influence spatial decisions.

Weber Location theory: Relevance of theory in Himalayan context: Weber's Location Theory, formulated by Alfred Weber, focuses on finding the most cost-effective location for industries by minimizing three key factors: transportation costs, labour costs, and agglomeration economies. While this model was developed in the context of flat and accessible terrains, its core principles can still be partially applied to the Himalayan region with certain modifications. In the Himalayan context, the high transportation costs due to steep slopes, narrow roads, and limited connectivity make location planning a complex task. Industries here must often locate near either raw materials (like forest produce or minerals) or local markets to reduce logistical challenges. Additionally, labour availability is often scattered and seasonal, and agglomeration (clustering of industries) is rare due to geographical constraints and fragile ecosystems. Moreover, the Himalayas are ecologically sensitive, prone to landslides, earthquakes, and other natural disasters—factors not addressed in Weber's original model. Therefore, while the theory offers a useful economic framework, its relevance in the Himalayas depends on incorporating local environmental, social, and infrastructural conditions into the analysis.

ii. August Losch's Location Theory

August Lösch (1906-1945) was a German economist who made substantial contributions to regional science and location theory. His most influential work, The Economics of Location (1940), presented a comprehensive theory of how firms choose their locations and how these choices shape the spatial structure of the economy. Lösch sought to develop a general equilibrium model that explained the location of industries based on both supply and demand factors, moving beyond the cost-oriented approach of Weber.

August Lösch's Profit Maximization Theory is a spatial economic theory that explains how businesses choose optimal locations to maximize profits rather than just minimize costs (as in Weber's theory). Lösch emphasized that market demand, consumer accessibility, and revenue potential play crucial roles in determining industrial or service location.

He proposed that a firm should be located where it can capture the largest possible market area, balancing production costs with the ability to sell goods or services at profitable prices. He introduced the concept of "**economic landscape**" using **hexagonal market** areas (instead of circles, as in Christaller's theory), suggesting that this shape provides the most efficient coverage without overlapping or leaving gaps.

Key features of the theory:

- Focuses on profit maximization through a balance of costs and revenues.
- Recognizes variation in demand across space.
- Suggests that firms will seek locations with high consumer accessibility and lower competition.
- Uses hexagonal spatial patterns for ideal market coverage. Lösch proposed that, under certain conditions, the optimal spatial arrangement of firms would result in a hexagonal lattice. This pattern arises because the hexagon is the most efficient shape for covering a plane without gaps or overlaps. In a hexagonal lattice, each firm is located at the center of a hexagon, and its market area extends to the boundaries of the hexagon.

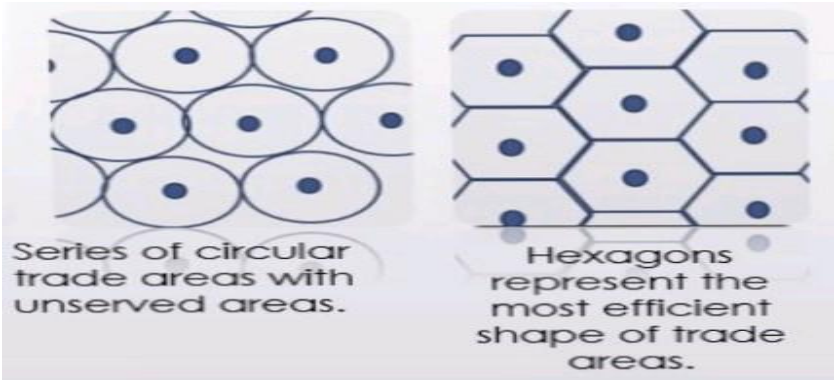


Fig 2.17: Hexagon Shape, Source:Google (Unacademy)

In simple terms, Lösch's theory is demand-driven, emphasizing location choice as a way for firms to reach the largest number of consumers while keeping costs under control to maximize profits. Unlike purely cost-based models, it broadens location theory by incorporating market dynamics and consumer behaviour.

Assumptions: Like Weber's model, Lösch's theory is built on a few idealized assumptions:

- **Uniform distribution of population and resources:** The model assumes an isotropic plain, where economic potential is evenly spread in all directions.
- **Rational behaviour of entrepreneurs:** Firms are considered "economic men," acting logically to maximize profits.

Applications: Lösch's framework is applied in regional planning, urban development, and retail location studies, especially for analyzing market area dynamics and understanding how demand shapes location decisions.

Relevance of August Losch's location theory in the Himalayan context: August Lösch's location theory, centered on profit maximization through optimal market access and spatial consumer reach, has partial relevance in the Himalayan context when adjusted for regional challenges. In theory, businesses should locate where they can maximize their customer base while managing production and distribution costs. However, the Himalayan terrain is highly rugged, with dispersed settlements, poor transportation infrastructure, and ecological constraints, making uniform market areas and hexagonal patterns (as Lösch proposed) impractical.

Despite these limitations, the theory's core idea remains valuable. In the Himalayas, industries such as eco-tourism, traditional handicrafts, agro-based enterprises, and local service centers can benefit from strategic location choices—particularly in transportation

hubs, market towns, or pilgrimage centres, where population density and tourist inflow are higher. These locations offer better access to consumers, allowing businesses to increase profits even in a geographically constrained environment.

Thus, while Lösch's geometric and spatial assumptions may not directly apply, his emphasis on demand-driven location planning and profit optimization provides a useful conceptual approach for promoting sustainable and regionally suitable economic activities in the Himalayas.

Comparison: Weber and Losch

Feature	**Weber (Least Cost)**	**Losch (Profit Maximization)**
Primary Goal	Minimize production costs (especially transportation)	Maximize profit (revenue minus cost)
Focus	Supply-side factors (raw materials, labour, transportation)	Demand-side factors (market area, sales volume)
Market Area	Assumed uniform demand/price; market areas not central	Market areas are crucial, influencing revenue and profit
Competition	Assumed perfect competition	Recognizes monopolistic competition

Both Weber's and Losch's theories have played an important role in shaping our understanding of how industries and services choose their locations. While their models rely on simplified assumptions that make them less directly applicable to today's complex real-world conditions, they still serve as useful starting points for analyzing location decisions. These frameworks continue to influence regional planning, economic geography, and business strategy by offering foundational insights into spatial organization and economic behaviour.

iii. Spatial Interaction Model.

The Spatial Interaction Model is a key geographical theory that explains and predicts the movement of people, goods, services, and information between places. It operates on the principle that interaction between two locations increases with their size—such as population

or economic activity—and decreases with greater distance, a concept often compared to Newton's law of gravity.

This model provides valuable insights into why movement occurs between places and how much interaction takes place. It is widely applied in human geography, regional planning, and urban studies to analyze and guide patterns of connectivity and development.

Key Components:

a. **Mass (or size of locations):** Larger cities or regions tend to generate and attract higher levels of interaction, such as migration, trade, and communication.
b. **Distance (or friction of distance):** The greater the distance between places, the lower the level of interaction, since longer distances involve higher costs, more time, and greater effort.
c. **Accessibility & Connectivity:** Places with stronger transport and communication networks experience more frequent and efficient interactions.Formula (basic gravity model form):

$$\text{Interaction}_{ij} = \frac{P_i \times P_j}{D_{ij}^2}$$

Where:

P_i and P_j = populations (or economic activity levels) of places i and j

D_{ij}= distance between the two places

The denominator may vary (e.g., exponent 1 or other values), depending on how strongly distance is believed to affect interaction.

Applications of the Spatial Interaction Model

- Predicting patterns of migration between regions
- Designing and optimizing transportation networks
- Examining trade flows and economic linkages
- Understanding connections between urban and rural areas
- Estimating commuting trends and travel behaviour

2.4 SUMMARY

This unit examines major theories and models that explain why regional development unfolds unevenly across space. It reviews key contributions from economists and planners, such as

Friedmann's Core-Periphery Model, Perroux's Growth Pole Theory, Myrdal's Cumulative Causation Theory, and Hirschman's Unbalanced Growth Theory. Each of these highlights how development often concentrates in certain areas—whether cores or growth poles—while leaving peripheral or rural regions behind.

It also considers Location Theories, with Weber emphasizing cost minimization and Losch focusing on profit maximization, as well as the Spatial Interaction Model, which shows how movement between places is influenced by their size and distance.

The theories are then evaluated in relation to the Himalayas, where rugged landscapes, dispersed settlements, and fragile ecosystems create distinctive development challenges. The unit underscores the need to adapt these frameworks to promote balanced, inclusive, and sustainable growth in mountainous regions, supported by strategic planning and geospatial tools.

2.5 GLOSSARY

Spatial Inequality: When various places or regions have unequal access to resources, opportunities, and services, this is referred to as spatial inequality.

Core Regions: Core regions, in the context of the core-periphery model, are areas characterized by high levels of economic activity, technological advancement, and cultural influence. They are typically characterized by high population densities, urbanization, and a diverse range of economic activities, often dominating global trade and finance.

Eco-tourism: Ecotourism is a type of travel that emphasises ethically visiting natural regions with the goal of protecting the environment and helping the local population. It places a strong emphasis on reducing adverse effects, raising environmental consciousness, and bolstering regional economies via sustainable practices.

Infrastructure: The fundamental physical systems of a company, area, or country are referred to as infrastructure, and they frequently involve the manufacturing of public goods or production procedures. Water, sewage, educational systems, communication networks, and transportation systems are a few examples of infrastructure.

2.6 ANSWERS TO CHECK YOUR PROGRESS

Do you know that August Lösch (1906-1945) was a German economist who made substantial contributions to regional science and location theory?

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2.8 TERMINAL QUESTIO*NS*

(A) Long Questions

1. Describe the Core -periphery model by John Friedmann and its relevance in the context of Himalayan region?
2. Discuss the Growth Pole Theory by François Perroux. How can it be applied for strategic regional development in the Himalayan region?

(B) Short Questions

1. What is the core-periphery model in development?
2. Which factors support to the creation of a core region?
3. How does the core-periphery model explain regional inequalities?
4. Can periphery regions transition to become core regions?
5. What are some criticisms of the core-periphery model in development?
6. What is the central idea of Myrdal's Cumulative Causation Theory?
7. Define "growth pole" as per François Perroux's theory.
8. What is meant by "backwash effects" in regional development theories?
9. How does Weber's Location Theory define optimal industrial location?
10. What are agglomeration economies in the context of location theory?
11. Briefly explain the concept of "forward and backward linkages" in Hirschman's theory.

12. What is the relevance of August Lösch's theory in market area analysis?
13. Why are spatial interaction models compared to Newton's law of gravity?
14. What challenges does the Himalayan region pose to uniform regional development?
15. How can geospatial tools assist in applying development theories to real-world planning?

(C) Multiple Choice Questions

1. Who proposed the Core-Periphery Model?

A. Weber

B. Myrdal

C. Friedmann

D. Hirschman

2. Growth Pole Theory emphasizes development from:

A. Uniform investment

B. Balanced sectors

C. Specific focal points

D. Random regions

3. What is a key feature of Weber's Location Theory?

A. Profit maximization

B. Least cost principle

C. Uniform demand

D. High consumer density

4. What does the term "agglomeration" refer to in Weber's theory?

A. Scattered industries

B. Concentration of industries for mutual benefits

C. Isolated development

D. Migration of labour

5. August Lösch focused primarily on:

A. Cost minimization

B. Agricultural regions

C. Profit maximization

D. Equal development

6. According to Myrdal, spread effects are:

A. Negative effects on peripheries

B. Positive impacts from core regions

C. Migration from cities

D. Resource depletion

Answer: B

7. Which model uses the concept of "mass and distance" similar to gravity?

A. Growth Pole Theory

B. Core-Periphery Model

C. Spatial Interaction Model

D. Cumulative Causation Theory

8. Hirschman's theory supports:

A. Equal investment across sectors

B. Unplanned industrial growth

C. Strategic imbalance in development

D. Immediate urbanization

9. In Weber’s model, "labour costs" influence location choice when:

A. Labor is seasonal

B. Labor cost is high

C. Cheap labour can offset transport cost

D. Labor is unavailable

10. Which of the following is a propulsive industry example in the Growth Pole Theory?

A. Cottage industries

B. Steel and automotive industries

C. Farming sector

D. Tourism in villages

11. A region losing talent and capital is experiencing which effect?

A. Spread effect

B. Linkage effect

C. Backwash effect

D. Core effect

12. Which of the following best defines a "resource frontier region"?

A. Urbanized zone

B. Developed core

C. Area with untapped resources

D. Agricultural center

13. Losch's hexagonal market concept is meant to:

A. Minimize cost

B. Maximize coverage without overlap

C. Centralize industries

D. Reduce competition

14. In Hirschman's theory, backward linkages refer to:

A. Connecting to distant markets

B. Selling finished goods

C. Demand for inputs from other sectors

D. Migration of workers

Answer: C

15. Which theory highlights self-reinforcing growth and deepening inequality?

A. Losch's theory

B. Growth Pole Theory

C. Myrdal's Cumulative Causation Theory

D. Weber's Theory

Answers: 1.c, 2.c, 3.b, 4.b, 5.c,6.b, 7.c, 8.c, 9.c, 10.b, 11.c,12.c, 13.b,14.c, 15.c

UNIT-3 REGIONAL DISPARITIES-IDENTIFICATION AND MEASUREMENT

3.1 OBJECTIVES

3.2. INTRODUCTION TO REGIONAL DISPARITIES

3.3. DEFINITION AND MEANING OF REGIONAL DISPARITIES REGIONAL DISPARITIES

3.4 TYPES OF REGIONAL DISPARITIES

3.5. DEVELOPMENT INDICES USED TO MEASURE DISPARITIES

3.6 TECHNIQUES FOR MEASURING REGIONAL DISPARITIES

3.7. SPATIAL TECHNIQUES AND GIS

3.8. LIMITATIONS IN MEASURING DISPARITIES IN HILLY REGIONS

3.9. CASE STUDY: REGIONAL DISPARITIES IN INDIA

3.10. GOVERNMENT INITIATIVES TO REDUCE DISPARITIES

3.11. RECOMMENDATIONS FOR BALANCED REGIONAL DEVELOPMENT

3.12. SUMMARY

3.13. GLOSSARY

3.14. ANSWER TO CHECK YOUR PROGRESS

3.15. REFERENCES

3.16 TERMINAL QUESTIONS

3.1 OBJECTIVES

After having the detailed study of this unit, you will be able to:

- Understand the Concept and Types of Regional Disparities.
- Identify Key Indicators and Indices for Measuring Disparities.
- Apply Techniques for Measuring Disparities Across Regions.
- Analyze Government Strategies to Address Regional Disparities.
- Assess Challenges in Disparity Measurement in Hilly Regions.

3.2. INTRODUCTION TO REGIONAL DISPARITIES

Regional disparities refer to unequal development and living standards across a country's different geographical areas. Income inequality, uneven infrastructure, unequal access to education and healthcare, and unequal opportunities for employment are some of the ways in which these disparities manifest. India, a large, diverse population, and diverse geography, has strong regional imbalances. Bihar, Jharkhand, and a lot of the northeast remain economically and socially underdeveloped. Other states and regions, like Maharashtra, Tamil Nadu, and Gujarat, have seen rapid industrialization and urbanization.

Regional disparities persist, hindering inclusive and balanced national development. It can cause socioeconomic tensions, more migration to cities, political unrest, and marginalization of poor areas for developing successful plans to mitigate these disparities, it is necessary to understand their primary causes, including colonial legacies, natural resource distribution, administrative inefficiency, and policy neglect. A comprehensive analysis and measurement of regional disparities help politicians find lagging areas, distribute resources more equitably, and implement targeted development initiatives that promote equity, social justice, and national cohesion.

3.3 DEFINITION AND MEANING OF REGIONAL DISPARITIES REGIONAL DISPARITIES

Refer to the uneven distribution of economic growth, infrastructure, social services, and opportunities within a nation India shows these differences both between developed and underdeveloped states (inter-state disparities) and between individual states (intra-state disparities). Geographic limitations, ineffective governance, and unequal investment practices are all causes of these disparities. For instance; states such as Maharashtra, Tamil Nadu, and Gujarat have experienced a rapid expansion in industrialization and infrastructure, while states such as Bihar, Odessa, and parts of the North-East are still behind in terms of economic development and human development.

3.3.1 The identification of regional disparities:

Is primarily based on key developmental indicators that show a region's socioeconomic status. Per capita income, literacy rate, access to health care, employment levels, poverty rate, availability of infrastructure, and quality of public services are all these indicators. Also, disparities are measured using indices like the Human Development Index (HDI), Consumption Disparity Index (CDI), Gini Coefficient, and Theil Index. Income distribution, consumption, and access to basic amenities are all assessed by these tools. For instance, the Theil index divides inequality between regions and between them, while the Gini coefficient rates income inequality on a scale from zero to one, meaning perfect inequality.

Planners often use techniques like composite indices, z-score standardization, and Lorenz curves to measure and analyze disparities in a more integrated manner. Composite indices enable comparison across areas by combining several indicators into one score. Z-scores help identify extreme deprivation or advancement in data by standardizing how far a region deviates from the national average. Lorenz curves graphically show income or consumption inequality across a population evidence-based planning and the development of regional policies depend on these measurement tools. Nonetheless, it is necessary to take into account restrictions in hilly and remote areas, where data collection is challenging and conventional indicators may not fully reflect ground reality.

3. 3.2 What Do We Mean by "Region"?

A region can be a state, district, city, rural area, or even a specific geographical zone like hills, coastal belts, deserts, or plains. Each region possesses its own unique characteristics-such as climate, topography, culture, and resource availability-which can impact its development trajectory.

3. 3.3 Nature of Regional Disparities

- Regional disparities are not random. They are influenced by:
- Historical factors (e.g., colonial policies)
- Geographic advantages or disadvantages (e.g., fertile plains vs. inaccessible hilly terrain)
- Policy decisions (e.g., where infrastructure or industry is promoted)
- Availability of natural resources
- Population density and urbanization trends

Better policies, talented people, or industrial investment can accelerate development in some areas, while poor infrastructure, remoteness, or administrative neglect can slow down development in others.

3.3.4 Types of Disparities by Scope:

1. Inter-Regional Disparities: These are differences between two or more significant areas, like between two states (e.g., Kerala vs. Jharkhand) between north and south India or between east and west. Compared to eastern states like Bihar or Odessa, southern states like Tamil Nadu and Karnataka have higher literacy, health indicators, and industrialization.

2. Intra-Regional Disparities: These differences occur in the same district or state An example: compared to urban areas compared to rural areas compared to forest areas plains in a hilly state like Uttarakhand example: Mumbai is Maharashtra's most developed city, but Vidarbha and Marathwada are less industrialized and often hit by drought.

3. 3.5 Implications of Regional Disparities:

- **Social Unrest and Migration**: People move from poor areas to urbanized areas, which increase population pressure in urban centers.
- **Inefficient Resource Use**: Poorly developed areas may have resources untapped due to infrastructure shortage.
- **National Integration Threats**: During inequality, separate states or regional autonomy movements may emerge.
- **Policy Challenges**: The government has difficulties in guaranteeing equal and inclusive growth.

3.4 TYPES OF REGIONAL DISPARITIES

Regional disparities, or regional imbalances, refer to inequalities in development and living standards across different geographic areas. These disparities can manifest in various forms, including economic, social, and infrastructure-related differences. Understanding these types helps in formulating targeted policies to address specific imbalances.

3.4.1 Inter-Regional Disparities

For enhancing equity and overall well-being, studying disparities is essential. We can address systemic inequalities and work toward a more just and healthy society by identifying and understanding differences in outcomes across various groups. This requires analyzing disparities in various areas, including health, education, economic opportunities, and understanding the fundamental causes of these disparities.

3. 4.2 Causes of Regional Disparities

Economic and geographic factors can cause regional disparities, or differences in development between regions. Imbalances can be caused by economic factors like uneven industrialization and infrastructure development. Geographic factors like resource distribution and terrain can also play a big role.

3.4.3 Indicators of Regional Disparities

Imbalances, also called imbalances, refer to significant disparities in development levels across different geographical areas, which are reflected in indicators like income, health, education, and infrastructure. These differences can exist between nations, within nations, or even within a city.

3.4.5. Economic Indicators

Per capita income: A crucial economic indicator is per capita income, which shows the average income per person in a particular geographic area. It can be found by dividing a region's total income by its total population. The economic well-being and living standards of a population are measured by this metric, which also allows for comparisons between different regions or over time.

Employment/unemployment rate: A crucial economic indicator is the unemployment rate, which shows how much of the labor force is actively seeking employment but is unemployed. It is a critical measurement of labor market health and has the potential to indicate broader economic trends. Throughout the business cycle, unemployment rates usually fluctuate, rising during economic downturns and falling during economic growth.

Industrial/agricultural productivity: Gross Value Added (GVA), Total Factor Productivity (TFP), and labor productivity are economic indicators that relate to industrial and agricultural productivity. These metrics help assess these industries' efficiency and output, showing their contribution to the overall economy.

3.4.6 Social Indicators

Various facets of social well-being and progress are measured and monitored by social indicators. They provide a quantifiable way to evaluate a society's condition in areas like health, education, environment, and overall quality of life. These indicators help identify trends, track changes over time, and influence policy decisions in order to improve social conditions.

- Literacy rate: According to the 2011 census, India's literacy rate is 74.04%. This means that about 74 percent of Indians aged seven and above are able to read and write. Male literacy rate is 82.14% and female 65.46%.
- Infant mortality rate (IMR): A significant indicator of a population's health is the infant mortality rate (IMR), which is measured by the number of deaths of infants under one year old per 1,000 live births Higher IMRs often indicate poorer living conditions and insufficient healthcare access, which reflects a community's general health and well-being.
- Life expectancy: Vedantu says that life expectancy is a statistical measure that shows how long someone is expected to live. Rather than predicting one's lifespan, it is a probability based on current mortality rates. Population health is often measured by life expectancy.

Individual well-being and societal development depend on access to high-quality education and healthcare. Healthcare maintains physical and mental well-being, while education equips people with knowledge and skills, both leading to a healthier, more productive society.

3.4.7 Infrastructure Indicators

Infrastructure indicators are metrics used to evaluate infrastructure systems' availability, quality, and performance. Infrastructure, including transportation, energy, communication, and water and sanitation systems, is assessed by these indicators. They are used for infrastructure development planning, investment, and policy decisions.

- Road density: Road density is the term used to describe the length of roads in a given area, usually expressed as kilometers of road per 100 square kilometers of land. It measures how well-connected a region is by roads and is often used to compare infrastructure development across different areas. For instance, Kerala has high road density while Jammu and Kashmir has low.
- Electricity consumption: Electrical consumption is the term used to describe how much electrical energy a device, appliance, or system has used, usually expressed in kilowatt-hours (kWh). For promoting energy efficiency and managing energy costs, it is crucial to

know how much electricity is used. Total electricity consumed by appliances, power ratings, and time of use are all influenced.

- Access to clean water: Though clean water is a fundamental human right, millions of people around the world do not have access to this essential commodity, which has negative effects on health, education, and economic growth. Water shortages cause waterborne diseases, educational opportunities, and gender inequality, especially for women and girls, who often bear the burden of water collection.
- Housing conditions: Housing conditions include the physical condition and quality of living environments, which have a significant impact on one's health and well-being. These include things like the type of house, how to get clean water and sanitation, and how safe and hygienic the living space is all. Poor housing can cause a number of health problems, including respiratory problems, infectious diseases, and mental health issues.

3.5. DEVELOPMENT INDICES USED TO MEASURE DISPARITIES

3.5.1 Human Development Index (HDI)

The Human Development Index (HDI) is a composite statistic that ranks nations according to their degree of "human development." Three fundamental dimensions are used to assess a nation's average achievements: health (life expectancy), education (mean and expected years of schooling), and a decent standard of living.

3.5.2 Composite Development Index (CDI)

A Composite Development Index (CDI) is a measurement that evaluates a region or nation's overall development using a set of indicators that take social, economic, and environmental factors into account. It aims to give a more comprehensive understanding of development than one-dimensional indicators like GDP or the Human Development Index (HDI).

A. **Multi-dimensional index**:

Multidimensional indexes are data structures that are designed to retrieve data based on several dimensions or criteria. It allows queries based on combinations of attributes instead of just one, which extends traditional indexing. Situations like databases and Geographic Information Systems (GIS) where data must be filtered on multiple characteristics at the same time are particularly beneficial to this.

3.5.3 Gini Coefficient

The Gini coefficient is a statistical measure that shows the distribution of income or wealth within a group of people, with values ranging from zero to one, meaning zero to one hundred percent. A zero Gini coefficient indicates perfect equality, which means that everyone has the same income. On the other hand, a one Gini coefficient, or one-hundred percent, indicates perfect inequality, which means that only one person has all the wealth or income. It is often used to evaluate income inequality within a nation or region.

3.5.4 Theil Index

Theil index is a measure of inequality, mostly used in economics to measure wealth or income inequality in a population. But it can also be used in other contexts, like racial segregation. It shows the "distance" that exists between a society's income distribution and a perfectly equal distribution where everyone gets the same amount of money. A higher Theil index indicates greater inequality.

3.6. TECHNIQUES FOR MEASURING REGIONAL DISPARITIES

There are a number of different approaches that can be used to determine regional disparities. These approaches examine variations in spatial, economic, and social factors across regions. The first principal component method uses composite indices, per capita income, Gini coefficients, and coefficient of variation among other indicators. The spatial patterns of disparities are also understood through cluster analysis and spatial analysis techniques.

3.6.1 Composite Index Method

Composite indexing represents a multifaceted concept or phenomenon by combining several individual indicators into a single, comprehensive index. When a single indicator is not enough to capture the complexity of the subject being measured, this technique is used. This method simplifies the analysis of complex issues.

3.6.2 Z-Score Standardization

Z-score standardization, which is also called standardization or z-score normalization, is a technique for changing data so that it has a mean of 0 and a standard deviation of 1. Each data point is converted into a z-score, which is the number of standard deviations a data point has from the mean.

3.6.3 Lorenz Curve

Income or wealth distribution within a population is shown graphically by the Lorenz curve. It plots the total percentage of income, or wealth, against the total percentage of recipients, usually arranged from the poorest to the richest. The curve shows the extent of income inequality visually; a diagonal line shows a perfectly equal distribution. The further the actual Lorenz curve deviates from this line, the greater the inequality.

3.7. SPATIAL TECHNIQUES AND GIS

Spatial techniques in GIS (Geographic Information Systems) include a variety of techniques for analyzing and interpreting geographic data. Data management, spatial analysis, and data manipulation are some of these techniques. GIS allows for spatial data integration, analysis, and visualization, which helps users understand spatial patterns and relationships.

3.7.1 Role of GIS in Measuring Disparities

- **Mapping physical and socio-economic data:** Mapping physical and socioeconomic data involves combining spatial (e.g., geographic locations and physical characteristics) information with socioeconomic (e.g., income, demographics, and education) information in order to visualize and study the relationships between these elements. Geographic

Information Systems (GIS) and other mapping methods can be used to accomplish this integration.

- **Analyzing spatial trends and patterns:** Looking at how phenomena are arranged and distributed across a given area is called spatial trends and patterns. This helps you understand their underlying processes and connections. Pattern like clustering, dispersion, or randomness are found in these analyses. They demonstrate how natural and human elements influence and organize phenomena.
- **Useful in targeted development planning:** For targeted development planning, development planning helps in identifying specific areas for growth and improvement at individual and organizational level. Development plans can optimize resource allocation, maximize impact, and ensure that efforts are directed toward achieving desired outcomes by focusing on key areas.

3.8 LIMITATIONS IN MEASURING DISPARITIES IN HILLY REGIONS

When it comes to measuring health disparities or access to healthcare in a hilly area, there are a number of different issues to address. These include geographical factors, socioeconomic diversity, and data collection issues. These limitations include the effects of rough terrain on accessibility, variations in local socioeconomic status, and the possibility that local surveys may use small sample sizes, which can make it difficult to accurately evaluate and address disparities.

3.8.1 Physical Constraints

Physical factors impose restrictions or limitations. These can have an impact on many areas of life, from biological functions to design and engineering. In essence, they are the limitations imposed by the physical world that affect what is possible and how things can be accomplished.

Difficult terrain restricts data collection: Data collection efforts can be significantly hindered by challenging terrain. Adverse conditions, terrible weather, and remote locations can take their toll. This could lead to delays, higher costs, and even making some data collection impractical.

A. Lack of road and internet connectivity: The lack of reliable road and internet connectivity in many rural areas, particularly in developing countries, poses significant challenges for education, economic development, and social inclusion. This issue is exacerbated by geographic disparities and a digital divide between urban and rural populations.

3.8.2 Statistical Limitations

Statistics has many limitations. These include its focus on quantitative data, the inability to handle individual cases, the possibility of misuse, and the fact that statistical results are frequently approximations rather than exact truths. To avoid misinterpretations and accurately interpret statistical findings, it is essential to comprehend these limitations.

- **Small population size**: In biological terms, a small population size refers to a population with a small population size, which is more susceptible to factors like inbreeding and genetic drift, which can lead to lower genetic diversity and higher risk of extinction. While there isn't a single consensus figure, populations with fewer than 5,000 people are often considered small. Occasionally, populations of only fifty people may be investigated.
- **Seasonal migration:** Seasonal migration is the short-term shift of people or animals from one location to another, usually as a result of seasonal changes in climate, food supply, or breeding conditions. Animals and humans often see this cyclical pattern as they adapt to various environmental conditions.

3.8.3 Inadequate Indicators

Performance measures that do not accurately show the true state or progress of a system, program, or process are called inadequate indicators. They may be unclear, unreliable, or not aligned with the intended goals, which can lead to inaccurate assessments and possible wrong decision-making. These markers may make it hard to monitor and evaluate effectively, and they may not give enough information for improvement.

National indicators: A national indicator is a statistical measure used to monitor progress towards national goals, which are frequently associated with Sustainable Development

Goals (SDGs). For instance, India's National Indicator Framework (NIF) monitors SDGs with 306 statistical indicators. These indicators help policymakers and program implementers evaluate policies and schemes' effectiveness.

3.8.4 Socio-Cultural Factors

Social and cultural elements of a society affect people's behaviors, attitudes, values, and preferences. These are known as socio-cultural factors. These elements influence how people think, act, and make decisions in their daily lives, which affect everything from their perceptions to their health and well-being.

- **Exclusion of traditional knowledge systems and indigenous practices:** The exclusion of traditional knowledge systems and indigenous practices, often referred to as Traditional Ecological Knowledge (TEK), from mainstream decision-making processes and development initiatives is a significant issue with far-reaching consequences. This exclusion can marginalize communities, undermine cultural heritage, and lead to unsustainable practices.

3.9 CASE STUDY: REGIONAL DISPARITIES IN INDIA

In India, regional disparities refer to significant disparities in socioeconomic development between different states and regions. Income levels, industrialization, infrastructure development, healthcare, and education are some of the ways in which these disparities manifest. Maharashtra and Gujarat have seen rapid economic growth, while Bihar and Odessa are lagging behind. Also, there is a noticeable division between the north, the south, and the east. Southern states generally have better human development indicators than their northern counterparts, and western states often are ahead of eastern ones.

3.9.1 Inter-State Inequalities

In India, interstate inequality refers to the significant disparities in living standards, economic development, and other important indicators between different states. This disparity has been an

issue for a long time, and some states always lag behind others in terms of per capita income, poverty rates, and access to essential services.

A. South Indian states vs. BIMARU states: Karnataka, Tamil Nadu, Telangana, Kerala, and Andhra Pradesh, the South Indian states, are generally considered to be the richest and most developed in India. These states contribute a lot to the country's GDP and have higher per capita incomes than the national average. Ashish Bose, a demographer, invented the acronym BIMARU in the mid-80s. It is made up of the first letters of the names of four states: Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh.

B. Investment, literacy, health indicators: Differences in development, living standards, and access to opportunities across different states within a nation are called interstate inequalities. These disparities are particularly evident in a large and diverse country like India, where states differ significantly in terms of geography, economy, governance, and social development. Investment, literacy, and health are three main metrics used to measure these disparities: Both public and private investment is essential to regional development. However, due to better infrastructure, market access, and skilled workforce, investment tends to concentrate in already developed or urbanized states.

This pushes some areas forward while leaving others behind. Literacy is a major barometer of human development and propulsion of socioeconomic growth. Literacy rates, on the other hand, significantly vary across Indian states. Human capital's essential component is health. Uneven access to medical services, clean water, sanitation, and nutrition reflects disparities in health outcomes across states.

3.9.2 Intra-State Disparities: Example of Uttarakhand

Despite being a relatively young state, Uttarakhand exhibits significant socioeconomic development differences between its hilly and plain areas. Infrastructure, agricultural development, urbanization, literacy, and poverty levels are some of these disparities.

A. Hill vs. plain districts: The geography, climate, and population density of hill and plain districts are significantly different Plains are comparatively flat, low-lying areas, while hills are

elevated land areas with steep slopes. Hills often have cooler temperatures and more rain than plains. Plains normally have denser populations and more intensive agriculture.

B. Variation in infrastructure, employment, education access: India, a geographically vast and socioeconomically diverse nation, shows significant regional disparities in terms of infrastructure development, job opportunities, and access to high-quality education. These disparities have an impact on social mobility, economic productivity, and quality of life across states and regions. Physical systems, including public transport, electricity, water, sanitation, and digital connectivity, are infrastructure. Its uneven growth makes big differences between urban and rural areas, and between states. In India, employment varies greatly based on a variety of industries (agriculture, industry, services), regions (urban or rural), and social groups. Informal employment, underemployment, and unemployment are significant issues. Indian states have significant differences in quality education from primary to higher levels.

3.10. GOVERNMENT INITIATIVES TO REDUCE DISPARITIES

India government has been working to reduce regional disparities by encouraging inclusive development and equitable development across states. Targeted development programs like the Backward Regions Grant Fund (BRGF), Aspirational Districts Programme, and special category status for some states are a major approach. These programs focus on improving health, education, infrastructure, and livelihoods by providing financial resources and administrative support to underdeveloped areas. Furthermore, schemes like Pradhan Mantri Gram Sadak Yojana (PMGSY) for rural roads, Saubhagya for electrification and Digital India for bridging the digital divide provide central assistance.

Additionally, centrally sponsored schemes and sector-specific missions are used to balance employment and human development disparities. Skill India, MNREGA (Mahatma Gandhi National Rural Employment Guarantee Act), and National Health Mission (NHM) are all programs whose objectives are to increase skill levels, increase rural employment, and enhance health services in lagging regions. Samagra Shiksha and Mid-Day Meal Schemes are education-focused programs that aim to ensure universal access and high-quality education. These efforts, in conjunction with fiscal transfers from the Finance Commission and NITI Aayog's contribution

to cooperative federalism, aim to guarantee that development reaches the country's most impoverished and remote regions.

3.10.1 Five-Year Plans and Backward Region Grants

India's Five-Year Plans, which were launched in 1951, set long-term economic and social goals to address regional disparities. Planners knew from the beginning that there were inequalities between and within states, and they tried to solve them through public investment, infrastructure development, and sectoral growth plans. Early plans focused on building basic infrastructure in underdeveloped areas, especially in the areas of irrigation, transport, and power. The Five-Year Plans in India, which was launched in 1951, made specific provisions over time. They helped resolve regional disparities by establishing long-term economic and social goals. Planners knew from the beginning that there were inequalities between and within states, and they tried to solve them through public investment, infrastructure development, and sectoral growth plans. Early plans focused on building basic infrastructure in underdeveloped areas, especially in the areas of irrigation, transport, and power. Over time, marginalized and geographically disadvantaged areas were supported by special area programs like Hill Area Development Programme, Desert Development Programme, and Tribal Sub-Plans. The Eleventh and Twelfth Plans (2007–2017) emphasized "inclusive growth" and aimed to reduce disparities by targeting interventions in employment, education, and health.

In 2007, the government established the Backward Regions Grant Fund (BRGF) to support this goal. This centrally sponsored program had the objective of encouraging progress in 250 identified underdeveloped districts throughout various states. Local bodies and district-level authorities were able to plan and implement projects based on local needs with the BRGF's untied funds. These projects were focused on critical gaps in infrastructure, human development, and service delivery. Bottom-up planning was encouraged by the BRGF, in contrast to previous top-down approaches. This allowed Panchayati Raj institutions to take responsibility for development. By adding to existing central and state schemes and enhancing governance capacity in less developed areas, the program aimed to reduce imbalances. BRGF set a strong foundation for decentralized, need-based regional planning in India, even though it was later merged into larger development frameworks. to support marginalized and geographically

disadvantaged areas, like the Hill Area Development Programme, Desert Development Programme, and Tribal Sub-Plans The Eleventh and Twelfth Plans (2007–2017) emphasized "inclusive growth" and aimed to reduce disparities by targeting interventions in employment, education, and health.

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3.10.2. Aspirational Districts Programme

Including poverty, health, nutrition, education, basic infrastructure, and agriculture was used to select a total of 112 districts from all over the states. The main goal of the ADP is to reduce district-to-district disparities by focusing on inclusive and balanced regional development through convergence of schemes, competition among districts, and cooperative federalism.

Under the ADP, districts are encouraged to improve their performance through a data-ADP encourages districts to improve their performance by using a data-driven and outcome-oriented approach. The "Champions of Change" dashboard, which monthly tracks progress in important sectors, provides real-time monitoring for the program. Districts are ranked, and they are encouraged to compete and learn from one another. Each district receives "Prabhari Officers", which are officers at central and state level, to help and monitor progress. Improve agricultural productivity, reduce stunting and malnutrition in children, increase immunization, increase access to drinking water and sanitation, and improve school learning outcomes are some

of the focus areas. The Aspirational Districts Programme aims to bring these districts at par with the national average by empowering local administrations and leveraging technology. This will promote equitable development across India.

3.10.3. Special Category Status to Hilly States

The Fifth Finance Commission created the Special Category Status (SCS) in 1969 to treat economically and geographically disadvantaged states, especially those in hilly and remote areas. This status was given to states that face significant developmental challenges because of difficult terrain, low population density, high transport costs, poor infrastructure, and high natural disaster risk. Major recipients of this status were hilly states like Jammu & Kashmir (now a UT), Himachal Pradesh, Uttarakhand, and northern states like Assam, Meghalaya, Manipur, etc.

State with Special Category Status received a number of financial and administrative benefits. These included higher share of central assistance, excise duty concessions, income tax exemptions, and prioritized funding for various development programs. Centrally sponsored schemes received 90% grant and 10% loan. The main goal was to reduce regional disparities by improving infrastructure, education, health, and employment in hilly and backward areas. Nonetheless, after the 14th Finance Commission (2015), the idea of SCS became less pertinent. The commission eliminated the distinction between special and general category states and suggested that all states receive more funds-which accounted for 42% of central taxes-and provided a greater devolution of funds. However, due to their geographical and strategic significance, hilly states continue to receive special financial packages and benefits under multiple centrally sponsored programs.

3.10.4 Role of Decentralized Planning and Panchayati Raj

Decentralized planning is the process of allowing local-level institutions to plan, implement, and track development programs according to the unique requirements of their areas. By ensuring local participation, efficient resource utilization, and context-specific development, it plays a critical role in reducing regional disparities. The 73rd Constitutional Amendment Act (1992), which gave constitutional status to Panchayati Raj Institutions (PRIs), a three-tier system

of rural local self-government. Bottom-up development strategies, which are decentralized, ensure that backward and marginalized regions, which are often overlooked in centralized planning, get enough attention.

Panchayati Raj Institutions serve as important instruments for decentralized governance and local planning. They are responsible for developing and implementing Gram Panchayat Development Plans (GPDPs), which concentrate on topics like education, health, water and sanitation, transportation, and employment. PRIs directly contribute to rural infrastructure and social welfare through programs like MGNREGA, PMAY-Gramin, and Swachh Bharat Abhiyan. Transparency, accountability, and ownership of development initiatives are improved when local communities are involved in decision-making process. Overall, decentralized planning and Panchayati Raj not only promote inclusive growth and social justice but also empower grassroots democracy, which is essential for resolving Indian regional and interregional disparities.

3.11. RECOMMENDATIONS FOR BALANCED REGIONAL DEVELOPMENT

For social justice, economic equity, and national integration, balanced regional development is necessary. The following strategic recommendations are proposed in order to reduce the disparities between developed and underdeveloped regions:

- **Need-Based Resource Allocation**: Instead of simply taking population or political factors into account, indicators like literacy rates, poverty levels, infrastructure gaps, and health outcomes should be used to assign financial assistance and developmental schemes. This will aid in bridging the developmental gap between areas that are advanced and those that are lagging.
- **Infrastructure Development in Backward Areas**: To build a base for economic activity and attract private investment, hilly, tribal, and remote areas should prioritize investments in public services such as roads, electricity, irrigation, digital connectivity, and public services.

- **Strengthening Decentralized Planning**: Local self-governments (Panchayati Raj Institutions and Urban Local Bodies) must be empowered with financial resources, skilled manpower, and autonomy to plan and implement development programs in accordance with local needs.
- **Promotion of Local Industries and Employment**: Local economies can grow and migration from urban areas will be reduced by encouraging agro-based industries, handicrafts, and micro, small, and medium enterprises (MSMEs) in underdeveloped areas.
- **Improving Education and Skill Development**: Building human capital and increasing employability in underdeveloped areas requires the expansion of high-quality educational institutions, vocational training facilities, and online learning resources.

- **Effective Monitoring and Evaluation**: Like the Aspirational Districts Programme, strong mechanisms for tracking development programs using real-time data, social audits, and performance-based rankings can improve accountability and outcomes.
- **Public-Private Partnerships (PPP)**: Encouraging collaboration between government and private organizations in fields like infrastructure, education, and health can lead to innovation, efficiency, and more funding for areas that are underserved.
- **Special Incentives for Investment**: Companies can be incentivized to establish operations in economically underdeveloped states and districts by offering tax breaks, subsidies, and single-window clearances.
- **Area-specific planning: Area-specific planning:** Refers to a focused and localized approach to development that takes into account a specific region's geographic, socioeconomic, cultural, and environmental attributes. Area-specific planning differs from general or uniform national planning in that it tailors strategies to meet the unique requirements and difficulties of certain regions, such as hilly terrains, tribal belts, coastal areas, drought-prone areas, or urban slums. By aligning development programs with the local context, this method ensures better outcomes and resource utilization. For example, area-specific strategies like watershed development in drought-prone areas, eco-tourism in hilly areas, or fisheries promotion in coastal areas address local issues and harness regional strengths for sustainable and inclusive growth.

- **Investment in hill-specific infrastructure:** Overcoming the unique logistical and geographical obstacles faced by hilly and mountainous areas is essential. These areas often suffer from poor connectivity, fragile ecosystems, and limited access to markets and services. Targeted investment in all-weather roads, ropeways, tunnels, decentralized renewable energy systems, climate-resilient housing, and landslide protection can significantly improve accessibility, mobility, and disaster resilience. Also, service delivery gaps can be filled by digital connectivity, healthcare, and education infrastructure tailored to remote and dispersed communities. Such specialized infrastructure improves hill communities' lives and encourages sustainable agriculture, tourism, and regional economic integration.
- **Promotion of ecotourism and sustainable agriculture:** is a strategy for enhancing the economy of environmentally sensitive rural and natural areas while simultaneously protecting their natural and cultural heritage Ecotourism helps local communities make money and create jobs while encouraging responsible travel to natural places. In addition, it promotes conservation awareness and supports biodiversity protection. Similarly, sustainable agriculture methods like organic farming, agro forestry, and water conservation improve soil fertility, minimize chemical use, and guarantee long-term productivity. These strategies reduce rural migration, create alternative livelihoods, and contribute to climate resilience, making development more inclusive and environmentally safe.
- **Capacity building and skill development:** Are essential to enable people and communities, particularly in rural and underdeveloped areas, to actively participate in the development process. These programs increase employability, increase productivity, and support self-reliance by developing entrepreneurial, technical, and managerial skills. Vocational training, digital literacy, and sector-specific skills (such as sustainable farming, tourism, or handicrafts) enable people to access local economic opportunities. Strengthening local institutions like Panchayati Raj bodies and community organizations also guarantees better planning, implementation, and governance. Overall, capacity building promotes inclusive growth by utilizing human potential as a motivator for regional development.

- **Strengthening** Local governance: is essential for ensuring responsive, transparent, and inclusive development at the grassroots level. When institutions like Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs) are given sufficient financial resources, decision-making power, and skilled human resources, they can more effectively address local needs. Strong local governance encourages community participation, increases accountability, and makes development projects more aligned with local priorities. It is also essential for the success of decentralized planning, efficient service delivery, and the implementation of plans concerning health, education, sanitation, and livelihoods. Strengthened local governance becomes a cornerstone of balanced and sustainable regional development by strengthening institutional capacity and encouraging democratic participation.

3.12 SUMMARY

Regional Disparities: Identification and Measurement provides a thorough understanding of the nature, causes, and effects of Indian regional disparities. It explains regional disparities as differences in development and access to resources and services across geographic areas, both between and within states. Historical neglect, unequal investment, geographic constraints, and policy failures are some of the causes of these disparities in economic, social, and infrastructural dimensions. Human Development Index (HDI), Gini Coefficient, Theil Index, and Lorenz Curve are used to measure disparities. Indicators include per capita income, literacy rate, infant mortality, road density, and electricity consumption.

Additionally, the unit discusses contemporary methods and government initiatives to address these disparities. These include spatial techniques and GIS for targeted planning. Inclusive development is encouraged by significant programs like the Aspirational Districts Programme, Backward Regions Grant Fund (BRGF), and the Special Category Status for hilly and disadvantaged states. Panchayati Raj Institutions' decentralized planning role is often highlighted due to its capacity to effectively address disparities at local level Chapter ends by suggesting ways to ensure India's regional development is balanced and equitable. These strategies include infrastructure investment, ecotourism, sustainable agriculture, capacity building, and stronger local governance.

3.13 GLOSSARY

- **Regional Disparities**: uneven development and living standards across nations.
- **Inter-Regional Disparities**- Developmental and resource disparities across large geographic regions, like states or zones.
- **Intra-Regional Disparities**: inequalities that exist within a single state or region, for example, between urban and rural or plains and hills.
- **Human Development Index (HDI)**: a composite index that measures the average achievements of a region in health, education, and income.
- **Gini Coefficient:** a statistical index that indicates income inequality within a population, with a zero value indicating perfect equality and a one value indicating total inequality.
- **Theil Index:** a measure of economic inequality that measures income inequality. It can be broken down into different groups to understand differences within and between groups.
- **Composite Index:** A means of evaluating development or disparity by combining a number of indicators into a single value.
- **Z-Score Standardization**-A statistical method that standardizes values by showing how far they deviate from the mean, useful for comparing across regions.
- **Lorenz Curve:**A graphical representation of income or wealth distribution used to illustrate inequality.
- **Aspirational Districts Programme:**A development initiative by the Government of India to uplift underdeveloped districts using data-driven governance.
- **Special Category Status (SCS):** A classification given to economically disadvantaged and geographically difficult states in India for preferential financial assistance.s multiple indicators into a single value to assess overall development or disparity.
- Panchayati Raj Institutions (PRIs): Decentralized planning and development is handled by rural India's local self-government bodies.
- **Backward Regions Grant Fund (BRGF):** It is a central scheme aimed at helping lagging districts develop by providing them financial assistance and local planning.

- **Spatial Techniques (GIS):** Using socioeconomic and environmental data, geographic techniques map, analyze, and visualize regional disparities.
- **Capacity Building:** is the process of enhancing abilities, resources, and skills in people and organizations in order to improve regional development outcomes.

3.14 ANSWER TO CHECK YOUR PROGRESS

1. **Regional disparities primarily refer to:**

   A. Climatic changes in different regions

   B. Unequal distribution of development and living standards

   C. Political differences among states

   D. Diversity in culture across regions

   Answer: B

2. **Which of the following is an example of inter-regional disparity?**

   A. Literacy differences between two villages

   B. Income gap between urban and rural areas of a district

   C. Development differences between Kerala and Bihar

   D. Infrastructure variation in a city

   Answer: C

3. **What does the Gini coefficient measure?**

   A. Industrial productivity

   B. Income inequality

   C. Poverty rate

   D. Literacy levels

   Answer: B

4. **The Theil Index is mainly used to:**

   A. Assess literacy rates

   B. Calculate agricultural growth

   C. Measure inequality in income distribution

   D. Evaluate infrastructure quality

   Answer: C

5. **Which of the following is NOT typically used as a regional disparity indicator?**

   A. Per capita income

   B. Road density

   C. Climate patterns

   D. Infant mortality rate

   Answer: C

6. **What is the purpose of a Lorenz Curve?**

   A. Represent population growth

   B. Show agricultural output

   C. Illustrate income distribution

   D. Measure urban expansion

   Answer: C

7. **Which technique helps in standardizing data for comparison across regions?**

   A. Composite Index

   B. Z-Score Standardization

   C. Theil Index

   D. HDI

   Answer: B

8. **The Human Development Index (HDI) combines which of the following dimensions?**

   A. Income, industrial output, and agriculture

   B. Health, education, and income

   C. Employment, trade, and transport

   D. Population, urbanization, and environment

   Answer: B

9. **Which region in India often shows intra-state disparities due to geographic challenges?**

   A. Kerala

   B. Uttarakhand

   C. Goa

   D. Punjab

   Answer: B

10. **The Aspirational Districts Programme was launched by:**

    A. Ministry of Rural Development

    B. NITI Aayog

    C. Planning Commission

    D. Ministry of Finance

    Answer: B

11. **Special Category Status was initially given to states based on:**

    A. Population density

    B. Climatic suitability

    C. Economic performance

    D. Geographical and economic disadvantages

    Answer: D

12. **Which method is used to visually represent economic inequality?**

    A. Theil Index

    B. Gini Coefficient

    C. Lorenz Curve

    D. HDI

    Answer: C

13. **Which of the following is a *social* indicator of regional disparities?**

    A. Road length

    B. Electricity consumption

    C. Infant mortality rate

    D. Industrial productivity

    Answer: C

14. **What is the role of GIS in measuring regional disparities?**

    A. Conduct census surveys

    B. Allocate funds

    C. Map and analyze spatial data

    D. Measure employment rates

    Answer: C

15. **Backward Region Grant Fund (BRGF) aimed to:**

    A. Promote foreign investment

    B. Fund political campaigns

    C. Develop backward districts through decentralized planning

    D. Support defense sector modernization

    Answer: C

3.15 REFERENCES

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3.16 TERMINAL QUESTIONS

A. Short Type Question

1. Define regional disparities. Give two examples from India.
2. What is the difference between inter-regional and intra-regional disparities?
3. List any three indicators used to measure regional disparities.
4. What do you understand by the term 'Human Development Index (HDI)'?
5. Explain the significance of the Gini Coefficient in measuring inequality.
6. Write a short note on the Lorenz Curve.
7. Mention any two major causes of regional disparities in India.
8. How is a Composite Development Index (CDI) different from HDI?
9. What is the objective of the Aspirational Districts Programme (ADP)?
10. State any two benefits provided under the Special Category Status (SCS).

B. Long Type Question

1. Explain the concept of regional disparities. What are its main types and how do they affect national development in India?
2. Discuss the key indicators used for identifying and measuring regional disparities. Give examples of economic, social, and infrastructure indicators.
3. Critically analyze the causes of regional disparities in India. How do historical, geographical, and policy factors contribute to the problem?
4. What is the significance of Human Development Index (HDI), Gini Coefficient, and Theil Index in assessing regional disparities? Explain with examples.

5. Describe the various techniques used to measure regional disparities, such as composite index, Z-score standardization, and Lorenz curve.
6. What are inter-state and intra-state disparities in India? Illustrate your answer with examples from states like Kerala, Bihar, and Uttarakhand.
7. Explain the role of government initiatives like the Aspirational Districts Programme and Backward Regions Grant Fund in reducing regional disparities.
8. Evaluate the impact of geographical challenges on measuring and addressing disparities in hilly regions. Use Uttarakhand as a case study.
9. Discuss the role of decentralized planning and Panchayati Raj Institutions in promoting balanced regional development.
10. Suggest effective strategies and recommendations for reducing regional disparities in India. Highlight the importance of area-specific planning, capacity building, and infrastructure development.

UNIT- 4 REGIONAL PLANNING AND POLICY FRAMEWORK

4.1 LEARNING OBJECTIVES

4.2 INTRODUCTION

4.3 EVOLUTION OF REGIONAL PLANNING IN INDIA

4.4 ROLE OF FIVE-YEAR PLANS AND NITI AAYOG

4.5 STATE-LEVEL DEVELOPMENT PLANS FOR HIMALAYAN REGION

4.6 DECENTRALIZED AND PARTICIPATORY PLANNING:

4.7 CHALLENGES IN REGIONAL PLANNING

4.8 SUMMARY

4.9 GLOSSARY

4.10 ANSWER TO CHECK YOUR PROGRESS

4.11 REFERENCES

4.12 TERMINAL QUESTIONS

4.1 LEARNING OBJECTIVES

After having the detailed study of this unit you will be able to-

- Understand the Evolution of Regional Planning in India.
- Analyze the Role of Five-Year Plans and NITI Aayog.
- Evaluate State-Level Development Plans for the Himalayan Region.
- Interpret the Concept and Practice of Decentralized and Participatory Planning.
- Identify Challenges and Propose Solutions for Effective Regional Planning.

4.2 INTRODUCTION

Regional planning in India has evolved as a vital component of national development strategies aimed at addressing spatial inequalities, promoting balanced economic growth, and ensuring inclusive progress across diverse geographical regions. Rooted in post-independence development goals, regional planning initially followed a centralized approach led by the Planning Commission and implemented through a series of Five-Year Plans. This method aimed at accelerating growth in underdeveloped and backward regions. However, it gradually revealed shortcomings in addressing the unique needs of diverse regions, especially in ecologically sensitive and socio-economically disadvantaged areas. The emphasis has since shifted toward more decentralized, participatory, and flexible planning mechanisms, integrating local voices and grassroots governance.

NITI Aayog and local bodies like Panchayati Raj Institutions (PRIs) drive the modern framework of regional planning, which prioritizes sustainability, cooperative federalism, and inclusiveness. Through state-level planning, centrally sponsored schemes, and targeted area-specific programs, special attention is given to development in difficult areas like the Himalayan region. Furthermore, initiatives such as the Aspiration Districts Programme show the trend toward real-time, data-driven governance in order to reduce disparities between states Regional planning remains ineffective because of insufficient funding, technical expertise, weak institutional coordination, and socio-political opposition Sustainable and equitable development

across all regions of India is guaranteed by addressing these issues through integrated, community-based, and technology-enabled planning.

4.3 EVOLUTION OF REGIONAL PLANNING IN INDIA

India post-independence adopted the concept of regional planning in order to address developmental spatial disparities. At first, the focus was on increasing the national economy through centralized planning under the direction of the Planning Commission. Nevertheless, this bottom-up approach slowly revealed significant regional disparities, especially between urban and rural areas, and across multiple states.

4.3.1 Pre-Independence Period

India's pre-independence period is the time before it got its independence from the British Empire in 1947. This period, approximately from 1857 to 1947, saw a number of socio-political shifts and reforms with the goal of getting self-rule and resolving social injustices. It was a significant period of change, which shaped India's path to independence.

In fact, regional planning in British India was limited and focused on a few areas that benefited colonial interests. Revenue generation, expansion of the railway network and development of urban centers were the main objectives, where a specific pattern, perhaps historical or related to economic policies, has led to unequal development and imbalances between regions, the difference between hinterlands, which lagged behind, and port cities, which saw significant progress, is a good example of this. Variables such as exploitative practices or strategic development focused on particular sectors may be responsible for this imbalance.

4.3.2 Post-Independence Planning Era

India’s post-independence planning era started after the country gained its independence in 1947 and implemented a planned economic and social growth system known as Five-Year Plans. During this period, the Planning Commission was established in 1950 and the First Five-Year Plan was implemented in 1951.

After India gained its independence in 1947, a centralized planned economy was established, mainly through the creation of the Planning Commission and the implementation of Five-Year Plans. This strategy was intended to address economic difficulties, encourage equitable development, and achieve self-reliance by directing resource allocation and setting goals for growth.

4.3.3 Shifts towards Regional Equity

- In India, specific area development programs like Tribal Sub-Plans (TSP), Hill Area Development Programs (HADP), and Drought-Prone Area Programs (DPAP) have been integrated into regional planning to address regional disparities and uneven development. These programs were designed to address specific socioeconomic and geographical issues that certain populations and regions face.
- The statement talks about different development approaches that aim to reduce differences between and within regions by focusing on individual interventions that are specific to each area. This method recognizes that different regions have different needs and challenges and tries to provide targeted solutions to them.

4.4 ROLE OF FIVE-YEAR PLANS AND NITI AAYOG

India used Five-Year Plans to promote growth, poverty reduction, and modernization. NITI Aayog took over the Planning Commission as a policy think tank and focused on a more flexible, cooperative, and competitive development approach.

4.4.1 Five-Year Plans (1951–2017)

- India government implemented a set of centralized and integrated national economic programs known as the Five-Year Plans from 1951 to 2017. These plans were inspired by the Soviet model and were intended to promote economic growth in a balanced way, reduce poverty, and modernize important industries in the Indian economy. In 2017, the twelfth five-year plan came to an end, and NITI Aayog took over the Planning Commission.

- By carefully directing public investment towards priority sectors, India's Five-Year Plans, which started in 1951, played a pivotal role in establishing the framework for regional development. With centralized planning and resource distribution, these plans-which were modeled after the Soviet model—sought to modernize the Indian economy. In order to achieve equitable and balanced growth throughout diverse regions, the plans concentrated on a number of sectors, including heavy industry, agriculture, irrigation, and social welfare initiatives.
- India's Second and Third Five-Year Plans (1956–1961, 1961–1966) placed a strong emphasis on infrastructural development and industrial expansion, especially in areas that were deemed underdeveloped at the time. With an emphasis on heavy and fundamental industries, these programs sought to strengthen India's economic base while addressing regional development imbalances.
- India's Eleventh and Twelfth Five Year Plans placed a strong emphasis on "inclusive growth," with particular attention to expanding access to rural infrastructure, healthcare, education, and job opportunities. These strategies sought to guarantee that everyone in society, particularly the weaker and more marginalized segments, would benefit from economic expansion.

4.4.2 NITI Aayog (2015-Present)

The Planning Commission was abolished in 2015, and the NITI Aayog was created as a policy think tank with an emphasis on competitive and cooperative federalism.

- **Bottom-up approach**: Starting with the details and working your way up to the general is known as a bottom-up approach. In a variety of situations, it entails taking discrete elements or features and combining them to create a more comprehensive whole, such as a system, a solution, or a strategy. In contrast, a top-down method starts with the general idea and divides it into more manageable components.
- **Aspiration Districts Programme**: Launched by the Indian government in 2018, the Aspiration Districts Programme (ADP) seeks to expedite the socio-economic development of 112 districts nationwide. By using data-driven governance, cooperation, and healthy competition among these districts, the program aims to turn them into growth engines.

- **State Indexes**: The term “state index” can refer to a number of rankings and evaluations of states, such as the Fragile States Index, the State Energy Efficiency Index, the India Innovation Index, and the State Food Safety Index by FSSAI. These indexes assess performance in a variety of areas, including state instability, innovation, food safety, and energy efficiency.

4.5 STATE-LEVEL DEVELOPMENT PLANS FOR HIMALAYAN REGION

India's state-level development plans for the Himalayan area emphasise striking a balance between environmental preservation, economic expansion, and catastrophe readiness. While taking into account the region's particular vulnerabilities, these plans frequently place an emphasis on infrastructure strengthening, sustainable tourism, and water resource management.

- **Eco-sensitive planning**: In order to control human activity and reduce adverse effects, eco-sensitive planning, which is frequently carried out through Eco-Sensitive Zones (ESZs), entails establishing zones surrounding protected ecosystems such as national parks and wildlife sanctuaries. In order to preserve biodiversity, safeguard wildlife habitats, and encourage sustainable development both inside and outside of protected areas, these zones function as buffers.
- **Infrastructure bottlenecks**: Infrastructure bottlenecks are restrictions or limitations in infrastructure systems that make it difficult for information, goods, or services to move freely, which can cause delays, higher expenses, and decreased productivity. These bottlenecks have a major influence on economic growth and development and can arise in a variety of industries, including telecommunications, energy, and transportation.
- **Livelihood support**: The term "livelihood support" describes aid intended to help people and communities meet their fundamental necessities and enhance their financial security. This might entail a number of tactics, such as developing one's skills, gaining access to resources, receiving financial assistance, and establishing chances for earning money. In the end, livelihood assistance aims to encourage sustainable development, self-sufficiency, and poverty reduction.

- **Disaster resilience**: The ability of people, communities, and systems to endure, adjust to, and recover from the effects of disasters is known as disaster resilience. It entails more than just recovering from a disaster; it also entails enhancing wellbeing and changing processes to better control risks in the future. This entails comprehending risks, evaluating susceptibilities, putting preparedness measures into action, and creating recovery and adaptation capabilities.

To combine environmental and economic concerns, state administrations create State Vision Documents and State Action Plans on Climate Change (SAPCCs) with help from the federal government (via programs like the Ministry of DONER, North Eastern Council, and Hill Area Development Programme).

4.5.1 Special Area Programs

Development projects known as Special Area Programs (SAPs) are created to meet the particular requirements and difficulties of particular geographic regions, which are frequently distinguished by particular social, economic, or physical characteristics. Local initiatives seek to enhance the general standard of living in local communities, support socioeconomic growth, and protect natural resources.

Particular tactics were used for less developed areas, including:

- **Backward Regions Grant Fund (BRGF):** To address regional development inequalities in India, the Ministry of Panchayati Raj launched the Backward Regions Grant Fund (BRGF). In designated underdeveloped districts, it sought to repair significant infrastructure gaps and address other development requirements. Through capacity building and professional assistance for local entities such as municipalities and panchayats, the initiative also aimed to strengthen local governance.
- **Integrated Tribal Development Programme:** An all-encompassing program called the Integrated Tribal Development Programme (ITDP) aims to enhance the socioeconomic circumstances of India's tribal groups. It emphasises a number of development-related topics, including as infrastructure development, social upliftment, cultural preservation,

and economic empowerment. Through resource allocation and focused interventions, the program seeks to meet the unique demands and difficulties experienced by tribal groups.

- **Hill Area Development Programme:** A government program called the Hill Area Development Programme (HADP) aims to develop India's mountainous areas. It was initially presented during the Fifth Five Year Plan and seeks to use a range of development initiatives to capitalize on these regions' distinct resources. The program focuses on small-scale industry, animal husbandry, plantation agriculture, and horticulture.

4.5.2 Transition to NITI Aayog (Post-2015)

By resolution of the Union Cabinet, the Planning Commission was replaced on January 1, 2015, by NITI Aayog (National Institution for Transforming India). With this reform, India's approach to economic planning and development saw a dramatic transformation from a top-down, centralized model to one that prioritized cooperative federalism and a more consultative role for the government's policy think tank.

- The National Institution for Transforming India, or NITI Aayog, did in fact take the place of the Planning Commission of India in 2015. The goal of this change was to encourage a federal system of governance in India that was more competitive and cooperative. The Indian government's policy think tank,
- NITI Aayog, places a strong emphasis on flexible planning, real-time data monitoring, and evidence-based policymaking. It seeks to replace strict, top-down planning with a more data-driven, cooperative strategy.

4.5.3 Initiatives by NITI Aayog

The Indian government's policy think tank, NITI Aayog, has started a number of important projects to support sustainable development, encourage innovation, and fortify cooperative federalism. These include the Sustainable Action for Transforming Human Capital (SATH) program, the Aspirational Districts Program, the Atal Innovation Mission, and a number of indices for tracking advancement in many fields.

- **Aspiration Districts Programme**: The Indian government introduced the Aspirational Districts Programme (ADP) in January 2018 with the goal of accelerating socioeconomic development in 112 districts that have been identified nationwide. Through convergence, cooperation, and competition, the initiative aims to improve important development indicators in sectors like infrastructure, agriculture, health, and education.
- **Encourages state-specific development strategies**: This statement outlines a development plan that gives priority to state-specific, tailored techniques, with incentives determined by performance indicators. Accordingly, assistance and resources would be provided to states according to their unique requirements and difficulties, and their availability would be dependent on their capacity to show advancement towards predetermined objectives.

4.5.4 State-Level Development Plans for the Himalayan Region

Sustainable development is given top priority in state-level development plans for the Himalayan area, with an emphasis on community empowerment, ecological resilience, and climate change adaptation. By tackling issues like urbanization, resource management, and livelihood possibilities, these plans seek to strike a balance between social justice, environmental preservation, and economic progress.

4.5.5 Unique Characteristics of the Himalayan States

High peaks, varied ecosystems, and rough, hilly terrain are characteristics of the Himalayan states. Because of their geological youth and ongoing formation, they frequently experience erosion and landslides. These states are important to India's climate because they function as a barrier to cold winds and have an impact on rainfall patterns. They also have different climatic zones, ranging from tropical to alpine.

- It is true that the topography and environment of Uttarakhand, Himachal Pradesh, and the northeastern states provide particular difficulties. Rough terrain, isolation, and delicate ecosystems are characteristics of these states that lead to a variety of particular problems.
- Development plans need to be thoughtfully written to take biodiversity preservation, local geography, and the effects of climate change into account. This entails minimizing

damage to ecosystems, integrating climate resilience measures, and tailoring policies to particular regional circumstances.

4.5.6 Focus Areas of State Plans

- In order to encourage comprehensive growth and development within the state, state plans—which are frequently created by State Planning Commissions or comparable organizations—focus on a number of topics. Economic growth, social welfare, and innovation are common examples of these sectors, with a focus on evidence-based policy recommendations. States may have different priorities, but they frequently cover topics like infrastructure, financial inclusion, health, education, and agriculture. Raising living standards and promoting inclusive growth for all citizens are the ultimate goals.
- **Infrastructure Development**: Building and enhancing the fundamental organizational and physical frameworks required for a society or economy to function is referred to as infrastructure development. This include social infrastructure including hospitals and schools, electricity and water systems, communication networks, and transportation networks like highways and railroads. Economic expansion, social advancement, and general quality of life all depend on efficient infrastructure development.
- **Eco-Tourism and Sustainable Livelihoods**: When used properly, ecotourism may be a potent instrument for supporting local populations' sustainable lives as well as environmental preservation. Ecotourism can lessen reliance on resource-intensive activities, encourage community involvement in conservation initiatives, and help create a more resilient and affluent future by giving locals alternative sources of income and empowering them.
- **Disaster-Resilient Planning**: Planning for disaster resilience is taking proactive steps to prevent, lessen, and recover from disasters while causing the least amount of disturbance to ecosystems and populations. It includes foreseeing possible risks, building resilient infrastructure, and creating efficient response and recovery plans. This method creates a comprehensive and long-lasting framework for catastrophe risk management by integrating different disciplines and stakeholders.
- **Health and Education Access:** For both societal advancement and personal well-being, access to high-quality healthcare and education is essential. Healthcare guarantees

physical and emotional well-being, while education equips people with information and skills that make society healthier and more productive.

4.5.7 Centrally Supported Schemes

The central government provides the majority of the funding for government programs known as Centrally Sponsored Schemes (CSS), which are jointly sponsored by the federal and state governments. State governments carry out these programs in areas covered by the Indian Constitution's state or concurrent lists. The Pradhan Mantri Gramme Sadak Yojana and the Mahatma Gandhi National Rural Employment Guarantee Act are two examples.

- **Special Category Status:** The Indian central government has designated some states as Special Category Status (SCS) in order to support their growth in the face of socioeconomic and topographical challenges. Although it was introduced in 1969 in response to the Fifth Finance Commission's recommendations, it is not a constitutional provision.
- **Ministry of DoNER (Development of North Eastern Region)** The central government's nodal ministry for organizing and supervising development initiatives in India's eight northeastern states is the Ministry of Development of the North Eastern Region (DoNER). It facilitates communication between state governments and central ministries in order to advance socioeconomic development in the area.

4.6 DECENTRALIZED AND PARTICIPATORY PLANNING:

Decentralized and participative planning entails actively including residents in the decision-making process and transferring planning authority from central to local levels. This strategy seeks to increase the efficacy and relevance of development plans, empower local communities, and promote a sense of accountability and ownership.

4.6.1PRI and Grassroots Governance

India's grassroots governance is based on Panchayati Raj Institutions (PRIs), a kind of local self-government designed to encourage participatory democracy and decentralize power.

PRIs promote rural development and governance by giving villagers the ability to organize development initiatives, manage local resources, and take part in decision-making.

4.6.2 What are PRIs?

- The Gramme Panchayat (at the village level), Panchayat Samiti (at the block level), and Zila Parishad (at the district level) make up India's three-tiered system of rural local self-government, known as PRIs.
- PRIs seek to bring governance closer to the people by allowing them to participate in decision-making processes.
- They were given constitutional status and strengthened their role in rural development when they were formalised under the 73rd Constitutional Amendment Act in 1992.

4.6.3. 73rd and 74th Constitutional Amendments

The 73rd and 74th Constitutional Amendments, passed in 1992, significantly impacted local self-governance in India by granting constitutional status to Panchayats (rural local bodies) and Municipalities (urban local bodies). These amendments aimed to decentralize power and empower local communities.

- The 1992 73rd and 74th Constitutional Amendment Acts were crucial in giving India's Panchayati Raj Institutions (PRIs) and Urban Local Bodies (ULBs) constitutional status. PRIs, or rural local governments, are expressly covered by the 73rd Amendment, whilst ULBs, or urban local governments, are the subject of the 74th Amendment. The purpose of these reforms was to encourage local self-governance and decentralize authority.
- **Promoted bottom-up planning**, Planning at the lowest levels of an organization, such as individual teams or departments, and then integrating the plans that are produced upward to develop the overall organizational strategy, is known as bottom-up planning. In contrast, top-down planning involves making decisions at the top and then letting them trickles down.

4.6.4 Functions of PRIs in Regional Planning

With bottom-up planning, the overall organizational strategy is created by integrating the plans that are created at the lower levels of the organization, such as specific teams or departments. In contrast, choices are taken at the top and then filtered down in top-down planning.

Preparation of Gram Panchayat Development Plans (GPDP) A participatory planning approach is used to prepare the Gramme Panchayat Development Plan (GPDP), which aims to promote social fairness and economic growth at the village level. Understanding and starting the process, performing scenario analysis, hosting Gramme Sabha meetings for approval and input, and then creating and carrying out the plan are all important elements in this thorough process. **MGNREGA**, **PMAY-Gramin**, and **Swachh Bharat Abhiyan**: The Indian government runs three significant programs for the welfare and development of rural areas: MGNREGA, PMAY-Gramin, and Swachh Bharat Abhiyan. Rural households are guaranteed employment for 100 days under the Mahatma Gandhi National Rural Employment Guarantee Act. In rural areas, the Pradhan Mantri Awas Yojana-Gramin (PMAY-Gramin) seeks to provide pucca dwellings for everyone. A nationwide initiative called Swachh Bharat Abhiyan (Clean India Campaign) aims to rid India of open defecation and promote cleanliness.

4.6.5 Benefits of Participatory Planning

The main advantage of participatory planning is that it actively involves stakeholders in the decision-making process. This method raises the possibility of successful execution and sustainability, enhances the quality of plans, and cultivates a sense of ownership.

- "Ensures local relevance, transparency, and community ownership" is a statement that is frequently linked to project execution and community development. It highlights the importance of programs being transparent and accountable to the community, fostering a sense of shared ownership and control, and being customized to the unique requirements and context of a local region. This strategy encourages more egalitarian, long-lasting, and successful results.

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4.6.6 Challenges and Way Forward

From highly centralized models in the early post-independence era to more inclusive, participatory approaches in recent decades, regional planning in India has gradually changed. Reducing regional imbalances through equitable economic development, infrastructure improvement, and the uplift of marginalized communities has always been the main goal. Several obstacles still stand in the way of regional planning's efficacy, even in the face of several legislative changes and planning tools. But these difficulties also present chances and a clear path ahead to improve the procedure.

4.7 CHALLENGES IN REGIONAL PLANNING

Managing fast urbanization, dealing with environmental concerns, making sure there is enough infrastructure, and coordinating across many governmental levels and stakeholders are just a few of the many difficulties that regional planning must overcome. Securing necessary money, addressing insufficient infrastructure, and advancing sustainable development are other crucial concerns.

4.7.1 Institutional and Governance Issues

- **Over-centralization**: When power and decision-making authority are concentrated in one central organization, frequently at the price of local or regional autonomy, this is referred to as over-centralization. This can happen in a number of settings, such as organizations, governments, and even social systems. As a result, there may be

inefficiencies and possible power disparities in a system that ignores local needs and viewpoints.

- **Weak coordination**: Ataxia, another name for poor coordination, is a lack of muscle control and coordination that causes jerky, unstable motions. Walking, balance; hand and eye movements, communication, and other bodily functions can all be impacted. Poor coordination can result from a number of situations, such as neurological abnormalities, injuries, and even some drugs.
- **Ineffective decentralization**: When authority and decision-making authority are transferred to local or lower levels of a government or organization, it is known as ineffective decentralization and does not provide the desired results. This can impede the efficient execution of policies and programs at the local level and take the form of a lack of true autonomy, scarce resources, or insufficient institutional capability.

4.7.2. Inadequate Financial Resources

A situation when a person, group, or even a country does not have enough money to meet its demands or accomplish its objectives is referred to as having an inadequate financial resource. This may show itself as a lack of capital, inadequate income, or incapacity to efficiently manage finances that are already available.

Skewed funding patterns: Compared to urban and industrial centers, underdeveloped or isolated areas do not receive enough investment.

- **Low absorption capacity**: Due to lack of planning experience or delays in the process, many regional and local organizations are unable to use the money that have been allotted.
- **Dependence on state and central grants**: This restricts liberty and frequently leads to planning that is not relevant.

4.7.3 Lack of Technical Expertise and Data

- **Shortage of trained personnel**: Professionals with expertise in GIS, environmental research, economic forecasting, etc. are lacking in planning units.

- **Outdated or unreliable data**: Current information on the economy, environment, infrastructure, and population is necessary for regional planning, yet it is frequently absent or badly maintained.
- **Limited use of technology**: The use of data analytics, satellite images, and spatial mapping in planning is still in its infancy.

4.7.4 Socio-political Constraints

Socio-political restrictions are limitations resulting from social and political variables that affect the activities, freedoms, or decisions of individuals or groups. Numerous factors, such as governmental regulations, societal conventions, power relationships, and economic disparities, might give birth to these limitations. They have an impact on many facets of life, ranging from media consumption to climate change adaption.

- **Regional disparities in political attention**: Regional disparities in political attention refer to the unequal distribution of political focus and resources across different geographical areas within a country or region. This can manifest as some regions receiving significantly more attention, funding, and development initiatives than others, leading to uneven growth and opportunities.

- **Resistance to change**: The hesitation or hesitancy of individuals or groups to embrace or adjust to novel circumstances, procedures, or methods of operation is known as resistance to change. Humans often react in this way, particularly when change entails uncertainty or perceived dangers to the status quo. This resistance can take many different forms, ranging from overt opposition to more covert, passive forms like diminished productivity or involvement.
- **Planning without people**: Plans that are top-down, technocratic, and detached from the reality on the ground result from a lack of sincere local participation.

4.7.5 Way Forward for Effective Regional Planning

A multifaceted strategy that strikes a balance between social justice, environmental sustainability, and economic development is necessary for effective regional planning. Strong

stakeholder participation, integrated planning across many sectors and an emphasis on implementation and monitoring are all necessary for this.

1. **Strengthening Decentralized Planning**: Increasing local governments' and communities' ability to actively engage in and oversee their own development is a key component of strengthening decentralized planning. This entails strengthening capacity among local authorities and representatives, enhancing coordination across various planning levels, and guaranteeing efficient resource allocation and data management at the local level.

- Empower District Planning Committees (DPCs) and Panchayati Raj Institutions (PRIs) to the focus should be on strengthening their capacity through policy interventions, financial support, and administrative reforms, ensuring they function as effective units of self-governance. This involves enhancing their planning capabilities, devolving appropriate powers and functions, and promoting transparency and accountability in their operations.

- Actively incorporating recommendations from Gramme Sabhas and local needs assessments into regional planning frameworks is essential for the successful implementation of bottom-up planning. In order to guarantee that development projects are in line with their unique requirements and goals, this entails giving local communities the authority to decide on their priorities and actively engage in the planning process. Promote participatory tools such as social audits**,** community mapping**,** and stakeholder consultations**.**

4.7.6. Ensuring Adequate and Equitable Funding

- Ensuring fair, effective, and sufficient funding for education. To provide inclusive, high-quality, and equitable education for all, it is imperative to close the funding gap and enhance the efficiency and equality of resource distribution. Introduce need-based allocation formulas that prioritize backward and underdeveloped regions.
- By improving user fees, tax collection, and public-private partnerships (PPP), local governments can increase their financial capability.
- Keep an eye on how funds are being used using clear audit procedures and real-time dashboards.

4.7.7 **Building Technical Capacity**

The process of enhancing and fortifying the abilities, know-how, and assets required efficiently using and overseeing technology in a community or organization is known as "building technical capacity." This entails developing both individual and group skills in addition to strengthening the procedures and frameworks that facilitate the adoption and use of technology.

- To create specialized regional planning, create regional planning cells.

- Cells: It's critical to establish institutional frameworks that can efficiently coordinate planning initiatives among several localities. To ensure that development is sustainable and cohesive, these cells would concentrate on creating and carrying out regional plans.
- Increase the application of spatial modeling, remote sensing, and GIS Using remote sensing, spatial modeling, and GIS more extensively entails combining these technologies for more thorough geographical analysis and decision-making in a variety of domains. Better knowledge of spatial patterns, enhanced monitoring of dynamic situations and more intelligent resource management are all made possible by this integration.
- Regular surveys, linked databases, and cooperation with academic institutions should be the main priorities for enhancing data infrastructure at the regional level. This entails putting in place strong data gathering techniques, defining explicit data governance standards, and utilizing technology to build an extensive and trustworthy data ecosystem.

4.7.8 Institutional Reforms and Policy Integration

To improve governance and achieve sustainable development, policy integration and institutional reforms are essential. To improve coordination and efficacy, institutional reforms entail alterations to the laws, policies, and organizational frameworks of the government. The practice of coordinating various policies and tactics across sectors and governmental levels in order to accomplish shared objectives is known as policy integration. Strong institutional capacity, which includes the ability of governmental institutions to create cogent policies,

coordinate actions, and adjust to changing conditions, is necessary for effective policy integration. Foster interdepartmental convergence by integrating planning efforts across agriculture, rural development, health, education, and transport.

- For synergy, coordinate regional planning with national programs such as PM Gati Shakti, Smart Cities, and the Aspirational Districts Programme.
- Establish development frameworks tailored to a given region, particularly for hilly, tribal, and ecologically delicate places.

4.7.9 Sustainable and Inclusive Planning

- The goal of sustainable and inclusive planning is to design cities that are fair to all citizens and environmentally conscious. In order to meet present needs without endangering the capacity of future generations to meet their own, it seeks to strike a balance between economic progress, social justice, and environmental preservation. This strategy places a strong emphasis on everyone in the community being involved in determining the direction of their cities and towns.
- A multidimensional strategy is required to successfully integrate social inclusion, gender equity, and climate resilience into regional development goals. This entails incorporating these factors throughout every phase of regional development initiative planning, execution, and assessment. This entails allocating sufficient funds, maintaining policy coherence, and bolstering institutional capacities.
- By lessening the effects of development and climate change on these delicate ecosystems, eco-friendly activities are essential for maintaining environmental balance in coastal and Himalayan regions. This entails putting integrated coastal management into practice in coastal areas and embracing tactics like community-led conservation, sustainable infrastructure development, and green energy promotion in the Himalayas.

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coastal areas and embracing tactics like community-led conservation, sustainable infrastructure development, and green energy promotion in the Himalayas.

4.8 SUMMARY

A thorough review of the development and organization of regional planning in India is given in Unit 4, emphasizing the transition from centralized post-independence planning to a more decentralized and participatory framework. The Planning Commission first spearheaded regional planning with its Five-Year Plans, which sought to balance the development and growth of underdeveloped areas. Area-specific initiatives like the Tribal Sub-Plan, Hill Area Development Program, and Drought-Prone Area Program were introduced as a result of the top-down approach's limitations over time. With programs like the Asp rational Districts Programme and other state-level performance indexes, the creation of NITI Aayog signaled a strategic shift towards cooperative federalism, adaptable policymaking, and data-driven government.

State-level development planning for the Himalayan region is also examined in the study, with particular attention paid to ecological sensitivity, infrastructure deficiencies, and the necessity of disaster resilience. It highlights how decentralization can promote grassroots involvement through Panchayati Raj Institutions (PRIs), which are empowered by the 73rd and 74th Constitutional Amendments. Regional planning still confronts significant obstacles despite progress, including a lack of funds, a lack of technical know-how, institutional fragmentation, and sociopolitical opposition. The section ends with recommendations for the future that include enhancing financial and technical capabilities, integrating policies, fostering inclusive, sustainable, and region-specific development plans, and fortifying local government.

4.9 GLOSSARY

- **Regional Planning -** A planning procedure that takes local requirements and spatial disparities into account in order to promote fair economic and social development across various geographic regions.

- **Five-Year Plans -** The Government of India implemented centralised economic planning schemes between 1951 and 2017 to direct national development, distribute funds, and correct regional imbalances.
- **NITI Aayog** - The Planning Commission was replaced in 2015 by the National Institution for Transforming India, which prioritises data-driven policymaking and cooperative federalism.
- **Aspirational Districts Programme (ADP)** - A 2018 government program that uses competitive federalism and real-time data to quickly improve socioeconomic indices in 112 disadvantaged districts.
- **Eco-Sensitive Zones (ESZs)** - Areas around protected areas, such as national parks, that are set aside to control development and maintain biodiversity and ecological balance.
- **Panchayati Raj Institutions (PRIs)** - India's 73rd Constitutional Amendment created a three-tiered system of rural self-government: Gramme Panchayat, Panchayat Samiti, and Zila Parishad.
- **Decentralized Planning** - An approach to planning that ensures grassroots involvement and development that is specific to the local context by transferring decision-making power from central bodies to local levels.
- **Backward Regions Grant Fund (BRGF)** - A centrally funded initiative to improve local infrastructure and governance in underdeveloped districts in order to close regional development disparities.
- **Hill Area Development Programme (HADP)** - A special area initiative that was started during the Fifth Five-Year Plan with the goal of fostering development in India's hilly areas by making targeted investments in livelihoods, horticulture, and agriculture.
- **Special Category Status (SCS)** - Indian states that are classified as having socioeconomic and geographic disadvantages are entitled to preferential financing and tax breaks.

4.10 ANSWER TO CHECK YOUR PROGRESS

1. **Which institution replaced the Planning Commission in 2015?**

   A. Finance Commission

   B. NITI Aayog

   C. RBI

   D. Ministry of Finance

   Answer: B

2. The primary focus of the Aspirational Districts Programme is:

   A. Urban development

   B. Industrial growth

   C. Rapid socio-economic development of underdeveloped districts

   D. Environmental conservation

   Answer: C

3. Which Constitutional Amendment formalized the Panchayati Raj Institutions?

   A. 42nd Amendment

   B. 44th Amendment

   C. 73rd Amendment

   D. 86th Amendment

   Answer: C

4. The Hill Area Development Programme was introduced during which Five-Year Plan?

   A. First

   B. Third

   C. Fifth

   D. Seventh

   Answer: D

5. What does BRGF stand for?

A. Budgetary Revenue Growth Fund
B. Basic Regional Growth Framework
C. Backward Regions Grant Fund
D. Balanced Rural Governance Forum

Answer: C

6. Which of the following is not a function of Panchayati Raj Institutions?

A. Tax collection in metropolitan cities
B. Preparation of Gram Panchayat Development Plans
C. Implementation of rural development schemes
D. Conducting social audits

Answer: A

7. Which approach is promoted by NITI Aayog in planning and governance?

A. Top-down
B. Centralized
C. Bottom-up
D. Globalization

Answer: C

8. Eco-sensitive zones (ESZs) are primarily aimed at:

A. Enhancing tourism infrastructure
B. Expanding industrial areas
C. Protecting biodiversity and regulating development
D. Promoting urbanization

Answer: C

9. Which of the following is a major challenge in regional planning?

A. Over-centralization
B. High literacy rates
C. Gender equality

D. Technological advancement

Answer: A

10. Special Category Status is mainly granted based on:

A. Population size

B. Educational achievements

C. Geographic and socio-economic disadvantages

D. Industrial output

Answer: C

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4.12 TERMINAL QUESTIONS

(A) Short Questions

1. What is the significance of regional planning in post-independence India?

2. Mention any two area-specific programs introduced to reduce regional disparities in India.

3. What is the main objective of the Aspirational Districts Programme (ADP)?

4. Define eco-sensitive planning and its relevance to the Himalayan region.

5. What are the key features of the Panchayati Raj system as per the 73rd Amendment?

6. How does NITI Aayog differ from the Planning Commission in its approach to regional development?

7. List any two challenges faced in regional planning as highlighted in the document.

8. What is the role of Gram Panchayat Development Plans (GPDP) in participatory planning?

(b) Long Questions

1. Discuss the evolution of regional planning in India from the pre-independence period to the post-independence era.

2. Explain the significance of Five-Year Plans in promoting regional development in India. Provide examples from specific plans.

3. Analyze the objectives, strategies, and outcomes of the Aspirational Districts Programme launched by NITI Aayog.

4. Describe the unique planning challenges and development priorities for the Himalayan region.

5. Examine the role of Panchayati Raj Institutions (PRIs) in decentralized and participatory planning.

6. Evaluate the effectiveness of centrally sponsored schemes like BRGF, MGNREGA, and HADP in reducing regional disparities.

7. What are the key institutional and governance-related challenges in regional planning in India? How can these be addressed?

8. Describe the transition from the Planning Commission to NITI Aayog. How has this shift changed the nature of regional planning?

9. Critically assess the role of eco-sensitive planning and sustainable development practices in regional development, particularly in ecologically fragile areas.

10. Suggest a comprehensive strategy for overcoming financial, technical, and socio-political challenges in effective regional planning.

BLOCK II: SPECIAL ANALYSIS OF DEVELOPMENT IN THE HIMALAYAN STATES

UNIT-5 PHYSICAL AND HUMAN REASSURE BASE:

5.1 OBJECTIVE

5.2 INTRODUCTION

5.3 TOPOGRAPHY

5.4 CLIMATE

5.5 WATER RESOURCE

5.6 FOREST AND BIODIVERSITY

5.7 DEMOGRAPHIC STRUCTURE

5.8 CULTURAL DIVERSITY AND ETHNIC COMPOSITION CHALLENGES OF ACCESSIBILITY AND REMOTENESS.

5.9 SUMMARY

5.10 GLOSSARY

5.11 ANSWER TO CHECK YOUR PROGRESS

5.12 REFERENCES

5.13 TERMINAL QUESTIONS

5.1 OBJECTIVES

After reading this unit, you will be able to:

- Know about the Topography, Climate, Water, Forest and Biodiversity of the Indian Himalayan Region (IHR).
- Understanding the Demographic structure of the Indian Himalayan Region (IHR).
- Know about Cultural diversity and ethnic composition, Challenges of accessibility and remoteness of the Indian Himalayan Region (IHR).

5.2 INTRODUCTION

The Indian Himalayan Region (IHR) possesses a unique and diverse physical resource base, characterised by its vast mountain ranges, varied topography, rich biodiversity, and extensive water systems. Stretching from Jammu & Kashmir in the northwest to Arunachal Pradesh in the east, the region includes snow-clad peaks, deep valleys, glaciers, rivers, and forested slopes. The terrain ranges from alpine and subalpine zones to temperate and tropical forests, supporting a diverse range of flora and fauna. It is also the origin of major river systems such as the Indus, Ganga, and Brahmaputra, which serve as lifelines for millions. The IHR is rich in natural resources, including forests, medicinal plants, and minerals, making it both ecologically vital and economically significant for India.

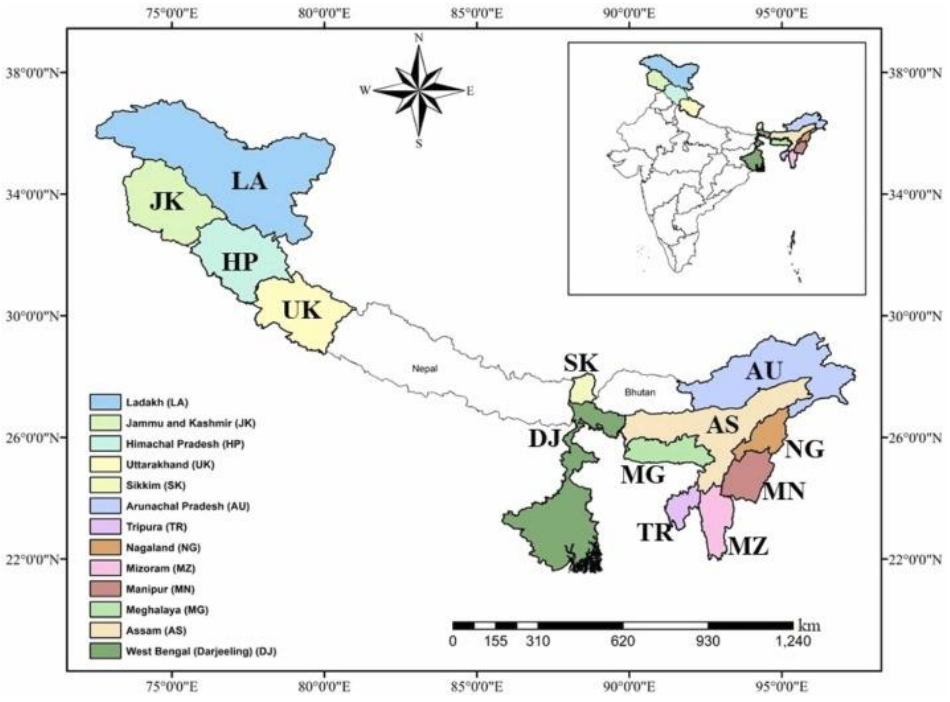


Fig. 5.1 Indian Himalaya Region, Source: Google Image

The human resource base of the IHR is equally diverse and complex, shaped by its physical geography and cultural richness. The population comprises various ethnic groups, tribal communities, and cultural traditions, each with distinct languages, customs, and lifestyles. Despite challenging terrain and limited accessibility, the region shows resilience and strong community networks. Literacy rates and population density vary across states, with states like Mizoram and Tripura showing high literacy, while others like Arunachal Pradesh and Jammu & Kashmir still face educational and developmental challenges. Migration, both seasonal and permanent, is common due to limited livelihood opportunities, especially in remote areas.

Together, the physical and human resource bases of the Indian Himalaya form a delicate balance, where development must be harmonised with conservation. Sustainable use of natural resources, infrastructure improvement, and empowering local communities are essential to ensure long-term growth and ecological security in this sensitive and vital region.

5.3 TOPOGRAPHY

Himalaya, a significant part of the intercontinental Alpine Himalayan mountain chain, is a mountain situated from Afghanistan to Arunachal Pradesh of the north India. In between these two extremes Himalaya is also developed in Pakistan, Nepal, Bhutan, and China. In India, Himalaya is developed in the Jammu & Kashmir, Himachal Pradesh, and Uttarakhand, fringes of Punjab, Haryana, Uttar Pradesh and West Bengal and in Sikkim. It is 2500 km long and 240to 320 km wide, mountainous terrain covering an area of approximately 7.00 lakh km. As such mountain is geographically defined as a region between the Brahmaputra River in the east and the Indus River in the west. The Indo-Gangetic Plain makes its southern contact, while the northern contact is in Tibet.

5.3.1 Divisions of the Himalaya

Latitudinal Divisions

Burrard and Hayden (1907) divided the Himalaya latitudinally into the following four divisions:

1. Assam Himalaya: The term Assam Himalaya defines a 720 km long region confined between the river Brahmaputra in the east and the river Tista in the west. The Assam Himalaya includes Arunachal Pradesh, Sikkim Himalaya, Darjeeling Himalaya of West Bengal state and Bhutan Himalaya.

2. Nepal Himalaya: This 800 km long region is situated between the river Tista in the east and

the river Kali (Mahakali) in the west, covering the entire geographical area of Nepal. Following the administrative set-up of Nepal, the Himalaya in Nepal is divided into Eastern Nepal Himalaya, Central-, Western-, Midwestern, and Farwestern Nepal Himalaya.

3. Kumaun Himalaya: The Area confined between the rivers Kali and Sutlej is designated after the Kumaun division of Uttaranchal state of India as Kumaun Himalaya. This division is 320 km long and is the geologically best-explored one, and the longitudinal divisions show their optimal development in this sector.

4. Punjab Himalaya: It is a 560 km long region bounded by the rivers Sutlej and the Indus, in the west.

A brief account of the important geological characters of these divisions is as follows:

1. Indo-Gangetic Plain: It is nearly 2700 km long and approximately 200 km wide in the east, but gradually widens to 450 km in the west and covers of nearly 8 lakh sq. km in Bangladesh, India, Nepal and Pakistan. It is a vast, featureless, highly fertile plain formed by deposition of Quaternary alluvium or molassic sediments brought mainly by the Himalayan Rivers from the north.

2. Outer Himalaya: This 10-50 km wide division is also known as the Sub-or Siwalik Himalaya. It is formed due to upliftment of a part of the foreland basin filled up with Quaternary sediments brought by the Himalayan Rivers. The Himalayan Frontal Thrust and the Main Boundary Thrust delineate the southern boundary of the Outer Himalaya with the Indo-Gangetic Plain and northern boundary with the Lesser Himalaya, respectively.

3. Lesser Himalaya: It is also known as Lower Himalaya and is 50-80 km wide. It is mainly made up of poorly fossiliferous, thoroughly deformed rocks of Middle Proterozoic to Cambrian age.

4. Higher Himalaya: It is also known as Central (Greisbach, 1891), Great or Inner Himalaya. This remobilised cratonic mass is more than 20 km in thickness, and its maximum width in the Western Himalaya is 52 km. It is mainly made up of low to medium grade metamorphosed, green schist to upper amphibolite facies, sedimentary and igneous rocks of Proterozoic age. The Higher Himalayan domain is confined between the MCT in the south and the Tethyan Thrust in the north.

5. Tethyan Himalaya: This segment is also referred to as Tibetan Himalaya and is named after the once existing, now disappeared, intercontinental Tethyan Sea. It is mainly made of nearly 10-12 km thick fossiliferous sedimentary rocks of Late Proterozoic to Late Mesozoic/Eocene age. Due to tectonic overhauling, this supposed to be continuous belt is dismembered into separate

blocks, i.e. of Kashmir, Lahaul-Spiti in Himachal Pradesh, Kumaun.

6. Indus Tsangpo Suture Zone: This division joins the Indian and Eurasian Plates. Indus-Tsangpo Thrust marks its contact with the Tethyan Himalaya. It is mainly developed in Tibet; however, in India and Pakistan, it is present in the Ladakh and Karakoram regions, where it branches out into two sutural zones, namely the southern Indus Suture and the northern Shyok Suture.

7. Trans Himalaya: This zone is a part of the southern Eurasian Plate, and in India and Pakistan, it is mainly developed in northern Ladakh (an administrative division of the state of Jammu & Kashmir) and northernmost Pakistan. It comprises of Kohistan area, the Shyok Suture of Ladakh and the Karakoram Zones of Western Himalaya

8. Tethys Ocean: Suess introduced this term in 1893 for a shallow epicontinental sea that existed between the Late Proterozoic to Early Tertiary. This ocean was positioned between southern Gondwanaland and northern Eurasia on a supercontinent named Pangaea. In its long geological history, the ocean more or less continuously received sediments for a mountain to evolve in a later period of time; thus, in a classical sense, it was viewed as a geosyncline. Tethys was obliterated by the Tertiary tectonic movement and gave rise to the birth of the Alpine-Himalayan mountain range. Splitting of the Tethyan Ocean into Palaeo- and Neo-Tethys and thereby placing large portions of Mongolia and Central Asia within the Tethys eased the problem of plate reconstruction.

9. Himalayan Arc: The Himalayan arc is convex towards peninsular India and has a length of 2200 km measured along the chord and 2400 km if measured along the length of the arc. The centre of the arc lies near the Lop Nor Lake or in the great Turfan depression in the Sinkiang province of South China. The arc is considered to be of primary or secondary origin. Wadia (1937) described it as a result of resistance exerted by the Deccan Graben to post-Tertiary tangential force from the north;otherssay it is a primary feature produced by the shear effect of the Ninety Degree East Ridge.

5.3.2 Major Longitudinal Faults of the Himalaya

Several major faults, mostly thrust, run parallel to the strike trends (NW-SE) of the Himalaya from west to east (Kumar et al., 1989). Some earlier workers also called these faults boundary faults, implying they limit the depositional boundary of a particular megasequence stratigraphic unit. The important longitudinal faults of the Himalaya are-

Himalayan Frontal Fault

It is also known as the Himalayan Frontal Thrust (HFT) or Main Frontal Fault/Thrust (MFF/MFT). This fault, for the first time, was reported by Nakata (1972) as a superficial reverse fault boundary between the Indo Gangetic Plain and the Outer Himalaya on the basis of photogeological and field evidence in Kumaun and Nepal. The Himalayan Frontal Fault is intermittently exposed as a set of echelon discontinuous or intermittent faults, which cut the Siwaliks obliquely. It is a blind fault in many segments. This is the youngest regional fault that came into existence 1.6 Ma ago, in the Early Pleistocene, when the foreland basin was in the intense compressional phase.

Main Boundary Thrust (MBT)

It is also regionally known as the Main Boundary Fault (MBF) and was first described by Middlemiss as a tectonic contact between the Outer and Lesser Himalaya and stratigraphically separates the younger Tertiary from older rocks. The highly active MBT is a set of three to four parallel running faults, and region-wise various names have been assigned to it, like Muree Thrust in Jammu, Krol Thrust in Himachal and Uttaranchal, Mahabharat Thrust in Nepal and Gaur Thrust in eastern Arunachal Pradesh. The fault marks the northern boundary of the Siwalik molasse. The north-dipping fault makes a 5-200m wide zone and shows very steep dip (50-60) to vertical dip on the surface but flattens in depth (20-25).

Krol Thrust

Auden (1934) recognised this 400 km long regional thrust fault in the Uttarakhand and Himachal Pradesh. He visualised that a nearly 4000 m thick largely sedimentary sequence and the mildly metamorphosed basal part of Middle Proterozoic to Early Palaeozoic rocks are thrust over the mainly Siwalik and partly on Subathu, Dagshai and Kasauli formations. Krol Thrust conceals the MBT in major parts of its length; however, both are exposed separately in the Tons valley. Loosely Krol Thrust is taken as a synonym of MBT in Uttarakhand and Himachal Pradesh.

Main Central Thrust

Heim and Gansser (1939) observed a thrust contact between sedimentary and low-grade metamorphics of the Lesser Himalaya and crystalline rocks of the Higher Himalaya and named this contact as Main Central Thrust (MCT). MCT is also responsible for the abrupt change in height of the Himalaya, i.e. sudden increase in topographic height of the Higher Himalaya terrain in comparison to the Lesser Himalaya. MCT is clearly recognised as a ductile intracontinental thrust in preference to a brittle thrust, and is not a single discontinuity, but a 5-20 km wide

ductile shear zone designated as MCT Zone.

Tethyan Thrust

The contact between crystallines of the Higher Himalaya and low-grade metamorphic rocks of Haimanta Formation and other sedimentary rocks are also described as Tethyan Thrust or Dar Martoli Fault, MalariThrust, Zanskar Thrust/ Fault, Zanskar Shear Zone, Trans Nimadi Shear Zone, Trans Nimadi Thrust, Annapurna Detachment Fault, Chomolonga Thrust, GontoLa Detachment, etc. This contact is low to steeply dipping (10-70) while in depth (>30 km) it flattens to 2-3. Fault forms a 2.2-6.7 km wide ductile shear zone characterised by a 250 m wide zone of intense mylonitisation with a minimum offset of 35 km along the detachment plane and vertical displacement of 5 km. Some workers interpreted this contact as normal fault contact and designated it as Jhala Normal Fault in the Garhwal Himalaya. The normal fault contact between these two tectonic units is also interpreted in Himachal Pradesh and in Kashmir and is visualised due to NE-SE extension leading to gravity collapse of Tethyan zone rocks.

Indus Suture Thrust

The Indus Suture Thrust, also known as Counter Thrust or the Zanskar Thrust, draws the boundary between the Himalaya and Trans-Himalaya. It is dipping in the south. The Trans-Himalayan terrain comprises the formations of the Indus Suture, Shyok Suture, Karakoram Block and of Kohistan region. Further north of the Indus Suture Thrust in Ladakh and Pakistan, the Main Mantle Thrust or Northern Thrust that dips north is present.

Karakoram Fault

The oblique Karakoram Fault trending in NW-SE direction is a regional strike-slip fault of more than 1000 km length, outcropped between North-West Tibet, cutting across the Shyok Suture and to the south Kailash thrust system and further southeast. The fault exhibits dextral displacement of-120 km. The fault is perceived as a very active one and has formed triangular facets as high as 2 km and scarps of 50 m height in the Indus valley region of Ladakh.

Main Himalayan Thrust

A lowly northward dipping subsurface detachment surface or zone has been identified based onthe focal depth of the recently struck earthquakes in the Himalaya. This detachment surface is described as the Main Himalayan Thrust or Basement Thrust Fault (BFT) or Himalayan Detachment Fault. Over HFT and in the Outer Himalaya,this alayar able n richne 1, env No ot rhaps ulture than al feat an co adapt made between the Hardwar and Rishikesh lineament controls the holy Ganga River. It shows a displacement of 1200 m and is active in nature.

1. Kotdwar-Devprayag Lineament - It shows an N-S trend, controls the Kot River and also limits the eastern margin of Chandpur and Nagthat formations, in Mussoorie Syncline.

2. Najibabad-Chamoli Lineament This lineament is of a left lateral nature, trending in NE-SW direction, draws the straight course of the Nayar River and parallel to this Doggada Fault is present.

3. Ramnagar-Kosi Lineament NNE-SSW running wrench fault controls the part of the Kosi River in Kumaun.

4. Haldwani-Karanprayag Lineament This is interpreted as a deep-seated dextral lineament trending in NNW-SSE direction.

Extensional Faults

Normal faults are common in many orogenic belts, but in the Himalaya, due to the dominance of thrust faults of compressive origin, they have been overlooked in the past. Normal faults and associated structures are reported from many regions; however, the size of such features is comparatively small.

In the Yamuna Valley, several normal faults of regional dimension are present, e.g. Hanumanchatti Normal Fault and Banas Normal Faults are making a conjugate pair and another pair dipping towards each other is constituted by Kharsali and Untagad Normal Faults and a small depression resulting inthe formation of a graben called Kharsali. In the Lahaul-Spiti region, a series of high-angle (42-80) normal faults originated in Miocene time are identified. In western Nepal, the Surkhet-Garahi Fault is nearly 90 km long.

Outer Himalaya

The Outer Himalaya comprises 7 km thick, normally sequenced autochthonous rocks of the Siwalik Group or Churia Supergroup in Nepalayar en Chne env

The polyphase deformed and metamorphosed region is considered a geoanticline ridge separating the southern Himalayan geosyncline and northern Tethyan syncline. Three tectonic units, namely Chail Thrust, Jutogh Thrust and Vaikrita Thrust units, respectively constituted by low, medium and high (upper amphibolite facies) grade metamorphic rocks in Himachal Pradesh and Uttaranchal. HHC shows remarkable uniformity in their structural characters. MCT is now recognised as the MCT zone along which shear 5-15 km wide ductile shear zone is characteristically developed, in which rocks are mylonitic and are displaced in the south

direction in general. HHC shows variable phases of deformation in different regions. One to six deformational phases are identified in the HHC.

5.3.3 Nappes in the Himalaya

Arnold Escher von der Linth described first time, in the nineteenth century, the large-scale movement of rocks in the orogenic Glarus area of Switzerland. The term nappe is now used for those rocks that have been displaced at least 10 km from their root zone. Nappes are divided into fold nappe (displaced large size recumbent or isoclinal folded regions) and thrust nappe (displacement of rocks due to thrusting), and also as thin skin nappe, i.e. involving displacement of a comparatively less thick sequence of sedimentary rocks and thick skin nappe showing movement of a thick sequence of crystalline rocks.

A state-wise description of nappes is as follows:

1. Jammu and Kashmir

In Jammu and Kashmir, Wadia (1928) identified allochthonous rocks in the Kashmir Valley and designated it as the Kashmir Nappe. This is also known as the Salkhala Nappe. The Panjal Thrust is believed to be the NW extension of the Suketi Thrust or the Chail Thrust. The Kashmir Nappe also continues in the western Himachal Pradesh, representing a basement thrust and is folded into an antiform and a synform. In the Chamba area, Himachal Pradesh and eastern Kashmir, Fuchs identified two nappes, namely Chail Nappe (low-grade metamorphic rock) and Crystalline Nappe (Jutogh Nappe or medium-grade metamorphic rocks), having roots in the Zanskar Range.

2. Himachal Pradesh and Uttarakhand

The following crystalline and sedimentary nappe are recognised:

Vaikrita Nappe

High-grade (upper amphibolite facies) metasedimentary rocks of Early Proterozoic age (2300-2400 Ma old) constitute this nappe. It is a 5-7 km thick thrust slab in which movement has taken place along the Vaikrita Thrust or MCT119.2 Ma ago.

Jutogh Nappe

Its equivalent in Uttarakhand is called Almora Nappe, which is one of the largest nappes in the Lesser Himalaya. Its southern boundary in Himachal Pradesh is defined by Jutogh Thrust

or MCT II, while in Uttaranchal by South Almora Thrust (SAT), and in the north, its limit is defined by North Almora Thrust (NAT). It is made up of medium-grade metamorphic rocks. In the Uttaranchal region, the nappe shows on either side thrust thrust-bound synformal structure and is divided into Ramgarh and Almora groups.

Chail Nappe

It is equivalent to Salkhala Nappe in Kashmir, Bajaura Nappe in Himachal Pradesh, Ramgarh Nappe is equivalent to Bijni Thrust sheet in Uttarakhand and Daling Nappe in Sikkim and Bhutan and Arunachal and Samchu and Sumar Nappes.

In Uttarakhand, the Chail Nappe is made up of low to medium-grade metamorphic rocks (Munsiari Formation) of Achaean age (2600-2850 Ma Old). The Chail acts as the basement for the Lesser Himalayan rocks, and its root is not exposed as it is overlapped by the Jutogh Nappe.

Jaunsar Nappe

It is mainly developed in Himachal Pradesh and partly in the western Garhwal. The rocks of the Jaunsar Group, comprising Mandhali, Chandpur and Nagthat formations,constitute the basal sequence of the Inner Krol Belt and are moved over the foundation of the Deoban Group. Jaunsar is correlated with the Shimla Group rocks of Himachal Pradesh.

Garhwal Nappe

Auden (1937) first reported this nappe in the Garhwal region of Uttaranchal. It is made up of two thrust sheets, namely the Bijni Nappe (less travelled) and the Amri Nappe (more travelled) of crystalline nature containing schistose phyllite, quartzite, gneisses, migmatite and gneissic granite. The Garhwal Nappe has 80 km in the south in Garhwal and 95 km in western Kumaun, and 115 km in eastern Kumaun.

Berinag Nappe

It is made up of coarse-grained massive to bouldery sericitic quartz arenite. Berinag Thrust and Munsiari (Chail) Thrust demarcatetheir lower (southern) and upper (northern) boundaries, respectively. This nappe is developed in the inner Lesser Himalaya.

Krol Nappe

The Krol Nappe or Krol belt is nearly 400 km long having more than 6 km thick mainly sedimentary sequence is situated between Kunihar (Himachal Pradesh) in the northwest and

Nainital (Uttaranchal) in the southeast, and is further extended into Farwestern Nepal. Subsequent deformation of this Belt has resulted inthe formation of several synclines named as Pachmunda, Krol, Raigarh, Khanog, Saindhar, Nigali, Korgai, Mussoorie, Garhwal and Nainital.

3. Arunachal Pradesh

Thrust sheets or nappes propagated as in piggyback fashion, Siang, Siyam and Rikar are the three thrust sheets developed in the Structure and Tectonics of the Himalaya 17

Arunachal Pradesh. They are present in descending order, and towards the core Abor Volcanics are exposed along the Yingkiong and Dalbuing Faults.

4. Nappe of Tethyan Rocks

The miogeosynclinal Tethyan rocks show SW or NE verging folds. Allochthons of the Tethyans are present in the Kashmir and Chamba in India.

5. Suture Zone Nappe

The eugeosynclinal sequence of suture zone occurs as 'exotic' blocks on the Tethyan sequence in Pakistan, Jammu & Kashmir, Himachal Pradesh, Uttaranchal and Nepal. Since some part of these sequences had moved as a superficial thrust sheet over a distance of 30-80 km tothe south. These transported rocks include volcanics, flysch, and radiolarians, chert mixed with Palaeozoic-Mesozoic exotics of basement rocks.

Indus Suture

Indus Tsangpo Suture Zone, abbreviated as Indus Suture, is a narrow tectonic belt of more than 2500 km length uniting the Indian and Eurasian plates together into one landmass and is mainly developed in Tibet. It runs along the Indus River in the west and along the Tsangpo on the Brahmaputra River in the east; however, a small and tectonically highly complex portion of the suture occurs in the Ladakh of Kashmir and in Pakistan. The Indus Suture Zone is a tectonic unit lying between the Tethyan Thrust in the south and the Indus Thrust in the north, and in Pakistan, it is called the Main Mantle Thrust (MMT). It is composed of 5 km thick ophiolites, a few hundred metres wide narrow belt of ophilitic mélange.

Shyok Suture

The Shyok Suture, also described as the Northern Suture in Pakistan and is developed between the Kohistan arc and the Karakoram microplate of Pakistan, while in Ladakh, it is

situated north of the Ladakh Batholith. The Karakoram block represents the southern margin of the Eurasian plate and is situated north of the Shyok Suture.

Unconformities in the Himalaya

Frequently interrupted sequences of Late Achaean (Munsiari Formation of Kumaun; 2600-2850 Ma old) to Recent sediments constitute the stratigraphical records of the Himalaya. Each interruption or break indicates the presence of unconformities, and in some unconformities time gap is many hundredsof millionsof years, while in some it is just a few tens of thousands of years. Ravishanker et al. (1989) meticulously compiled the stratigraphical column of the Himalaya and identified a total of fifteen super sequences in it. According to them, a supersequence is a grouping of rocks formed in different parts of the Himalaya during a particular geological time and is separated by underlying and overlying unconformities. In short, a supersequence is a block of homotaxial lithounits demarcated by unconformity.

Rate of Upliftment of the Himalayan Terrain

Upliftment in the Himalaya has been quantitatively calculated in many locations by dating, triangulation, Global Positioning System (GPS) and by fossil record techniques. The Himalaya is rising with 5 mm/year, and upliftment of 3-5 km has taken place at many places in the Quaternary period. This rate is five times faster than measured in the Alps. Three to five or six phases of rapid upliftment have been recorded in the Quaternary. The most spectacular example of upliftment is the Tibetan plateau (average height 5100 m), which was just a few hundred meters above the mean sea level before the Quaternary. The Pir Panjal range is rising with 3.5-10 mm/year rates in Kashmir to become a barrier between the Karewa of the north and the Siwalik in the south, while the Great Himalaya is rising there with 0.7 to 1.1 mm/year. The Nanga Parbat has shown uplift of 6 km in the last 1.3 Ma with a rate of 10 mm/year and of 10 km in the past 10 Ma. Kargil molasse (Liyam Formation) contains fossils like fan palm, Trachycarpus, rhino skull, charaphytes gyronites (Livistone major). The present-day analogues of these fossils occur between 1600-2100 m altitude, while in Kargil, they are recorded at 5400 m level. This indicates more than 3300 m uplift of molasse since the Upper Oligocene. The Karakoram ranges rose by 2 mm/year. Doon Valley shows an interesting effect of recent tectonics. An uplift of Siwalik between 30-45 m relative to the Lesser Himalaya is recorded in many sections. Nainital rose to 2600 m along the MBT in the Quaternary. Kathmandu Valley has more than 500 m thick lake deposits at 1360-1550 m elevation at present. The fossil records show that the area had the same elevation before the Quaternary. The present uplift rate in the Himalaya appears to be very fast.

Subsidence in the Himalaya

Geodetic survey pointed out subsidence in several parts of the Himalaya, viz.,inthe Pala-Maneri Hydroelectricity Scheme area near Uttarkashi has shown subsidence of 0.7 to 8.8 cm during 1973-74 and 1977-78 and on the east bank of the Ganga River. Doon Valley has subsided by 6.0 cm during the period 1974-77 to 1991, and with respect to the Structure and Tectonics of the Himalaya

Force Direction

The direction of the maximum stress axis in the Himalaya varies from NNW-SSE in the Quetta region of Afghanistan to N-S and NNE-SSW along the Himalayan frontal arc, NE-SW in the eastern syntaxes and to the E-W in the Burmese trend.

Impact of Neotectonics on Topography

Several geomorphic features related totectonics have been mentioned earlier. It is commonly observed that in the transverse profile lower part of the relief shows youthful topography while the upper part of the relief shows mature or old topography. Three to six levels of terraces are recognised in the majority of the Himalayan valleys (viz. Yamuna valley), and also due to tectonic activities, several hundred-meter-wide valleys turn into narrow vertical gorges in the Dehradun and Nainital area. Due to neotectonic movements in Doon Valley river terraces (in the Rispana, Song, and Bandal rivers) and sub-Recent fans have been displaced. In Raipur (Dehradun), rocks of the Chandpur Formation override the Doon Gravel, indicating tectonic movements along the MBT. Seismites are reported from the Tons and Kathmandu Valleys. Pressure ridges are reported from the Siwaliks of Western Nepal and in Doon Valley. Srinagar Thrust (North Almora Thrust) not only differentially uplifted the terraces but also shifted the palaeochannel in Alaknanda Valley. Fault depression, sag ponds, fault saddles, and diversion and offset of streams and pressure ridges are reported from the outer Himalaya of Nepal. Pull-apart antecedent Sutlej Valley has carved out a more than 1000 m deep canyon due to Late Quaternary upliftment. Similarly, Brahmaputra, Kosi, Karnali, Bhatekosi, Trishuli, Ganga and Indus are antecedent rivers; these rivers enter into Lesser Himalaya through gorges. The Lesser Himalaya is uplifted at a rate of 0.7 to 1.1 mm/year, which is controlled by intracrustal boundary thrust and other faults.

Active Tectonics

This field of geology is mainly concerned with catastrophic activities of the recent past and with those likely to occur in the near future. Palaeoseismological investigations have been carried out in the Garhwal, Kumaun, and Himachal Pradesh, Doon Valley, Assam and in many parts of Nepal. It is reported that the repeat time of an earthquake of 8.4 magnitude is 200 to 270 years, and the entire Himalaya ruptures once in duration of 180 to 240 years.

Active Faults in the Himalaya

Nakata was the first to identify active faults in the Himalaya. Present-day displacement in several Himalayan faults has been identified by the photogeological, remote sensing, topographic and other techniques. Direction and rate of movement in them are quantitatively measured by precision levelling or by GPS techniques in many faults of the Himalaya. In the far northwestern Himalayan region, the Transcurrent Karakoram Fault, Tso Morari Fault, Tsokar More Plain Fault, Chandri Faults, Sarchu Fault, Spiti Fault and Lingtu Faults are active faults. Raikot Fault in Pakistan shows upliftment of 1.0-1.5 cm/year, causing lateral offset of Indus River in the east by 1.5 km, and has captured the Structure and Tectonics of the Himalaya / 23

The Soan River is due to tilting and also tilted Pleistocene sediments by 400. The Chaman Fault is also an active strike-slip fault. Yamuna Sinistral Tear is of neotectonic origin. Displacement of 100-200 m is recorded across the tear plane in the Higher Himalaya along with the development of secondary tears (Paligad and Ujargad strike-slip faults). In the Outer Himalaya, the Yamuna Tear has shown strike displacement of 30 cm in 4 years and between 1965 to 76 duration recorded vertical displacement in the order of 0.7 and 5.7 cm. In the adjoining Ganga Tear, the recorded respective horizontal and vertical displacements are 1.0 to 5.7 cm and 1.6 to 3.8 cm in a period of 11 years between 1974 and 85. Precision levelling and geodetic triangulation survey recorded horizontal movement of 3-15 cm and vertical movements of 0.7 to 8.8 cm during afour-year interval. Krol Thrust, Nahan Thrust and Shali Thrust are active faults present in the Uttaranchal and Himachal Pradesh. Black gouge entrapped in the Krol Thrust yielded 20660 450 years are suggesting reactivation of the fault at that time, while in the Yamuna Valley same fault has shown movement of 4 mm/year. The transverse Sile The MBT has lifted Doon Gravel by 200 m in the Late Pleistocene and Recent. Analysis of the trench wall revealed the occurrence of two large earthquakes in AD 1294 and AD 1423, and the possibility of another earthquake in AD 260. The Kuria Fault in Kumaun has produced an offset of 100 m in MBT. The 18 km long Sanghrkhola dextral strike-slip fault (NW-SE) has uplifted the southern block by 10 m relative to the northern block.

In Darjeeling, the average rate of movement in faults is 3-4 mm/year. In Arunachal Pradesh, older tectonic lineaments like the Main Central Thrust, the Main Boundary Thrust, and the Himalayan Frontal Fault show reactivation in localisedareas. Mishmash, Lapland and Tiding thrusts and Lohitpur, Tellu Nala, Roing, Hunli-Ryalli and Angolin-Kadali faults are recently reactivated and are deflecting the rivers, abrupt rise in the mountain front fault scarps without development of gullies, landslides, gorges, blockage of rivers, upliftment of river terraces and damage to civil structures like bridges.

5.3.4 SeismicZonation

The Indian Himalayan Region (IHR), spanning multiple northeastern and northern states, is one of the most seismically active zones in the world due to its location along the collision boundary of the Indian and Eurasian tectonic plates. The Seismic Zonation of the IHR highlights the vulnerability of these states to high-intensity earthquakes, as defined by the Medvedev-Sponheuer-Karnik (MSK) scale, which measures the impact of seismic events based on observed ground effects. The states in this region fall into Seismic Zones IV and V, indicating very high to extremely high seismic risk.

Table 5.1 SeismicZonationindifferentStatesoftheIHR

States	**IntensityMSK***	**SeismicZone**
Jammu&Kashmir	VIIItoIXormore	IV&V
HimachalPradesh	VIIItoIXormore	IV&V
Uttarakhand	IXormore	V
Sikkim	VIII	IV
ArunachalPradesh	IXormore	V
Meghalaya	IXormore	V
Mizoram	IXormore	V
Manipur	IXormore	V
Nagaland	IXormore	V
Tripura	IXormore	V
Assam	IXormore	V

*
Medvedev-Sponheuer-Karnik Scale, also known as the MSK or MSK-64, is a macroseismic intensity scale used to evaluate the severity of ground shaking on the basis of observed effects in an area of the earthquake occurrence.
Source*BISSeismicZone2000.Note:WestBengalhillsfallinZoneIV.*

Jammu & Kashmir and Himachal Pradesh lie in Seismic Zones IV and V, with MSK intensity levels ranging from VIII to IX or more, meaning they are susceptible to very destructive to devastating earthquakes. These states are characterised by rugged mountainous terrain and deep fault systems, making them especially prone to severe ground shaking and landslides during seismic events. The high population density in certain valleys and increasing urbanisation in vulnerable areas further increase the potential risk to life and infrastructure.

Uttarakhand is classified entirely under Seismic Zone V, the highest risk category, with MSK intensity IX or more, suggesting extreme vulnerability to major seismic activity. Located in the central Himalayas, the region has witnessed multiple historical earthquakes. The presence of densely populated towns, pilgrimage centres, and fragile mountain ecosystems adds to the seismic risk. The tectonic activity here is intensified due to the Main Central Thrust (MCT) and Main Boundary Thrust (MBT) fault lines that run across the state.

In the eastern Himalayan belt, Sikkim is situated in Seismic Zone IV, with an expected MSK intensity of VIII, indicating the likelihood of very damaging earthquakes. Although its seismic risk is slightly lower compared to other northeastern states, its steep slopes and settlement patterns still pose serious hazards during tremors.

The remaining northeastern states—Arunachal Pradesh, Meghalaya, Mizoram, Manipur, Nagaland, Tripura, and Assam—are all placed in Seismic Zone V, with MSK intensity levels of IX or higher. These regions are among the most earthquake-prone in the entire country. The region's complex geology, frequent tectonic movements, and location along active faults make it highly susceptible to intense seismic activity. Notably, Assam and Manipur have experienced several destructive earthquakes in the past. The infrastructural fragility, combined with high population density in urban areas like Guwahati and Imphal, compounds the potential damage risk.

5.4 CLIMATE

The Himalayas, as a great climatic divide affecting large systems of air and water circulation, help determine meteorological conditions in the Indian subcontinent to the south and in the Central Asian highlands to the north. By virtue of its location and stupendous height, the Great Himalaya Range obstructs the passage of cold continental air from the north into India in winter and also forces the southwesterly monsoon (rain-bearing) winds to give up most of their moisture before crossing the range northward. The result is heavy precipitation (both rain and snow) on the Indian side but arid conditions in Tibet. The average annual rainfall on the south slopes varies between 60 inches (1,530 mm) at Shimla, Himachal Pradesh, and Mussoorie, Uttarakhand, in the western Himalayas and 120 inches (3,050 mm) at Darjeeling, West Bengal state, in the eastern Himalayas. North of the Great Himalayas, at places such as Skardu, Gilgit, and Leh in the Ladakh portion of the Indus valley, only 3 to 6 inches (75 to 150 mm) of precipitation occur.

Local relief and location determine climatic variation not only in different parts of the Himalayas but even on different slopes of the same range. Because of its favorable location on top of the Mussoorie Range facing the Dehra Dun, the town of Mussoorie, for example, at an

elevation of about 6,100 feet (1,900 meters), receives 92 inches (2,335 mm) of precipitation annually, compared with 62 inches (1,575 mm) in the town of Shimla, which lies some 90 miles (145 km) to the northwest behind a series of ridges reaching 6,600 feet (2,000 meters). The eastern Himalayas, which are at a lower latitude than the western Himalayas, are relatively warmer. The average minimum temperature for May, recorded in Darjeeling at an elevation of 6,380 feet (1,945 meters), is 52 °F (11 °C). In the same month, at an elevation of 16,500 feet (5,000 meters) in the neighborhood of Mount Everest, the minimum temperature is about 17 °F (−8 °C); at 19,500 feet (6,000 meters) it falls to −8 °F (−22 °C), the lowest minimum having been −21 °F (−29 °C); during the day, in areas sheltered from strong winds that often blow at more than 100 miles (160 km) per hour, the sun is often pleasantly warm, even at high elevations.

There are two periods of precipitation: the moderate amounts brought by winter storms and the heavier precipitation of summer, with its southwesterly monsoon winds. During winter, low-pressure weather systems advance into the Himalayas from the west and cause heavy snowfall. Within the regions where western disturbances are felt, condensation occurs in upper air levels, and, as a result, precipitation is much greater over the high mountains. During that season, snow accumulates around the Himalayan high peaks, and precipitation is greater in the west than in the east. In January, for example, Mussoorie in the west receives almost 3 inches (75 mm), whereas Darjeeling to the east receives less than 1 inch (25 mm). By the end of May, the meteorological conditions have reversed. Southwesterly monsoon currents channel moist air toward the eastern Himalayas, where the moisture rising over the steep terrain cools and condenses to fall as rain or snow; in June, therefore, Darjeeling receives about 24 inches (600 mm) and Mussoorie less than 8 inches (200 mm). The rain and snow cease in September, after which the finest weather in the Himalayas prevails until the beginning of winter in December.

5.5 WATER RESOURCE

Water is universally acknowledged as one of the most vital natural resources, second only to air, essential for sustaining all forms of life. The water resource system is composed of a variety of sources, including snow, glaciers, rivers, groundwater, springs, lakes, and wetlands, all of which collectively support ecological and human systems. The Indian Himalayan Region (IHR) plays a central role in this context and is often referred to as the "Water Tower of Asia" due to its vast reserves of snow and ice-covered mountains. These mountains not only act as natural water reservoirs but are also integral to maintaining the balance of water, food, energy, and environmental security for the region.

The IHR is the birthplace of many major rivers that flow across the Indian subcontinent and beyond, making it a lifeline for nearly 2 billion people. These water bodies are indispensable for various purposes such as domestic use, irrigation, industrial applications, and hydropower

generation. Moreover, the IHR provides a wide range of ecosystem services, categorized as Provisioning, Supporting, Regulating, and Cultural services. These services are fundamental in maintaining biodiversity, supporting agriculture and forestry, regulating climate and hydrological cycles, and nurturing the rich cultural heritage and traditional knowledge systems of the mountain communities.

In addition to its hydrological and ecological significance, the IHR is renowned for its hill stations and scenic landscapes, which serve as popular holiday destinations. Located at higher altitudes, these places offer a pollution-free environment, mild and pleasant climate, and peaceful settings far removed from urban chaos. Their aesthetic appeal and natural serenity make them valuable not only from a tourism perspective but also for their role in promoting mental well-being and cultural connections. Thus, the IHR stands as both a functional and spiritual sanctuary, embodying the intertwined relationship between nature and society.

The Himalayas and their hill stations represent one of the most ecologically sensitive and biologically diverse regions on the planet, housing an extraordinary range **of** flora, fauna, and glaciers**.** However, this fragile ecosystem is facing escalating environmental stress due to intensifying human interference**.** The once harmonious relationship between humans and nature is being strained, giving rise to frequent ecological imbalances and environmental disasters**.** In states likeHimachal Pradesh**,** this degradation is especially evident, where urban environmental problems are compounding rapidly. Population growth exerts immense pressure on limited natural resources, and practices such as deforestation, overgrazing, and unregulated construction, coupled with expansive road networks and landscape alterations, have led to irreversible ecological damagein several parts of the region.

In the context of urbanization, the foothills (Siwaliks) have witnessed a more accelerated pace of urban growthcompared to higher altitudes. Urban centers like Srinagarin the western Himalayas and Gangtok, Kalimpong, and Darjeelingin the eastern Himalayas are expanding rapidly, posing further environmental challenges. While higher altitudes remain less urbanized, the development pressures are gradually creeping upwards, driven by the demand for connectivity, housing, and tourism. In hill stations, tourism has emerged as a central economic activity, and efforts are often focused on increasing tourist footfall. As a result**,** infrastructure development—such as hotels, roads, and commercial establishments—has outpaced the carrying capacity of the local environment.

Unfortunately, the natural constraints that should guide such development—like land stability, water availability, waste disposal, and ecological sensitivity—are frequently ignored. This results in the depletion of natural resources, degradation of ecosystems, and collapse of traditional support systems. If this unchecked expansion continues, not only will the natural charm and ecological integrity of the Himalayan hill stations be lost, but the very livelihoods

andsustainability of mountain communities will be put at risk. Therefore, a balanced, eco-sensitive approach to development is crucial to preserve the environmental health of the region for future generations.

The unique geographical setting of many hill stations, established during the colonial era by the British on ridge-tops, poses significant challenges to sustainable water management. While these elevated locations offered cooler climates and scenic views, they are inherently distant from natural water sources, which typically originate in the valleys below. This topographical mismatch creates a structural water deficit, as water has to be lifted or transported uphill, requiring considerable infrastructure and energy.

The water scarcity problem is further aggravated by the neglect of traditional water systems, such as stone spouts (naulas) and springs, which historically met the needs of local communities in a sustainable manner. These systems, often ingeniously designed to work in harmony with the mountain environment, have been disregarded or poorly maintained. In their place, modern piped water systems have been introduced—many of which are technically flawed, leaky, and inefficient. These newer systems are often superimposed without proper integration into the existing traditional frameworks, causing redundancy and system failure.

Additionally, poor governance and planning have placed undue emphasis on centralized piped water supply, ignoring the potential of localized, community-managed water systems. As a result, water distribution becomes unequal and unreliable, especially for the resident populations. The problem is exacerbated in tourist seasons, when the influx of visitors dramatically increases water demand. Local communities often suffer water shortages as resources are diverted to meet the consumption needs of tourists and commercial establishments, including hotels and restaurants. This unsustainable model creates conflicts over water use, undermines water security, and threatens the long-term resilience of mountain towns. To address this crisis, there is an urgent need to revive traditional water harvesting practices, modernize existing systems with ecological sensitivity, and prioritize the water needs of local communities alongside tourism development.

Three main Rivers basins in Indian Himalayan Region:

1. **Ganga River Basin**
2. **Indus River Basin**
3. **Brahmaputra River Basin**

5.5.1 Ganga River Basin

Ganga: The Ganga river is one of the prime rivers of India and it flows east through the

Gangetic plains of Northern India into the country of Bangladesh. The Ganga originates as Bhagirathi from the Gangotri glaciers in the Himalayas at an elevation of about 7,010 m in Uttarkashi district of Uttarakhand. After its confluence with the Alaknanda at Devprayag, the river assumes the name of 'Ganga' and flows for a total length of about 2525 km (Uttar Pradesh 1,450 km, Bihar 445 km, West Bengal 520 km) up to its outfall into the Bay of Bengal through the former main course of BhagirathiHooghly. Although many small streams comprise the headwaters of the Ganga, the six longest are the Alaknanda, Dhauliganga, Nandakini, Pindar, Mandakini, and Bhagirathi rivers. The five confluences of these rivers are considered important and sacred in Hindu mythology, known as the Panch Prayag, are all along the Alaknanda. They are, in downstream order, Vishnuprayag, where the Dhauliganga joins the Alaknanda; Nandprayag, where the Nandakini joins; Karnaprayag, where the Pindar joins, Rudraprayag, where the Mandakini joins; and finally, Devprayag, where the Bhagirathi joins the Alaknanda to form the Ganga river.After running some 250 km from its source, the Ganga pierces through the Himalayas at Sukhi (near Rishikesh), before turning southwestwards for another 30 km where it finally descends into the vast Indo-Gangetic plain at Haridwar (elevation 283 m). At this point, the river swells into a mighty stream of 750 m width. The Ganga does not receive any major tributary until the Ramganga joins at Kannauj adding about 17.79 billion cum/annum of water. From Haridwar down to Allahabad, a distance of about 720 km it flows in south/south-easterly direction. At Allahabad (1020 km from the source), the Ganga is joined on the right by the Yamuna river, which actually contributes more water (57.24 billion cum / annum) than the main river itself, augmenting the flow volume of the Ganga significantly. Lower down, the river bears eastwards and flow past Varanasi to enter Bihar just below Ballia.



Fig. 5.1 Source Google Image

Entering West Bengal, the river swings round the Rajmahal hill range opposite Manihari Ghat and flows almost due south. The delta of the Ganga can be said to start from Farakka, in the state of West Bengal, having increased its flow volume at each confluence. In addition to flow volume, water quality and sediment load also fluctuate depending on the composition of the contributing stream. The river divides into two arms about 40km. Below Farakka. The left arm, known as the Padma, flows eastwards into Bangladesh, while the right arm, known as the Bhagirathi, continues to flow in a southerly direction. After Nabadwip, it is known as the Hooghly. The river ultimately flows into the Bay of Bengal downstream of Calcutta. Important tributaries to join the river in West Bengal are the Ajay, the Dwarka, the Damodar, the Rupnarayan and the Haldi.

Yamuna: The Yamuna river is the biggest tributary of the Ganga river. It is also considered as sacred river in India. The Yamuna river originates in the Tehri Garhwal district of Uttarakhand from the Yamunotri glacier near Banderpoonch peaks (38° 59'N 78° 27'E) at the elevation of about 6,320m above the sea level in the Mussoorie range of lower Himalayas. Arising from the source, the Yamuna river flows through a series of valleys for about 200 km in lower Himalayas and then emerges into Indo-Gangetic plains. In the upper reaches, the gradient of the river is steep and the entire geomorphology of the valley has been carved by the erosive action of the river water. In the headwater reach of 200 km, the Yamuna draws water from several major streams. The combined stream flows through the Shivalik range of hills of Himachal Pradesh and

Uttarakhand states and enters into the plains at Dak Pathar in Uttarakhand. From Dak Pathar, the Yamuna flows through the famous Sikh religious shrine of Poanta Sahib. Flowing through the Poanta Sahib, it emerges from the foothills of Kalesan, north of Hathnikund/Tajewala where the river water get diverted into Western Yamuna Canal and Eastern Yamuna Canal for irrigation.
The Yamuna river enters Delhi near Palla village after traversing for about 224 km. Further downstream, Yamuna flows through the Agra city which is famous for Taj Mahal. Shortly afterwards, it passes through another historical city, Mathura. The total length of Yamuna from its origin to Allahabad (confluence with Ganga) is 1,376 km and the drainage area is 3,66,223 Sq.km. The Yamuna is a mighty river in itself and has a number of tributaries. In its first 170 km stretch, the tributaries the Risiganga, Hanumanganga, Tons and Giri join the main river. Later big rivers, such as the Chambal, the Sind, the Betwa and the Ken join it. The catchment of the Yamuna river system covers the parts of Uttar Pradesh, Uttarakhand, Himachal Pradesh, Haryana, Rajasthan, Madhya Pradesh and Delhi.

Tributaries of the Yamuna

The tributaries of Yamuna account for 70.9 percent of the catchment area; the balance of 29.1 percent area is directly drained by the Yamuna. Further the catchment area of Yamuna amounts to 40.2 percent of the area of the Ganga basin and 10.7 percent of the land in our country. The important tributaries of Yamuna river are the Tons, the Chambal, the Hindon, the Sarda, the Betwa and the Ken. The main Yamuna and Tons are fed by glaciers, viz., the Banderpoonch glacier and its branches originate from the Great Himalayas. Other small tributaries include the Risiganga, the Hanumanganga, the Unta, the Karan, the Rind and the Giri. The Risiganga a tributary of the Yamuna rises 3 km further north-west and joins the Yamunotri stream on its right bank near Banas while other two streams the Unta and the Hanumanganga rising from the Jakhal glacier and the Chhaian Barmak glacier respectively to the south of Banderpoonch meet the main stream on its left bank. A brief description of important tributaries of the Yamuna is given in the following sections:

Tons: The Tons is the largest Himalayan tributary of the Yamuna, rises from the north-eastern slope of Banderpoonch at an elevation of 3900 m and flowing in a valley north-west of Yamuna, meets it below Kalsi on the south-west fringe of the Mussoorie range. At the confluence of the two rivers, the Tons carry almost twice the volume of waters as the Yamuna and are considered as the principal source of the river. Another important tributary, the Giri rise further north-west of the Tons draining areas in Himachal Pradesh.

Kali: The Kali river originates from the Doon valley in the western part of Uttarakhand. The river is named Kali possibly because of the color of the river water that is black in color. From its origin up to the confluence with Hindon river, a tributary of Yamuna travels a distance of about 150 km through Saharanpur, Muzaffarnagar, Meerut and Ghaziabad districts. Despite a

significant drainage area of about 750 Sq.km, mostly laying in plains the river does not carry any significant flow.

Hindon: Hindon is an important tributary of Yamuna river, which is sandwiched between two major rivers: Ganga on the left and Yamuna on the right. Hindon originates from upper Shivalik (lower Himalayas). It is purely rainfed river with a catchment area of about 7,083 Sq.km and this river has a total run of about 400 km.

Banganga: The Banganga originates in the Aravalli hills near Arnasar and Bairath in Jaipur district. It flows towards south up to the village of Ghat, then east through partly hilly and partly plain terrain. The length of the river is 240 km. The main tributaries of the Banganga are the Gumti Nala, the Suri, the Sanwan and the Palasan rivers.

Chambal: The most important tributary of the Yamuna is the Chambal river also known as Charmanvati in ancient times is the largest river flowing through Rajasthan state. It rises in the Vindhya range near Mhow in the Indore district of Madhya Pradesh at an elevation of 854 m and flows generally northerly direction up to the Madhya Pradesh-Rajasthan border. In this reach, the Chamla, the Siwana and the Retam join the river from the left and the Shipra and the Chhoti Kali Sindh from the right. It receives a major tributary from the right near the village of Laban, the Kali Sindh and another tributary, the Kural, from the left. The Banas, the major left bank tributary of Chambal, joins the Chambal near the village of Rameshwar and another major right bank tributary, the Parbati, joins the river near the village of Pali district. The river is mainly a rainfed river.

Betwa: The Betwa river tributary of the Yamuna rises in the Bhopal district of Madhya Pradesh at an elevation of about 475 m above the mean sea level. After flowing in a generally north-eastern direction through Madhya Pradesh, it enters the Jhansi district of Uttar Pradesh. After traversing a distance of 590 km, the river joins the Yamuna near Hamirpur in Uttar Pradesh. One of the important tributaries of the Betwa river is the Dhasan river. The river has 14 principal tributaries out of which 11 are completely in Madhya Pradesh. The Halali and Dhasan rivers are the important tributaries of the Betwa river, the Halali being the largest tributary with a length of 180 km.

Ken: The Ken, one of the tributary of Yamuna flows through the Madhya Pradesh and Uttar Pradesh states. The Ken River has its origin on the north-west slopes of the Kaimur hills in the Satna district of Madhya Pradesh. It generally flows in a north-easterly direction and joins the Yamuna near Chilla. The river has a total length of 357 km and forms a state boundary between the Chhattarpur district of Madhya Pradesh and the Banda district of Uttar Pradesh. The tributaries of the Ken are the Sonar, the Bearma, the Kopra, the Bewas, the Urmil, the Mirhasan, the Kutni, the Kail, the Gurne, the Patan, the Siameri, the Chandrawal, the Banne, etc. The

longest tributary is Sonar, which is 227 km in length and wholly lies in Madhya Pradesh.

Sindh: The Sindh river is one of the longest rivers of Central India to join the Yamuna river on its right bank. It rises in a tank 543m above sea level near a village in the Vidisha district of Madhya Pradesh. It generally flows in a north-eastern direction and joins the Yamuna in Uttar Pradesh, slightly downstream of the confluence of the Chambal with the Yamuna. The river receives a number of tributaries; the more important of them are the Parbati and the Kunwari on its left bank and the Pahuj on its right.

Ramganga: The Ramganga river is the first major tributary to join the Ganga at its left bank. It rises in the lower Himalayas at an altitude of about 3110 m above the mean sea level near the village of Lohba in the Garhwal district of Uttarakhand. The total length of the river from the source to its outfall into the Ganga is 596 km, and the entire length lies in the Uttarakhand and Uttar Pradesh. Several tributaries join the river mostly from the left. The river enters the plains at Kalagarh near the border of the Garhwal district, where the famous Ramganga dam has been constructed. Beyond Kalagarh, the river flows in a southeasterly direction and finally joins the Ganga on its left bank near Kannauj in the Fategarh district. The most important tributaries are the Khoh, the Gangan, the Aril, the Kosi and the Deoha (Gorra) rivers.

Gomti: The Gomti river originates near Manikot in the Pillibhit district of Uttar Pradesh at an elevation of 200 m and drains the area between the Ramganga and the Sarda, in the upper reach and the area between the Ganga and the Ghaghara, in the lower reach. The total length of the river is about 940 km. From the origin to its confluence with Ganga, the river flows entirely in the State of Uttar Pradesh. Lucknow the capital city of Uttar Pradesh is situated on the banks of Gomti and it joins the Ganga in Audihar in Jaunpur district of Uttar Pradesh. The main tributaries of the Gomti are the Gachai, the Sai, the Jomkai, the Barna, the Chuha and the Saryu. Major cities situated on its banks are Lucknow, Sitapur, Hardoi, Barabanki, Rae Bareli, Pratapgarh, Sultanpur and Jaunpur.

Ghaghara: The Ghaghara river known variously as the Sarju or the Dehwa contains the combined waters of the Chauka or Sarda and the Kauriala which unite near Bahramghat in the Baranki district in the Uttar Pradesh. The Ghaghara is a mighty river with a considerable Himalayan catchment. The Ghaghara (Karnali or Kauriala) rises in the glaciers of Mapchachungo in Nepal, north-west of Taklakot and collecting the waters of the Tila, the Seti and the Beri rivers carves out a deep 600 m gorge at Shishapani. In the plains it is joined by the Sarda (Kali or Kaliganga) and flows south-eastward so as to meet the Ganga at Chapra. Ghaghara enters into India at Kotia Ghat near Royal Bardia National Park, Nepal Ganj, where it is known as Girwa for about 25 km. A barrage called Girijapuri barrage is constructed and below the barrage the river Girwa attains the name of the Ghaghara. Out of the total catchment of the Ghaghara only 45 percent lies in India. The Sarda river is the important tributary of the

Ghaghara, which forms the boundary between India and Nepal for some distance. The total length of the Ghaghara before its confluence with Ganga river at Doriganj downstream of Chapra town in Bihar is 1,080 km. The Ghaghara river carries more water than Ganga before its confluence. The Sarju, the Rapti and the Little Gandak are other important tributaries of the Ghaghara.

Karamnasa: The Karamnasa, tributary of the Ganga, originates at an elevation of 350 m near Sarodag on the northern face of the Kaimur range in the Mirzapur district of Uttar Pradesh. It flows in a north-westerly direction through the plains of Mirzapur and joins the Ganga river near Chanusa. The tributaries are the Durgawati and the Chandraprabha, the Karnauti, the Nadi and the Khajuri.

Sone: The Sone river (Swarna Nadi) is the principal right bank tributary of the Ganga, rises at Sonbhadra in the Maikala range of hills in Madhya Pradesh at an elevation of 600 m in Amarkantak plateau not far off from the source of the Narmada river. It is a large river with a length 780 km and a drainage area of 71,900 Sq.km. It first flows in north-westerly direction and then takes a northeasterly course to meet the Ganga near Arrah (west of the Patna). In the plains of Bihar it has wide bed (4.8 km) and assumes huge size during rains. The important tributaries of the Sone are the Mahanadi, the Banas, the Gopat, the Rihand, the Kanhar and the North Koel.

Punpun: The Punpun river is an important river bank tributary of the Ganga River in lower reaches. The Punpun River originates from the Chottanagpur hills of Palamau district at an elevation of 300 m in Bihar. The river mostly flows in a northeast direction and finally joins the Ganga River at Fatawh, about 25 km downstream of Patna. The river is 200 km long and is mostly rainfed and carries little discharge during the non-monsoon period. It meets several tributaries namely the Butane, the Madar and the Morhar, while flowing through the Chottanagpur plateau. The Punpun often causes heavy flood damage on the eastern side of Patna city.

Gandak: The Gandak river (Sadanira, Saligrami in Nepal, or Narayani in the plains), known as the Kali or Krishna Gandak in the upper reaches, rises at the altitude of 7620 m in Tibet near Nepal border. After receiving number of tributaries, like the Mayangundi, the Bari and the Trisuli, the Gandak debouches into the plains of the Champaran district of Bihar at Tribeni. At this point two more tributaries namely the Panchnad and the Sonhad join the river. The Gandak comprises two streamsthe Kali Gandak rising close to Photu Pass near Muktinath and the Trisulganga originating north of Gosainthan (8013 m). It cuts through the Mahabharat Range and covering a distance of 425 km joins the Ganga near Patna. Its total catchment area is 48,500 Sq.km, of which 9,540 Sq.km lies in India. The total length of the river from its source to outfall into the Ganga is 630 km of which 255 km falls in India.

Kosi: The Kosi (Kausika) is the largest of the tributaries of the Ganga is formed by the confluence of three streams namely the Sun Kosi, the Arun Kosi and the Tamur Kosi, all taking their origin in the Himalayan region of Nepal and Tibet. The Arun Kosi (Phungchu in Tibet) rises to the north of Gosainthan is the biggest of the three streams and has two of the highest peaks in the world namely Mount Everest and Mount Kanchenjunga in its catchment. It has a total length of 730 km with a drainage area of 86,900 Sq.km (in India 21,500 Sq.km). The Kosi is notorious for its frequent and disastrous floods and shifting of courses. It is also called as 'the sorrow of Bihar' and meets the Ganga 32 km west of Manihari. The main tributaries of Kosi river are Bagmati and the Kamala rivers.

Mahananda: The Mahananda river originates in the hills of the Himalayas in the Darjeeling district of West Bengal at an elevation of 2100 m. The first 20 km of its course lies in the hills of Darjeeling and thereafter it flows in a south-westerly direction forming the boundary between India and Bangladesh. The Balsan, the Mechi, the Ratwa and the Kankai are the main tributaries of the Mahananda river.

Mayurakshi: The river has its origin on the slopes of Trikut hills about 43 km upstream from Dumka in Bihar. At its origin it is known as Matihara. The prominent among its tributaries are the Bhurburi, the Dhobai, the Pusaro, the Tepra, the Bhamri, the Dauna and the Sidheswari rivers.

Damodar: The Damodar river also known as the Deonadi in its initial reaches is one of the most important rivers to join the Ganga on its right bank, east of the Sone. The Damodar rises in the south-east corner in the hills of the Chottanagpur Plateau of the Palamau district of Bihar at an elevation of 1366m. It joins the Hugli river 48 km south of Kolkata with the length of 541 km and drainage area of 22,000 Sq.km. The river has been tamed through DVC multi-purpose project which is providing significant contribution in the economic development of the area.

Ajay: The Ajay river originates in the low hills near Deoghar in the Santhal Parganas district of Jharkhand and flows in a south-easterly direction passing through the Monghyr, Birbhum and Burdwan districts of West Bengal. Ultimately the river falls into the Bhagirathi river at Katwa about 216 km above Calcutta. The Ajay river system lies between the Mayurakshi on the north and Damodar and the Banka/Khari river system on the south. The Ajay river traverses a total length of 299 km, 24 km being in Monghyr, 102 km in District Santhal Parganas, 22 km along the boundary of Santhal Parganas and Burdwan, 115 km along the boundary between Singhbhum and Burdwan and the rest of the total length falls in the Burdwan district of West Bengal. It meets the Bhagirathi near Katwa. The river has a catchment area of 6,050 Sq.km. The various tributaries of the Ajay river are Darua, Pathro, Jainti, Hinglo, Tumuni, Kane, Kanur and Kundur rivers.

5.5.2 Indus River Basin

River network or drainage channels which flow from higher reaches to lower levels often following the topography and slope of the terrain. They flow towards the sea or lake waters. The network of drainage consists of rivers and streams.

The Indus River rises from the lofty mountains of Himalayas around Mansarovar Lake in Tibet. The total length of Indus from origin to its outfall in Arabian Sea is 2,880 km, out of which 801 km flows through India. Its principal tributaries in India are the Jhelum, the Chenab, the Ravi, the Beas and the Satluj, all joining from left.

The chief right bank tributaries of the Indus are the Shyok, the Shigar and the Gilgit while the important left bank tributaries are the Astor, the Shigar (South),the Zaskar, and the Hanle.The Shyok originates from the Depsang Plain(above 5000m), flows westwards and reaching the flanks of the Karakoram Ranges takes a turn towards the South Eastern again to take a sharp bend towards the North West. After receiving the Nubra and the Daltoro as its right hand tributaries, the Shoyk meets the Indus about 40km above Skardu.

The Shigar draining the meltwaters of some of the famous Karakoram glaciers,joins the Indus just opposite Skardu. The Gilgit takes its origin near North north-northwest boundary of Kashmir and receives Ghizar and the Hunza as its right and left-hand tributaries, respectively.The Hunza originates from beyond the Karakoram Range, which it crosses after receiving Shishal as its left-hand tributary.

The Astor rises near Burzil Pass and flowing in the north–westerly direction drains the area lying east of the Nanga Parbat and joins the Indus a little below Bunji. The Shigar (South) drains the northen slopes of the Himadri with its tributaries, the Shiugo, Dras, Suru and Wakha. It joins Indus from opposite Marol. The Zaskar with its tribuatries Doda,Tsarap Lingti and Khurna drains the northern slopes of the Zaskar ranges and join the Indus about 40km below Leh. The Hanle, a small left hand tributary of the Indus, drains the area lying east of the lake Morarai in Rupshu and joins the Indus near Loma.



Fig. 5.2 Source: Google Image

The Jhelum River is known in Kashmir as Veth. It has its source in Verinag, aspring at the bottom of a high scarp of a mountain spur. At the upper end of the Kashmir Valley. The river has several tributaries in the valley.The Jhelum originating from the eastern mountains girdle of theVale of Kashmir meanders in the Vale, enters the Wular lake, leaves it near sopore and flows in a narrow gorge across the Pir Panjal from Baramula to Muzaffarabad, where it sharply turn towards the south making a typical hair-pin bend. Its main right hand tributaries area the Liddar, The Sind and the Kishan Ganga, the former two joining it in the Vale of Kashmir.The poonch is only important tributary on the left bank of the Jhelum joining it near Dhangrol in Jammu region. The Chenab River rises in two streams- the Chandra and the Bhaga in the Himalayan canton of Lahul in Himachal Pradesh. The united stream known as the Chandrabhaga or Chenab flows through the Pangi valley and enters Kashmir. The Chandra Bhaga, the largest river in Himachal Pradesh, is the joint stream of Chandra and the Bhaga. The two streams have their origin on the opposite sides of Bara Lacha at an elevation of 4,900m. After their confluence at Tandi, the Chandra and Bhaga flow as a joint stream (Also Known as Chenab) for 122 Km before entering Kashmir. The Chenab drains the eastern section of the southern slopes of the Pir Panjal, the Jammu hills and the foothills plains. The main tributaries in its passage up to Kishtwar are

Thirot, Shedi, Lidar and Marusudar. Among these, Marusudar is the biggest tributary, which meets the Chenab at Bandalkot. Between Kishtwar and Akhnoor, Chenab receives the water of Neeru, Pugal, Bagi, Bachleri, and Ana tributaries.

The Ravi River rises in Bara Banghal as a joint stream formed by the glacier-fed Bhadal and Tant-Gari and escapes from the area through a precipitous gorge. The Ravi reaches near the Rohtang Pass in the Kangra district and drains the southern slopes of the Dhauladhar.The length of the river is about 95 km in Himachal Pradesh.The Ujh River is a tributary of the Ravi. The headwaters of Ujh lie in the Kailash Mountains at an altitude of 4,300 m near the Bhaderwah hills of Jammu province.

The Beas River rises in the Pir Panjal range near Rohtang Pass.It runs past Manali and Kulu, where its beautiful valley is known as the Kulu valley.It flows from the north-west path from the town of Mandi and later a westerly path, before entering the Punjab plains near Mirthal.It joins the Satluj River near Harika, after being joined by a few tributaries. Fairly steep in its upper portion, it meanders lower down in a westerly course.The river flow in summer mainly consists of monsoonal run-off combined with snow-melt discharge.

The Satluj River rises from the Rakas Lake, which is connected to the Manasarover Lake by a stream. It has a very long course through the mountain ranges.It flows for a distance of 676 km, almost parallel to the Indus and then cuts right through both the Zaskar range and the Great Himalaya. It flows in a north-western direction and enters Himachal Pradesh at the Shipki Pass, where it is joined by the Spiti River.It cut deep gorges in the ranges of the Himalayas and finally enters the Punjab plain after cutting a gorge in a hill range, the Naina Devi Dhar, where the Bhakra Dam, having a large reservoir of water, called Gobind Sagar, has been constructed. It turns west below Rupar, and it is later joined by the Beas.

5.5.3 Brahamaputra River Basin

The course of the Brahmaputra River can be divided into three reaches: Upper, Middle, and Lower. In the upper reaches, the river is fed by the glaciers and in the lower reaches, it is joined by a number of tributaries.The three reaches are described briefly below:

Upper Reach: In its upper reach, the river flows 1,625 km from the source to the Indo-China border through the Tibetan plateau, mainly in an east direction, almost parallel to the Himalayan mountains and north thereof. In Tibet, it is known as “Tsangpo”. After flowing for 80 km in an easterly direction, Tsangpo meets two big rivers, viz, Mayum Chu and Chema Yung Dung.In the eastern part of the Tibetan plateau, the Tsangpo River takes a hairpin bend around the Namcha Barwa mountain range. Tsangpo arrives at the Indo-China border near Monku at an elevation of 660 m and flows for 5 km as the international boundary to arrive at Kobo in Arunachal Pradesh,

India. It enters India flowing south and is known as the Siang River. Up to this reach, the major tributaries joining the Tsangpo are the Shap Chu, Nayang Chu, Rang Chu, Yarling Chu, Tong Chu, Shang Chu, Kyi Chu and Po-Tsangpo.

Middle Reach: In the middle reach Brahmaputra, from the Indo-China border to the Indo-Bangladesh border, the Brahmaputra flows 916 km through India.In Arunachal Pradesh, the river is known as Siang in the upper reach and Dihang in the lower reach. The river then flows almost in a Southern direction for another distance of about 226 km from the Indo-China border up to Passighat. Dihang River enters the plains of Assam at Kobo, where it meets two major trans-Himalayan tributaries, Dibong and Lohit, coming from northeast and east, respectively. The combined flow, hereafter called the Brahmaputra, flows westward through Assam until near Dhubri, where it abruptly turns south and enters Bangladesh and then falls into the Bay of Bengal. The river is highly braided due to its low gradient. As a result, there are innumerable riverain islands. ˚E), the former biggest river island of the world,is the most remarkable feature of the valley reach of the Brahmaputra.Owing to active bank erosion, the area of the island has reduced from 1300 Sq.km as in 1950 to 900 Sq.km at present.

The river Brahmaputra receives several tributaries at its north and south banks (Map 2) in the catchment area in India. Northern tributaries also receive considerable contribution from snow in higher ranges of the Himalayas, with peak contribution commencing in August.The major tributaries are as follows:

Tributaries from the North bank: The Subansiri, the Manas, the Ranganadi, the Borgong, the Jiadhal, the Sankosh, the Siang, the Kameng (Jiabharali in Assam), the Dhansiri (North), the Puthimari, the Pagladiya, the Champamati, the Saralbhanga, the Aie and the Sankosh.

Tributaries from the South bank: The Noa Dehing, the Buridehing, the Debang, the Dikhow, the Dhansiri, the Kopili, the Digaru, the Dudhnai, and the Krishnai.

The characteristics of the North bank tributaries are quite different from those of the South bank tributaries. The north bank tributaries are flashy and flow through steep slopes.These rivers carry a heavy silt charge, thus forming shallow braided channels and coarse sandy beds. Rainfall in the north bank tributary basin is much higher, and the catchment areas of the north bank tributaries are also much bigger than the south bank tributaries. The South bank tributaries have flatter grades, deep meandering channels, fine alluvial soils and comparatively low silt charge.

Lower Reach: It covers the lower portion of the river for a length of 337 km from the Indo-Bangladesh border to its outfall into the Bay of Bengal.The whole portion of the lower reach of the river falls within Bangladesh.Near the Indo-Bangladesh border, the Brahmaputra

River takes a turn towards the south and flows mostly in the southern direction with a little eastward trend. The river flows 225 km from the Indo-Bangladesh border up to Goalundo. In the reach from the confluence of the Teesta River near Bahadurabad to Goalundo, the Brahmaputra River is known as Jamuna. At Goalundo, the Brahmaputra (Jamuna) joins another major river, the Ganges-Padma, coming from the west, and the combined river flows as Ganga-Padma for 80 km. Near Rajabari, another major tributary, Meghna, coming from the north-east, joins it and the combined river flows for 32 km as Meghna River. A little downstream, the Meghna River trifurcates into three channels forming a delta. The three channels are: Sandwip (the east channel), Shahbaz (the central channel), and Tutulia (the western channel). These channels ultimately outfall into the Bay of Bengal, forming broad estuaries.Practically, there is no notable tributary on its east (left) bank, except the Meghna River.Important tributaries on its right bank are the Ridak, Jaldhaka (Dharla), Teesta and Torsa.



Fig.5.3 Source: Google Image

The important tributaries of the Brahmaputra, lying in the Indian Territory, are described below:

(i) Subansiri: Subansiri is among the largest tributaries of the Brahmaputra. It is a snowfed perennial trans-Himalayan riverthat rises in the mountains of Tibet. In India, the river drains 347.84 km, and the rest of the riverflows in Tibet. It drains an area of 37,700 Sq.km. Subansiri has a maximum discharge of 18,799 cumec and a minimum of 131 cumec. It contributes 7.92% of the total yield of the Brahmaputra.

(ii) Kameng (Jiabharali): The Kameng rises from the hills of the Himalayas, presumably in the territory of Tibet, beyond the Aka & Duffa Hills. The river Kameng flows for 55 km in south south-southwesterly direction and then reaches Bhalukpong, where it ends its hilly journey. The river is nearly 205.72 km long.

(iii) Dhansiri: The Dhansiri rises in the southwest corner of Nagaland below the Laishiang peak. From its source up to Dimapur, the Dhansiri forms the boundary between the districts of Cachar, Nagaon and Nagaland. Beyond Dimapur, the river enters and flows through the KarbiAnglong and Golaghat districts of Assam.

(iv) Buri-Dihing: The Buri-Dehing is formed by the confluence of the Namphuk and the Namchik, which rises from the Patkai ranges and the Maganton River, which is the southern branch of the Noadehing. The Namphuk, which may be considered the principal source of the Buridehing.

(v) Kopili: The Kopili is one of the important tributaries of the Brahmaputra on its left bank. It originates in the Saipong Reserve Forest situated in south southeast of Meghalaya and passes through the borders of Meghalaya, North Cachar hills and Karbi Anglong and enters the plains in Nagaon district of Assam and finally joins the Brahmaputra at Kopilimukh. Its total length is 258 km, of which 78 km form the common border of Meghalaya and Assam, and the remaining 180 km lie in Assam.

(vi) Manas: The River enters into plains of Assam near Mathanguri and flows through the Manas reserve forest. At Mathanguri, this river bifurcates into two branches; the eastern branch is known as Beki and the western branch is known as Manas. The river Manas meets the river Brahmaputra near Jogighopa. Manas' total catchment area is about 37,500 Sq.km. It contributes 5.48 % of the total discharge of the Brahmaputra.

(vii) Sankosh: Sankosh is another big river that contributes 2.81 % of the total discharge of the Brahmaputra.

(viii) Jaldhaka: The Jaldhaka has its origin in Sikkim. It traverses a total distance of 186 km, passing through Bhutan, Darjeeling, Jalpaiguri and Koch Behar districts of West Bengal, before finally joining the Brahmaputra near the Kurigram district of Bangladesh. The Murti and the Diana are its main tributaries.

(ix) Torsa: The Torsa originates from the Chumbi valley of Tibet, where it is called Machu. Its upper reach falls in the territory of Bhutan. It enters Indian Territory near Phuentsholling after travelling about 70 km in China and 78 km in Bhutan. It then flows through the districts of Jalpaiguri and Koch Behar in West Bengal and joins the Brahmaputra in Bangladesh. The length

of the river from its origin to Ghughumari (Koch Behar) is 222 km, having a total catchment area of about 4530 Sq.km. Therafter, it meets Raidak-I. In India, it flows for a distance of 108 km.

(x) Teesta: The Teesta is the largest river of North Bengal. It rises in the Himalayas in North Sikkim. Running through narrow gorges for nearly 138 km, it debouches into the plains of the Jalpaiguri district at Sevoke. It flows in a steady course up to Jalpaiguri town, beyond which it records frequent changes. It has a drainage area of 12,540 Sq.km of which 3,017 Sq.km lies in North Bengal. It joins the Brahmaputra near Rangpur town in Bangladesh.

Table 5.2 ImportantGlaciersintheIHR

Location	Glacier	Length(km)
KarakoramRange	Siachin	72
	Hispar	62
	Baifo	69
	Batura	59
Jammu&Kashmir	Kolahai	6
	Machai	8
	Shishram	6
	Liddar	5
HimachalPradesh	BaraShigri	30
	ChhotaShigri	9
	SaraUmga	17
	Parvati	8
	SamudraTapu	9
Uttarakhand	NorthNandaDevi	19
	SouthNandaDevi	19
	Trishul	15
	Gangotri	30
	Dokriani	5
	Chorabari	7
	Gantotri	19
	Chowkhamba	12
	Satopanth	13
	Pindari	8
	Milam	19
Sikkim	Zemu	26
	Kchangchendzonga	16

Source *Report of the Task Force onMountain Ecosystems Environment and Forest Sector for Eleventh*

The unique geographical setting of many hill stations, established during the colonial era by the British on ridge-tops, poses significant challenges to sustainable water management. While these elevated locations offered cooler climates and scenic views, they are inherently distant from natural water sources, which typically originate in the valleys below. This topographical mismatch creates a structural water deficit, as water has to be lifted or transported uphill, requiring considerable infrastructure and energy.

The water scarcity problem is further aggravated by the neglect of traditional water systems, such as stone spouts (naulas) and springs, which historically met the needs of local communities sustainably. These systems, often ingeniously designed to work in harmony with the mountain environment, have been disregarded or poorly maintained. In their place, modern piped water systems have been introduced—many of which are technically flawed, leaky, and inefficient. These newer systems are often superimposed without proper integration into the existing traditional frameworks, causing redundancy and system failure.

Additionally, poor governance and planning have placed undue emphasis on centralised piped water supply, ignoring the potential of localised, community-managed water systems. As a result, water distribution becomes unequal and unreliable, especially for the resident populations. The problem is exacerbated in tourist seasons, when the influx of visitors dramatically increases water demand. Local communities often suffer water shortages as resources are diverted to meet the consumption needs of tourists and commercial establishments, including hotels and restaurants. This unsustainable model creates conflicts over water use, undermines water security, and threatens the long-term resilience of mountain towns. To address this crisis, there is an urgent need to revive traditional water harvesting practices, modernise existing systems with ecological sensitivity, and prioritise the water needs of local communities alongside tourism development.

The establishment of hill stations during the colonial era was driven more by climatic and strategic preferences than ecological suitability, resulting in many such towns being located on ridge-tops, far above the natural water sources that lie in the valleys. This geographical disconnect creates a persistent challenge of water scarcity, as sourcing and transporting water uphill demands extensive infrastructure and constant maintenance. Compounding this natural limitation are systemic issues such as the neglect of traditional water systems, including stone spouts (dharas) and natural springs, which were once the backbone of local water security.

In modern times, the focus has shifted overwhelmingly to piped water supply, often implemented without sensitivity to the terrain or existing systems. These modern networks are frequently characterised by leakages, outdated technology, and poor integration with traditional

sources, resulting in inefficiencies and waste. The superimposition of modern systems over older ones without adequate planning has led to conflicting water flows, service disruptions, and maintenance difficulties. Moreover, governance practices often prioritise visible infrastructure projects over sustainable water management, sidelining community-based solutions that are better suited to the local environment.

Table 5.3 RateofRecessionofselectedGlaciersintheIHR.

NameofGlacier	Period of Measuring	Period (inyears)	Recession (in m)	Averagerate (m/yr)
Milamglacier	1849-1957	108	1350	12.50
Pindariglacier	1845-1966	121	2840	23.40
Gangotriglacier	1962-1991	29	580	20.00
Tipraglacier	1960-1986	26	325	12.50
Dokrianiglacier	1962-1991	29	480	16.5
Dokrianiglacier	1991-2000	09	161.15	18.0
Chorabari	1962-2005	41	238	5.8
Shankulpa	1881-1957	76	518	6.8
Poting	1906-1957	51	262	5.13
Glacierno-3Arwa	1932-1956	24	198	8.25
BaraShigri	1956-1963	07	219	31.28
ChhotaShigri	1987-1989	03	54	18.5
Sonapani	1909-1961	52	899	17.2
Kolai	1912-1961	49	800	16.3
Zemu	1977-1984	07	193	27.5

Source*ReportoftheTaskForceonMountainEcosystemsEnvironmentandForestSectorforEleventh Five-Year Plan.PlanningCommission,Govt. of India, 2006*

The recession of glaciers in the Indian Himalayan Region (IHR) is a clear and alarming indicator of the effects of climate change in one of the most sensitive ecological zones of the world. Several glaciers across the IHR have been receding at varying rates, reflecting both natural variability and increasing anthropogenic stress on the mountain environment. The measured recession data of selected glaciers from different time periods provide valuable insights into the rate of glacial retreat, with serious implications for water availability, river systems, and ecosystem stability.

Among the most studied glaciers is the Pindari Glacier, which retreated 2,840 meters over a span of 121 years (1845–1966), recording an average annual recession rate of 23.4 meters per year. This high rate highlights its vulnerability to warming temperatures and reduced snowfall. Similarly, the Gangotri Glacier, one of the largest and most important glaciers feeding the Ganga River, receded 580 meters between 1962 and 1991, with an average rate of 20 meters per year. Another prominent glacier, the Milam Glacier, recorded a recession of 1,350 meters over 108 years (1849–1957), with a more moderate rate of 12.5 meters per year, consistent with trends in the Kumaon Himalayas.

The Dokriani Glacier was observed over two different periods. Between 1962 and 1991, it receded 480 meters at a rate of 16.5 meters per year, while during a more recent period from 1991 to 2000, the glacier retreated 161.15 meters, showing a slightly higher annual rate of 18.0 meters per year, which reflects the accelerating trend in glacial retreat. The Tipra Glacier, measured from 1960 to 1986, also receded 325 meters, maintaining a steady rate of 12.5 meters annually.

In contrast, some smaller or less dynamic glaciers like Chorabari (238 meters in 41 years), Shankulpa (518 meters in 76 years), and Poting (262 meters in 51 years) show slower retreat rates, ranging from 5.13 to 6.8 meters per year. These glaciers may be less sensitive to short-term climatic variations, but their cumulative recession over decades still points to sustained warming effects.

Exceptionally rapid retreat was recorded in Bara Shigri Glacier (219 meters in just 7 years, at 31.28 m/yr), and Zemu Glacier, which retreated 193 meters in 7 years (1977–1984) at a rate of 27.5 m/yr, indicating significant localised glacial instability. Similarly, Chhota Shigri retreated 54 meters in 3 years, showing a rate of 18.5 meters annually, and Sonapani and Kolai Glaciers also showed considerable recession over 50-year periods, retreating 899 meters and 800 meters respectively.

5.4 PrincipalGlacier-fedRiverSystemsoftheHimalaya

River	MountainArea(km^2)	GlacierArea(km^2)
Indus	268842	7890
Jhelum	33670	170
Chenab	27195	2944
Ravi	8092	206
Sutlej	47915	1295
Beas	12504	638

Jamuna	11655	125
Ganga	23051	2312
Kali	16317	997
Karnali	53354	1543
Gandak	37814	1845
Kosi	61901	1281
Tista	12432	495
Raikad	26418	195
Manas	31080	528
Subansiri	81130	725
Brahmaputra	256928	108
Dibang	12950	90
Lohit	20720	425

Source:*GlacierAtlasofIndia,2008*

The Himalayan region, often referred to as the "Water Tower of Asia", is home to some of the largest and most significant glacier-fed river systems in the world. These rivers originate from the glaciers and snowfields of the Himalayas and are crucial for maintaining the hydrological balance and supporting the agriculture, ecology, and economy of millions of people in South Asia. The Glacier Atlas of India (2008) provides detailed data on the glacier area and mountain catchment area of these principal river systems, highlighting the scale and importance of Himalayan glacial hydrology

The Indus River System represents one of the largest glacial-fed networks, with a mountain catchment area of 268,842 km² and a glacier-covered area of 7,890 km². This makes it the most extensively glacier-fed river system in the Himalayas. The Chenab, a major tributary of the Indus, also stands out with a glacier area of 2,944 km² within its 27,195 km² catchment, showing its significant dependence on glacial meltwater. Other Indus tributaries like the Jhelum (170 km²), Ravi (206 km²), Sutlej (1,295 km²) and Beas (638 km²) contribute to this vast river network, supporting irrigation and hydropower generation across northwest India and Pakistan.
In the central Himalayas, the Ganga River system plays a vital role, originating from the Gangotri Glacier and flowing through the Indo-Gangetic plains. The Ganga basin spans a mountain area of 23,051 km² and includes 2,312 km² of glacier coverage. One of its significant tributaries, the Yamuna, with a relatively smaller glacier area of 125 km², still contributes

significantly to the regional water supply, especially during the dry season. Other important glacial tributaries of the Ganga system include the Kali (997 km² glacier area) and Karnali (1,543 km²), both flowing through the Uttarakhand-Nepal border areas and playing crucial roles in supporting river flows downstream.

The eastern Himalayan rivers also have substantial glacier-fed systems. The Gandak River, with a mountain catchment of 37,814 km² and 1,845 km² of glacier area, and the Kosi River, spanning 61,901 km² with 1,281 km² of glaciers, are prominent rivers flowing into Bihar and eastern India. These rivers are known for their dynamic and sediment-laden flows, contributing to fertile floodplains while also being prone to devastating floods.

In the northeastern Himalayas, the Brahmaputra River system stands out with a vast mountain catchment area of 256,928 km², though its glacier area is relatively modest at 108 km², as much of its flow is derived from rainfall and snowmelt. Its tributaries, such as the Subansiri (725 km² glacier area), Manas (528 km²), Tista (495 km²), Raikad (195 km²), Lohit (425 km²), and Dibang (90 km²), flow through Arunachal Pradesh and neighbouring regions, contributing to the hydrological richness and ecological diversity of the Brahmaputra basin.

Collectively, these principal glacier-fed river systems form the lifeline of South Asia, supporting agriculture, drinking water, biodiversity, and hydroelectric projects across several countries. However, with the accelerated melting of glaciers due to climate change, the seasonal flow regimes and long-term water availability of these rivers are under serious threat. The data provided by the Glacier Atlas of India (2008) underscores the urgent need for integrated water resource management and glacier monitoring to ensure the sustainability of these crucial river systems.

Table 5.5 WaterResourcesinDifferentStatesoftheIHR

State	Waterbodies (lakhhectare)	TotalReplenishable groundwater (Mcm/yr)
Jammu&Kashmir	0.30	4425.84
HimachalPradesh	0.43	365.81
Uttarakhand	0.20	-
Sikkim	0.03	-
ArunachalPradesh	0.04	1438.50
Meghalaya	0.10	539.66

Mizoram	0.02	-
Manipur	0.46	3154.00
Nagaland	0.67	724.00
Tripura	0.17	663.41

Mcm=MillionCubicMeters.1millionis 10lakhs

Source*GroundWaterStatistics1996,CentralGroundWaterBoard*

The Indian Himalayan Region (IHR), often referred to as the "water tower" of South Asia, is endowed with a rich diversity of surface water bodies and groundwater resources, which play a crucial role in sustaining ecosystems, agriculture, drinking water supply, and hydropower generation. However, the distribution and availability of these water resources vary significantly across different Himalayan states due to topographic, climatic, and geological differences. The Ground Water Statistics (1996) by the Central Ground Water Board presents data on water bodies (in lakh hectares) and total replenishable groundwater (in million cubic meters per year) in several states of the IHR, reflecting the hydrological diversity and potential of the region.
In the western Himalayan states, Jammu & Kashmir has 0.30 lakh hectares of water bodies and a notably high volume of replenishable groundwater—4425.84 million cubic meters (Mcm/yr). This is attributed to the presence of vast snow-fed rivers, natural lakes, and aquifers in the Kashmir Valley and Ladakh region. Himachal Pradesh, another key Himalayan state, contains 0.43 lakh hectares of water bodies, the highest in this group, but its groundwater availability is much lower at 365.81 Mcm/yr, due to steep terrain and lesser aquifer development compared to the plains.

Uttarakhand, while having 0.20 lakh hectares of surface water bodies, does not have reported groundwater estimates in the data source, though it is known for its numerous springs and rivers like the Ganga and Yamuna. Similarly, Sikkim, despite having 0.03 lakh hectares of water bodies, also lacks official replenishable groundwater data. Both these states rely heavily on surface water and spring-fed systems, which are vulnerable to climate change and anthropogenic stress.

In the eastern Himalayan states, Arunachal Pradesh—rich in river networks and rainfall—has 0.04 lakh hectares of water bodies and a significant groundwater potential of 1438.50 Mcm/yr. Meghalaya and Nagaland report 0.10 lakh hectares and 0.67 lakh hectares of water bodies, respectively. Meghalaya possesses 539.66 Mcm/yr of groundwater, while Nagaland has 724 Mcm/yr, indicating moderate groundwater potential that supports domestic and agricultural use in these high-rainfall areas.

The north-eastern hill states also exhibit interesting contrasts. Manipur, with 0.46 lakh hectares of water bodies, enjoys a high groundwater availability of 3154.00 Mcm/yr, largely supported by natural lakes like Loktak and abundant rainfall. Tripura, though smaller in geographical area, has 0.17 lakh hectares of water bodies and 663.41 Mcm/yr of replenishable groundwater, reflecting a balanced hydrological profile. On the other hand, Mizoram, despite its rugged terrain and rainfall, has a limited 0.02 lakh hectares of water bodies and lacks documented groundwater data, indicating potential gaps in hydrogeological surveys.

5.6 FOREST AND BIODIVERSITY

The "Great Southern Watershed" of the Himalaya is divided into different administrative boundaries, which include exclusive mountainous countries (Nepal and Bhutan) and several hilly states (stretching from west to east) within India. Variation in longitude, altitude, geology, and soil has resulted in a great forest diversity along this bioclimatic gradient stretched over 5000 km in different administrative and political boundaries. This prime natural resource in these countries has ecological and biological significance for the greater landscape of the earth, particularly the Indian sub-continent.

The forest cover in the different Himalayan states (or hilly region) of the country (i.e., Indian Himalayan Region) varies considerably from 2,289 km2 (West Bengal Hills) to 67,353 km2 (Arunachal Pradesh) in the year 2007 (FSI, 2009). As a percentage of an administrative boundary (state or hilly district), this forest cover contributes from 10.2% (Jammu and Kashmir) to 91.2% (Mizoram) among the states. The lower contribution in Jammu & Kashmir state is because most of the area in the state lies in the high altitude region (above the limit of tree growth) and the trans-Himalayan region; otherwise, nowhere in the Indian Himalayan states does forest cover contribute less than one-fourth of the administrative region in the year 2007

In the North-Western Himalayan region (west of the Nepal) generally forest cover remains less than 50% of the total area of a state where total human population is high (67.2% of the total population) in the IHR while in the east of Nepal (eastern and north-eastern region) all the Indian states have more than 75% forest cover in each state (except Sikkim). Sikkim state has 47.3% of the area under forest cover, as it has a considerable area in the high altitudes and snow-covered areas, which are beyond the limit of tree growth. Per cent contribution of forest cover to the total geographical area of a state is given in Table 1. Since the first forest cover assessment (1987) in the country, forest cover status has been improved in the IHR states, such as in Himachal Pradesh (an increase of 17.5% since 1987) in the north-western region, and Meghalaya (5.1% increase) and Tripura (35.6% increase) in the north-eastern region. Decline in forest cover of two states of the north-eastern region was also recorded between the two decades (1987 and 2007), viz., Manipur (reduction of 1.1%) and Nagaland (reduction of 6.4%).

Table 5.6 ForestCoverindifferentStatesofthe IHR(1997-2007)

State	AssessmentYear(AreaKm^2)					
	1997	**1999**	**2001**	**2003**	**2005**	**2007**
Jammu&Kashmir	20,440	20,441	19,886	21,273	21,273	22,686
HimachalPradesh	12,521	13,082	12,907	14,359	14,369	14,668
Uttarakhand	23,243	23,260	23,354	24,460	24,442	24,495
Arunachal Pradesh	68,602	68,847	69,760	67,692	67,777	67,353
Sikkim	3,129	3,118	3164	3,262	3,262	3,357
Manipur	17,418	17,384	17,889	17,259	17,086	17,280
Meghalaya	15,657	15,633	16,535	16,925	16,988	17,321
Mizoram	18,775	18,338	16,397	18,583	18,684	19,240
Nagaland	14,221	14,164	13,980	14,015	13,719	13,464
Tripura	5,745	5,745	8,869	8,123	8,155	8,073
Assam	23,824	23,688	25,290	27,735	27,645	27,692
WestBengalHills	-	-	2,196	2,221	2,221	2,289
Assam Hills	-	-	13,024	13,158	13,051	13,003

-NotAvailable

Source*StateofForestReport(2001,2005,2009),ForestSurveyofIndia,Dehradun*

The forest cover in the Indian Himalayan Region (IHR) between 1997 and 2007 reflects a complex interplay of natural regeneration, deforestation, afforestation efforts, and land use changes. This period witnessed both gains and losses in forest area across various Himalayan states, influenced by environmental policies, demographic pressures, shifting cultivation, and development activities. The data from the State of Forest Reports (2001, 2005, 2009) by the Forest Survey of India presents annual trends in forest cover (in km²) for the IHR states, highlighting regional variations in forest management and ecological health.

In the western Himalayan states, Jammu & Kashmir recorded a significant increase in forest cover from 20,440 km² in 1997 to 22,686 km² in 2007, indicating positive developments in forest conservation and afforestation, especially after a dip in 2001. Himachal Pradesh showed a steady growth trend as well, with forest area expanding from 12,521 km² in 1997 to 14,668 km² in 2007, likely due to active forest protection and plantation efforts. Uttarakhand also witnessed a consistent rise from 23,243 km² to 24,495 km² during the same period, reflecting improved forest governance following its statehood in 2000 and focused conservation programs.

In contrast, the eastern Himalayan state of Arunachal Pradesh, which holds the largest forest area among IHR states, showed fluctuations in forest cover. It increased from 68,602 km² in 1997 to a peak of 69,760 km² in 2001, but later declined to 67,353 km² by 2007, likely due to jhum cultivation (shifting agriculture), logging, and encroachments. Sikkim, though small in size, demonstrated consistent forest cover growth—from 3,129 km² in 1997 to 3,357 km² in 2007, owing to its strong environmental policies and ecological sensitivity.

The northeastern hill states presented a mixed picture. Manipur saw fluctuations: from 17,418 km² in 1997, dropping to 17,086 km² in 2005, and slightly recovering to 17,280 km² in 2007, possibly reflecting shifting cultivation and regeneration cycles. Meghalaya, on the other hand, recorded an encouraging increase from 15,657 km² in 1997 to 17,321 km² in 2007, indicating effective reforestation and natural forest recovery. Mizoram showed notable variation—dropping from 18,775 km² in 1997 to 16,397 km² in 2001, then recovering to 19,240 km² by 2007, suggesting alternating trends of deforestation and afforestation.

Nagaland experienced a gradual decline in forest cover from 14,221 km² in 1997 to 13,464 km² in 2007, primarily due to expanding agriculture and developmental pressures. Tripura exhibited an unusual pattern, with a sharp jump from 5,745 km² in 1999 to 8,869 km² in 2001, likely due to methodological changes in satellite imagery interpretation or afforestation drives, before stabilising around 8,073 km² by 2007.

In the Brahmaputra valley and adjacent hills, Assam experienced a steady increase from 23,824 km² in 1997 to 27,692 km² in 2007, reflecting significant progress in afforestation, particularly in degraded areas. The Assam Hills, for which data starts from 2001, maintained a relatively stable forest cover of around 13,000 km² over the years. Similarly, the West Bengal Hills, with data available from 2001, showed a modest rise from 2,196 km² to 2,289 km² by 2007.

The Indian Himalayan Region (IHR), comprising a significant portion of India’s mountainous terrain, plays a crucial role in the country’s ecological framework, particularly in terms of forest cover. As of 2007, the IHR encompasses a geographical area of 537,435 square kilometres, which is approximately 16.3% of India's total geographical area. Within this region, the total forest cover is 223,229 km², accounting for 32.3% of the country’s entire forest cover.

This clearly signifies the vital ecological contribution of the IHR, despite it covering a smaller geographical area compared to the rest of the country.

Table 5.7 ContributionoftheIHRtotheTotalForestCoverofIndia(2007)

Region / Country	Geographical Area (km^2) (values inper cent)	ForestCover(km^2)			
		Very Dense	Moderate	Open	Total
IHR	537435 (16.3%)	37741 (45.2%)	100596 (31.5%)	84892 (29.4%)	223229 (32.3%)
India	3287263 (100%)	83510 (2.5%)*	319012 (9.7%)	288377 (8.8%)	690899 (21.0%)

*Percentofthe totalgeographicalareaof thecountry

Source*ReportoftheTaskForce"Tolookintoproblems ofhillstatesandhillareas andtosuggestwaysto ensurethatthesestatesandareasdonotsufferinanywaybecauseoftheirpeculiarities".2010. Planning Commission, Government of India*

Breaking down the forest cover in the IHR, the region contains 37,741 km² of very dense forests, 100,596 km² of moderately dense forests, and 84,892 km² of open forests. These categories correspond to 45.2% of the moderately dense forest, 31.5% of the open forest, and 29.4% of the very dense forest cover within the region. Compared to the national figures—India's total forest cover standing at 690,899 km²—the IHR contributes a substantial portion, particularly in the moderately dense and open forest categories.

The significance of these figures is underscored when placed in the broader national context. Although India's overall very dense forest constitutes only 2.5% of its total geographical area, and the total forest cover amounts to 21.0%, the IHR alone contributes nearly one-third of the national forest resources. This highlights not only the rich biodiversity and ecological importance of the Himalayan states but also stresses the need for careful conservation efforts in these fragile and often ecologically sensitive areas. The data, sourced from the Planning Commission's 2010 report, emphasises the IHR's indispensable role in maintaining India's forest wealth and environmental stability.

5.6.1 Biodiversity in the Indian Himalayan Region

The Protected Area Network in the Indian Himalayan Region (IHR) is a crucial component of biodiversity conservation, encompassing both National Parks and Wildlife Sanctuaries across the states and regions within the Himalayan belt. This network not only preserves diverse ecosystems and endemic species but also supports ecological balance and sustainable development.

Among the Himalayan states, Sikkim stands out for having the highest proportion of its geographical area under protection, with one National Park covering 1,784 km² and seven Wildlife Sanctuaries covering 399.1 km², totalling 2,183.1 km², which amounts to a remarkable 30.8% of the state's total area. Similarly, Uttarakhand and Himachal Pradesh both show strong conservation efforts. Uttarakhand has six National Parks (4,915.44 km²) and six Wildlife Sanctuaries (2,418.61 km²), combining to 7,334.05 km² or 13.7% of its total area under protection. Himachal Pradesh has two National Parks (1,430 km²) and 33 Wildlife Sanctuaries (6,171.11 km²), summing up to 7,601.11 km², also 13.7% of its total land area.

Table: 5.8 ProtectedAreaNetworkintheIHR–NationalParks & WildlifeSanctuaries

States/Regions	NationalPark		WildlifeSanctuary		TotalArea (km^2)	%of Total area
	No.	Area(km^2)	No.	Area(km^2)		
Jammu&Kashmir	4	3925	15	10243.11	14168.11	6.4
HimachalPradesh	2	1430	33	6171.11	7601.11	13.7
Uttarakhand	6	4915.44	6	2418.61	7334.05	13.7
Sikkim	1	1784	7	399.1	2183.1	30.8
ArunachalPradesh	2	2290.82	11	7487.75	9778.57	11.7
Meghalaya	2	269.44	3	34.2	303.64	1.4
Mizoram	2	150	8	1090.75	1240.75	5.9
Manipur	1	40	1	184.4	224.4	1.0
Nagaland	1	202.02	3	20.34	222.36	1.3
Tripura	2	36.71	4	566.93	603.64	5.8

Assam hills	-	0	4	360.86	360.86	1.9
WestBengalhills	2	166.6	3	166.14	332.74	10.6

Source*National Wildlife database, Wildlife Institute of India, 2009* http://oldwww.wii.gov.in/nwdc/nparks.htm,http://oldwww.wii.gov.in/nwdc/sanctuaries.htm

In contrast, Jammu & Kashmir, with four National Parks (3,925 km²) and 15 Wildlife Sanctuaries (10,243.11 km²), has the largest total protected area in the IHR—14,168.11 km², yet it constitutes a relatively smaller 6.4% of its vast territory. Arunachal Pradesh has an impressive spread with two National Parks (2,290.82 km²) and 11 Sanctuaries (7,487.75 km²), totaling 9,778.57 km², which makes up 11.7% of the state's area.

Some northeastern states show comparatively limited coverage. For instance, Meghalaya has two National Parks (269.44 km²) and three Sanctuaries (34.2 km²) totaling only 303.64 km² or 1.4% of its area. Manipur, Nagaland, and Tripura similarly have low percentages, with 1.0%, 1.3%, and 5.8% of their areas under protection, respectively. The Assam Hills region, without any National Parks, relies on its four Wildlife Sanctuaries (360.86 km²), contributing 1.9% coverage, while the West Bengal hills maintain two National Parks (166.6 km²) and three Sanctuaries (166.14 km²), totaling 332.74 km² or 10.6%.

Table: 5.9 BiosphereReservesin the IHR

BiosphereReserve	**Date of Notification**	**Area(km^2)**	**State**
NandaDevi*	18.01.1988	6497.03	Uttarakhand
Nokrek	01.09.1988	820	Meghalaya
Manas	14.03.1989	2837	Assam
Dibru-Saikhowa	28.07.1997	765	Assam
DehangDebang	02.09.1998	5111.5	ArunachalPradesh
Kanchanjunga	07.02.2000	2619.92	Sikkim

ColdDesert	28.08.2009	7770	HimachalPradesh

*RecognizedbyUNESCOonWorldNetworkofBiosphereReserves.
Source*MinistryofEnvironment&Forests,GovernmentofIndia,NewDelhi*

The Indian Himalayan Region (IHR), known for its rich biodiversity and unique ecological zones, is home to several Biosphere Reserves established to promote conservation, research, and sustainable development. These reserves are part of a global initiative to protect representative ecosystems while allowing for traditional human activity in harmony with nature.

Among the most prominent is the Nanda Devi Biosphere Reserve in Uttarakhand, notified on 18 January 1988, covering an extensive area of 6,497.03 km². It is notable not only for its diverse flora and fauna but also for its international recognition—it has been included in the UNESCO World Network of Biosphere Reserves, underscoring its global ecological significance. The reserve includes high-altitude ecosystems and is a critical habitat for endangered species like the snow leopard and Himalayan musk deer.

In the northeastern region, Nokrek in Meghalaya was notified shortly after Nanda Devi, on 1 September 1988, covering an area of 820 km². It is one of the last remaining homes of the red panda in this part of the Himalayas. Manas Biosphere Reserve, notified on 14 March 1989, spans 2,837 km² in Assam, integrating both wildlife conservation and human habitation. It is part of the larger Manas National Park, which is also a UNESCO World Heritage Site.

Another significant reserve in Assam is Dibru-Saikhowa, established on 28 July 1997 with an area of 765 km². This lowland biosphere is important for its wetland ecosystems and houses a mix of semi-evergreen and swamp forests, providing refuge for several rare and endemic bird species. In Arunachal Pradesh, the Dehang Debang Biosphere Reserve, notified on 2 September 1998, spans 5,111.5 km² and is known for its rugged topography and rich tribal culture. It supports a high diversity of plant and animal life, many of which are endemic to the Eastern Himalayas.

Kanchanjunga Biosphere Reserve in Sikkim, notified on 7 February 2000, encompasses 2,619.92 km². It lies in the lap of Mount Kanchenjunga, the world's third-highest peak, and is distinguished by its pristine alpine forests, glaciers, and sacred cultural significance among local communities. Lastly, the Cold Desert Biosphere Reserve in Himachal Pradesh, notified on 28 August 2009, is the most recent addition. Spanning 7,770 km², it includes high-altitude cold deserts of the Trans-Himalayas, characterized by sparse vegetation but unique adaptations in both flora and fauna.

5.7 DEMOGRAPHIC STRUCTURE:

Demography is the statistical study of human populations, focusing on aspects such as size, distribution, composition, and the dynamics of population change through birth, death, migration, and aging. It helps in understanding how populations grow, decline, or shift over time and space. Demography is essential for planning in areas like health, education, employment, and resource distribution. It provides vital insights for policymakers to make informed decisions based on population trends.

5.7.1 Population Growth of Indian Himalayan Regions 2011

The Indian Himalayan Region (IHR), encompassing a wide array of states across northern and northeastern India, exhibits significant diversity in human population dynamics and economic development. According to the 2001 Census of India, these states collectively demonstrate varied demographic trends shaped by geography, social structure, and economic factors.

Table: 5.10 Humanpopulationandgrowthin variousstatesoftheIHR

India/State	Geographical Area (Km^2)	HumanPopulation 2001			Percent Decadal Growth	
		Male	Female	Total	1981-1991	1991-2001
INDIA	**3,287,263**	**532,223,090**	**496,514,346**	**1,028,737,436**	**23.87**	**21.54**
Jammu& Kashmir	222,236	5,360,926	4.782,774	10,143,700	30.89	29.43
Himachal Pradesh	55,673	3,087,940	2,989,960	6,077,900	20.79	17.54
Uttarakhand	53,483	4,325,924	4,163,425	8,489,349	23.13	20.41
Sikkim	7,096	288,484	252,367	540,851	28.47	33.06
Arunachal Pradesh	83,743	579,941	518,027	1,097,968	36.83	27.00
Nagaland	16,579	1,047,141	942,895	1,990,036	56.08	64.53
Manipur	22,327	1,161,952	1,131,944	2,293,896	29.29	24.86
Mizoram	21,081	459,109	429,464	888,573	39.70	28.82
Meghalaya	22,429	1,176,087	1,142,735	2,318,822	32.86	30.65
Tripura	10,486	1,642,225	1,556,978	3,199,203	34.30	16.03
Assam	78,438	13,777,037	12,878,491	26,655,528	24.24	18.92
Assam Hills	15,322	NA		3,313,896	NA	NA

WB Hills	3,149	NA	1,605,900	NA	NA

NA:NotAvailable

SourceHumanPopulation–*CensusofIndia2001,RegistrarGeneralofIndia,NewDelhi*
GeographicalArea –*StateofForestReport2005,ForestSurvey ofIndia,Dehradun*

Table: 5.11 GrossStateDomesticProduct atCurrentPrices
(₹inCrores)

State	1999-2000	2000-2001	2001-2002	2002-2003	2003-2004	2004-2005	2005-2006	2006-2007
Jammu&Kashmir	15660	16700	18039	20326	22194	24265	NA	NA
Himachal Pradesh	14112	15661	17148	18905	20721	23024	25435	28298
Uttarakhand	12786	14703	16011	18675	20668	22765	25776	29881
Sikkim	896	1014	1136	1276	1430	1602	1003	2040
Arunachal Pradesh	1615	1806	2127	2103	2408	2788	2987	NA
Manipur	3260	3112	3369	3506	3979	5050	5714	6438
Meghalaya	3638	4049	4615	4900	5504	5980	6470	7052
Mizoram	1550	1737	1947	2166	2325	2455	2697	2985
Nagaland	2800	3552	4166	4684	5040	5346	NA	NA
Tripura	4867	5499	6370	6733	7551	8297	9124	NA
Assam	34833	36841	38313	43407	47305	52920	57543	65033

Source*Directorate of Economics &StatisticsofrespectiveStateGovernments*
Quotedby: –MinistryofStatisticsandProgrammeImplementation,GovernmentofIndia
http://mospi.nic.in/6_gsdp_cur_9394ser.htm (visitedAugust13,2010)

As of 2001, the total population of India was 1.028 billion, with 532 million males and 496 million females, reflecting a decadal growth rate of 21.54% between 1991 and 2001 (down from 23.87% during 1981–1991). In comparison, several Himalayan states recorded much higher population growth rates. Nagaland topped the list with an extraordinary decadal growth of 64.53%, following an already high 56.08% in the previous decade. Similarly, Sikkim showed rapid growth at 33.06%, up from 28.47%, while Meghalaya and Mizoram also exhibited strong growth trends at 30.65% and 28.82%, respectively. These rising trends highlight the demographic dynamism and possibly migratory movements or improved census coverage in these areas.

Jammu & Kashmir, the largest Himalayan state by area (222,236 km²), had a population of over 10.14 million, growing by 29.43% from 1991 to 2001. Arunachal Pradesh, with a relatively low population of around 1.1 million, experienced a significant growth rate of 27.00%, reflecting both natural growth and possible in-migration. On the other hand, Tripura saw a slowdown in growth to 16.03%, down from 34.30%, suggesting demographic stabilization. The Assam hills and West Bengal hills had unavailable or partial data, but their role in the regional dynamics remains important due to their strategic location and diverse populations.

In terms of Gross State Domestic Product (GSDP) at current prices, a trend of gradual economic improvement is evident. For example, Uttarakhand's GSDP rose from ₹12,786 crore in 1999–2000 to ₹29,881 crore in 2006–2007, showing robust economic performance likely driven by industrial growth and infrastructure development. Similarly, Himachal Pradesh grew steadily from ₹14,112 crore to ₹28,298 crore in the same period. While larger states like Assam posted the highest GSDP in absolute terms—₹65,033 crore by 2006–2007—the per capita benefits may be diluted due to its larger population.

Smaller states such as Sikkim, Mizoram, and Meghalaya also demonstrated economic growth, although on a smaller scale. For instance, Sikkim's GSDP more than doubled from ₹896 crore in 1999–2000 to ₹2,040 crore in 2006–2007, possibly due to hydropower, tourism, and organic agriculture. Mizoram and Manipur also showed notable growth, though they face infrastructural and connectivity challenges.

5.7.2 Population Distribution of Indian Himalayan Regions 2011

The 2011 Census of India provides a comprehensive picture of the population distribution **across** the Indian Himalayan Region (IHR)**,** revealing both demographic structure and the region's share in the national population. The IHR, consisting of 13 Himalayan states and hill regions, had a combined population of 46.79 million, which accounted for 3.77% of India's total populationof over 1.21 billion. This region is home to a wide diversity of ethnic groups, cultures, and ecological zones spread across 109 districts**.**

Table: 5.12 Population Distribution

S. N.	State	Person	Male	Female	Himalaya	India	No. of District
1.	Jammu & Kashmir	12541302	6640662	5906640	26.80	1.04	22
2.	Himanchal	6864602	3481873	3382729	14.67	0.57	12
3.	Uttarakhand	10086292	5137373	4948519	21.56	0.83	13
4.	Sikkim	610577	323070	287507	1.30	0.03	4
5.	Arunachal	1383727	713912	669815	2.96	0.11	16

6.	Nagaland	1978502	1024649	953853	4.23	0.16	11
7.	Manipur	2570390	1290171	1280219	5.49	0.21	9
8.	Mizoram	1097206	555339	541869	2.34	0.09	8
9.	Tripura	3673917	1874376	1799541	7.85	0.30	4
10	Meghalaya	2966889	1491832	1475057	6.34	0.25	7
11	Assam Hill	1170415	600969	569446	2.50	0.10	2
12	West Bangal Hill	1846823	937259	909564	3.95	0.15	1
13	IHR	46790642	24071885	22718757	100.0	3.77	109
		1210569573	623121843	587447730	-	100.00	640

SourceHumanPopulation–*CensusofIndia2011*

Among the Himalayan states, Jammu & Kashmir had the largest population in the IHR with over 12.54 million people—6.64 million males and 5.91 million females—making up 26.80% of the total IHR population**.** It alone contributed 1.04% of India's total population, reflecting both its size and strategic importance. Uttarakhand**,** with a population of approximately 10.09 million**,** ranked next, contributing 21.56% to the IHRand 0.83% to the national population**.** Close behind was Himachal Pradesh**,** with 6.86 million people**,** contributing 14.67% of the IHR and 0.57% of India's population**.**

The northeastern states, though smaller in terms of population share, are crucial for the cultural and ecological diversity of the Himalayas. Manipur and Tripura were the most populous among them, with 2.57 million and 3.67 million people respectively, contributing 5.49% and 7.85% to the IHR population. Nagaland**,** Meghalaya**,** Arunachal Pradesh, and Mizorameach had populations ranging between 1.1 to 2 million**,** collectively accounting for a significant portion of the eastern Himalayan demographic profile. Notably, Sikkim, with a population of just 610,577**,** was the least populous Himalayan state, comprising only 1.30% of the IHR and a mere 0.03% of India's total population**.**

In addition to the Himalayan states, the Assam Hill region and the West Bengal Hill regionalso form part of the IHR. These regions had populations of 1.17 million and 1.85 million respectively, contributing 2.5% and 3.95% to the IHR's total. While these are relatively small shares, they represent important socio-cultural landscapes like Darjeelingin West Bengal and Karbi Anglong in Assam.

5.7.3Literacy in Indian Himalayan Region 2011

The literacy landscape of the Indian Himalayan Region (IHR) reveals a mixed but overall

encouraging picture of educational attainment across the hill states and regions. While some states exhibit remarkably high literacy rates, others still face challenges due to remote terrain, lack of infrastructure, and socio-economic barriers.

Table: 5.13 Literacy Rate

S. N.	State	Literacy (%)
1.	Jammu & Kashmir	67.2
2.	Himanchal	82.8
3.	Uttarakhand	78.8
4.	Sikkim	81.4
5.	Arunachal	65.4
6.	Nagaland	79.6
7.	Manipur	76.9
8.	Mizoram	91.3
9.	Tripura	87.2
10	Meghalaya	74.4
11	Assam Hill	72.2
12	West Bangal Hill	85.91

SourceHumanPopulation–*CensusofIndia2011*

Mizoram leads the IHR in literacy with an impressive rate of 91.3%, indicating significant progress in educational outreach and awareness. This is followed closely by Tripura at 87.2%, and the West Bengal Hill region (which includes areas like Darjeeling) at 85.91%, reflecting strong education systems and relatively better access to schooling in these areas. Himachal Pradesh, a traditionally strong performer in social indicators, also boasts a high literacy rate of 82.8%, showing consistent investments in rural education and female literacy.

Sikkim and Nagaland follow with literacy rates of 81.4% and 79.6%, respectively. These states have shown considerable improvements in education in recent decades, aided by targeted government initiatives and community participation. Uttarakhand, with a literacy rate of 78.8%, also performs well, highlighting its efforts to bridge the urban-rural educational divide.

Mid-range literacy levels are observed in Manipur (76.9%) and Meghalaya (74.4%), where education is relatively widespread, but disparities still exist, particularly in remote tribal and hilly regions. The Assam Hill region, with 72.2%, reflects moderate literacy, suggesting the

need for increased focus on inclusive and multilingual education, especially among indigenous communities.

At the lower end of the spectrum are Jammu & Kashmir (67.2%) and Arunachal Pradesh (65.4%), where literacy rates remain below the national average. These figures point to persistent challenges such as difficult topography, low school enrollment in remote areas, and in some cases, political and social instability which hampers educational development.

5.7.4 Population Density in Indian Himalayan Region 2011

Table: 5.14Population Density

S. N.	State	Density
1.	Jammu & Kashmir	56
2.	Himanchal	123
3.	Uttarakhand	189
4.	Sikkim	86
5.	Arunachal	17
6.	Nagaland	119
7.	Manipur	115
8.	Mizoram	52
9.	Tripura	350
10	Meghalaya	132
11	Assam Hill	76
12	West Bangal Hill	586
	IHR	88
	Inda	368

SourceHumanPopulation–*CensusofIndia2011*

The population density across the Indian Himalayan Region (IHR) reflects a diverse demographic distribution influenced by the region's mountainous terrain, ecological sensitivity, and varying degrees of urbanization. The average population density of the IHR stands at 88 persons per square kilometer, which is significantly lower than the national average of 368. This lower density is largely due to the challenging topography, forest cover, and limited arable land in the Himalayan states.

Among the Himalayan states, West Bengal Hill region, which includes highly populated areas like Darjeeling, records the highest population density of 586 persons per km². This figure is well above both the IHR and national averages, driven by a combination of favorable climate, tourism, and semi-urban settlement patterns. Tripura, located in the eastern Himalayan foothills, also shows a high density of 350, indicating considerable population pressure on limited land resources.

On the other hand, states like Uttarakhand (189) and Himachal Pradesh (123) fall in the mid-range of density. These states have pockets of densely populated valleys and towns, such as Dehradun and Shimla, interspersed with sparsely populated mountainous and forested areas. Nagaland (119), Manipur (115), and Meghalaya (132) also fall within this moderate density bracket, with populations generally concentrated in central urban hubs and valleys.

States with relatively lower densities include Jammu & Kashmir (56) and Sikkim (86), which is consistent with their rugged terrain and sparse settlement patterns in high-altitude areas. Mizoram, with a density of 52, also reflects similar geographic limitations. The lowest density in the IHR is found in Arunachal Pradesh, at just 17 persons per km², due to its vast, forest-covered landscape, high-altitude zones, and remote tribal settlements.

The Assam Hill region, with a density of 76, and other northeastern areas show relatively light population pressure, though pockets of these regions face constraints due to ecological fragility and land use limitations.

5.8 CULTURAL DIVERSITY AND ETHNIC COMPOSITION CHALLENGES OF ACCESSIBILITY AND REMOTENESS.

Every mountain slope is, from the anthropo-geographical standpoint, a complex phenomenon. It displays a whole range of cultural features/combinations- a variety of occupations from commercial cropping and agroprocessing to nomadic pastoralists, every degree of density from congestion to vacancy, every range of cultural development from industrialisation to nomadism. The isolation bred by the high mountain ranges have helped nurture a multiplicity of tribes with unique cultures that include languages, social structures, and spiritual traditions. Each tribe also has its own arts & crafts (weaving, metal craft, architecture, music & dance) and certain invaluable traditional knowledge systems (ethnobotany, medicine).

Cultural region indicates those areas that display relative consistency, homogeneity, and distinctiveness in inhabitants' lifestyle, in that there are a greater number of shared cultural elements within the region, than between the region and others. The cultural complex of the Himalayas may be differentiated into multiple cultural regions. Cultural variation in the Himalayas is both vertical and lateral. While vertical variation predominantly flows from

ecological factors, lateral variation in cultures is mediated by ethnicity and migration.

5.8.1 Western Himalaya:

The people of this region display a flow of the Afghan-Iranian cultures from the west, with an impinging of the Indic cultures from the south and Tibetan cultures from the north. Pradyumna P. Karan4 divides the Western Himalayaan realm into the Sub-Himalayan Kashmir (Poonch and Jammu), Pir Panjal, Vale of Kaashmir, Ladakh and Baltistan, and the Kohistan and Gilgit regions. 'The Laddakh division of Jammu and Kashmir is represented by the Changpas in the highland areas of extreme north, Laddakhis in the plateau areas of central zones and Baltis, Bropkpas and Dards in the river valleys of Western zones. The Changpas are mostly nomads engaged in trans-human activities while Laddakhis, Dardi and Balti are engaged in primitive agricultural activities mostly concentrated in river valleys. Laddakhi, Dardi and Balti are the major languages spoken in this region.'5 Kashimiris, Gujjars and Bakkerwals inhabit the Pirpanjal and Kashmir valley mountains areas who speak kashmiri, and Pahari/Gojri respectively. The people in the upper reaches of the mountains follow Islam while the population in the foothills are mostly Hindu. Both Ladakhis and Baltis are Mongolid in physical traits. While Ladakh's population is predominantly Buddhist, the Baltistan consists of both Muslims and Buddhists. It is therefore that 'Buddhist monasteries, prayer flags and chortens form significant elements of the cultural landscape in Ladakh and adjoining Baltistan."

5.8.2 Central Himalaya:

The Central Himalayan region can be divided into the regions of Himachal and Punjab, Garhwal and Kumaon and the Nepal Himalayas. With the exception of a few Buddhists, the region is inhabited by people of the Aryan stock. People in the foothills of the Inner Himalayan region are loosely referred to as 'Paharis' and "… comprise a variety of subgroups which share basic cultural patterns but show local differences in such features as dialect, ceremonial forms, deities worshipped, house styles, dress and ornamentation, range of castes, and rules of marriage. These variations are often extremely limited in distribution so that it is possible for one acquainted with a region to identify readily the particular valley or ridge from which a person comes by his speech or dress."7 "They are isolated from the Tibetan Bhotiyas by high mountains, but have trading contacts when the Bhotiyas come (to the) lower regions. …The semi-nomadic Bhotiyas live in the northern regions. …(they) live in their villages only for short periods in the year. They go either to high altitudes with their herds during the summer months, or to the Bhabar near the plains for trade during the winter when the valleys are severley cold."

5.8.3 Eastern Himalayas:

The Eastern Himalayan regions are said to consist of the Sikkim and Darjeeling hills,

Bhutan and Arunachal Pradesh. The main communities inhabiting these regions are Bhutias, Gorkhas, native Lepchas, Mon and Nepalis in the Sikkim and Darjeeling regions. They are either Hindu or Buddhist by religion and mainly speak Gorkha and Nepali. People of the Tibetan culture also dominate in certain regions of the area. The Tibetan culture is also predominant in most areas of Bhutan, southwestern parts of which are characterized by the increasing number of Nepali settlers. In Arunachal, the Akas, Daflas, Apa Tanis, Galongs, Abors and Mishmis are the predominant tribes, majority of who speak their tribal languages. The people are mostly followers of animistic faith or are Hindus and Buddhists. A significant size of the population is also now converted to Christianity. The region is characterized by practices of shifting agriculture. Bamboo, an intrinsic part of the cultural lives, is used as building material, furniture and as food (shoots).

5.8.4 Languages:

The Himalayan region is characterized by considerable linguistic diversity and multilingualism as well. "The Himalayan reaches of South Asia have been described as one of the ten biodiversity 'mega centres' of the world. But this diverse region is also home to almost 20% of all human languages, so the area should be thought of as a linguistic and cultural 'mega centre' as well, and as a key site for the common heritage of all humanity."9 Language communities of the Himalayas include the Indo-European language family, the Dravidian language family, the Tibeto-Burman language family, the Austro-Asiatic language family, as well as some language isolates. A study has listed as many as 51 languages in the Himalayan region10, with 20 each in the western and central regions, predominantly of the Indo-Aryan group, and 11 in the eastern, predominantly of the Tibeto-Burman group. The languages of the rituals (Sanskrit, Tibetan) are usually well developed and documented, and some of the more widely used languages such as Nepali, Burmese, etc., also have detailed dictionaries. Classical literature is available in the language of the rituals, and neo-classical and modern literature in the more dominant languages in use. Long contact between the different languages have also caused linguistic borrowing and change and the languages as they exist today and the literature of the current times is a reflection of the migration patterns, patterns of dominance-submission among communities, social structures and trade relations.

The Human-Nature Connect: To claim that this feature is unique only to the tribal populations of the mountains would be grossly unfair to their counter parts in the plains. But the geographical isolation of the mountains makes this a rather striking feature of the people living within them. One and all, the people of the Himalayas worship the mountains as their preserver and protector and life-giver. Nature and its relationship with the human are intrinsic in all the systems and institutions governing the functioning a particular community. Natural resources are looked upon as living entities interacting with the human and animal population. Forests, trees, rivers, mountains and lakes are worshipped. Religion and medicine is centered on nature and its practice

aided with natural resources. Traditional livelihood practices of agriculture or pastoralism are also mostly in sync with the cycle of death and rejuvenation in nature.

5.8.5 Art & architecture:

The Himalayan communities have a wealth of traditional art forms and crafts, that include thangka painting, wood carving, carpet weaving, and traditional music and dances. These art and craft forms follow a distinct Himalayan style that is indigenous to the Himalayas, characterized by Tibetan, Nepali and Kashmiri religious cultures and span the areas under the sway of these particular cultures. Himalayan style art is generally religio-aesthetic in nature, and comprises the iconography, composition, symbols and motifs drawn from the forms of religions of Buddhism, Hinduism and Islam. Crafts of the Himalayan region are in keeping with the available resources, climatic conditions and terrain of the Himalayas. The seclusion of the region and the long periods of hibernation during the severe winters allows considerable time for crafts work. Most crafts also serve certain functions, for clothing, food, and various social, cultural and spiritual traditions, and the isolation of the Himalayan worlds has necessitated self-reliance in their production. Many Himalayan communities therefore developed superior craftsmanship- in bamboo & wood carving, silver and gold articles, weaving of shawls, carpets and rugs.

As with other aspects, geography, geology and climate, apart from lifestyle and aesthetic considerations, play a big role in the architectural styles that have evolved in the Himalayan region. The flat-roofed, earthen structures of the western Himalayas and the higher altitudes characterized by low precipitation, the timber and stone constructions of the mid-altitude ranges in the central and eastern Himalayas, are attuned to the materials, the climate, as well as the religio-aesthetic and lifestyle considerations of the region. While the material differs – construction tends to follow a distinctive style across the Himalayan belt. All housing is typically of two stories, the lower floor being used for storage and cattle, and the upper floor for living.

5.8.6 'Invisible' Culture and cultural erosion:

Mountain regions had developed a rich base of indigenous traditional knowledge that is being rapidly eroded under the forces of modernisation, as new methods/ sciences make inroads and local value and promotion of ITK declines. The mountain ITK systems themselves – socio-political, education, environmental conservation, medicine, religious practices etc.- lack recognition among the mainstream. Although 'visible' as exotic, for touristic purposes, they are 'invisible' and appear to lack credibility enough to be recognized at par with mainstream systems. This has in turn has led to the erosion of many traditional agricultural, medicine, food, education systems and knowledge and loss of many languages, under the onslaught of external influences after the exposure of these regions to wider population and influences. For example, the Lepchas in North Sikkim are now labeled as the 'Vanishing Tribe' because their indigenous

systems of medicine, art, culture, livelihood practices, language etc. are fast eroding as they have been pushed to the peripheries of their own lands in Sikkim and Darjeeling. In Dzongu, the Lepcha Reserve in North Sikkim which is also the last bastion of this vast dwindling tribe, there are only a handful of traditional medicinal experts called 'bongthing's12. Mainstream medical practice questions the validity of traditional systems of healing of the Himalayas and although efforts are being made to preserve the knowledge in these practices, it still is in the danger of being appropriated for commercial use

The spread of many cultural forms (language, arts & crafts) to new generations has not continued, and they have also not evolved to modern lifestyles & needs, hence leading to declining use and endangerment of traditional cultural forms. The multilingualism practiced in the Himalayas is also a cause for the death of many Himalayan languages. The language of the rituals (Sanskrit, Tibetan) tends to survive, although primarily as a script, while more dominant languages of neighbouring areas are adopted for regular use.

Cultural dispossession: In recent years, the Himalayas have been shaken with examples of development projects like hydropower dams, limestone mines and roads usurping right of communities over sacred landscape and seriously endangering not only culture but basic livelihood and survival. This has led to the sudden loss of an entire resource base, owing to a majority of development projects in these mountains, uprooting people physically and culturally. Sadly, the developmental process consisting of an Environmental Impact Assessment does not take into account social and cultural costs of a developmental project. Therefore, local peoples' concerns regarding marginalization, the need to preserve landscapes for religious and spiritual beliefs, do not find value in the cost benefit analysis of neither the project proponents nor the Government.

5.9 SUMMARY

The Indian Himalayan Region (IHR) presents a unique blend of physical and human resource bases shaped by its rugged topography, diverse climate, rich biodiversity, and vibrant cultural mosaic. Topographically, it stretches from the foothills to towering snow-clad peaks, encompassing deep valleys, steep slopes, and glaciated landscapes, which influence settlement patterns and economic activities. The climate varies sharply with altitude, ranging from subtropical in the lower Himalayas to temperate, alpine, and frigid zones at higher elevations, supporting a wide range of flora and fauna, making it one of the world's recognized biodiversity hotspots. Water resources are abundant, with perennial rivers like the Ganga, Brahmaputra, and Indus originating from its glaciers, along with numerous lakes and springs that sustain agriculture, hydropower, and domestic needs. Forests dominate large portions of the region, providing timber, medicinal plants, and ecosystem services, while sheltering wildlife such as snow leopards, red pandas, and Himalayan monals. Demographically, the IHR is characterized

by low population density due to its challenging terrain, with pockets of higher density in valleys and urban centers; literacy rates vary but are generally improving, with male literacy higher than female literacy. Migration is common, often driven by limited employment opportunities, search for better livelihoods, or educational aspirations, leading to socio-economic shifts in rural areas. The region's cultural diversity is reflected in its mosaic of ethnic groups, languages, festivals, and traditional livelihoods, ranging from agriculture and pastoralism to handicrafts. However, challenges of accessibility and remoteness remain significant, as landslides, snow-blocked passes, and lack of transport infrastructure hinder connectivity, trade, healthcare access, and emergency response, thereby influencing both the pace and pattern of development in this ecologically fragile yet resource-rich region.

5.10 GLOSSARY

- **Topography:** The physical features and layout of the Earth's surface, including mountains, valleys, plateaus, and plains. In the Indian Himalayan Region (IHR), topography plays a crucial role in determining climate, agriculture, settlement patterns, and transportation.
- **Climate:** The long-term pattern of temperature, precipitation, humidity, and wind in a particular area. The Himalayas influence the monsoon system and create diverse climatic zones ranging from tropical to alpine.
- **Watershed:** A land area that channels rainfall and snowmelt to creeks, rivers, and eventually outflows to reservoirs, bays, or the ocean. The IHR acts as a major watershed zone feeding several major rivers of the Indian subcontinent.
- **Biodiversity:** The variety of plant, animal, and microbial life in a particular habitat or ecosystem. The IHR is known for its rich biodiversity, including many endemic and endangered species.
- **Forest Cover:** The total area under forest vegetation, important for ecological balance, carbon storage, and supporting wildlife. Forests in the Himalayan region also play a key role in preventing soil erosion and sustaining water cycles.
- **Demographic Growth:** The increase in population over time, which affects resource use, urbanization, and pressure on ecosystems. High population growth in Himalayan regions can strain limited natural resources.
- **Literacy Rate:** The percentage of people above a certain age who can read and write. Literacy is a key indicator of human development and affects employment, health, and social awareness.
- **Migration:** The movement of people from one place to another, either temporarily or permanently. In the IHR, migration patterns are often influenced by limited livelihood opportunities and environmental stress.
- **Cultural Diversity:** The existence of multiple cultural groups with distinct languages, traditions, and belief systems. The Himalayas are home to a mosaic of ethnic

communities, each contributing to the region's rich cultural heritage.

- **Remoteness:** The degree of physical isolation of a location from urban centers or essential services. Many areas in the Himalayas suffer from inaccessibility due to rugged terrain, affecting development and service delivery.

5.11 ANSWER TO CHECK YOUR PROGRESS

1. Which of the following best describes the topography of the Indian Himalayan Region (IHR)?
a) Uniform flat plains
b) High mountain ranges, deep valleys, and plateaus
c) Coastal lowlands
d) Desert dunes
Answer: b) High mountain ranges, deep valleys, and plateaus

2. The Indian Himalayan Region experiences which type of climate in most of its higher altitudes?
a) Tropical humid
b) Arid desert
c) Alpine and tundra
d) Mediterranean
Answer: c) Alpine and tundra

3. Which river system originates from the Indian Himalayan Region and contributes significantly to India's water resources?
a) Godavari
b) Narmada
c) Ganga
d) Mahanadi
Answer: c) Ganga

4. Which of the following statements about biodiversity in the IHR is correct?
a) It has low biodiversity due to extreme climate
b) It is a global biodiversity hotspot with unique flora and fauna
c) Only cultivated plant species are found here
d) Wildlife is absent in the higher altitudes
Answer: b) It is a global biodiversity hotspot with unique flora and fauna

5. The primary reason for high migration rates from rural areas of the IHR is:
a) Overpopulation
b) Lack of employment opportunities

c) Urban congestion
d) Industrial pollution
Answer: b) Lack of employment opportunities

6. Which of the following is a major challenge of accessibility and remoteness in the IHR?
a) High literacy rates
b) Dense road and rail networks
c) Difficult terrain and fragile environment
d) Surplus of healthcare facilities
Answer: c) Difficult terrain and fragile environment

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5.13 TERMINAL QUESTION

Short Answer Questions

1. Define the term biodiversity hotspot and name one such hotspot found in the Indian Himalayan Region.
2. What type of topography characterizes the Indian Himalayan Region?
3. Mention two major challenges of accessibility in the IHR.
4. Name any two major rivers originating from the IHR.
5. What is the main reason for migration from rural areas in the IHR?

Long Answer Questions

1. Describe the topography and climate of the Indian Himalayan Region.
2. Discuss the importance of water resources in the Indian Himalayan Region.
3. Explain the biodiversity and forest resources of the IHR.
4. Analyze the demographic structure of the IHR.
5. Evaluate the challenges of accessibility and remoteness in the IHR.

UNIT-6 PECTORAL DEVELOPMENT PATTERN:

6.1 OBJECTIVE

6.2 INTRODUCTION

6.3 AGRICULTURE

6.4 HORTICULTURE

6.5 HYDROPOWER

6.6 MINING

6.7 FOREST-BASED RESOURCE

6.8 TOURISM, PILGRIMAGE AND ECO-TOURISM POTENTIAL

6.9 INDUSTRIALIZATION AND SERVICE SECTOR GROWTH

6.10 SUMMARY

6.11 GLOSSARY

6.12 ANSWER TO CHECK YOUR PROGRESS

6.13 REFERENCES

6.14 TERMINAL QUESTIONS

6.1 OBJECTIVE

After reading this unit, you will be able to:

- Know about the Agriculture, horticulture and traditional farming systems of the Indian Himalayan Region (IHR).
- Understanding Hydropower, mining and forest-based resource Tourism, pilgrimage and eco-tourism potential of the Indian Himalayan Region (IHR).
- Know about Industrialization and service sector growth of the Indian Himalayan Region (IHR).

6.2 INTRODUCTION

The Pectoral Development Pattern in the Indian Himalayan Region (IHR) reflects a multi-sectoral evolution of its economy, grounded in its unique ecological, cultural, and geographical contexts. Agriculture, horticulture, and traditional farming systems have historically formed the backbone of rural livelihoods in the IHR. These systems are deeply rooted in indigenous knowledge, ecological sustainability, and community participation. The cultivation of diverse crops, fruits, and medicinal plants across terraced landscapes not only sustains food security but also conserves agrobiodiversity. Horticulture, particularly apple, citrus, and spice cultivation, has emerged as a key economic driver in states like Himachal Pradesh and Uttarakhand. Simultaneously, the region's rich hydrological resources have enabled the development of hydropower projects, offering clean energy and economic returns, albeit with ecological and social concerns. Mining, although limited due to ecological fragility, continues in specific areas with resources like limestone, coal, and gypsum. Forest-based livelihoods—including non-timber forest products (NTFPs), medicinal plant collection, and bamboo-based crafts—still play a vital role in sustaining mountain communities, especially among tribal populations.

Tourism, pilgrimage, and eco-tourism represent rapidly expanding dimensions of development in the IHR. The region is dotted with religious shrines like Kedarnath, Badrinath, Vaishno Devi, and Tawang Monastery, attracting millions of pilgrims annually and contributing significantly to local economies. Alongside religious tourism, eco-tourism is gaining ground, promoting conservation, environmental awareness, and income generation through activities like trekking, wildlife tourism, and homestays. Industrialisation, although constrained by terrain and infrastructure, has seen focused growth in sectors such as food processing, herbal products, and handicrafts. Uttarakhand and Himachal Pradesh have developed industrial estates, attracting small and medium enterprises. The service sector—including education, health, communication, and transport—is steadily growing, enhancing access and connectivity. Overall, the pectoral development pattern in the IHR reflects a blend of traditional livelihoods and modern economic

activities, requiring a balanced and sustainable approach to ensure inclusive growth while preserving fragile ecosystems.

6.3 AGRICULTURE

Agricultural practices in the Himalayan region are gradually transitioning from traditional cereal-based farming to the cultivation of high-value cash crops like fruits and vegetables. This shift from subsistence agriculture to commercial farming introduces several new challenges, particularly in maintaining crop productivity and quality. One of the major issues emerging is the failure of crops due to insufficient pollination. This problem primarily stems from a decline in both the population and diversity of pollinators. Contributing factors include habitat loss, reduced wilderness areas, changes in land use, the dominance of monocultures, and the overuse of agricultural chemicals and pesticides. As a result, there is a growing need to secure effective pollination by conserving natural pollinators and promoting managed pollination strategies. Addressing this issue requires greater attention from policy-makers, researchers, and agricultural extension services. Key priorities include revising current policies, strengthening institutional frameworks, and investing in capacity building and human resource development.

Table No. 6.1 State-wise land use classification (2005-6) (Thousand Hectare)

State	GeographicalArea	Reportingarea forlandutilisationstatistics	Forest	Noavailableforcultivation			Otheruncultivatedland,excludingfallow Land			
				Areaputtonon-agriculturaluses	Barren&unculturableland	Total	Permanentpastures&othergrazinglands	LandunderMisc.Treecrops &grovesnotincl. innet areasown.	Culturablewasteland	Total
Jammu& Kashmir	22224	3781	2023	293	289	582	125	71	141	338
Himachal Pradesh	5567	4544	1099	453	673	1126	1515	62	128	1706
Uttarakhand	5348	5670	3465	152	312	464	229	249	386	864
Sikkim	710	728	319	143	107	250	4	5	2	12
Arunachal Pradesh	8374	5547	5154		32	32		46	28	74
Manipur	2233	1950	1693	26	1	27	1	6	1	8
Meghalaya	2243	2227	942	90	137	227		158	453	611
Mizoram	2108	1951	1594	125	9	134	5	10	5	21
Nagaland	1658	1582	863	75		75		120	56	177

Tripura	1049	1049	606	131	3	134		27	1	28
Assam	7844	7850	1933	1081	1453	2533	160	209	77	445

Source*2006-2007.MinistryofAgriculture,GovernmentofIndia*

Jammu & Kashmir, with a vast geographical area of 22,224 thousand hectares, reported 3,781 thousand hectares for land utilisation statistics. The state had 2,023 thousand hectares under forest cover, while 582 thousand hectares were classified as land not available for cultivation, which includes 293 thousand hectares under non-agricultural use and 289 thousand hectares of barren and unculturable land. The remaining 338 thousand hectares fell under other uncultivated land, excluding fallow lands, consisting of 125 thousand hectares of permanent pastures and grazing lands, 71 thousand hectares under miscellaneous tree crops, and 141 thousand hectares of cultivable waste land.

In Himachal Pradesh, the geographical area spans 5,567 thousand hectares, with a reporting area of 4,544 thousand hectares. The forest area was 1,099 thousand hectares. Land not available for cultivation was 1,126 thousand hectares, comprising 453 thousand hectares under non-agricultural use and 673 thousand hectares barren and unculturable. Other uncultivated lands accounted for a total of 1,706 thousand hectares, which included a high share of 1,515 thousand hectares of permanent pastures, 62 thousand hectares under tree crops, and 128 thousand hectares of cultivable waste land.

Uttarakhand reported 5,670 thousand hectares of land utilisation against a geographical area of 5,348 thousand hectares, indicating some discrepancies due to reporting overlap. Forests occupied a significant 3,465 thousand hectares. Land unavailable for cultivation amounted to 464 thousand hectares, including 152 thousand hectares under non-agricultural uses and 312 thousand hectares of barren land. Uncultivated land totalled 864 thousand hectares, with 229 thousand hectares of permanent pastures, 249 thousand hectares under miscellaneous tree crops, and 386 thousand hectares of culturable wasteland.

Sikkim, with a small geographical area of 710 thousand hectares, had 728 thousand hectares reported, again suggesting a reporting extension. Forests covered 319 thousand hectares, while land not available for cultivation stood at 250 thousand hectares (comprising 143 thousand hectares non-agricultural and 107 thousand hectares barren). Other uncultivated lands were minimal at 12 thousand hectares, including 4 thousand hectares of pastures, 5 thousand hectares of tree crops, and 2 thousand hectares of cultivable waste.

Arunachal Pradesh's total geographical area was 8,374 thousand hectares, with 5,547 thousand hectares reported. A massive 5,154 thousand hectares were under forests. Land not available for cultivation was very limited at 32 thousand hectares, and other uncultivated land stood at 74 thousand hectares, including 46 thousand hectares of pastures, 28 thousand hectares of culturable waste, and no reported tree crops.

Manipur had a geographical area of 2,233 thousand hectares, with 1,950 thousand hectares reported. Forests accounted for 1,693 thousand hectares, making up a major portion. Land not available for cultivation was 27 thousand hectares, with 26 thousand under non-agricultural use and only 1 thousand hectares barren. Other uncultivated lands were minimal, totalling just 8 thousand hectares, including 1 thousand hectares of pastures, 6 thousand hectares of tree crops, and 1 thousand hectares of cultivable waste.

In Meghalaya, out of a total geographical area of 2,243 thousand hectares, 2,227 thousand hectares were reported. Forests occupied 942 thousand hectares. Land not available for cultivation was 227 thousand hectares, including 90 thousand hectares for non-agricultural use and 137 thousand hectares of barren land. Other uncultivated lands amounted to 611 thousand hectares, with 158 thousand hectares of pastures, 453 thousand hectares of culturable waste, but no reported area under miscellaneous tree crops.

Mizoram's geographical area was 2,108 thousand hectares, with a reporting of 1,951 thousand hectares. Forests dominated with 1,594 thousand hectares. Land not available for cultivation was 134 thousand hectares (125 thousand hectares for non-agricultural purposes and 9 thousand hectares barren). Other uncultivated lands totalled 21 thousand hectares, comprising 5 thousand hectares each of pastures and culturable waste, and 10 thousand hectares of tree crops.

Nagaland, having a geographical area of 1,658 thousand hectares, reported 1,582 thousand hectares. Forests occupied 863 thousand hectares. Land not available for cultivation stood at 75 thousand hectares, all of it under non-agricultural uses. Other uncultivated lands were 177 thousand hectares, made up of 120 thousand hectares of pastures, 56 thousand hectares of cultivable waste, and no reported land under tree crops.

Tripura had 1,049 thousand hectares both as a geographical and reporting area. Forest cover was 606 thousand hectares. Land not available for cultivation was 134 thousand hectares (131 thousand non-agricultural and 3 thousand barren). Other uncultivated lands stood at 28 thousand hectares, including 27 thousand hectares of pastures and just 1 thousand hectares of cultivable waste, with no tree crop area reported.



Fig. No. 6.1:An Example of Agriculture in the Himalayan hilly area

Assam had a geographical and reporting area of 7,844 and 7,850 thousand hectares, respectively. Forests spanned 1,933 thousand hectares. Land not available for cultivation was the highest among northeastern states at 2,533 thousand hectares, composed of 1,081 thousand hectares non-agricultural use and 1,453 thousand hectares barren and unculturable land. Other uncultivated land totalled 445 thousand hectares, including 160 thousand hectares of pastures, 209 thousand hectares under tree crops, and 77 thousand hectares of cultivable waste land.

Table No. 6.2 Contribution of Some of the IHR States to National Agricultural Production (2005-2006)

Crop	State	AllIndia Ranking	%ofTotal		AverageYield (kg/ha)	
			Area	Production	State	National
Food Grains	Uttarakhand	17	0.85	0.76	1548	1715
Coarse Cereals	HimachalPradesh	11	1.14	1.67	1715	1172
	Jammu&Kashmir	12	1.20	1.38	1344	
	Uttarakhand	14	0.93	0.94	1188	
	HimachalPradesh	10	1.36	0.98	1894	

Wheat	Uttarakhand	11	1.51	0.94	1633	2619
	Jammu&Kashmir	12	0.94	0.63	1790	
Potato	HimachalPradesh	11	1.00	0.40	6850	17058
	Tripura	12	0.38	0.39	17642	
Maize	HimachalPradesh	9	3.95	3.67	1839	1938
	Jammu&Kashmir	10	4.22	3.06	1413	
Sugarcane	Uttarakhand	8	2.38	2.18	60733	66928

Source*StatisticalAbstracts,India2007,CentralStatisticalOrganisation,NewDelhi*

Region-specific Factors Responsible for Low Productivity of Agriculture in the IHR (11th Five-Year Plan, 2007-12)

Table No. 6.3 Agro-climatic Region

Agro-climatic Region	States	Region-specific Constraints
Western Himalayan Region-I	Jammu&Kashmir, HimachalPradesh, Uttarakhand	Severe soil erosion, degradation due to heavy rainfall/floodsanddeforestation,poorroads,poo r inputdelivery, inadequate communication infrastructure and marketing
Eastern Himalayan Region-II	NEStates,Sikkim, Assam	Aluminium toxicity and soil acidity, soil erosion and floods, shifting cultivation, non-availability of electricity, poor roads, poor input delivery system and communication infrastructure

Source*WorkingGrouponAgro-ClimaticZonalPlanning.PlanningCommissionofIndia*

Table No.6.4 State-wiseIrrigatedareaintheIHR(2005-06)
(ThousandHectares)

State	Netirrigatedarea	Gross irrigatedarea	Area irrigated morethan Once	Netunirrigatedarea	TotalGross un-irrigated area
Jammu&Kashmir	311	454	143	442	636
Himachal Pradesh	105	177	72	435	763

Uttarakhand	345	559	214	422	707
Sikkim	-	-	-	-	-
Arunachal Pradesh	44	45	0	156	222
Manipur	51	51		172	172
Meghalaya	55	64	9	156	194
Mizoram	16	19	2	81	78
Nagaland	67	106	39	242	281
Tripura	61	104	43	219	194
Assam	140	161	21	2634	3570

-:Notavailable

Source*2006-2007.MinistryofAgriculture,GovernmentofIndia*

The state-wise irrigated area data for the Indian Himalayan Region (IHR) in 2005–06 reflects significant variation in agricultural water use patterns, influenced by geography, topography, and the extent of irrigation infrastructure available. In Jammu & Kashmir, the net irrigated area was 311 thousand hectares, while the gross irrigated area stood at 454 thousand hectares. This indicates that 143 thousand hectares were irrigated more than once in a year, pointing to regions with multiple cropping practices. However, 442 thousand hectares remained net unirrigated, and the total gross unirrigated area reached 636 thousand hectares, highlighting the dependence on rainfed agriculture in certain parts of the state, especially in hilly and remote terrains.

In Himachal Pradesh, irrigation coverage was considerably lower, with a net irrigated area of 105 thousand hectares and a gross irrigated area of 177 thousand hectares. The additional 72 thousand hectares irrigated more than once suggest limited but intensive irrigation in certain valleys and plains. Nevertheless, the state had a much larger net unirrigated area (435 thousand hectares) and an even higher gross unirrigated area (763 thousand hectares), which reflects its predominantly rainfed farming system due to steep slopes and limited canal or tube well infrastructure.

Uttarakhand reported relatively better irrigation statistics, with a net irrigated area of 345 thousand hectares and a gross irrigated area of 559 thousand hectares, implying that 214 thousand hectares were irrigated more than once. However, the state still had 422 thousand hectares of net unirrigated land and 707 thousand hectares of gross unirrigated area. This suggests that while irrigation infrastructure is relatively more developed in certain river valleys and the Terai region, large tracts in the middle and upper Himalayas remain dependent on rainfall and traditional water harvesting systems.

For Sikkim, data on irrigated and unirrigated areas for 2005–06 were not available, which limits comparison. In Arunachal Pradesh, irrigation coverage was minimal, with only 44 thousand hectares under net irrigation and 45 thousand hectares under gross irrigation, indicating negligible multiple cropping. The net unirrigated area stood at 156 thousand hectares, and the gross unirrigated area was 222 thousand hectares, showing heavy dependence on monsoon rainfall.

In the North-Eastern Himalayan states, irrigation development varied widely. Manipur had a net and gross irrigated area of 51 thousand hectares, indicating no multiple cropping through irrigation, with 172 thousand hectares remaining unirrigated. Meghalaya had slightly better coverage with 55 thousand hectares net irrigated and 64 thousand hectares gross irrigated, meaning 9 thousand hectares received multiple irrigation cycles. Still, unirrigated areas were large, with 156 thousand hectares net and 194 thousand hectares gross unirrigated. Mizoram showed very limited irrigation coverage with just 16 thousand hectares net and 19 thousand hectares gross irrigated, while unirrigated land was over 78–81 thousand hectares, reflecting its steep and rainfed farming conditions.

Nagaland reported 67 thousand hectares net irrigated and 106 thousand hectares gross irrigated, meaning 39 thousand hectares benefited from multiple irrigation cycles. However, unirrigated areas dominated with 242 thousand hectares net and 281 thousand hectares gross. Tripura presented a similar pattern with 61 thousand hectares net irrigated, 104 thousand hectares gross irrigated, and 43 thousand hectares irrigated more than once. Unirrigated areas remained significant, at 219 thousand hectares net and 194 thousand hectares gross.

The state of Assam had a larger absolute irrigated area in the IHR's eastern region, with 140 thousand hectares net irrigated and 161 thousand hectares gross irrigated, and 21 thousand hectares irrigated more than once. Despite this, unirrigated farming dominated overwhelmingly, with 2,634 thousand hectares net unirrigated and a gross unirrigated area of 3,570 thousand hectares, largely due to its vast rainfed floodplain agriculture system.

6.4 Horticulture

Spanning five countries—India, Nepal, Bhutan, China, and Pakistan—the Himalayan region is distinguished by its exceptional geography and diverse climatic zones, making it an important centre for horticultural production. This vast mountainous area supports a wide variety of fruits, vegetables, and medicinal plants, many cultivated in high-altitude environments. Horticulture serves as a vital source of income, food security, and employment for local communities. Despite its potential, the sector is constrained by rugged terrain, shifting climate patterns, and limited infrastructure. This study seeks to assess the present status of horticulture in

the Himalayas, identify the key obstacles to its growth, and outline strategies for fostering sustainable development. Rich in natural beauty and ecological variety, the Himalayas present both formidable challenges and exceptional opportunities for the advancement of horticulture. The paper highlights the barriers that impede progress and recommends approaches to harness the region's potential for sustainable horticultural growth.

Table No.6.5 State-wiseAreaunderFruitsandVegetablesasperland use(Hectares)

State	1990-91	2005-06(P)	2006-07(P)
Jammu&Kashmir	60	76	84
HimachalPradesh	73	102	101
Uttarakhand	-	51	54
Sikkim	7	8	8
ArunachalPradesh	33	25	28
Manipur	24	34	34
Meghalaya	57	72	79
Mizoram	9	4	5
Nagaland	9	29	24
Tripura	84	11	12
Assam	209	279	288

P=Provisional; -NotAvailable

Source: *AgriculturalStatisticsataGlance2009,MinistryofAgriculture,GovernmentofIndia*

The state-wise area under fruits and vegetables in the Indian Himalayan Region (IHR) over the period from 1990–91 to 2006–07 shows considerable variation, reflecting both regional agricultural patterns and developmental trends in horticulture. In Jammu & Kashmir, the area devoted to fruit and vegetable cultivation increased steadily from 60 thousand hectares in 1990–91 to 76 thousand hectares in 2005–06, and further to 84 thousand hectares in 2006–07. This upward trend can be attributed to the expansion of apple orchards, saffron cultivation, and vegetable farming in the valley, as well as government-led horticultural promotion programs.

In Himachal Pradesh, the area under fruits and vegetables also saw a notable increase

over the years, rising from 73 thousand hectares in 1990–91 to 102 thousand hectares in 2005–06. However, there was a slight decline to 101 thousand hectares in 2006–07, possibly due to land-use shifts or climatic factors affecting horticultural land. The expansion of apple cultivation in mid-hill regions and the diversification into off-season vegetables contributed significantly to this growth during the 1990s and early 2000s.

For Uttarakhand, data for 1990–91 is unavailable, but provisional figures show 51 thousand hectares in 2005–06 and a small increase to 54 thousand hectares in 2006–07. This growth reflects the rising importance of horticulture in the state's mid- and low-altitude valleys, particularly in the production of citrus fruits, apples, and seasonal vegetables. Sikkim recorded a modest increase, with the area under fruits and vegetables moving from 7 thousand hectares in 1990–91 to 8 thousand hectares in both 2005–06 and 2006–07, indicating relatively stable cultivation practices in the state's limited arable land.



Fig. No. 6.2An Example of Himalayan Fruit Apple, Source: Google image

Arunachal Pradesh experienced a decline in fruit and vegetable cultivation area from 33 thousand hectares in 1990–91 to 25 thousand hectares in 2005–06, followed by a slight recovery to 28 thousand hectares in 2006–07. The initial decline could be linked to shifting cultivation changes and limited commercial horticulture expansion, whereas the later increase may suggest emerging interest in permanent fruit orchards. Manipur showed steady growth, with the area rising from 24 thousand hectares in 1990–91 to 34 thousand hectares in both 2005–06 and 2006–07, driven by the production of pineapples, oranges, and a variety of vegetables for both local consumption and trade.

In Meghalaya, the area under fruits and vegetables grew significantly from 57 thousand hectares in 1990–91 to 72 thousand hectares in 2005–06 and further to 79 thousand hectares in 2006–07. This steady growth indicates successful expansion of citrus orchards, pineapples, and temperate vegetables in both highland and lowland regions. In contrast, Mizoram saw a sharp decline from 9 thousand hectares in 1990–91 to just 4 thousand hectares in 2005–06, with a minor increase to 5 thousand hectares in 2006–07, suggesting a possible reduction in horticulture area due to shifting cultivation pressures or land use diversification.

Nagaland exhibited remarkable growth from 9 thousand hectares in 1990–91 to 29 thousand hectares in 2005–06, before dropping slightly to 24 thousand hectares in 2006–07. This suggests an initial horticultural expansion phase, possibly aided by government programs, followed by a minor contraction. Tripura, however, recorded a drastic decline from 84 thousand hectares in 1990–91 to just 11 thousand hectares in 2005–06 and 12 thousand hectares in 2006–07, indicating a significant shift away from horticulture, perhaps toward other land uses or due to data reclassification.

Finally, Assam consistently maintained the largest area under fruits and vegetables among the IHR states, expanding from 209 thousand hectares in 1990–91 to 279 thousand hectares in 2005–06, and further to 288 thousand hectares in 2006–07. This growth reflects the state's fertile plains and strong market linkages for crops like bananas, citrus fruits, and a wide range of vegetables.

6.4.1 Traditional Farming Systems

The estimates of area under jhum cultivation in the North-Eastern states of the Indian Himalayan Region (IHR) show significant variation across different sources, reflecting differences in methodology, definitions, and assessment years. Data from the Task Force of the Ministry of Agriculture (MoA, 1983) provides an early baseline, primarily based on the number of families practising shifting cultivation. For instance, Arunachal Pradesh had 54,000 families engaged in jhum over 700 km², while Assam had 58,000 families over 696 km². Manipur recorded the highest number of families (70,000) practising shifting cultivation on 900 km², while Nagaland, despite having 116,046 families involved, showed a much smaller area (192 km²) under jhum, possibly due to shorter fallow cycles and smaller individual plots. Tripura recorded the smallest jhum area of 223 km² with 43,000 families. In total, the MoA estimates put the jhum area at 3,869 km², which was only about 2% of the total geographical area of the region.

Table No. 6.6 Variations in the Estimates of Area under *Jhum* Cultivation in Different

States of the North-Eastern parts of IHR

State	SourcesandAreaunderShiftingCultivation(km²)				
	TaskForceMoA,1983		Wastelands Atlas 2000	Satapathy, 2003	NRSA, 2005
	NoofFamilies	Area			
ArunachalPradesh	54000	700	3088.08	2610	1613.1
Assam	58000	696	8046.75	3100	3930.9
Manipur	70000	900	12014.10	3600	4816.6
Meghalaya	52290	530	2086.77	2650	743.8
Mizoram	50000	630	3761.23	450	4017.9
Nagaland	116046	192	5224.65	6330	1917.9
Tripura	43000	223	400.88	1080	395.2
Totalareaunder*Jhum*cultivation		3869	34622.40	19820	17435.4
%oftotal Geographical area		2.0	17.7	10.1	8.9

Source*Report of the Task Force onMountain Ecosystems [Environment and Forest Sector] forEleventh Five-Year Plan.PlanningCommission,Govt. of India. 2006*

In contrast, the Wastelands Atlas (2000) presented a much larger estimate of shifting cultivation, with a total of 34,622.40 km², representing 17.7% of the total geographical area. This figure is substantially higher than the MoA estimates, indicating either a more inclusive classification of degraded lands linked to shifting cultivation or a reflection of more widespread practice at that time. Notably, Assam topped the list with 8,046.75 km² under jhum, followed by Manipur with 12,014.10 km² and Nagaland with 5,224.65 km². Arunachal Pradesh, Mizoram, and Meghalaya also recorded significantly higher jhum areas than earlier estimates, suggesting that in the late 1990s and early 2000s, shifting cultivation was far more extensive and covered vast tracts of hilly terrain.

The estimates provided by Satapathy (2003) and NRSA (2005) again show a considerable decline from the Wastelands Atlas data, likely due to improvements in remote sensing accuracy, policy interventions to promote settled agriculture, and changes in land-use practices. Satapathy (2003) estimated a total jhum area of 19,820 km² (10.1% of the total geographical area), with Manipur (3,600 km²), Assam (3,100 km²), and Nagaland (6,330 km²) as major contributors. By 2005, the National Remote Sensing Agency (NRSA) reported a further reduction to 17,435.4 km² (8.9% of the total area), with the most notable decreases in Arunachal Pradesh (1,613.1 km²), Meghalaya (743.8 km²), and Nagaland (1,917.9 km²). Interestingly, Mizoram's jhum area increased slightly in the NRSA data (4,017.9 km²), possibly reflecting localised expansion or longer fallow cycles in some districts.

These variations highlight the challenges in accurately estimating the extent of jhum cultivation, which fluctuates with socio-economic changes, population pressures, government rehabilitation programs, and shifts in agricultural preferences. The differences also underline the role of data sources—older field survey-based estimates tend to be lower, while early remote sensing products may have overestimated degraded lands linked to jhum, and more recent satellite-based assessments provide refined, often lower figures. The declining trend from 2000 to 2005 suggests that shifting cultivation in the North-Eastern IHR is gradually reducing in extent, although it remains a significant livelihood practice in many hilly communities.

6.5 HYDROPOWER

The status of hydropower potential development in the Indian Himalayan Region (IHR) reveals significant disparities among states in terms of utilisation of their identified capacities.

In Jammu & Kashmir, the identified hydropower potential stands at 14,146 MW, of which only 1,864.2 MW (13.18%) has been developed. An additional 899 MW (6.36%) is under construction, bringing the combined developed and under-construction capacity to 2,763.2 MW (19.53%). However, a massive 11,382.9 MW, or 80.47% of the potential, remains untapped. This underutilization is largely due to geographical challenges, environmental constraints, and socio-political factors.

Himachal Pradesh has made comparatively better progress, with 18,820 MW of identified potential. The state has developed 6,085.5 MW (32.34%) and has another 4,435 MW (23.57%) under construction, giving a combined figure of 10,520.5 MW (55.90%). Still, 8,299.6 MW (44.10%) is yet to be developed, indicating both significant achievements and future opportunities in the sector.

In Uttarakhand, the identified potential is 18,175 MW. The state has developed 2,980.1 MW (16.40%) and has 1,926 MW (10.60%) under construction, totalling 4,906.1 MW (26.99%). The remaining 13,269 MW (73.01%) is still undeveloped, showing that despite favourable hydrological conditions, progress has been relatively slow due to environmental sensitivities and displacement concerns.

Table No.6.7 Status of Hydropower Potential Development in the IHR (Installed capacity)

State	Identified Capacity	Capacity Developed	Capacity Under construction	CapacityDeveloped& Under Construction	Capacity yet to be developed

	(MW)	(MW)	(%)	(MW)	(%)	(MW)	(%)	(MW)	(%)
Jammu& Kashmir	14146	1864.2	13.18	899.0	6.36	2763.2	19.53	11382.9	80.47
Himachal Pradesh	18820	6085.5	32.34	4435.0	23.57	10520.5	55.90	8299.6	44.10
Uttarakhand	18175	2980.1	16.40	1926.0	10.60	4906.1	26.99	13269.0	73.01
Sikkim	4286	254	1.96	2139.0	53.87	2393.0	55.83	893.0	44.17
Arunachal Pradesh	50328	423.5	0.84	2600.0	5.17	3023.5	6.01	47304.5	93.99
Meghalaya	2394	185.2	7.74	84.0	3.51	269.2	11.24	2124.8	88.76
Mizoram	2196	0.0	0.00	0.0	0.00	0.0	0.00	2196.0	100.00
Manipur	1784	105.0	5.89	0.0	0.00	105.0	5.89	1679.0	94.11
Nagaland	1574	99.0	6.29	0.0	0.00	99.0	6.29	1475.0	93.71
Tripura	15	15.0	100.00	0.00	0.00	105.0	5.89	1679.0	94.11
Assam	680	375.0	55.15	0.0	0.00	375.0	55.15	305.0	44.85

Source*CentralElectricityAuthority,2008*

Sikkim has an identified capacity of 4,286 MW, but development has been modest so far, with only 254 MW (1.96%) installed. However, the state has made significant progress in ongoing projects, with 2,139 MW (53.87%) under construction. Together, developed and under-construction capacities account for 2,393 MW (55.83%), leaving 893 MW (44.17%) yet to be developed.

Arunachal Pradesh has the largest identified hydropower potential in the IHR at 50,328 MW, but only 423.5 MW (0.84%) has been developed so far. With 2,600 MW (5.17%) under construction, the total developed and under-construction capacity is 3,023.5 MW (6.01%), leaving an enormous 47,304.5 MW (93.99%) untapped. The low utilisation reflects infrastructural challenges, remote terrain, and the scale of investment required.



Fig. No. 6.3Hydropower project in the Himalayan Region, Source: Google Image

In Meghalaya, out of 2,394 MW potential, 185.2 MW (7.74%) has been developed, and 84 MW (3.51%) is under construction, resulting in a total of 269.2 MW (11.24%) completed or in progress. The remaining 2,124.8 MW (88.76%) is yet to be utilised.

Mizoram has an identified potential of 2,196 MW, but no development or construction activity has been undertaken so far, leaving 100% of its potential untapped. Similarly, Manipur has developed only 105 MW (5.89%) of its 1,784 MW capacity, with no projects currently under construction, leaving 1,679 MW (94.11%) still available. Nagaland has achieved 99 MW (6.29%) out of 1,574 MW, also with no current construction projects, leaving 1,475 MW (93.71%) undeveloped.

Tripura, with the smallest potential of just 15 MW, has fully developed its capacity (100%). On the other hand, Assam has an identified capacity of 680 MW, with 375 MW (55.15%) already developed and no ongoing projects, leaving 305 MW (44.85%) yet to be exploited.

The data highlights that while states like Himachal Pradesh, Assam, and Sikkim have made considerable strides in harnessing their hydropower potential, the majority of the IHR states, especially Arunachal Pradesh, Mizoram, and Nagaland, remain largely underdeveloped in this sector. This underutilization represents both a challenge and a vast opportunity for future clean energy development in the Himalayan region.

6.6 MINING

The value of mineral production by mineral groups in different states of the Indian Himalayan Region (IHR) during 2006–07 and 2007–08 reveals clear variations in resource distribution, mineral specialisation, and extraction intensity across states. The data, expressed in ₹' '000, highlights the dominance of fuel minerals in certain states, while others rely primarily on non-metallic and minor mineral production.

Table No. 6.8 ValueofMineralProductionbyMineralGroupsindifferentStatesoftheIHR (In₹'000)

State	FuelMinerals		Metallicminerals		Non-metallic minerals		MinorMinerals	
	2006-07	2007-08(P)	2006-07	2007-08(P)	2006-07	2007-08(P)	2006-07	2007-08(P)
Jammu&Kashmir	12000	13804	-	-	74272	65274	231863	231863
HimachalPradesh					677467	740904	257169	257169
Uttarakhand					161558	169698	475154	475154
Sikkim			4386				9050	9050
ArunachalPradesh	601560	568140	-	-	-		1523	1523
Manipur							2866	2866
Meghalaya	7638840	5292390	-	-	398797	342630	72075	72075
Mizoram	755	755	-	-	-	-	755	755
Nagaland	-	-	-	-	-	-	1744	1744
Tripura	998400	1025280					5507	5507
Assam	30824370	31315648			60685	76164	342553	342553

Source*IndianMineralYearBook,2008,IndianBureauofMines,MinistryofMines,GovernmentofIndia*.

In Jammu & Kashmir, fuel mineral production was valued at ₹12,000 in 2006–07, increasing to ₹13,804 in 2007–08. The state reported no metallic mineral output but recorded a substantial non-metallic mineral production value of ₹74,272 in 2006–07, which declined to ₹65,274 in 2007–08. Minor minerals, such as building stones, gypsum, and sand, contributed significantly, maintaining a steady value of ₹231,863 in both years, reflecting consistent demand from the construction sector.

Himachal Pradesh did not report fuel or metallic mineral production, but non-metallic mineral output was significant, increasing from ₹677,467 in 2006–07 to ₹740,904 in 2007–08. These include limestone, gypsum, and slate, which are essential for the cement and construction industries. Minor minerals were valued at ₹257,169 in both years, indicating a stable local mining economy driven by construction materials.

In Uttarakhand, there was no recorded fuel or metallic mineral production, but non-metallic minerals contributed ₹161,558 in 2006–07, rising to ₹169,698 in 2007–08. Minor minerals showed much higher values, at ₹475,154 for both years, pointing to significant extraction of riverbed materials, boulders, and stones used in infrastructure development.

Sikkim recorded no fuel mineral output but produced metallic minerals valued at ₹4,386 in 2006–07, along with non-metallic minerals worth ₹9,050 in both years. This reflects limited but specialised mining activity, possibly linked to small-scale extraction of chromite and limestone.

In Arunachal Pradesh, fuel mineral production—likely coal—was valued at ₹601,560 in 2006–07 and slightly declined to ₹568,140 in 2007–08. No metallic or non-metallic minerals were reported, but minor minerals contributed a modest ₹1,523 in both years, suggesting limited local construction material extraction.

Manipur reported no production of fuel, metallic, or non-metallic minerals, with only minor minerals valued at ₹2,866 for both years, indicating minimal mining activity focused on local needs.

Meghalaya showed a strong dependence on fuel minerals, with production valued at ₹7,638,840 in 2006–07 and ₹5,292,390 in 2007–08, reflecting coal mining dominance. Non-metallic minerals such as limestone were also significant, valued at ₹398,797 in 2006–07 and ₹342,630 in 2007–08. Minor minerals contributed ₹72,075 steadily in both years. The drop in fuel mineral value could be linked to market fluctuations or regulatory restrictions.

In Mizoram, both fuel and metallic minerals were absent, with only minor mineral production valued at ₹755 for both years, indicating very limited extraction activity.

Nagaland had no reported fuel, metallic, or non-metallic minerals, with minor mineral production valued at ₹1,744 in both years, reflecting small-scale quarrying.

Tripura's mineral sector was dominated by fuel minerals—likely natural gas—valued at ₹998,400 in 2006–07 and ₹1,025,280 in 2007–08. Minor minerals contributed ₹5,507 steadily in both years, showing minimal construction-related mining.

Assam emerged as the largest producer of fuel minerals in the IHR, with values of ₹30,824,370 in 2006–07 and ₹31,315,648 in 2007–08, driven by oil and natural gas extraction. Non-metallic mineral output increased from ₹60,685 to ₹76,164, while minor minerals maintained a significant contribution at ₹342,553 in both years, supporting construction activities

across the state.

Table No. 6.9 ExistingMiningLeasesin differentStatesoftheIHR (2004-05to 2006-07)

State	2004-05		2005-06		2006-07	
	No.	**Area(ha)**	**No.**	**Area(ha)**	**No.**	**Area(ha)**
Jammu&Kashmir	19	730.35	19	730.35	21	739.92
HimachalPradesh	60	1998.70	60	1999.55	59	1988.05
Uttarakhand	93	9424.33	67	3063.92	88	9290.11
Sikkim	4	86.00	4	102.06	4	102.6
Manipur	2	610.17	2	610.17	2	610.17
Meghalaya	14	1660.16	14	1660.16	18	1679.41
Assam	11	981.33	11	981.33	8	929.5

Source*IndianMineralYearBook,2008,IndianBureauofMines,MinistryofMines,Governmentof India*.

The record of existing mining leases in different states of the Indian Himalayan Region (IHR) from 2004–05 to 2006–07 shows notable differences in both the number of leases and the total leased area, reflecting variations in mineral availability, regulatory changes, and economic activity in each state.

In Jammu & Kashmir, the number of mining leases remained constant at 19 during 2004–05 and 2005–06, with a total leased area of 730.35 hectares in both years. In 2006–07, there was a slight increase to 21 leases, accompanied by a marginal increase in area to 739.92 hectares. This indicates stable mining operations with modest growth, likely involving minor minerals such as gypsum, limestone, and building stones.

Himachal Pradesh maintained a steady number of leases at 60 for both 2004–05 and 2005–06, with a very slight increase in leased area from 1,998.70 to 1,999.55 hectares. By 2006–07, the number of leases reduced slightly to 59, with the area also decreasing to 1,988.05 hectares. This reflects a mature and relatively stable mining sector, primarily focused on non-metallic minerals such as limestone, slate, and gypsum, with only minimal changes in

operational extent.

In Uttarakhand, there was a significant fluctuation. The state had the highest total leased area among all IHR states in 2004–05, with 93 leases covering 9,424.33 hectares. However, in 2005–06, both the number and area of leases dropped sharply to 67 leases and 3,063.92 hectares. This could indicate regulatory tightening, lease cancellations, or temporary suspensions of mining operations. By 2006–07, the number of leases rose again to 88, and the leased area almost recovered to earlier levels at 9,290.11 hectares, suggesting revival and re-issuance of leases. Mining in Uttarakhand is mainly for limestone, soapstone, and building materials.

Sikkim had a very small but consistent mining sector, with only 4 leases during all three years. The leased area increased from 86.00 hectares in 2004–05 to 102.06 hectares in 2005–06, and remained stable at 102.60 hectares in 2006–07. This stability reflects small-scale, controlled extraction, possibly involving chromite, copper, and limestone deposits.

In Manipur, mining leases were minimal, with only 2 leases recorded throughout the period, covering a constant area of 610.17 hectares. The stability suggests very limited mining activity, possibly in coal or minor mineral extraction for local use.

Meghalaya displayed moderate activity, with 14 leases covering 1,660.16 hectares in both 2004–05 and 2005–06. By 2006–07, the number of leases increased to 18, and the total area slightly expanded to 1,679.41 hectares. This likely reflects growing coal and limestone mining operations, which are key to the state's economy.

Assam showed a gradual decline in mining lease activity. From 11 leases covering 981.33 hectares in both 2004–05 and 2005–06, the figures dropped to 8 leases covering 929.5 hectares in 2006–07. The reduction could be due to resource depletion, stricter environmental regulations, or shifting priorities toward petroleum and natural gas extraction, which are handled under separate licensing systems.

6.7 FOREST-BASED RESOURCE

The production of wood-based forest products in the Indian Himalayan Region (IHR) during 2005–06 displays wide variation across states, influenced by forest composition, accessibility, extraction policies, and local demand patterns.

Table No. 6.10 State-wiseProduction(2005-06)of ForestProduceintheIHR–Wood

State	Roundwood		Woodfuel	Saw logs &Veneerlogs		Pulpwood	
	C	NC		C	NC	C	NC
	(Cum)	(Cum)	(Cum)	(Cum)	(Cum)	(Cum)	(Cum)
Jammu&Kashmir	51250.0	0.0	22924.0	0.0	0.0	0.0	0.0
Himachal Pradesh	8089.46	66.0	22291.0	13423.06	3705.07	6430.50	0.00
Uttarakhand	77775.0	168265.0	63898.0	-	-	-	85279.0
Arunachal Pradesh	40656.43	0.0	12878.9	0.0	0.0	0.0	0.0
Mizoram	250	0.0	1203.0	0.0	0.0	0.0	0.0
Nagaland	NA	NA	NA	NA	NA	NA	NA
Tripura	0.0	351.02	6462.36	0.0	0.0	0.0	0.0
Assam	0.0	12064.0	510.0	NA	NA	NA	NA

State	OtherIndustrial Round wood (Poles&Posts)		Sawnwood		Chips &particles	Woodresidues	Wood charcoal
	C	NC	C	NC			
	(Cum)	(Cum)	MT	MT	MT	MT	MT
Jammu&Kashmir	0.00	0.00	35150.00	0.00	0.00	0.00	0.00
Himachal Pradesh	2065.00	0.00	69259.49	0.00	0.00	0.00	7924.93
Uttarakhand	-	-	34262.42	75.52	-	-	353.30
Mizoram	0.00	0.00	0.00	0.00	170.02	0.00	26.37
Tripura	0.00	2472.01	0.00	0.00	0.00	0.00	0.00

Cum=CubicMeter,MT=MetricTon,C=Coniferous,NC=NonConiferous
-IndicatesthatInformation is notavailable.

Source*IndianCouncilofForestryResearchandEducation,Dehradun*
Quotedby-CompendiumofEnvironmentStatisticsIndia(2008-09),CentralStatisticalOrganisation, New Delhi

In Jammu & Kashmir, round wood production was recorded entirely from coniferous species, amounting to 51,250 cubic meters (cum), with no production reported from non-coniferous sources. The state also produced 22,924 cum of wood fuel (C) and a substantial 35,150 metric tons (MT) of sawn wood, but there was no recorded output of saw logs, veneer logs, pulp wood, poles, posts, chips, particles, residues, or charcoal. This reflects the dominance of coniferous forests in the region, particularly deodar, kail, and fir, which are primarily used for

timber and construction purposes.

Himachal Pradesh demonstrated a more diversified production profile. Round wood production included 8,089.46 cum from coniferous species and 66 cum from non-coniferous sources. Wood fuel production was significant, with 22,291 cum from conifers and 13,423.06 cum from non-conifers, reflecting high domestic fuelwood dependence in rural areas. The state also reported 3,705.07 cum of coniferous and 6,430.50 cum of non-coniferous saw logs and veneer logs. While no pulp wood was produced, Himachal Pradesh generated 2,065 cum of industrial round wood (poles and posts), and a notable 69,259.49 MT of sawn wood. Additionally, 7,924.93 MT of wood charcoal was produced, indicating small-scale but active traditional charcoal-making practices.

In Uttarakhand, round wood production was relatively high, with 77,775 cum from conifers and 168,265 cum from non-conifers. Wood fuel output from conifers reached 63,898 cum, although data for non-conifer fuelwood was unavailable. There was no data reported for saw logs and veneer logs, but pulp wood production was significant at 85,279 cum, indicating the presence of industrial wood-processing activities. The state also produced 34,262.42 MT of sawn wood (C) and 75.52 MT (NC), along with 353.30 MT of wood charcoal, which points to both industrial and artisanal wood utilisation.

Arunachal Pradesh produced 40,656.43 cum of coniferous round wood, 12,878.9 cum of coniferous wood fuel, and no recorded production for saw logs, veneer logs, pulp wood, or other wood-based categories. The limited product diversification could be attributed to the remoteness of forest areas and a reliance on local-scale wood use.

In Mizoram, round wood output from conifers was only 250 cum, and wood fuel production was 1,203 cum. There was no recorded production of saw logs, veneer logs, or pulp wood, but the state did report 170.02 MT of chips and particles, along with 26.37 MT of wood charcoal, indicating localised processing for domestic consumption.

Tripura reported no coniferous round wood production but produced 351.02 cum of non-coniferous round wood and 6,462.36 cum of coniferous wood fuel. The state did not record saw logs, veneer logs, or pulp wood, but it had 2,472.01 cum of non-coniferous industrial round wood (poles and posts), pointing to a modest role of small timber products in the local economy.

In Assam, there was no coniferous round wood production, but 12,064 cum of non-coniferous round wood was reported, alongside 510 cum of coniferous wood fuel. No further product category data was available, indicating partial reporting.

Notably, Nagaland had no available data for 2005–06, leaving a significant gap in the

understanding of its forest produce profile. This lack of information, along with missing figures for several other states in specific categories, underscores the need for more comprehensive and consistent forestry statistics in the IHR.

Table No.6.11State-wiseResinProduction(2005-06)fromIHRForests

State	Resins (Metric tonnes)	
	2004-05	**2005-06**
Jammu&Kashmir	3941.00	6748.00
HimachalPradesh	8797.00	8508.00
Uttarakhand	17983.00	18349.00
ArunachalPradesh	4040.00	1415430.00

Source: *IndianCouncilofForestryResearchandEducation, Dehradun*
Quoted by - Compendium of EnvironmentStatistics India (2008-09), Central Statistical Organisation, New Delhi

The state-wise resin production data for 2005–06 in the Indian Himalayan Region (IHR) reveal both steady trends and anomalies that require careful interpretation. Resin, mainly derived from chir pine (Pinus roxburghii), is a valuable non-timber forest product used in the manufacture of turpentine, rosin, and other industrial goods, and its production reflects both forest resource availability and management practices.

In Jammu & Kashmir, resin production witnessed a remarkable rise from 3,941 metric tonnes in 2004–05 to 6,748 metric tonnes in 2005–06. This substantial increase of over 70% may be linked to an expansion of tapping areas, favourable climatic conditions enhancing resin flow, or improved collection and processing infrastructure. Chir pine forests in the lower altitudes of the Jammu division and parts of the Kashmir valley are the primary sources for this resin, which supports both local industries and export-oriented processing units.

Himachal Pradesh recorded a slight decline in resin output, dropping from 8,797 metric tonnes in 2004–05 to 8,508 metric tonnes in 2005–06, a reduction of about 3%. The state has an established resin tapping industry, but this small dip could be attributed to regulated extraction limits for sustainable forest management, localised forest protection measures, or temporary declines in productivity due to environmental conditions. Despite this decrease, Himachal remains one of the leading resin-producing states in the IHR.

Uttarakhand maintained its position as the highest resin producer among the western

Himalayan states, with production increasing from 17,983 metric tonnes in 2004–05 to 18,349 metric tonnes in 2005–06. This marginal growth reflects both the extensive chir pine forests in the state and the consistent demand for resin-based products. The resin industry here plays a vital role in the rural economy, particularly in districts such as Pauri Garhwal, Almora, and Nainital, where tapping is a significant seasonal employment source.

The most striking and unusual figure comes from Arunachal Pradesh, where reported production jumped from 4,040 metric tonnes in 2004–05 to an astonishing 1,415,430 metric tonnes in 2005–06. This represents an increase of over 35,000% in a single year, which is highly improbable given the state's forest composition and extent of resin-yielding pine species. Such a figure almost certainly indicates a data reporting or unit error in the official records rather than a real production surge. In reality, Arunachal Pradesh's pine forest cover is far smaller than that of the western Himalayan states, making such massive production logistically and ecologically implausible.

6.8 TOURISM, PILGRIMAGE AND ECO-TOURISM POTENTIAL

The state-wise data on domestic and foreign tourist visits to the Indian Himalayan Region (IHR) in 2006 highlights significant variations in tourism flow, percentage share on an all-India basis, and national ranking. These patterns reflect the combined influence of natural attractions, cultural heritage, infrastructure, accessibility, and promotion of tourism in different states.

In Jammu & Kashmir, 7,646,274 domestic tourists and 46,087 foreign tourists visited in 2006, accounting for 1.66% of the total domestic and 0.39% of the total foreign tourist visits in India. The state ranked 13th in domestic tourism and 19th in foreign tourist arrivals nationwide. Its scenic landscapes, religious sites like Vaishno Devi, and adventure tourism offerings contribute to strong domestic tourism. However, foreign tourist numbers were comparatively lower, possibly due to perceptions of security issues and seasonal accessibility constraints.

Table No.6.12 State-wiseDomesticandForeignTouristVisitsintheIHR(2006)

State	TouristVisits (numbers)		Percentageshare(All India basis)		AllIndiaRank	
	Domestic	Foreign	Domestic	Foreign	Domestic	Foreign
Jammu&Kashmir	7646274	46087	1.66	0.39	13	19
HimachalPradesh	7671902	281569	1.66	2.40	12	11
Uttarakhand	16666525	85284	3.61	0.73	7	15

Sikkim	292486	18026	0.06	0.15	28	22
ArunachalPradesh	80137	607	0.02	0.01	32	32
Manipur	116984	295	0.03	0.00	31	35
Meghalaya	401529	4287	0.09	0.04	25	27
Mizoram	50987	436	0.01	0.00	33	33
Nagaland	15850	426	0.00	0.00	35	34
Tripura	230645	3245	0.05	0.03	29	28

Source: *CentralStatisticalOrganisation*

Himachal Pradesh recorded 7,671,902 domestic tourist visits and 281,569 foreign tourist visits, sharing the same domestic percentage as Jammu & Kashmir (1.66%) but securing a better position for foreign visitors with 2.40% of the national share, ranking 11th in India. Popular hill stations such as Shimla, Manali, and Dharamshala, along with adventure activities and Buddhist monasteries, have a strong international appeal, reflected in their higher foreign tourist ranking compared to Jammu & Kashmir.

Uttarakhand emerged as a leading tourist destination, attracting 16,666,525 domestic tourists—the highest in the IHR—representing 3.61% of India's total domestic tourist visits, ranking 7th nationally. Foreign tourist visits were recorded at 85,284, representing 0.73% of India's total and placing the state 15th in foreign arrivals. The state's dominance in domestic tourism is driven by its numerous pilgrimage centres (such as Char Dham), hill stations like Nainital and Mussoorie, and adventure tourism hubs like Rishikesh.

In Sikkim, 292,486 domestic and 18,026 foreign tourists visited in 2006, representing 0.06% and 0.15% of the national share, ranking 28th and 22nd, respectively. Despite its small geographical size, Sikkim has considerable international interest due to its pristine environment, culture.

6.8.1 Festivalsand unique biodiversity.

Arunachal Pradesh recorded 80,137 domestic and 607 foreign tourist visits, accounting for 0.02% and 0.01% of India's totals, ranking 32nd for both domestic and foreign arrivals. Limited infrastructure, remote location, and permit requirements may have contributed to the low tourist numbers despite its rich cultural and natural heritage.

Manipur saw 116,984 domestic tourists and just 295 foreign tourists, contributing 0.03% and virtually 0.00% to the national totals, with ranks of 31 and 35, respectively. Tourism here is hindered by connectivity challenges and limited international marketing, despite its cultural diversity and scenic landscapes.

Meghalaya received 401,529 domestic and 4,287 foreign tourists, capturing 0.09% and 0.04% of the national share, ranking 25th and 27th, respectively. The state's natural attractions, like waterfalls, caves, and living root bridges, draw interest, but foreign tourism remains modest.
Mizoram hosted 50,987 domestic and 436 foreign visitors, representing just 0.01% and 0.00% of national totals, ranking 33rd for both domestic and foreign tourism. Similar to other northeastern states, geographic isolation and limited promotional efforts restrict large-scale tourist inflow.
Nagaland recorded the lowest domestic tourist visits in the IHR with 15,850 visitors and 426 foreign arrivals, both contributing virtually 0.00% to the national totals, ranking 35th and 34th, respectively. Despite unique cultural attractions like the Hornbill Festival, tourism remains niche.
Tripura attracted 230,645 domestic tourists and 3,245 foreign visitors, representing 0.05% and 0.03% of the total national share, ranking 29th and 28th, respectively. Historical monuments, temples, and eco-tourism spots form the backbone of its tourism industry, though infrastructure limitations affect growth.

6.8.2 Pilgrimage

The Indian Himalayan Region (IHR) is home to some of the most sacred and spiritually significant pilgrimage destinations in the country, drawing millions of devotees and tourists each year. Rich in cultural, religious, and spiritual heritage, this region is deeply interwoven with Hinduism, Buddhism, Sikhism, and indigenous belief systems. Pilgrimage in the IHR not only holds immense religious value but also plays a crucial role in shaping the socio-economic landscape of the area.



Fig. No. 6.4 Char Dham Example ofPilgrimage Tourism, Source: Google Image

Important Pilgrimage Sites:

1) Uttarakhand is known as Devbhumi (Land of the Gods) and houses the famous Char Dham (Badrinath, Kedarnath, Gangotri, and Yamunotri), visited by lakhs of devotees every year. The holy towns of Haridwar and Rishikesh, though located in the foothills, also act as gateways to the Himalayan shrines.
2) Jammu & Kashmir is famous for Vaishno Devi, one of India's most visited shrines, and Amarnath Cave Temple, which hosts an annual yatra to the ice Shiva Linga in challenging high-altitude terrain.
3) Himachal Pradesh hosts prominent temples like Jwala Devi, Chintpurni, Naina Devi, and Manimahesh, which are revered among Hindu pilgrims. It also has important Buddhist sites like Rewalsar and Tabo Monastery in Spiti.
4) Sikkim is an important centre for Buddhist pilgrimage, with sacred sites like Rumtek Monastery, Tashiding, and Guru Padmasambhava's sacred caves.
5) Arunachal Pradesh features important Buddhist monasteries such as Tawang Monastery, the largest in India and the second-largest in the world.
6) Ladakh, formerly part of Jammu & Kashmir and now a separate Union Territory, is home to ancient Tibetan Buddhist monasteries like Hemis, Thiksey, and Diskit, attracting monks and spiritual seekers globally.
7) In the Punjab-Himachal foothills, Paonta Sahib, a revered Sikh pilgrimage site, draws followers of Guru Gobind Singh.

6.8.3 Socio-Economic and Environmental Dimensions:

Pilgrimage tourism contributes significantly to local economies by generating employment in transport, hospitality, and allied services. Seasonal pilgrimages like the Char Dham Yatra and Amarnath Yatra create livelihood opportunities for thousands of locals, including porters, pony owners, guides, and hoteliers.

However, the growing number of pilgrims has also raised concerns about environmental degradation, waste management, fragile ecosystem damage, and infrastructure strain, especially in ecologically sensitive zones. Incidents like the 2013 Kedarnath floods exposed the vulnerability of unregulated pilgrimage growth in the Himalayan context. Hence, there is increasing emphasis on sustainable pilgrimage tourism, improved planning, eco-friendly infrastructure, and regulated pilgrim flow.

Even though religion has become a politically charged word in recent years in India, it is the glue that holds the entire country together, from Kashmir to Kanyakumari. This article does not cover the complexitiesof religion and its function in India; however, it does discuss the economic face of religion and how it can be used to eliminate economic imbalance across the country. India is a country that has a startling number of diverse religions, including Hinduism, Islam, Christianity, Buddhism, Sikhism, Jainism, and Persian, to name a few. Despite this, the people who embrace these various religions coexist peacefully. In addition, adherents of many religions travel to the holy sites of other religions, which is something that is both remarkable and unexpected. Even though India has a diverse population that respects one another's differences, the culture is quite complicated. For researchers interested in the field of behavioural science, it is always a wonderful place to work. People in India follow a variety of religions, customs, and traditions, and have vastly different ways of life, tastes, and preferences. Because this diversity presents a constant challenge for marketers, many multinational corporations send their global managers to India for training because the country serves as a potential training ground. Marketers also focus on casing the religious beliefs of the population by targeting religious tourism locations to market their locations. Locations such as Kumbh Mela at Varanasi, Allahabad, Rajmundry,

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6.8.4 Eco-Tourism

Eco-tourism in the IHR emphasises low-impact tourism that respects local ecology, culture, and traditions. States like Uttarakhand, Himachal Pradesh, Sikkim, Arunachal Pradesh, and Ladakh have made significant strides in promoting eco-tourism by setting up nature trails, eco-camps, wildlife safaris, homestays, and conservation-based tours. Protected areas such as Valley of Flowers National Park (Uttarakhand), Great Himalayan National Park (Himachal Pradesh), Khangchendzonga National Park (Sikkim), and Namdapha National Park (Arunachal Pradesh) are major eco-tourism attractions. Activities include bird watching, trekking, camping, wildlife viewing, river rafting, and cultural tours.



Fig. No. 6.5:An Example of Eco-Camp, Source: Google Image

A key aspect of eco-tourism in the IHR is the active participation of local communities. Many villages have established community-managed eco-tourism ventures, employing while promoting environmental stewardship. Homestays have become popular in places like Spiti Valley, Ziro Valley, Tawang, and Lachung, offering tourists authentic cultural experiences and generating income for locals. Government policies and organisations such as the Eco-Tourism Development Boards and Forest Departments are supporting infrastructure development, skill training, and conservation efforts.

However, the growth of eco-tourism also brings challenges, such as maintaining a balance between visitor pressure and ecological conservation. Inadequate regulation, unmanaged waste, and over-tourism in sensitive regions like Manali, Gangtok, and Rishikesh can threaten the fragile ecosystems. Therefore, there is an urgent need to implement strict environmental guidelines, carrying capacity assessments, and awareness programs to ensure the long-term sustainability of eco-tourism in the IHR.

In essence, eco-tourism in the Indian Himalayan Region offers a promising model for sustainable mountain development—combining nature conservation, cultural preservation, and socio-economic benefits for mountain communities—while fostering a deeper respect for the Himalayas among travelers.

6.9 INDUSTRIALIZATION AND SERVICE SECTOR GROWTH

The state of industries in the Indian Himalayan Region (IHR) shows considerable variation across states in terms of the number of factories, capital investment, workforce size, and wage distribution. These differences reflect disparities in industrial infrastructure, resource availability, policy incentives, and market accessibility in each state.

Table No. 6.13 Some Information on the state of Industriesin the IHR (Valuesin ₹Lakhs, others in Numbers)

Characteristics	Jammu&Kashmir	Himachal Pradesh	Uttarakhand	Nagaland	Manipur	Tripura	Meghalaya
Numberof Factories	342	530	679	120	45	269	47
FixedCapital	38189	571383	218176	2768	579	4966	10691
WorkingCapital	18704	157138	89458	2835	246	6340	7647
InvestedCapital	66566	697916	416974	6449	804	11805	15674

Outstanding Loans	36405	467984	84016	3835	415	4831	6278
Numberof Workers	21993	27636	27592	2356	1090	13105	1773
TotalPersons Engaged	26952	36753	41561	2802	1231	14508	2228
WagestoWorkers	8562	12261	23868	401	182	2008	496
TotalEmoluments	12897	28170	46881	584	218	2701	919

Source*CentralStatisticalOrganization*

In Jammu & Kashmir, there were 342 factories operating, employing 21,993 workers and engaging a total of 26,952 persons, including supervisory and administrative staff. The state reported ₹38,189 lakh in fixed capital and ₹18,704 lakh in working capital, bringing the invested capital to ₹66,566 lakh. Outstanding loans amounted to ₹36,405 lakh, suggesting a moderate reliance on borrowed funds. The wages paid to workers totaled ₹8,562 lakh, while total emoluments, which include salaries to all personnel, stood at ₹12,897 lakh. Jammu & Kashmir's industrial base is largely comprised of handicrafts, carpet weaving, food processing, and light manufacturing, supported by its unique artisanal traditions.

Himachal Pradesh had a stronger industrial presence with 530 factories and 27,636 workers, engaging a total of 36,753 persons. The state recorded very high fixed capital investment at ₹5,71,383 lakh, the highest in the IHR, along with ₹1,57,138 lakh in working capital and ₹6,97,916 lakh as invested capital. Outstanding loans were also substantial at ₹4,67,984 lakh, reflecting both large-scale industrial operations and credit dependence. Worker wages amounted to ₹12,261 lakh, while total emoluments were ₹28,170 lakh. Himachal Pradesh benefits from policy incentives for industry, attracting sectors such as pharmaceuticals, textiles, and food processing, particularly in industrial hubs like Baddi and Parwanoo.

Uttarakhand emerged as another major industrial state in the IHR, with 679 factories employing 27,592 workers and engaging 41,561 persons in total. The state's fixed capital stood at ₹2,18,176 lakh, with ₹89,458 lakh as working capital, leading to ₹4,16,974 lakh in invested capital. Outstanding loans were ₹84,016 lakh, indicating a relatively lower loan dependency compared to Himachal Pradesh despite having a large industrial base. Workers received wages totaling ₹23,868 lakh, while total emoluments reached ₹46,881 lakh—the highest in the IHR, reflecting the presence of high-value industries such as automobiles, electronics, and food processing in areas like Haridwar and Pantnagar.

In Nagaland, the industrial sector was comparatively small, with 120 factories

employing 2,356 workers and engaging 2,802 people in total. Fixed capital investment was ₹2,768 lakh, with ₹2,835 lakh in working capital, making the invested capital ₹6,449 lakh. Outstanding loans stood at ₹3,835 lakh. Wages to workers totalled ₹401 lakh, while total emoluments were ₹584 lakh. The state's industries are mostly small-scale, focusing on agro-processing, handloom, and handicrafts, with limited heavy manufacturing.

Manipur had only 45 factories, employing 1,090 workers and engaging 1,231 persons overall. The fixed capital was ₹579 lakh, with working capital of ₹246 lakh, making the invested capital ₹804 lakh—the lowest among the states considered. Outstanding loans were ₹415 lakh, with wages at ₹182 lakh and total emoluments at ₹218 lakh, showing the very modest scale of industrial activity in the state, dominated by cottage industries and small-scale enterprises.

Tripura had 269 factories, employing 13,105 workers and engaging 14,508 persons overall. Fixed capital investment stood at ₹4,966 lakh, with ₹6,340 lakh in working capital, totalling ₹11,805 lakh in invested capital. Outstanding loans were ₹4,831 lakh. Workers received ₹2,008 lakh in wages, with total emoluments at ₹2,701 lakh. The state's industrial base includes rubber processing, bamboo-based industries, and food processing, supported by the availability of local raw materials.

Meghalaya had a relatively small industrial sector with 47 factories employing 1,773 workers and engaging 2,228 persons. The state's fixed capital investment was ₹10,691 lakh, with ₹7,647 lakh in working capital, resulting in ₹15,674 lakh in invested capital. Outstanding loans amounted to ₹6,278 lakh. Wages to workers totalled ₹496 lakh, and total emoluments were ₹919 lakh. Industries in Meghalaya mainly focus on cement production, coal mining, and small-scale food processing, driven by mineral resources and local demand.

The data shows that Himachal Pradesh and Uttarakhand are the industrial leaders in the IHR, both in terms of capital investment and workforce engagement, while Manipur, Nagaland, and Meghalaya have relatively smaller, resource-based industrial sectors. Tripura has a moderate industrial base with a focus on resource processing, and Jammu & Kashmir has a unique artisan-driven industrial profile with moderate capital investment. These differences are shaped by geographic accessibility, resource availability, state policies, and market linkages.

Table No. 6.14 State-wise Distribution of Working and Closed SSI Units in Various Statesof the IHR (registered SSI sector)

State	Number of Permanently RegisteredSSI Units	Workingunits		ClosedUnits	
		Number	%	Number	%
Jammu&Kashmir	39680	16699	30.2	22981	49.3

HimachalPradesh	17432	11092	20.0	6340	13.6
Uttarakhand	27415	15907	28.7	11508	24.7
Sikkim	338	158	0.3	180	0.4
ArunachalPradesh	579	361	0.7	218	0.5
Nagaland	698	503	0.9	195	0.4
Manipur	5778	4746	8.6	1032	2.2
Mizoram	4217	2890	5.2	1327	2.9
Tripura	2039	995	1.8	1044	2.2
Meghalaya	3768	2023	3.6	1745	3.7

Source*CentralStatisticalOrganisation*

The distribution of working and closed Small Scale Industrial (SSI) units across the Indian Himalayan Region (IHR) reflects both the industrial potential and the challenges faced by the registered SSI sector in different states. The data shows wide variations in the number of permanently registered units, the share of operational units, and the proportion of closed units, indicating differences in industrial growth, sustainability, and market conditions across the region.

In Jammu & Kashmir, there were 39,680 permanently registered SSI units, of which 16,699 were working, accounting for 30.2% of the total in the IHR. The state also recorded the highest number of closed units at 22,981, which is 49.3% of the total closed units in the IHR. This high closure rate reflects the combined impact of infrastructure limitations, market disruptions, and socio-political challenges, although sectors like handicrafts, wool processing, and traditional food industries still contribute significantly to employment.

Himachal Pradesh had 17,432 registered SSI units, with 11,092 operational, representing 20% of the total working units in the IHR. Closed units numbered 6,340, making up 13.6% of total closures. The relatively high share of functioning units suggests better industrial stability, supported by policy incentives and infrastructure in industrial hubs such as Baddi and Parwanoo. The dominant sectors include pharmaceuticals, food processing, and light manufacturing.

Uttarakhand recorded 27,415 registered SSI units, with 15,907 working units, contributing 28.7% of the total active units in the IHR. The state had 11,508 closed units, making

up 24.7% of closures. Uttarakhand's strong industrial base, supported by tax incentives under special industrial packages, has helped maintain a high proportion of active units, particularly in areas like Haridwar, Pantnagar, and Dehradun, focusing on auto components, packaged foods, and herbal products.

In Sikkim, the SSI sector is very small, with only 338 registered units. Of these, 158 were operational, representing just 0.3% of the total working units in the IHR. Closed units numbered 180, which is 0.4% of closures. The state's industrial activity is limited but is growing in niche sectors such as organic farming-based food processing and small-scale handicrafts.

Arunachal Pradesh had 579 registered SSI units, with 361 operational (0.7% of the IHR's total working units) and 218 closed units (0.5% of closures). Industrial activities here are constrained by remoteness, low market access, and limited infrastructure, with most SSIs focusing on agro-processing and handloom.

Nagaland reported 698 registered SSI units, with 503 in operation, accounting for 0.9% of the IHR total, and 195 closed units (0.4% of closures). The state's SSI sector is largely based on handicrafts, bamboo processing, and agro-based industries, with challenges in scaling up production and accessing wider markets.

Manipur had 5,778 registered SSI units, with 4,746 active units, representing 8.6% of all working SSIs in the IHR, and 1,032 closed units (2.2% of closures). This relatively high operational rate shows resilience, despite infrastructural and connectivity challenges, with the sector dominated by weaving, food processing, and small engineering workshops.

Mizoram had 4,217 registered SSIs, with 2,890 working (5.2% of total operational units) and 1,327 closed (2.9% of closures). Bamboo-based industries, food processing, and handicrafts dominate the industrial landscape, but market limitations and production constraints affect growth.

Tripura recorded 2,039 registered SSIs, with 995 working (1.8% of the total) and 1,044 closed (2.2% of closures). Rubber processing, bamboo crafts, and food processing form the backbone of the sector, though industrial expansion is limited by geographic isolation.

Meghalaya had 3,768 registered SSI units, of which 2,023 were operational (3.6% of total active units) and 1,745 closed (3.7% of closures). Cement production, handloom, and small-scale food processing are major activities, but irregular market demand and transport bottlenecks hinder
expansion.

Jammu & Kashmir, Uttarakhand, and Himachal Pradesh account for the majority of working SSI units in the IHR, reflecting relatively stronger industrial ecosystems. In contrast, states like Sikkim, Arunachal Pradesh, and Nagaland have very small SSI sectors, while Manipur and Mizoram show good operational percentages despite smaller absolute numbers. The high closure rates in some states point to the need for better market access, financial support, and technology upgrades to sustain small-scale industries in the Himalayan region.

Table No. 6.15 Annual Survey of Industries: Employment and Value Added (State-wise: Factory Sector; 2004-05)

State	TotalPersonsemployed		NetvalueaddedbyFactorySector		
	Nos.	%tothe total country	₹Mn.	%tothe total country	Rank
Assam	119548	1.41	37208	1.36	15
HimachalPradesh	44287	0.52	21852	0.80	22
Jammu&Kashmir	31090	0.37	5760	0.21	25
Manipur	1835	0.02	58	0.00	31
Meghalaya	3037	0.04	921	0.03	28
Nagaland	2821	0.03	200	0.01	29
Tripura	15392	0.18	2312	0.08	27
Uttarakhand	51762	0.61	19480	0.71	23
WestBengal	517939	6.13	105489	3.86	9

Mn=Million

Source*StatisticalPocketBookIndia,2008,46thEdition,CentralStatisticalOrganisation,NewDelhi*

The Annual Survey of Industries (2004–05) for the factory sector highlights significant variations in employment generation and value addition across different states of the Indian Himalayan Region (IHR), as well as a comparison with a major industrial state like West Bengal. The data reflects the relative scale and economic contribution of the factory sector in each state, indicating differences in industrial capacity, diversification, and economic integration.

In Assam, the factory sector employed 119,548 persons, accounting for 1.41% of the total

employment in India's factory sector. The state generated a net value added (NVA) of ₹37,208 million, representing 1.36% of the national total, ranking 15th in the country. Assam's industrial activities are largely driven by tea processing, petroleum refining, natural gas, and agro-based industries. The relatively high employment numbers compared to value added suggest a labour-intensive industrial structure with moderate capital investment.

Himachal Pradesh had 44,287 people employed in the factory sector, making up 0.52% of the country's total factory employment. The NVA was ₹21,852 million, forming 0.80% of the national share and ranking the state 22nd in value addition. The state's industrial sector benefits from tax incentives and has a strong base in pharmaceuticals, textiles, and food processing, particularly in Baddi and surrounding industrial areas, which have seen rapid growth since the early 2000s.

In Jammu & Kashmir, the factory sector employed 31,090 persons (0.37% of India's total) and contributed an NVA of ₹5,760 million, a mere 0.21% of the national total, placing the state 25th in rank. The industrial base is dominated by handicrafts, woollen products, paper, and light manufacturing, but the small share in national value added reflects both limited large-scale industry and challenges arising from geographical constraints and socio-political instability.

Manipur had a very small industrial base, employing just 1,835 persons (0.02% of the national total) and generating an NVA of only ₹58 million, effectively 0% of the country's share, ranking 31st. The factory sector here is almost negligible, comprising mostly small agro-processing units and handloom-based enterprises, with very limited heavy industry presence.

Meghalaya recorded 3,037 factory employees (0.04%) and an NVA of ₹921 million (0.03%), ranking 28th nationally. Industrial activities here include cement manufacturing, coal mining, and small-scale food processing, but overall industrial growth is constrained by infrastructure limitations.

In Nagaland, employment stood at 2,821 persons (0.03%) with a modest NVA of ₹200 million (0.01%), ranking 29th in India. The industrial base is minimal, focusing on bamboo-based products, handicrafts, and limited agro-processing, with little contribution from large-scale manufacturing.

Tripura employed 15,392 persons (0.18%) and generated an NVA of ₹2,312 million (0.08%), ranking 27th nationally. The sector is centred on rubber processing, food production, and bamboo-based industries, but industrial expansion is hampered by remoteness and small market size.

Uttarakhand had 51,762 persons employed (0.61%) with an NVA of ₹19,480 million

(0.71%), ranking 23rd in the country. Since receiving special industrial incentives, the state has seen rapid growth in automobile manufacturing, electronics, and packaged food industries, particularly in Haridwar, Pantnagar, and Dehradun, with a balanced mix of labour and capital-intensive industries.

For comparison, West Bengal—a major industrial state—employed 517,939 persons (6.13%) and produced an NVA of ₹105,489 million (3.86%), ranking 9th nationally. Its diverse industrial base includes steel, engineering, chemicals, textiles, and food processing, highlighting the scale difference compared to IHR states.

The data reveals that Assam leads the IHR in both employment and value added in the factory sector, while Himachal Pradesh and Uttarakhand show promising industrial performance due to policy incentives and growing manufacturing hubs. States like Manipur, Nagaland, and Meghalaya remain at the lower end of the industrial spectrum, highlighting the need for infrastructure development, investment promotion, and better market access to enhance their industrial contributions.

6.10 SUMMARY

The pattern of sectoral development in the Indian Himalayan Region (IHR) reflects a unique blend of traditional practices and modern economic transitions, shaped by the region's diverse topography, climatic variations, and socio-cultural context. Agriculture remains the dominant livelihood source, especially in hill and valley regions, often practised through terrace farming, shifting cultivation (jhum), and other traditional ecological methods. Crops like millets, pulses, maize, and paddy dominate subsistence farming, while horticulture—especially the cultivation of apples, oranges, walnuts, and spices—has seen rapid expansion in states like Himachal Pradesh, Uttarakhand, and Sikkim. These high-value crops contribute significantly to the regional economy. Traditional knowledge systems, biodiversity conservation practices, and sustainable use of natural resources remain deeply embedded in farming communities. Hydropower development has emerged as a major sector due to the abundant river systems in steep terrains, providing clean energy but also raising concerns over displacement, ecological damage, and downstream flow alteration. Similarly, mining and forest-based industries such as resin tapping, medicinal plant harvesting, and timber extraction offer income opportunities but often conflict with conservation efforts and tribal rights.

Parallel to this, the region's rich spiritual and ecological heritage supports significant growth in tourism, pilgrimage, and eco-tourism. Destinations like Kedarnath, Gangotri, Tawang, and Sikkim's monasteries attract millions annually, boosting hospitality, transport, and related services. Eco-tourism models are increasingly promoted in states like Arunachal Pradesh and Meghalaya to combine conservation with livelihood generation. Industrialisation, although

limited due to terrain and accessibility issues, has seen notable growth in selected pockets—especially in Uttarakhand and Himachal Pradesh—where industrial corridors, tax incentives, and infrastructure development have drawn investment in pharmaceuticals, food processing, and light manufacturing. Meanwhile, the service sector—especially education, health, finance, and communication—is gradually expanding across the IHR, supported by urbanisation and digital connectivity. Despite these developments, the region faces persistent challenges: fragile ecosystems, natural disasters, poor infrastructure, and socio-political instability in some areas. Overall, sectoral development in the IHR is marked by a complex interplay between tradition and transition, emphasising the need for region-specific, inclusive, and environmentally sensitive growth strategies.

6.11 GLOSSARY

- **Terrace Farming:** A traditional agricultural practice in hilly areas where flat steps or terraces are cut into slopes to grow crops. It reduces soil erosion and maximises arable land use in mountainous terrain.
- **Horticulture:** The cultivation of fruits, vegetables, flowers, and ornamental plants. In the IHR, it plays a significant role in improving rural incomes through high-value crops like apples, oranges, and spices.
- **Jhum Cultivation (Shifting Cultivation):** A traditional farming method practised in northeastern hill states, involving clearing forest patches, growing crops for a few seasons, and then shifting to new areas to allow natural regeneration.
- **Hydropower:** Renewable energy generated from the flow of rivers and streams. The steep gradients and perennial rivers in the Himalayas make the region ideal for hydropower projects, though often controversial due to ecological impacts.
- **Forest-Based Livelihoods:** Economic activities that depend on forest resources like resin, medicinal plants, bamboo, and timber. These provide income to local communities but must be managed sustainably to prevent forest degradation.
- **Eco-Tourism:** Responsible travel to natural areas that conserves the environment and improves the well-being of local people. It is promoted in the IHR as an alternative to mass tourism, focusing on sustainability and cultural respect.
- **Pilgrimage Tourism:** Travel for religious or spiritual purposes, often to sacred Himalayan sites like Kedarnath, Badrinath, or Tawang Monastery. It supports local economies but needs regulation to manage environmental pressures.
- **Industrial Cluster:** A geographically concentrated area where industries of a similar type develop, sharing infrastructure and services. Uttarakhand and Himachal Pradesh have developed such clusters under special economic incentives.
- **Service Sector:** The part of the economy that provides intangible goods like education, health, tourism, banking, and telecommunications. Its growth in the IHR reflects increasing urbanisation and connectivity.

- **Sustainable Development:** Development that meets present needs without compromising future generations' ability to meet their own needs. In the IHR, it involves balancing ecological preservation with economic progress.

6.12 ANSWER TO CHECK YOUR PROGRESS

1. Which of the following sectors has traditionally formed the backbone of rural livelihoods in the Indian Himalayan Region (IHR)?
A) Mining
B) Tourism
C) Agriculture and traditional farming systems
D) Hydropower
Answer: C) Agriculture and traditional farming systems

2. The Indian Himalayan Region is well-suited for horticulture due to:
A) Abundance of coal reserves
B) Arid and flat terrain
C) Varied altitudinal and climatic zones
D) Presence of industrial corridors
Answer: C) Varied altitudinal and climatic zones

3. Eco-tourism in the IHR promotes:
A) Large-scale urbanisation
B) Environmental awareness and conservation
C) Unregulated construction
D) Only religious tourism
Answer: B) Environmental awareness and conservation

4. Which of the following Indian Himalayan states is most known for its hydropower potential?
A) Sikkim
B) Nagaland
C) Himachal Pradesh
D) Tripura
Answer: C) Himachal Pradesh

5. Forest-based livelihoods in the IHR primarily depend on:
A) Automobile industries
B) Export of coal and petroleum
C) Non-Timber Forest Products (NTFPs) and medicinal plants

D) Marine fisheries

Answer: C) Non-Timber Forest Products (NTFPs) and medicinal plants

6. What is a major challenge to industrial development in the Indian Himalayan Region?

A) Overpopulation

B) Desertification

C) Fragile terrain and limited connectivity

D) Lack of water sources

Answer: C) Fragile terrain and limited connectivity

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6.14 TERMINAL QUESTIONS

Short Answer type Questions

1. What are the main crops cultivated under traditional farming systems in the Himalayan region?
2. Why is hydropower considered a key developmental resource in the Himalayas?
3. Mention two challenges faced by forest-based resource utilisation in the Himalayan states.
4. What is the role of pilgrimage tourism in the economy of the Indian Himalayan Region?
5. How is the service sector contributing to recent economic development in the Himalayas?

Long Answer-typeQuestions

1. Describe the role of agriculture, horticulture, and traditional farming systems in sustaining the livelihoods of Himalayan communities. Discuss their limitations in the context of modernisation.
2. Analyse the potential and challenges of hydropower development in the Himalayan region, with special reference to environmental concerns and sustainability.
3. Examine the contribution of tourism—both pilgrimage and eco-tourism—to the economy of Himalayan states, highlighting the opportunities and threats associated with unregulated tourism.
4. Discuss the status and prospects of industrialisation in the Himalayan region, and evaluate how the growth of the service sector has altered the socio-economic landscape.
5. Evaluate the overall developmental pattern of the Himalayas, focusing on the balance between natural resource use (agriculture, forests, mining, hydropower) and sustainable development through eco-friendly practices.

UNIT-7 INTRA-STATE DISPARITIES- A SPECIAL OVERVIEW:

7.1OBJECTIVE

7.2INTRODUCTION

7.43EDUCATION

7.4HEALTH

7.5URBAN AND URBANIZATION GARHWAL VS KUMAUN

7.6SUMMARY

7.7GLOSSARY

7.8ANSWER TO CHECK YOUR PROGRESS

7.9REFERENCES

7.10 TERMINAL QUESTIONS

7.1 OBJECTIVES

After reading this unit, you will be able to:

- Know about the education, health, and infrastructure across districts. Case Study: Garhwal vs. Kumaun in Uttarakhand (or similar)
- Understanding the Urban-rural divide and the migration of peri-urban spaces and their socio-economic implication of Uttarakhand.

7.2 INTRODUCTION

Intra-state disparities refer to the uneven distribution of resources, opportunities, and development outcomes within the boundaries of a state, reflecting inequalities across districts, regions, or communities. In the Indian Himalayan Region (IHR), and particularly in Uttarakhand, these disparities are shaped by a unique combination of physical geography, socio-economic structures, and policy priorities. The mountainous terrain, fragile ecology, and difficult accessibility often restrict uniform growth across all districts, creating stark differences in education, health, and infrastructure. For example, while urban centres such as Dehradun, Haldwani, and Haridwar have witnessed concentrated investments in schools, hospitals, and roads, many remote villages in Chamoli, Bageshwar, or Pithoragarh continue to lag in basic services. Such inequalities highlight how the benefits of development are unevenly distributed, leading to regional imbalances. Education access remains higher in urban and semi-urban areas, while health outcomes vary widely depending on the availability of medical colleges and hospitals. Similarly, infrastructure such as road connectivity, electricity, and internet access is concentrated in accessible valleys and plains, leaving hill communities isolated and marginalised.

The disparities become more evident when comparing the two major regions of Uttarakhand—Garhwal and Kumaun. While Garhwal, with Dehradun as the state capital, has attracted more government institutions, higher education centres, and corporate investments, Kumaun still faces relative neglect, despite its potential in tourism, horticulture, and cross-border trade. This uneven pattern is further deepened by the urban-rural divide, where towns and emerging peri-urban spaces act as development hubs while rural areas are trapped in cycles of out-migration and underdevelopment. Migration, in particular, is both a cause and a consequence of these disparities, as lack of employment, education, and healthcare pushes people out of villages into towns or outside the state, leading to "ghost villages" in the hills. On the other hand, peri-urban spaces near cities are witnessing rapid population growth, changing land-use patterns, and new socio-economic dynamics. These intra-state disparities not only hinder balanced regional development but also raise long-term challenges of sustainability, equity, and social cohesion in Uttarakhand and the broader Indian Himalayan Region.

7.3 EDUCATION

Education is a systematic process of facilitating learning, acquiring knowledge, skills, values, morals, beliefs, and habits that enable individuals to develop their intellectual, social, and emotional capacities. It is both a personal and societal endeavour, aiming not only to prepare individuals for employment but also to cultivate critical thinking, creativity, and responsible citizenship. The concept of education is broad, encompassing formal settings such as schools, colleges, and universities, as well as informal means such as family teachings, community interactions, and self-directed learning. Philosophers like John Dewey (1938) viewed education as a lifelong process essential for personal growth and democratic participation, while Paulo Freire (1970) emphasised its role in liberation and social change. Internationally, bodies like UNESCO define education as a fundamental human right and a key driver of sustainable development, highlighting its role in promoting equality, peace, and economic prosperity (UNESCO, 2015). The importance of education is further reinforced by the United Nations' Sustainable Development Goal 4, which seeks to ensure inclusive and equitable quality education for all by 2030. Empirical research has consistently shown that education correlates positively with economic growth, public health, and social stability (Hanushek & Woessmann, 2010). Thus, education is not merely the transfer of information but a transformative force that shapes individuals and societies, enabling them to navigate complex challenges and contribute meaningfully to the global community.

7.3.1 School Education and Number of Schools in Uttarakhand

Table No. 7.1 Fundamental Education in Uttarakhand 2021-22

Indicator	Primary School	Upper Primary School	High School	Higher Secondary School	Total
Number	22815	5426	1407	2578	22815

The next tier is made up of Upper Primary Schools, totalling 5,426 institutions. This significant drop in the number of primary schools reflects the typical progression structure in education, where selected primary schools are upgraded to upper primary level (classes VI–VIII) based on student population, location, and local demand. Upper primary schools play a bridging role, preparing students for the transition to secondary education. In remote and mountainous areas, however, accessibility to upper primary schools can still be an issue, sometimes forcing students to travel long distances, which may contribute to dropout rates after primary education.

At the secondary stage, Uttarakhand has 1,407 High Schools, which serve students in classes IX–X. The relatively smaller number of high schools compared to upper primary schools is part of the education system's natural filtering process, where only a proportion of students continue beyond class VIII. Many of these high schools are strategically located in block or sub-block headquarters to serve multiple feeder schools. Nevertheless, for children in remote areas, the journey to high school can be long and difficult, particularly in districts with difficult terrain such as Chamoli, Uttarkashi, and Pithoragarh.

The Higher Secondary Schools (classes XI–XII) number 2,578, which interestingly exceeds the number of high schools. This is partly because many higher secondary institutions function as composite schools, offering education from class IX to XII under a single management. These institutions are critical for preparing students for higher education, vocational training, or employment, and they play a decisive role in shaping career paths. They also often serve as educational hubs for larger regions, attracting students from smaller towns and villages.

While the table provided lists the "Total" as 22,815, this appears to be a repetition of the primary school figure rather than the combined total of all levels. If the actual numbers are summed, the total number of institutions across all levels of fundamental education in Uttarakhand for 2021–22 is 32,226. This layered distribution shows that while Uttarakhand has succeeded in achieving a broad primary education base, there is still a narrowing at higher levels of education. Bridging this gap requires investment in infrastructure, transport facilities, and targeted educational policies to ensure smooth transition and retention of students from primary to higher secondary levels.

The UDISE+ 2021–22 data for Uttarakhand provides a comprehensive snapshot of the state's school education scenario, highlighting the distribution of schools, student enrollment, teacher availability, and key educational efficiency indicators.

In terms of institutional infrastructure, Uttarakhand has a total of 22,815 schools functioning across the state, spanning from the primary to higher secondary level. This extensive network of schools is crucial for ensuring accessibility in a state characterised by challenging mountainous terrain and scattered settlements. The presence of such a large number of institutions indicates a commitment to making education geographically reachable, particularly for children living in remote rural and hilly areas.

On the enrollment front, the state records a total of 24,49,926 students across all levels. This figure shows the scale of educational participation in the state and reflects efforts towards achieving near-universal enrollment. However, given Uttarakhand's relatively small population compared to larger Indian states, this number also suggests a healthy rate of school attendance.

The enrollment per school works out to 107 students, indicating that, on average, schools in Uttarakhand cater to small to moderate student populations. This is partly due to the dispersed rural habitation patterns, where small schools are established to ensure proximity to students' homes.

Teacher availability in Uttarakhand's schools is another important highlight. The state has 1,23,212 teachers, which translates to a teacher–per–school ratio of 5. This means that, on average, each school has about five teachers, enabling the handling of multiple classes and subjects, although the actual distribution may vary between urban and rural locations. The Pupil–Teacher Ratio (PTR) for the state stands at 20, which is significantly better than the Right to Education (RTE) Act's recommended maximum of 30:1 for primary classes and 35:1 for upper primary classes. This relatively low PTR suggests that Uttarakhand maintains a favourable teacher-student balance, potentially enabling more individualised attention to learners.

From a resource and efficiency perspective, the combination of a moderate enrollment per school and a low PTR points towards a more personalised learning environment in Uttarakhand compared to many other Indian states. However, these averages can sometimes mask disparities, as remote rural schools might still face teacher shortages, while urban or semi-urban schools may have larger class sizes. The teacher–per–school ratio also reflects that many institutions, especially in sparsely populated areas, operate with limited staff, making multi-grade teaching a common feature.

The literacy scenario in Uttarakhand from 1991 to 2011 shows remarkable progress across almost all districts, reflecting the state's focused efforts toward educational development. In 1991, the average literacy rate of the region was 52.73%, which rose significantly to 72.73% by 2001 and further to 80.31% by 2011. This steady improvement over two decades indicates a successful expansion of educational infrastructure, government literacy missions, and greater societal awareness about the importance of education. The overall growth in literacy during the decade 2001–2011 was 7.58 percentage points, though the pace of growth varied between districts, influenced by factors such as urbanisation, accessibility, and socio-economic conditions.

Table No. 7.2 Literacy: District-wise literacy rate in percentage

S.No.	District	Total Literacy rate(%)		Growth (%)	
		1991	2001	2011	2001-2011
1	Uttarkashi	44.50	66.58	75.98	9.40
2	Chamoli	58.95	76.23	83.48	7.25
3	Rudrapryag	-	74.23	82.09	7.86

4	Tehri	46.48	67.04	75.10	8.06
5	Dehradun	57.34	78.96	85.24	6.28
6	Pauri	63.85	77.99	82.59	4.60
7	Haridwar	37.43	64.60	74.62	4.60
8	Pitoragarh	56.88	76.48	82.93	10.02
9	Bageshwar	-	71.94	80.69	6.45
10	Almora	56.63	74.53	81.06	8.75
11	Champawat	-	71.11	80.73	9.63
12	Nainital	52.55	79.60	84.65	5.05
13	Udhamsingh nagar	-	65.73	74.44	8.71
		52.73	72.73	80.31	7.58

In the Garhwal Division, districts like Chamoli and Dehradun consistently recorded high literacy levels. Chamoli improved from 58.95% in 1991 to 83.48% in 2011, with a growth of 7.25% during the last decade of the period. Dehradun, the state capital and an educational hub, rose from 57.34% in 1991 to 85.24% in 2011, though it saw a modest 6.28% growth between 2001 and 2011, indicating that literacy rates were already high by the start of the decade. Pauri Garhwal recorded one of the highest literacy rates in 2001 (77.99%) but showed slower growth (4.60%) in the next decade. Tehri Garhwal and Uttarkashi both experienced strong improvements, with Uttarkashi growing by 9.40% between 2001 and 2011, reflecting positive changes in remote areas.

In the Kumaon Division, districts like Pithoragarh, Champawat, and Almora saw robust gains. Pithoragarh, for instance, achieved a literacy rate of 82.93% in 2011, with a decade growth of 10.02%, the highest among all districts, reflecting effective rural education programs and relatively better access compared to more isolated areas. Champawat recorded 9.63% growth, reaching 80.73% literacy in 2011. Almora and Bageshwar also posted impressive progress, although their growth rates were slightly lower than the state average. In the plains region of Kumaon, Nainital showed a high literacy rate (84.65% in 2011) but only 5.05% growth, indicating saturation effects in already literate areas. Udham Singh Nagar, a rapidly urbanising district, recorded 8.71% growth, reflecting the educational benefits of industrial and economic development.

The plains district of Haridwar in the Garhwal region, despite starting from a low base of 37.43% literacy in 1991, reached 74.62% by 2011. However, its growth during 2001–2011 was limited to 4.60%, possibly due to the socio-economic challenges of a large migrant and industrial workforce. Overall, the data illustrate a significant narrowing of the literacy gap between remote hill districts and more urbanised plains areas, although disparities persist. The rapid improvement

in literacy in districts such as Pithoragarh, Uttarkashi, and Champawat suggests that government interventions in remote education access, particularly post-statehood (2000), have been effective, whereas slower growth in already high-literacy districts like Pauri, Nainital, and Dehradun indicates a shift in focus from basic literacy to quality and higher education in those areas.

7.4 HEALTH

The demographic profile of Uttarakhand, as per the 2011 Census, presents a distinctive socio-economic and cultural pattern when compared to the national average of India. The total population of Uttarakhand stood at 1 crore, which is significantly smaller in scale compared to India's 121.08 crore population. Despite its smaller size, Uttarakhand's settlement pattern reflects a relatively balanced rural–urban distribution, with 69.77% of people living in rural areas and 30.23% residing in urban centres. This is closely aligned with the national pattern, where 68.85% of the population is rural and 31.14% is urban, indicating that both the state and the country maintain a predominantly rural character, though urbanisation is steadily increasing.

Table No.7.3 StateProfile

Indicator	Uttarakhand2011[1]	India
TotalPopulation(InCrore)	1	121.08
Rural(%)	69.77	68.85
Urban(%)	30.23	31.14
ScheduledCastepopulation(SC)(incrore)	0.18(18.76%)	20.14(16.63%)
ScheduledTribepopulation(ST)(incrore)	0.03(2.89%)	10.45(8.63%)
TotalLiteracyRate(%)	78.8	72.99
MaleLiteracyRate(%)	87.4	80.89
FemaleLiteracyRate(%)	70	64.64

Source: National Health Mission, Health Dossier 2021:Reflection on Key Health Indicators

In terms of social composition, the Scheduled Caste (SC) population in Uttarakhand is about 0.18 crore, which constitutes 18.76% of the state's population—higher than the national average of 16.63% (20.14 crore in India). Conversely, the Scheduled Tribe (ST) population in the state is relatively low at 0.03 crore or 2.89%, which is significantly below the national figure of 8.63% (10.45 crore). This reflects the state's demographic uniqueness, as the ST population is concentrated mainly in certain Himalayan districts and represents a smaller fraction of the total populace compared to India's tribal diversity spread across various regions.

On the literacy front, Uttarakhand performs better than the national average in all key

indicators. The state's total literacy rate is 78.8%, higher than India's 72.99%, reflecting a stronger educational base. The male literacy rate in Uttarakhand stands at 87.4%, surpassing the national average of 80.89%, while the female literacy rate is 70%, also higher than the national rate of 64.64%. This gender gap in literacy, although present, is narrower in Uttarakhand than in India as a whole, suggesting relatively better progress toward gender parity in education. These figures indicate that while Uttarakhand shares many demographic similarities with the rest of India, its higher literacy levels, smaller tribal proportion, and slightly more balanced rural–urban composition set it apart in the national context.

Table No. 7.4 KeyHealthStatus&ImpactIndicators

Indicators	Uttarakhand	India
InfantMortalityRate(IMR)[3]	27	30
CrudeDeathRate(CDR)[3]	6	6
Crude Birth Rate (CBR)3	17.1	19.7
Maternal Mortality Ratio (MMR)3	99	113
Neonatal Mortality Rate (NNMR)4	22	23
Under Five Mortality Rate (U5MR)4	33	36
StillbirthRate 4	8	4
Total Fertility Rate (TFR)4	1.8	2.2
Life expectancy at birth	70.9	69.4
Sex Ratio at Birth4	840	899

Source: National Health Mission, Health Dossier 2021:Reflection on Key Health Indicators

The health status and impact indicators of Uttarakhand, when compared to the national averages of India, reflect a mixed picture of achievements and challenges in the state's public health outcomes. In terms of Infant Mortality Rate (IMR), which measures the number of deaths of infants under one year of age per 1,000 live births, Uttarakhand records a rate of 27, which is slightly better than the national average of 30. This suggests relatively stronger infant healthcare and maternal health services in the state. Similarly, the Crude Death Rate (CDR), at 6 for both Uttarakhand and India, indicates parity in mortality trends at the broader population level. However, the Crude Birth Rate (CBR) in Uttarakhand stands at 17.1, lower than India's 19.7, which could be linked to the state's lower Total Fertility Rate (TFR) of 1.8 compared to the national average of 2.2, reflecting slower population growth and a demographic transition toward stabilisation.

In terms of maternal health, the Maternal Mortality Ratio (MMR) in Uttarakhand is 99 per 100,000 live births, which is better than the national figure of 113, highlighting progress in

antenatal care, institutional deliveries, and skilled birth attendance. The Neo-Natal Mortality Rate (NNMR), representing deaths within the first 28 days of life, is 22 in Uttarakhand compared to 23 nationally, while the Under-Five Mortality Rate (U5MR) stands at 33 in the state versus 36 in India. These differences, though modest, indicate that Uttarakhand has slightly more favourable child survival rates than the national average. However, the stillbirth rate in Uttarakhand is 8, double the national rate of 4, suggesting gaps in prenatal care, high-risk pregnancy monitoring, or timely intervention during childbirth.

On the demographic and longevity front, Life Expectancy at Birth in Uttarakhand is 70.9 years, higher than the national figure of 69.4 years, reflecting relatively better health outcomes, nutrition levels, and access to medical facilities in many parts of the state. Yet, the Sex Ratio at Birth presents a stark concern—Uttarakhand records 840 females per 1,000 males, significantly lower than the already skewed national average of 899. This indicates persistent gender bias, possibly linked to socio-cultural preferences and prenatal sex selection, which can have long-term implications for gender equity and social balance.

Table No. 7.5 SelectDemographicFeaturesofUttarakhandandIndia,2011

Sl. No.	***Variable***	***Uttarakhand***			***India***
		Hill areas	**Plain areas**	**Total**	
1.	Population(inmillions)	48.50	52.36	100.86	1210.86
2.	0-6yearspopulation(%)	13.18	13.68	13.44	13.60
3.	Populationgrowthrate (2001-2011)	0.70	2.82	1.74	1.64
4.	Sexratio(allage groups)	1037	900	963	943
5.	Sexratio(0-6age group)	894	888	890	919
6.	SCpopulation (%)	20.91	16.78	18.76	16.6
7.	STpopulation(%)	1.05	4.60	2.89	8.6
8.	%Urban population	17.06	42.43	30.23	31.2
9.	Growth in the urban population (2001-2011)	2.43	3.81	3.42	2.80
10.	LiteracyRate(%)	80.87	76.90	78.82	73.0
11.	% Workers (main plus marginal) in the total population (WPR)	43.71	33.47	38.39	39.8
12.	WPR-Male	48.32	50.84	49.67	53.3

13	WPR-Female	39.26	14.16	26.68	25.5

Source:CalculatedfromPrimaryCensusAbstract,IndiaandUttarakhand,2011

The demographic profile of Uttarakhand in 2011 reveals distinct variations between its hill and plain regions, along with notable differences when compared to the national averages of India. The state's total population stood at 100.86 million, with 48.50 million residing in the hill areas and 52.36 million in the plains. Children aged 0–6 years accounted for 13.44% of the state's population, slightly lower in the hills (13.18%) than in the plains (13.68%), and almost identical to the national average of 13.6%. Population growth between 2001 and 2011 was significantly higher in the plains (2.82%) than in the hills (0.70%), suggesting migration trends and differential birth rates. Compared to the national growth rate of 1.64%, Uttarakhand's overall growth rate of 1.74% was marginally higher.

Sex ratio figures indicate a contrasting demographic reality. While the hill areas recorded a relatively high overall sex ratio of 1037 females per 1000 males, the plains had a much lower ratio of 900, bringing the state's average to 963—higher than India's 943. However, the sex ratio for the 0–6 age group was less favorable, at 890 for the state, with only a slight difference between hills (894) and plains (888), and lagging behind the national figure of 919. In terms of social composition, Scheduled Castes constituted 18.76% of Uttarakhand's total population, higher in the hills (20.91%) than in the plains (16.78%), and above the national average of 16.6%. Scheduled Tribes were more concentrated in the plains (4.60%) than in the hills (1.05%), though both figures were lower than the national share of 8.6%.

Urbanisation patterns also differed notably. While only 17.06% of the hill population was urban, the plains recorded 42.43% urbanisation, giving the state an overall urban population share of 30.23%, close to the national figure of 31.2%. Urban population growth from 2001–2011 was higher in the plains (3.81%) than in the hills (2.43%), with the state average (3.42%) exceeding the national rate of 2.80%. Literacy rates were relatively high in Uttarakhand, at 78.82% overall, higher in the hills (80.87%) than in the plains (76.90%), and surpassing India's 73%. The Worker Population Ratio (WPR) indicated that 38.39% of the total population in Uttarakhand was engaged in work, slightly below India's 39.8%. Male WPR in the state (49.67%) was slightly lower than the national average (53.3%), with plains showing a higher male participation rate (50.84%) compared to hills (48.32%). Female WPR revealed a sharp regional disparity—39.26% in hills versus only 14.16% in plains—yet the state's overall female participation rate (26.68%) was slightly above the national average of 25.5%.

Table No.7.6 MagnitudeofOut-migration

Duration	***Male***		***Female***		***Person***	
	Number	**Percent**	**Number**	**Percent**	**Number**	**Percent**
Shortduration migration(2-6 months)	36	11.0	3	4.6	39	10.0
Longduration migration(6-12 months)	251	77.0	35	53.8	286	73.1
Permanentmigration (more than 12 months)	39	12.0	27	41.5	66	16.9
Total	326	100.0	65	100.0	391	100.0
Samplepopulation	650	50.2	468	13.9	1118	35.0

Source:FieldSurvey, Final Report OUTMIGRATIONFROMHILLREGIONOFUTTARAKHAND:Magnitude,ChallengesandPolicy OptionsRajendraP.MamgainandD.N.Reddy(SponsoredbyS.R.SankaranChair(RuralLabour),Natio nalInstituteofRuralDevelopmentandPanchayatiRaj,Rajendranagar Hyderabad – 500 030www.nird.org.in

Table No.7.7 Reasonsformigration

Reasonsformigration	***Number***	***Percent***
Gotemployment/Jobtransfers	68	17.39
Insearchofbetteremploymentandincomeopportunities	73	18.67
Lack ofemployment opportunities	184	47.06
Educationandtraining	45	11.51
Others	21	5.37
Total	391	100.00

Source:FieldSurvey, Final Report OUTMIGRATIONFROMHILLREGIONOFUTTARAKHAND:Magnitude,ChallengesandPolicy OptionsRajendraP.MamgainandD.N.Reddy(SponsoredbyS.R.SankaranChair(RuralLabour),Natio nalInstituteofRuralDevelopmentandPanchayatiRaj,Rajendranagar Hyderabad – 500 030www.nird.org.in

Migration in Uttarakhand is driven by a variety of socio-economic factors, with the majority of movements linked to employment-related reasons. The most significant cause, as revealed by the field survey, is the lack of employment opportunities, accounting for nearly half of all migration cases (47.06%). This reflects the persistent challenge of limited job availability

in the state, especially in rural and hilly areas, where agriculture remains the primary livelihood but is increasingly affected by low productivity, small landholdings, and climate variability. Many residents are compelled to leave their native places in search of livelihoods that can offer stability and sustainable income.

A considerable portion of migrants (18.67%) move in search of better employment and income opportunities, indicating that even those with jobs often seek higher wages, improved working conditions, and career growth prospects elsewhere. Similarly, job transfers and employment placements account for 17.39% of migration, representing government employees, private sector staff, and skilled workers who relocate as part of their career obligations. This category also includes individuals moving to urban centers within or outside the state for more secure and well-paying positions.

Migration for education and training constitutes 11.51% of the total, highlighting the lack of higher education institutions, vocational training centers, and specialised professional courses in many districts of Uttarakhand. Families and young individuals often relocate to cities like Dehradun, Delhi, or other metro areas to access better academic and skill development opportunities. A smaller share of migration, 5.37%, falls under other reasons, which may include marriage-related relocations, health care needs, and lifestyle preferences. Overall, the data paints a picture of a state where migration is largely an outcome of economic necessity, underlining the urgent need for localised employment generation, educational infrastructure, and rural development initiatives to curb the outflow of human resources.

The magnitude of out-migration in Uttarakhand reveals significant gender differences in migration patterns and duration, highlighting socio-economic factors that influence mobility within the state. According to the data, out of a sample population of 1,118 individuals, 391 persons (35%) reported migration during the reference period, with males constituting a much larger proportion of migrants than females. Specifically, 326 males (50.2% of the male sample) migrated compared to only 65 females (13.9% of the female sample). This stark contrast reflects traditional gender roles, where men are more likely to migrate for work or livelihood opportunities, while women tend to stay within their communities.

Examining migration duration reveals that the majority of migrants in Uttarakhand engage in long-duration migration lasting between six to twelve months. Among males, 77% (251 individuals) fell into this category, while 53.8% (35 individuals) of female migrants were long-duration migrants. Overall, 73.1% of all migrants reported this medium-term migration pattern, indicating that many workers leave their homes for extended seasonal work but eventually return, possibly to resume agricultural activities or family responsibilities.

Short-duration migration, defined as two to six months, was less common but still

notable, especially among males. Approximately 11% of male migrants (36 individuals) reported migrating for this brief period, while only 4.6% of females (3 individuals) did so. The overall share of short-term migrants was 10%, indicating that some migration may be linked to seasonal or temporary employment, such as in construction, tourism, or casual labour markets.

Permanent migration, lasting more than 12 months, was relatively less frequent but showed a higher proportion among female migrants. About 41.5% of female migrants (27 individuals) reported permanent migration, compared to 12% of males (39 individuals). This suggests that when women migrate, it is more likely for long-term or permanent reasons such as marriage, family relocation, or resettlement. For the total migrant population, permanent migration accounted for 16.9% (66 individuals).

7.5 URBAN AND URBANIZATION GARHWAL VS. KUMAUN

Comparative Study of Working and Non-Working Urban Population in Garhwal and Kumaon Regions of Uttarakhand

The urban population dynamics of Uttarakhand show marked regional variations between the Garhwal and Kumaon divisions, both in terms of working population share, employment in the organised sector, and non-working population proportion. These differences are influenced by geography, economic opportunities, migration patterns, and socio-cultural factors.

7.5.1 Working Urban Population

In the Garhwal region, the average share of the working population in urban areas is 27.7%, significantly higher than Kumaon's 17.0%. This difference is largely due to the presence of major urban centres like Dehradun (49.4% working population) and Haridwar (29.5%), both of which have diverse economic bases including administrative services, education, industries, and trade. In contrast, Kumaon's major urban hubs, such as Udhamsingh Nagar (29.1%) and Nainital (26.2%), are exceptions to an otherwise lower regional average, with many districts like Bageshwar (2.0%) and Almora (6.0%) showing very small urban working populations.

7.8 Working and Non-Working Urban Population in Uttarakhand

Sr.No.	District	Total working population under urban Population (%)	Employment in the organisational sector(Government & Private Sector)		Total non-working population under the Urban population (%)
			Male (%)	Female (%)	
1.	Chamoli	10.9	87.7	13.3	15.4

2.	Rudrapryag	1.4	97.5	2.5	1.0
3.	Pauri	9.4	81.6	18.4	15.2
4.	Tehri Gahrwal	8.7	94.4	8.6	10.8
5.	Uttarkashi	5.6	88.3	11.7	9.6
6.	Dehradun	49.4	86.8	13.2	54.2
7.	Haridwar	29.5	94.4	5.6	31.4
	Gahrwal	27.7	90.0	10.0	30.4
8.	Pithoraharh	7.8	87.7	12.3	40.7
9.	Bageshwar	2.0	95.3	4.7	4.1
10.	Champawat	10.6	90.2	9.8	17.3
11.	Almora	6.0	86.2	13.8	11.0
12.	Nainital	26.2	84.8	15.2	40.7
13.	Udhamsingh nagar	29.1	94.8	5.2	34.4
	Kumaun	17.0	89.8	10.2	27.10
	Uttarakhand	20.2	89.9	10.1	28.8

Source: Census of India

The higher Garhwal percentage also reflects greater migration of working-age people to its urban nodes for government jobs, defence services, and the private sector, while Kumaon has more seasonal migration outwards to the plains and other states.

7.5.2 Employment in the Organised Sector (Government & Private)

Organised sector employment is relatively balanced across regions — Garhwal has 90.0% and Kumaon 89.8% of its urban working population in organised jobs. This suggests that formal employment is the primary source of livelihood in both divisions' towns, reflecting the dominance of government offices, defence establishments, and institutional services in Uttarakhand's urban economy. However, the distribution within districts varies:

Rudraprayag (97.5%) and Bageshwar (95.3%) have exceptionally high organised sector shares, mainly due to limited informal opportunities and reliance on public sector jobs.

Pauri (81.6%) and Nainital (84.8%) have relatively lower shares, indicating more presence of informal trade, tourism-linked self-employment, and household enterprises.

7.5.3 Gender Composition of Urban Workers

Across both regions, male employment dominates (around 90% male vs. 10% female in the organised sector), showing low female participation in formal urban employment. Slight variations appear in Pauri (18.4% female) and Almora (13.8% female), possibly due to higher female involvement in teaching, small-scale businesses, and tourism-linked activities.

7.5.3.1 Non-Working Urban Population

The share of the non-working population is higher in Garhwal (30.4%) than in Kumaon (27.1%). In Garhwal, Dehradun (54.2%) and Haridwar (31.4%) raise the regional average — both have large student populations, dependents, and retired individuals. In Kumaon, high non-working shares are seen in Pithoragarh (40.7%), Nainital (40.7%), and Udhamsingh Nagar (34.4%), linked to education hubs, tourism inflow, and industrial towns with dependent families.

Comparative Summary Table 7.9

Indicator	Garhwal Region	Kumaon Region	Observations
Urban working population (%)	27.7	17.0	Garhwal is higher due to Dehradun & Haridwar.
Organised sector employment (%)	90.0	89.8	Almost identical, showing formal sector dominance
Male share in organised jobs (%)	90.0	89.8	Male dominance in both regions
Female share in organised jobs (%)	10.0	10.2	Low female participation overall
Urban non-working population (%)	30.4	27.1	Higher in Garhwal due to a larger dependent population in big cities

Source: Census of India

Garhwal's urban economy is relatively more active in terms of working population percentage, driven by major cities with administrative, industrial, and educational functions. Kumaon, while similar in organised sector dominance, has a smaller proportion of its urban

residents working, partly due to smaller urban centres and migration patterns. Both regions share challenges of low female workforce participation and significant dependent populations, which impact economic productivity but also reflect Uttarakhand's role as a service-based, government-job-oriented state.

7.5.2 Urban population in Uttarakhand (1991-2011)

Between 1991 and 2011, both the Garhwal and Kumaun regions of Uttarakhand witnessed a notable rise in the percentage of urban population, though the pattern, pace, and underlying factors of change varied significantly between them. In 1991, Garhwal already had a comparatively higher urbanisation level at 23.10%, largely due to the presence of major urban centres like Dehradun and Haridwar. By 2011, this figure had risen to 31.86%, an overall increase of 8.76 percentage points. The growth in Garhwal was more pronounced in the decade between 1991 and 2001, with an increase of over six percentage points, after which the pace slowed. The main contributors to Garhwal's urbanisation were Dehradun, which saw its urban share rise from 44.64% to 54.15%, and Haridwar, which maintained a high urban percentage around 35%. Hill districts such as Chamoli, Pauri, and Rudraprayag showed modest increases, while Uttarkashi remained almost stagnant and Tehri Garhwal experienced a slight decline between 2001 and 2011, possibly due to administrative or demographic shifts.

Table No. 7.10 Urban population Percentage in Uttarakhand (1991-2011)

Sr.No.	District	1991	2001	2011
1.	Chamoli	9.92	13.69	15.76
2.	Rudrapryag	0.92	1.16	4.10
3.	Pauri	10.45	11.50	16.30
4.	Tehri Gahrwal	5.45	13.24	11.45
5.	Uttarkashi	7.20	7.77	7.36
6.	Dehradun	44.64	53.78	54.15
7.	Haridwar	30.31	35.77	35.60
	Gahrwal	23.10	29.28	31.86
8.	Pithoraharh	8.57	12.13	14.40
9.	Bageshwar	1.51	3.13	2.72
10.	Champawat	13.66	14.82	14.77
11.	Almora	8.51	9.30	4.67
12.	Nainital	32.12	34.41	38.02
13.	Udhamsingh nagar	28.04	32.65	40.78
	Kumaun	15.80	23.05	27.67
	Uttarakhand	19.45	26.67	30.10

Source: Census of India

In contrast, Kumaun began the period with a much lower urban share—15.80% in 1991—but demonstrated a sharper proportional increase, reaching 27.67% by 2011, a rise of 11.87 percentage points. This represents a relative growth of about 75%, compared to Garhwal's 38%, indicating that Kumaun was in a catch-up phase of urbanisation. The most significant growth was observed in Udham Singh Nagar, where the urban population share jumped from 28.04% to 40.78%, fuelled by industrial development and its location in the plains. Nainital also maintained a high and rising urban share, increasing from 32.12% to 38.02%. Other districts such as Pithoragarh and Champawat showed moderate gains, while Bageshwar had a small net increase and Almora experienced a sharp decline in urban share after 2001, likely linked to census reclassification or outmigration from small towns.

When viewed at the state level, Uttarakhand's overall urban share rose from 19.45% in 1991 to 30.10% in 2011. While Garhwal maintained its lead in absolute urbanization levels throughout the period, Kumaun's faster growth rate suggests a gradual narrowing of the gap. The Garhwal region's urban profile remains dominated by a few large urban centres with already high urban percentages, whereas Kumaun's rise has been driven by rapid growth in specific districts, especially those in the plains and economically active zones. This indicates a more concentrated but faster-paced urbanization in Kumaun, while Garhwal's pattern reflects steady but slower growth from a higher base. Both regions also display signs of uneven urban development, with plains districts urbanizing far more rapidly than hill districts, highlighting a spatial disparity that continues to shape Uttarakhand's demographic and economic landscape.

7.5.4 Trend comparison (decade dynamics)

1991–2001: both regions saw faster increases in urban share (Garhwal +6.18 points, Kumaun +7.25 points). This decade captured early post-1991 economic changes, town growth, and new census town recognitions.

2001–2011: growth slowed (Garhwal +2.58 points; Kumaun +4.62 points). For Garhwal the slowdown is particularly pronounced because its growth was front-loaded in the 1990s and dominated by existing larger urban centres (Dehradun/Haridwar). Kumaun continued catching up, but at a reduced pace versus the previous decade.

7.5.4.1 Interpretation — why the patterns occurred (plausible causes)

Base effect & concentrated urban centres

Garhwal already had higher urban percentages in 1991 (23.1%) with big urban centres

(Dehradun, Haridwar). When a region starts with higher urbanisation, future % increases by the same absolute number are proportionally smaller → explains lower relative growth vs Kumaun.

Economic activity & plains advantage

Udham Singh Nagar (Kumaun) is an agri-industrial/industrial plain fringe district that attracted workers and urban development, driving Kumaun's rise.

Census reclassification / statutory/non-statutory town recognition

Many rises (and some falls) across districts often reflect classification changes — villages reclassified as census towns between censuses, or boundary changes — rather than only migration. The Almora decline and the Tehri dip suggest such administrative effects.

Out-migration from hill districts

The Himalayan hill areas often see out-migration to plains and metros (jobs, education). This can either reduce small-town populations or leave only the rural share increasing proportionally, influencing the percentage urban.

Infrastructure & policy

Roads, industry, and service sector growth around plains and major towns (Dehradun, Haridwar, Udham Singh Nagar, Nainital) concentrate urbanisation. Smaller hill towns with fewer economic pull factors show low or volatile urban shares.

Policy implications

Planning & services: Rapid urban growth in some districts (Dehradun, Udham Singh Nagar, Udhamsingh Nagar → 40.78% by 2011) requires scaled urban infrastructure, housing, water/sanitation, and transport.

Balanced regional development: Hill districts with low/declining urban share (e.g., Almora, some Garhwal hill districts) need policies to either support sustainable town growth or provide rural livelihoods to reduce distress migration.

Data caution: Some district changes are likely administrative; state planners should inspect census town reclassifications and boundary changes before attributing trends solely to migration or natural urban growth.

Decadal slowdown (2001–2011) suggests either saturation in some urban centres or a slower rate of new town formation—monitor 2011→2021 data (not covered here) to see whether the slowdown continued.

Short concluding comparison

Absolute increase (1991→2011): Kumaun (+11.87 points) > Uttarakhand overall (+10.65) > Garhwal (+8.76).

Relative increase: Kumaun (≈+75%) grew much faster proportionally than Garhwal (≈+38%) because Kumaun started from a much lower base in 1991.

Drivers: Kumaun's gains were driven by districts like Udham Singh Nagar and Nainital; Garhwal's urban profile remains dominated by Dehradun and Haridwar, which are already highly urbanised.

7.5.5 District-wise Number of Cities in Uttarakhand

Between 1991 and 2011, the number of cities in both the Garhwal and Kumaun regions of Uttarakhand grew substantially, reflecting processes of urban expansion, reclassification of settlements, and administrative changes. However, the patterns of growth show a clear regional distinction: Garhwal consistently had a larger number of cities, while Kumaun showed a faster proportional increase in certain districts, especially in the plains and economically dynamic zones.

In the Garhwal region, the total number of cities rose from 37 in 1991 to 73 in 2011, nearly doubling over two decades. The most striking increases occurred in Dehradun and Haridwar, the two major urban hubs of the state. Dehradun expanded from 10 cities in 1991 to 22 by 2011, largely due to population growth, the rise of new census towns, and its designation as the state capital in 2000. Haridwar showed an even sharper increase, from 8 cities in 1991 to 26 in 2011, driven by industrial development, tourism, and the Kumbh Mela-related infrastructure boom. Hill districts in Garhwal recorded moderate growth: Pauri rose from 5 to 8 cities, Chamoli from 5 to 6, and Rudraprayag and Uttarkashi remained unchanged, indicating limited urban expansion in high-altitude areas. Tehri Garhwal showed a sharp rise between 1991 and 2001 (from 4 to 8 cities) but then declined to 6 in 2011, possibly due to changes in classification or population thresholds.

Table No. 7.11 District-wise Number of Cities in Uttarakhand (1991-2011)

		Number of Cities		
Sr.No.	District	1991	2001	2011
1.	Chamoli	5	6	6
2.	Rudrapryag	2	2	2
3.	Pauri	5	7	8
4.	Tehri Gahrwal	4	8	6
5.	Uttarkashi	3	3	3
6.	Dehradun	10	17	22
7.	Haridwar	8	24	26
	Gahrwal	37	67	73
8.	Pithoraharh	3	3	3
9.	Bageshwar	1	1	1
10.	Champawat	4	4	4
11.	Almora	3	5	4
12.	Nainital	6	20	21
13.	Udhamsingh nagar	12	18	27
	Kumaun	29	511	60
	Uttarakhand	66	118	133

In the Kumaun region, the total number of cities increased from 29 in 1991 to 60 in 2011, a growth of over 100%, though the decade 2001–2011 saw slower growth compared to 1991–2001. The plains district of Udham Singh Nagar experienced the most significant expansion, from 12 cities in 1991 to 27 by 2011, fuelled by industrialisation, agricultural trade centres, and migration from hill areas. Nainital also saw a rapid rise from 6 cities in 1991 to 21 in 2011, reflecting its role as a tourist hub and administrative centre. In contrast, the hill districts of Pithoragarh, Bageshwar, and Champawat saw no net change in the number of cities, and Almora showed a small fluctuation—rising from 3 in 1991 to 5 in 2001 but falling back to 4 in 2011, possibly due to reclassification of settlements.

Uttarakhand's total number of cities increased from 66 in 1991 to 133 in 2011, effectively doubling in 20 years. Garhwal maintained a larger absolute number of cities throughout (37 to 73), while Kumaun's growth was more concentrated in a few key districts, especially Udham Singh Nagar and Nainital. The expansion in both regions was heavily influenced by the recognition of new census towns, industrial growth in the plains, and infrastructural development following the creation of Uttarakhand in 2000. However, the lack of

change in many hill districts highlights a persistent geographical imbalance in urban growth, with plains areas absorbing most of the new urban settlements.

7.5.5.1 Category-wise details of Cities of Uttarakhand

The state of Uttarakhand in 2011 comprised a total of 86 urban centres, distributed unevenly between its two main divisions — Garhwal and Kumaun. Garhwal housed 50 cities, representing nearly 58% of the total, while Kumaun had 36 cities, making up the remaining 42%. This distribution reveals distinct urbanisation patterns in each division, shaped by geography, economy, and historical settlement trends. The cities are classified into six categories based on their population size, highlighting how each division contributes to different tiers of urban settlements.

Table No. 7.12 Category-wise details of Cities of Uttarakhand (2011)

Sr.No.	Urban Index	Numbers of Cites		Total
		Gahrwal Division	Kumaun Division	
1.	I-100,000 Above	3	3	6
2.	II-50,000-99,999	3	2	5
3.	III-20,000-49,999	7	9	16
4.	IV-10,000-19,999	11	3	14
5.	V-5,000-9,999	14	12	26
6.	VI-5,000 Below	12	7	19
	Total	50	36	86

Category I: Cities with Population 100,000 and Above

Both the Garhwal and Kumaun divisions equally possess three cities each in this highest population category, making a total of six large metropolitan centres. This parity indicates balanced urban development at the top tier in the state. In Garhwal, cities such as Dehradun and Haridwar function as prominent administrative, educatiourbanisationmercial hubs, attracting a large population and providing extensive services. Similarly, Kumaun's major cities like Haldwani and Rudrapur play vital roles in regional trade and industry. This equal distribution reflects comparable economic opportunities and infrastructural development in both divisions' major urban centres.

Category II: Cities with Population Between 50,000 and 99,999

Garhwal slightly outnumbers Kumaun in this category, with three cities compared to

Kumaun's two. This suggests that Garhwal has a marginally broader base of medium-large cities, which act as important secondary centres for trade, governance, and service provision. These towns are crucial in bridging the gap between large metropolitan areas and smaller towns or rural regions, supporting a more extensive network of urban influence across Garhwal. Kumaun, while slightly behind here, still maintains a presence of medium-scale urban centresthat contribute to its regional economy.

Category III: Cities with Population Between 20,000 and 49,999

In contrast, Kumaun leads in this category with nine cities, compared to Garhwal's seven. This higher number of mid-sized towns in Kumaun indicates a more concentrated urban growth pattern where a few important towns serve as significant economic and administrative nodes. These towns often provide commercial services, healthcare, and education to their surrounding rural hinterlands. The prevalence of such towns suggests that Kumaun's urbanisation is less dispersed but potentially more focused on a network of stronger regional centres, which can drive development in their areas more effectively.

Category IV: Cities with Population Between 10,000 and 19,999

Garhwal dominates this category significantly, hosting eleven cities against Kumaun's three. This points to Garhwal having a larger number of smaller urban settlements, reflecting a more fragmented urban landscape. Such a spread is often characteristic of mountainous or hilly regions where geographical barriers restrict the expansion of large towns, but small settlements thrive by serving localised needs. These small towns in Garhwal likely function as essential access points for rural populations to basic urban services such as markets, schools, and healthcare facilities, thereby ensuring better regional accessibility.

Category V: Cities with Population Between 5,000 and 9,999

Both divisions have a substantial number of small towns in this category, with Garhwal having 14 and Kumaun 12. The closeness in numbers suggests that both divisions maintain a relatively similar base of smaller urban settlements. These towns typically act as local trade and service centres, supporting the surrounding rural population and possibly serving as emerging growth centres for future urban expansion. The near parity indicates that both Garhwal and Kumaun retain a healthy network of small towns, essential for balanced regional development.

Category VI: Cities with Population Below 5,000

Garhwal again leads in the smallest city category, with twelve compared to Kumaun's seven. This reflects Garhwal's larger number of very small urban settlements, often transitional

zones between rural and urban lifestyles. These towns may be characterised by limited infrastructure but are important for providing localised urban functions in geographically remote or difficult-to-access areas. The higher number of such small towns in Garhwal may be due to its more rugged terrain and dispersed population distribution, necessitating multiple small urban centres.

7.6 SUMMARY

Intra-state disparities in Uttarakhand reveal a complex picture when examined through the lens of education, health, and infrastructure, particularly between the Garhwal and Kumaun regions. While both regions share the common challenges of difficult terrain and remoteness, the Garhwal region has historically benefited more from infrastructural development due to its political and administrative significance, with Dehradun serving as the state capital and a hub for higher education and health facilities. Kumaun, on the other hand, though rich in natural and cultural resources, continues to lag in terms of equitable access to advanced medical facilities and educational institutions, especially in the hilly interiors. Rural areas in both regions suffer from poor connectivity, a lack of quality schools, and uneven distribution of health infrastructure, which contributes to regional imbalance. The urban centres of Dehradun, Haridwar, Haldwani, and Rudrapur are witnessing rapid growth, while the interior hill districts face out-migration, weak service delivery, and underdeveloped infrastructure. This uneven development pattern widens the education and health divide, further reinforcing disparities between urban and rural areas, as well as between Garhwal and Kumaun.

The urban-rural divide is becoming sharper with the emergence of peri-urban spaces, especially around Dehradun, Haridwar, and Haldwani, which are experiencing rapid commercialisation and population inflow. These spaces act as transitional zones where rural populations migrate in search of better employment, education, and health services, thereby creating new socio-economic dynamics. However, the migration trend, particularly from hill districts to the plains and urban centres, has significant implications. On the one hand, remittances from migrants support rural households, improve access to education and health, and reduce poverty. On the other hand, large-scale out-migration leads to depopulation of hill villages, neglect of agricultural land, and a declining workforce in traditional sectors, thereby threatening cultural continuity and sustainable livelihoods. The Garhwal region, for instance, experiences higher out-migration compared to Kumaun, largely due to harsher geographic conditions and limited economic opportunities. This dual reality of growth in peri-urban hubs and stagnation in remote villages underscores the urgent need for balanced regional development policies, focusing on decentralised infrastructure, skill-based employment, and sustainable resource use to bridge the intra-state disparities.

7.7 GLOSSARY

- **Intra-State Disparities** – Differences and inequalities in development indicators such as education, health, and infrastructure within different regions or districts of the same state.
- **Regional Imbalance –** Uneven socio-economic progress between areas like Garhwal and Kumaun in Uttarakhand, where some districts advance in facilities while others remain underdeveloped.
- **Urban-Rural Divide –** The gap in living standards, opportunities, and access to education, healthcare, and infrastructure between urban centres and rural or remote villages.
- **Peri-Urban Areas –** Transitional zones located between rural and urban spaces, experiencing rapid urbanisation, commercialisation, and demographic changes due to migration.
- **Migration –** Movement of people from one region to another, often from rural hills to plains or cities, driven by employment, education, or better living opportunities.
- **Socio-Economic Implications –** The combined effects of migration and disparities on society and economy, including income patterns, remittances, depopulation of villages, and changes in cultural practices.
- **Human Development Indicators (HDI) –** Measures such as literacy rate, life expectancy, healthcare access, and standard of living, used to assess development across districts.
- **Infrastructure Inequality –** Unequal distribution of physical and social infrastructure like roads, schools, hospitals, electricity, and digital connectivity, which contributes to uneven regional growth.

7.8 ANSWER TO CHECK YOUR PROGRESS

Which of the following best explains "Intra-State Disparities"?

a) Inequalities between different countries

b) Differences in development within a single state

c) Economic growth across all states is equally

d) Equal distribution of resources within a state

Answer: b) Differences in development within a single state

2. In Uttarakhand, the Garhwal and Kumaun regions are often compared to highlight disparities in:

a) Climate and soil fertility

b) Education, health, and infrastructure
c) Mining and forestry alone
d) Language and religion only
Answer: b) Education, health, and infrastructure

3. Which one of the following is a major factor behind migration from the hill districts of Uttarakhand to the plains?
a) High agricultural productivity in the hills
b) Better employment and educational opportunities in the plains
c) Over-availability of healthcare in villages
d) Decline of urban centres
Answer: b) Better employment and educational opportunities in the plains

4. The term "Peri-Urban" refers to:
a) Remote mountain villages far from cities
b) Areas within the urban core of a city
c) Transitional zones between rural and urban areas
d) Regions with no population settlement
Answer: c) Transitional zones between rural and urban areas

5. Which of the following is NOT a socio-economic implication of migration in the Himalayan region?
a) Depopulation of hill villages
b) Flow of remittances to rural households
c) Increased access to education and healthcare in source villages
d) Shortage of workforce in rural agriculture
Answer: c) Increased access to education and healthcare in source villages

6. The urban-rural divide in the Indian Himalayan Region is most visible in terms of:
a) Natural resource distribution
b) Access to modern education, healthcare, and infrastructure
c) Similarities in cultural practices
d) Uniform employment opportunities
Answer: b) Access to modern education, healthcare, and infrastructure

7. Human Development Indicators (HDI) used to assess intra-state disparities include all EXCEPT:
a) Literacy rate
b) Life expectancy
c) Per capita income

d) Geological formations
Answer: d) Geological formations

8. Which factor contributes most to infrastructure inequality in Uttarakhand's hill districts?
a) Difficult topography and remoteness
b) Overpopulation in rural areas
c) Decline in tourism
d) Rich mineral deposits
Answer: a) Difficult topography and remoteness

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7.10 TERMINAL QUESTIONS

Short Answer type Questions

1. What is meant by intra-state disparities in the context of development?
2. Name two key sectors where disparities between the Garhwal and Kumaun regions of Uttarakhand are most visible.
3. What does the term "peri-urban spaces" signify in the Indian Himalayan Region?
4. Mention one socio-economic implication of migration from rural to urban areas in

Uttarakhand.
5. How does the urban-rural divide affect access to healthcare in the Himalayan region?

Long Answer-type Questions

1. Discuss the major disparities in education, health, and infrastructure across the districts of Uttarakhand, highlighting Garhwal and Kumaun as a case study.
2. Analyse the role of topography and remoteness in widening intra-state disparities in the Indian Himalayan Region. Provide suitable examples.
3. Examine how the urban-rural divide has led to the growth of peri-urban spaces in the Himalayan states, and discuss their impact on local socio-economic structures.
4. "Migration in Uttarakhand is both a challenge and an opportunity." Critically evaluate this statement with reference to its socio-economic implications.
5. Compare and contrast the development pattern of the Garhwal and Kumaun regions in Uttarakhand, focusing on disparities in basic services and opportunities.

UNIT-8 BORDER AND REMOTE AREA DEVELOPMENT

8.1 OBJECTIVES

8.2 INTRODUCTION

8.3BORDER AND REMOTE AREA DEVELOPMENT INTEGRATING BIOGRAPHY WITH OTHER DISCIPLINES

8.3.1. Strategic and socio-political significance of border areas

8.3.2. Development deficits in international border regions

8.3.3. Role of BADP, BRO & other special schemes

8.3.4. Livelihood vulnerabilities and security issues

8.4 SUMMARY

8.5. GLOSSARY

8.6 ANSWER TO CHECK YOUR PROGRESS

8.7 REFERENCES

8.9 TERMINAL QUESTION

8.1 OBJECTIVES

After this unit, you will be able to:

- To do a geographical study of the border areas of the Indian Himalayan region.
- To analyze the importance and utility of the border and boundary areas for the state and the nation.
- To study and make suggestions for developmental policies in the Himalayan Border States.

8.2 INTRODUCTION

The Himalayas, being a newly folded mountain range, have geographical and geological unevenness and instability here. Human, ecological and seasonal diversities are observed in the uneven mountain structures in all the 13 Himalayan states governed by the Centre and the State, which act as the biggest obstacle in the infrastructure development at a particular place, whereas border areas are of utmost importance for any nation and state from the security point of view, through which all the citizens residing within the boundary of the nation get security and it also becomes an indicator of the progress of the nation, therefore all these characteristics are present in a state, district, village and town. The general meaning of border is taken as the last border of the country, state, district and village. On the basis of the importance of these areas, there is a need for the implementation of different policies according to the area. Hence, the policies of connecting all the people within the physical boundaries i.e. human residence and reach within the boundaries of the earth to the main stream of development are the concept of border development which is based on the concept of development of the border and inaccessible areas of the country, the objective of which is to improve the standard of living of the people living in these areas, to provide basic services and to increase economic activities. Thus, border and remote areas are geographically inaccessible, far-flung and often neglected areas.

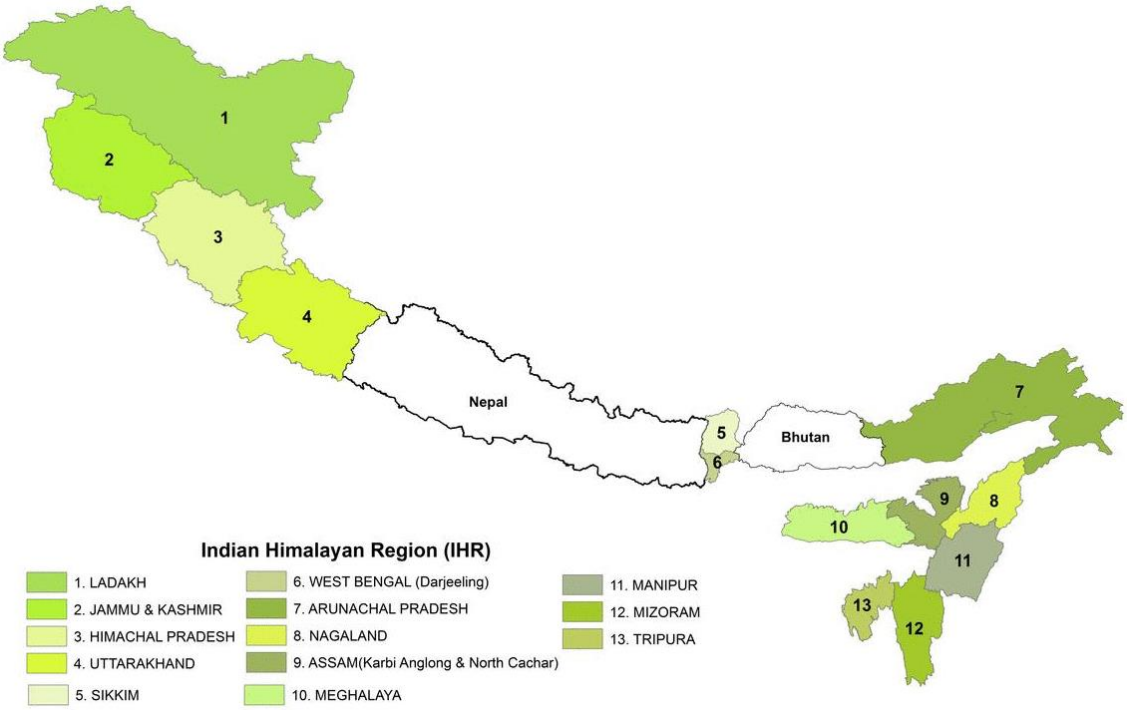
Due to the slow pace of development in these areas, basic services like housing, education, health services, and communication facilities have to be made available to the people living here. Because all these basic services are lacking in these areas. In conclusion, it can be said that even the people living in the remotest limits have to be made economically strong by providing them with the comforts and facilities of a developed society, which mainly includes basic infrastructure development, development of economic activities, expansion and improvement of education and health services, and development of human efficiency. Because the geographical area of Indian Himalayan states has the specialty of assimilating its unique and complex ecological systems, which have been in very difficult physical and environmental conditions from the time of human

Himalayan settlement till today and are far away from modern urban development because there are high snow-clad mountain ranges, steep slopes, deep valleys, lack of forests and human settlements and lack of means of livelihood, along with this, these are also difficult from ecological and environmental point of view, but with the help of many inventions of science and technology, the development of road and communication services is being done by the Central and State Governments for the community residing in the middle and Shivalik Himalayan regions even in the most difficult areas. For example, road development in the Himalayan areas by the Border Roads Organisation (BRO) is being done by the Prime Minister. He is trying to develop the last village on the country's border as the first village and establish it as a developed and ideal model village for domestic and foreign tourists, and the development of remote areas is being done. This effort is succeeding to some extent. Because of environmental and physical conditions, many types of challenges have to be faced in remote and inaccessible areas in order to carry out developmental activities. Thus, diversity is seen in the border development schemes in all Himalayan states (Jammu-Kashmir and Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Assam, Manipur, Mizoram, Tripura and Meghalaya and the mountainous areas of West Bengal). Most of the border development schemes are being implemented by the Central Government, while the North-Eastern states are also developing tribal and basic services with their own resources.

8.3 BORDER AND REMOTE AREA DEVELOPMENT INTEGRATING BIOGRAPHY WITH OTHER DISCIPLINES **(Strategic and socio-political significance of border areas development deficits in international border regions, role of BADP, BRO & other special schemes, livelihood vulnerabilities and security issues)**

Border and remote area development-Border and remote area development means all the plans, policies and activities within the boundaries of a nation which are being operated in the accessible and developed areas, all those plans are to be operated in the border and remote Himalayan areas, that is, border areas are those areas which are generally very sensitive and backward from the main stream from the geographical, socio-economic and political point of view. Whereas remote areas mean those areas which are very backwards and geographically far from the administrative, economic, industrial, urban or population centres, where it is difficult to reach and the reach of development has also reached only a very limited area. The Indian Himalayan region border areas are clarified in Figure 8.1.

Indian Himalayan Region (IHR)



Source: https://www.drishtiias.com/daily-updates/daily-news-analysis/carrying-capacity-of-himalayan-states

Indian Border Areas- Border and Remote Area Development also refers to those plans, policies and activities in which physical infrastructure (roads, electricity, water), social services like health, education and communication means, and economic activities like agriculture, industry are deprived of human security and sustainable development. Border development is the provision of all these aspects in border and remote areas. Among the Himalayan states, Uttarakhand, Arunachal Pradesh, Ladakh, and Nagaland are the most inaccessible, border and remote areas of the Himalayan region. In the context of the Indian Himalayan region and the country, the border is very important from the point of view of overall development and national unity, which is not only essential for the overall development of India and national unity, but economic progress is determined by development, and human social equality and environmental balance will also be strengthened in areas with complex geographical structure. This concept is based on the values of people-based and region-specific, and sustainable development.

The main objective of border and remote area development is to conduct human activities and basic works in human-inhabited areas and strategically useful land plots, that is, to improve national security and the lives of people living in inaccessible areas. In the states located in the Himalayan region with diverse physical structures, socio-economic and strategic development provides strength in socio-cultural, economic and environmental contexts in addition to physical structural development. By definition, border areas are those areas where the availability of resources is limited, and these areas remain deprived of the mainstream of development, even in

social and economic development. These are also sensitive from the geopolitical and strategic point of view. For example, in the Himalayan states of India, Jammu Kashmir, Pakistan, China border, Himachal, Uttarakhand, China and Nepal border, in the north-eastern states, China, Bangladesh and Myanmar borders are included in the border regions. From the point of view of remote areas, the human beings residing here are still leading the life of forest dwellers. There is a lack of basic facilities like transport, communication, education and health here. Even if they are available, they are available only to a minimum extent.

Border Remote Area Development Needs- Development of border areas, security and strategic, social inclusion, especially of tribes residing in these remote areas, who are deprived of traditional community development, and conservation of natural resources, which have been preserved as heritage, which is beneficial from the viewpoint of sustainable development. Apart from this, this area has been useful for human habitation for a long time in preventing migration, even in the most difficult situations. Because this region is geographically very inaccessible, lacks means of transport and communication, lacks education and health services, is full of natural crises, which are still deprived of human development and civilisation, the main developmental objective is to remove all these crises and provide all the basic facilities, needs and amenities of modern human society to humans. At present, many types of schemes are being implemented by the Central and State Governments for border area development, such as Border Area Development Program, Ministry of Development of North-Eastern Region, Pradhan Mantri Gram SadakYojana, National e-Governance Scheme, Vanbandhu KalyanYojana etc. are being implemented on a large scale, due to which the governments are paying more attention to preparing development plans at the local level for the local people living in difficult geographical areas (all Himalayan states), in which the establishment of education and health centres as a priority, preservation of tribal culture and traditions, bringing the youth promoting environmental tourism to the forefront, developing skills to become self-reliant are currently being adopted for border area development, due to which the expected results are also being achieved in the border and border areas.

Thus, the need for development in border and remote areas is essential for the overall development and national integration of the Himalayan states of India. Its development will not only boost economic progress but will also adopt the norms of sustainable development in social equality and environmental balance which will be people based, which mainly includes development of infrastructure such as roads, drinking water, bridges, communication services, agricultural development, tourism and local There is a need to develop small scale and craft industry development, protection of local popular businesses, promotion of businesses, women

empowerment, tribal and backward class development on priority basis. Thus, the objective of border and remote area development is to bring these areas into the mainstream and provide an opportunity for a better life to the community residing in the Himalayan border areas and to meet the special developmental needs of the people living in the remote and inaccessible areas along the borders, which are full of essential infrastructure and livelihood development activities of the community residing in remote areas.

To enhance local development, activities like border area development program, skill development program, self-help groups, producer groups, village producer groups, livelihood cooperatives, village organisations, cluster level associations and sustainable livelihood for community organisations will have to be adopted for the communities of the areas deprived of development. Apart from this, development work can also be made possible in the complex physical structure of the Indian Himalayan regions by promoting technology transfer and border tourism in the remote Himalayan areas, because this area is very favourable from the point of view of health and environment, which is a wonderland of many possibilities for animal husbandry, horticulture, handicrafts and natural tourism instead of agricultural work, where human development and population in the most inaccessible areas is increasing. On one hand, the population of the border is increasing, and on the other hand, the country's borders will be safe, especially from China, Pakistan, Nepal, Bangladesh and Myanmar, because the general and tribal community residing in the local border provide the work of the intelligence agency in strategic security to the security forces. The entire Himalayan region is famous for rare natural forest products (herbs, fruits, medicines) and agricultural products produced by the local community, which can be made useful for humans and can be made available to the country and the world by developing these remote areas. This will be the most successful way to make the local youth self-reliant by giving them employment and stopping migration.

Himalayan State Border Development Schemes- Himalayan State Border and Remote Area Development Scheme is a scheme of India whose main objective is to develop the border and remote areas of the Himalayan region by improving infrastructure, education, health care and means of livelihood and to connect the people living in the Himalayan highly complex geographical areas with the stream of development and self-employment by explaining the utility and importance of local resources and also to improve their lives by making them self-reliant, apart from this, to strengthen the national interest i.e. border security. The main objective is to provide human stability in the geological and geographical instabilities of the Himalayan region without causing sustainable development and environmental damage. Because this step is the most important effort to improve the Himalayan regions, as the Indian Himalayan Region (IHR) is

not only geographically sensitive but also climatically sensitive, it is the highest and densely populated mountain region of the world, to bring stability in which there are nationwide missions to maintain the Kanchenjunga, Valley of Flowers National Park, Valley of Fruits, Nanda Devi, Himalayan ecosystem, apart from this, Himalayan National Mission, Indian Himalayan Climate Program and Himalaya Project are an effective public and environmental welfare step for remote development.

These are steps to manage the natural resources of the Indian Himalayan region internally for human welfare in the economy of the region, which is an attempt to develop the 2400 km long area of the Himalayan mountain range under sustainable development, where regulating the ecological balance, protecting biodiversity, tribal diversity residing here, unique cultures, languages, traditions, religious places, beliefs display the rich cultural characteristics of the Himalayan region, as well as pave the way for bringing the dimensions of modern development to the areas with uneven mountain structure. Because the Indian Himalayan region is the head of the Indian nation, which is naturally the sentinel of India, it stands firmly in all natural protection, human or climatic, and provides a shield of life and security to the citizens of the entire country, yet it has been more useful for North and North East India than for other parts of the country, so the responsibility of the overall development of the entire Indian Himalayan region is the moral responsibility of the Central and Himalayan state governments and responsible citizens. The biggest obstacle in the development of remote and border areas of the Indian Himalayan region is the natural calamities occurring here, which include earthquakes, cloudbursts, avalanches, soil erosion, forest fires and floods in the North East, which occur every year in the Himalayan region. Political instability and internal unrest, to some extent, are another major reason for the hindrance in development.

Since most of the residents of these areas are from the tribal community, it does not meet the criteria of science. But we will still have to try to make all the states in the Indian Himalayan region work on an integrated sustainable development use plan, and after reviewing the environmental changes, adopt modern developmental planning. Border and remote area development can be brought to the grassroots level by adopting techniques such as remote sensing and GIS. Because the human communities residing in the Indian Himalayan region deserve a sustainable development concept that is available in this region and also ensures the long-term prosperity and well-being of the Himalayan community, with special emphasis on the balance between development and environmental sustainability.

At present, the Government of India is adopting the policy of think tank for sustainable development and development of border areas in the Indian Himalayan region, which is being enriched with the help of international organizations like ICIMOD, which has been working at the grassroots level in many areas of the Himalayas for a long time, which is mainly emphasizing on works like evergreen farming, agricultural improvement, sustainable tourism, Sifting farming control, skill development and entrepreneurship strengthening in the border areas, along with this, emphasis is being laid on ensuring the participation of the wider Himalayan community in mountain developmental issues on the theme of Himalaya Aawahan. Apart from this, the works being done for border and remote area development by the 13 Central and Union Territories located in the Indian Himalayan region are clarified state-wise.

1. Uttarakhand State Border and Remote Development Policies- Central and State schemes for the development of border areas of Uttarakhand state are being implemented to provide basic infrastructure and livelihood in border areas through the MBADP fund to enhance local development along with border area development programmes. Various skill development programmes are being run in border districts for sustainable livelihood for community organisations like self-help groups, producer groups, village producer groups, livelihood cooperatives, village organisations and cluster level associations for the residents living in remote areas. For road development, road and air transport is being strengthened from Chamoli to Pithoragarh district till the last village with the help of the Border Roads Organisation. To strengthen the agriculture, animal and local handicraft products of residents, the government itself is managing publicity and exhibitions, which is a strategic preparation to increase the means of livelihood and self-employment in border areas and reduce migration, especially by providing special grants by giving the status of backwards border development block to 9 border development blocks of the state. With priority given to remote area development, many types of activities like infrastructure development, sustainable livelihood creation, employment, reverse migration, skill development, and establishment of development centres are being run as innovative schemes in border areas.

Apart from this, from the year 2023, with the help of Rural Development and Migration Prevention Commission, the Uttarakhand government has started the Border Tourism Scheme up to the border areas, in which Uttarkashi, Bhatwadi, Chamoli, Joshimath, Munsyari and Dharchula development blocks are currently included, where seasonal charm has started returning to the border villages with home stay, new tourist destination development, ancient temple renovation works. Because these border villages act as sentinels in the country, that is why the Prime Minister of the country has given the honour of being the first village of the country to Mana village.Apart

from this, construction of perennial roads in border areas of border districts, establishment of ITBP posts, electrification, construction of roads (CPWD), local migration control, adventure tourism, creation of winter tourism coordination cell, construction of trek routes, promotion of production of medicinal plants in high Himalayan areas, tourism development in remote border areas Malari, Mana, Harshil, Nelang, 24 hours electricity supply and establishment of mobile towers for communication system in border areas are being done with priority.

2. Himachal Pradesh State Border and Remote Development Policies- For border and remote area development, Himachal Pradesh is currently working with the support of the Center to provide basic facilities under the Master Plan Scheme, in which tribal area development is being given priority and remote areas of Chamba, Kinnaur and Kangra with a population of more than 500 and 270 villages of the entire state have been included in this scheme, where proper arrangements of road, electricity and water are to be made. Apart from this, many villages have been included in the Vibrant Village Scheme. Under the Border Area Development Policy (BADP), with the joint efforts of the Central and State Governments, road, health, education, irrigation, sports, rural and border tourism development work is being done in border residential areas up to 10 km, which is being operated in the ratio of 90:10. By the year 2023, at the very beginning of the Vibrant Village Program (VVP), the Central Government has provided an amount of Rs. 4800 crores as grant money. Through this, 113 projects have been provided in the villages connected to the China border to develop roads, skill centres, solar street lights, community buildings, sewage systems, and to improve the living standards of the villages in the border areas, to control migration, to create tourism and agriculture-basedlivelihoods. Along with this, the Border Tourism Initiative Scheme, Devasthan and medical facilities and socio-economic upliftment projects in the border areas have also been included in border development. Under inclusive development, the local youth of border areas are being made skilled by imparting them training, along with this self help groups, producer groups, village level clusters, organic farming extension, information and communication development, local livelihood in forest areas of Kinnaur, LahaulSpiti, tourism based model, self-reliance through sustainable development by linking border areas with the mainstream and areas with zero-line of development are being made effective for the improvement of human life in remote areas of Himachal.

At present, the state government is also working on a plan to connect 17 villages of the state with border tourism, where only tourism based economic activities take place, which is to be developed by the joint efforts of the Center and the State through mutual coordination, local self-employment growth, agricultural prosperity, expansion of road, communication and health facilities to develop the deprived community.

3. Jammu-Kashmir and Ladakh Union Territory Border and Remote Development Policies - Under the Border Area Development Program (BADP) in the Union Territories, road, electricity, health and education and communication facilities are being strengthened in the border rural areas, while under the Prime Minister Development Package (PMDP) for the development of border areas in both the states, road, energy, tourism, agriculture and urban development, all-weather road network is being prepared in the entire border areas, while for the Ladakh region, Ladakh Autonomous Hill Development Council is being engaged in local decision and development planning. While under Deen Dayal Antyodaya Yojana a package of Rs. 520 crore has been provided for development of rural areas for rural women self-help groups and self-employment growth, through which means of rural livelihood are being increased along with road, electricity, education, health and digital connectivity in border and remote areas of the Union Territory, along with emphasis is being laid on employment promotion, tourism and women empowerment.

4. Sikkim State Border and Remote Development Policies- Sikkim state has its own historical heritage, geography, trade and ethnic diversity, which is distinct from the rest of the country. Rich natural biodiversity and mountain heritage enrich the global level biodiversity sites here. Sikkim is a border state which shares its borders with Bangladesh, Bhutan, China and Nepal, which are more sensitive states from the point of view of national security. The adverse and hilly lands of the state become the biggest obstacle to the development of the state. Nevertheless, the Sikkim government has taken the lead among all the north-eastern states by preparing the North Eastern Region Vision Tourism Master Plan under the Sikkim Industrial and Investment Policy. Border area development in the state was started in the year 1998-99, which was specially implemented in 17 border development blocks of the international border of the state, where roads, bridges, education, health services, irrigation facilities and communication systems are being strengthened under border area development in the ratio of 90:10 of the Center and the State, basic infrastructure development in 46 blocks of 19 districts in Phase 1 and 2, increase in 5G communication service mobile coverage under Sikkim Special State in the year 2024, all-weather road development and railway line development works are being done on priority. At the same time, home stay, digital marketing, technical training, financial accessibility and innovation are being promoted especially for women and youth by providing employment training and empowerment for women and youth development in remote and deprived areas of the mainstream of development. Under PMAAGY and Adarsh Gram Yojana, Kyawjin, Pandam, Aritor, and Lingjen development blocks are being included in the first phase of the scheme for empowerment

of tribal areas and villages, creation of village development plans, education, health and infrastructure development.

5. Arunachal Pradesh State Border and Remote Development Policies- The Border Area Development Program in Arunachal Pradesh was started in the year 1997-98, in which the areas adjoining the borders of Myanmar, China and Bhutan were developed under infrastructure. Initially, 46 border development blocks were included, which included 1944 villages of 15 districts, in which education, health, agriculture, drinking water, electricity and skill development were to be provided to 3.9 lakh people of the total population of the state. On the basis of these achievements, 65 model villages have been established in the state under the State Border Area Development. Under the Vibrant Village Program, 662 villages have been included in the first phase by expanding residential development, economic opportunities and basic services in border villages, especially in the Indo-China border. Out of the 455 selected villages, 135 villages are now left, which are deprived of modern developmental activities. Under the Forerunner Highway and Inter-Connectivity, 1500 km of National Highway is proposed to be constructed from East to West along the border line and six inter-corridor highways are proposed to be built under the Trans Arunachal Highway. Under Project Udayak and Project Vartak, 2100 km of roads, bridges and tunnels are to be constructed in eastern Arunachal. Apart from this, under Mission Krishi Veer, agricultural empowerment is to be strengthened by organising local farmers and supplying fresh fruits and vegetables to the army and security forces. Along with this, the target of providing digital connectivity to all border villages by the end of the year 2025 has been set under border development.

6. Assam Border and Remote Development Policies- Under border development, the Government of Assam is carrying out infrastructural development works in villages within 0-10 kms of the borders with Bangladesh and Bhutan under the International Border Development Programme, which mainly includes Dhubri, Baksa, Chirang, Kakarjor, Udalguri, South Salmara, Mankachar, Karimganj and Cachar districts, where roads, bridges, drinking water, schools, health centres, village markets, tourist centres, renewable energy resources and small industries are being established.Emphasis is being laid on. In May 2025, the state government has also decided to give licensed weapons to the tribals and natives living in remote and border areas so that they can protect themselves. For border security and development, the Assam government is currently adopting the study of remote border areas, long-term and short-term plans, employment generation capacity development, transparency assurance, community harmony in border areas through social participation and peaceful resolution of border disputes, etc. This policy of the

government is an effort to provide overall development of the border and remote areas of Assam, access to government services and security to the citizens of Assam.

7. Meghalaya Border and Remote Development Policies - The Meghalaya government is operating border and remote area development to connect socio-economic and basic facilities to the border and remote human settlements of the state, in which the Border Area Development Program is being run through Inter-State Border Area Development Programs. Here too, for border development, water, education, health, sports activities, road construction, community centers and development of mandal villages are being done in villages within 0-10 km radius of the international border with Bangladesh in the ratio of 90:10. In the same Inter State Border Area Development Program, 100 percent financing is being done by the state government whose main objective is to provide socio-economic security within 0-10 km radius, along with this, border scholarships are provided to economically backward Scheduled Caste and Scheduled Tribe students in border areas. This department has been working in border districts by establishing the Border Development Department Organisation by the state government since the year 1973. Thus, the main objective of the Border and Remote Area Development Policy by the Government of Meghalaya is to provide basic facilities to the border and remote villages and to provide self-reliance to the residents there.

8. Manipur Border and Remote Area Development Policies- Like other states, the Border and Remote Area Development Policy in Manipur was also started in 1997-98, where plans for road, bridge, health, and education improvement were prepared in the border development blocks of Bhindanchan (Padhijin, Jindswad), Bhindkamas (Jhamdawanchan, Bhindpantwad) and Bhindamp, Gyurwadih, Nitin, Gyunsamad of Nitin district, up to 10 km from the Myanmar border. To improve connectivity and transportation in the border areas, the state government has provided road, rail and air routes, and about 60per cent drinking water in rural areas under Jal Jeevan Mission. Under digital and telecommunication connectivity, communication facilities are being provided in 74 percent remote areas of the state by installing 194 mobile towers in 263 border villages in Manipur. Under other border development schemes, products are being sold directly to consumers by women in the Rural Root Market in the Manipur State Rural Livelihood Mission, so that the economy of the border areas can be strengthened. The state government is continuously working on issues like police service, police stations, outposts, border security, Highway movement, rehabilitation and farmer security in the border areas.

9. Mizoram Border and Remote Development Policies - The objective of the Mizoram government is also to connect the citizens living in border and remote areas to the mainstream of

development by improving physical and social infrastructure. Supply of health, education, roads, drinking water and electricity should be ensured for all. The programme of marginal development was implemented in the year 1993-94, and is currently implemented in 16 development blocks. Under the Rural Development and Rural Livelihood Mission, financial inclusion through self-help groups for poor families, assistance in agricultural/non-agricultural activities and skill development, people residing in 11 districts and 22 development blocks of the state are benefiting from this scheme. There is also a plan to develop 47 villages of four clusters under the Shyama Prasad Mukherjee Rurban Mission. The first train will be operated by the Indian Railways from July 2025. Under road construction and improvement, 50-60 thousand families are being linked to skills and employment in trades/areas as emergency repairs and socio-economic development, through the Chief Minister's Strategic Road Scheme.

10. Nagaland Border and Remote Development Policies- In the Border and Remote Area Development Policy of the government, basic services are being developed like other states in the 10 km area of the borders of India's neighbouring countries, such as Myanmar, in which inclusive agriculture, means of transportation, education, health and special financial management are being done. At the same time, priority work is being done in the remote and border development blocks of J&K, Doda, Gyaptam, and Chhawasan. Special development projects have been run in backwards areas since 2003 by the Department for Development of Underdeveloped Areas of the state government. Which Eastern Nagaland State Package is also being given? Under DeenDayalAntyodayaYojana, 1260 villages in 74 development blocks of 11 districts will be provided with various scheme benefits, fostering climate climate-resilient upland farming system that will start from January 2018.

1.18 lakh families of 9 districts are being empowered by involving them in the AalitKrishiYojana. Keyhole surgery, portable diagnostics, ultrasound and X-ray facilities are being provided in remote rural and border areas through the Chief Minister's Mobile Operation Theatre. 51 advanced schools have been constructed in remote areas under the Integrated Education for improving school infrastructure. However, even today, there is a lack of basic facilities in the border areas. Especially, there is a lot of imbalance in development in the eastern districts. Currently, the Nagaland Government has launched 100 schemes for border and remote area development, which have been successful in strengthening education, health, road, energy, livelihood and social institutions.

11. Tripura Border and Remote Development Policies- In the state of Tripura, the Border and Frontier Development Program was started in 1986-87 by the Ministry of Home

Affairs to connect the residents of inaccessible and border areas along the international border with basic developmental infrastructure, in which roads, health, education, electricity, communication, sports and agricultural development were to be developed with priority. In the year 2023, under the Venerable Villages Program, 2967 border villages have again been selected to improve the standard of living in the border areas and to stop migration, where all the essential basic services are to be expanded, while under the Chief Minister's Border Area Development Program, a special package is being given to meet the essential developmental needs of the people living in border and remote areas from the year 2020, in which clusters have been created here in the form of local self-help groups, producer groups, development centers, which are helping in stopping migration and ensuring sustainable livelihood.

Apart from this, to improve the lives of remote and tribal areas, the Tripura government is working on road connectivity. Local participation, skill development, self-employment and national security and facilities are the primary objectives of remote area development. Through the Tripura Rural Economy Growth and Service Delivery Project, quality education, road connectivity, livelihood and access to government services have been kept as the main focus in 23 tribal dominated blocks. Through the Ravitak Livelihood Project, 75000 beneficiaries and the establishment of 23 training centres, development of 121 roads in 12 aspiring blocks, and construction of the infrastructure of 16 schools are being made available to the citizens in a simple manner. Under PM DIVINE, 274 solar microgrids have been installed in remote development blocks Dhalai, Gomti, and South Tripura. For security and infrastructure improvement in border areas, projects like the modern ICP India-Bangladesh border trade, tourism development, Agartala-Akhora railway line have been started in South Tripura. For tribal education, under the tribal welfare department, free textbooks are being provided in schools, grants to ashram schools, the minority welfare department is providing financial assistance for infrastructure, house building grants, agricultural assistance, self-employment and women empowerment to minority communities and developing remote and border areas. Apart from this, rich connectivity, autonomous energy and education, inclusive social assistance, a goal-oriented development plan, etc., have been implemented on a large scale.

12. West Bengal Border and Remote Development Policies- Generally, West Bengal is not included in the Himalayan states, but due to some part of the state being mountainous, it is compelled to be included in the Indian Himalayan region because only two districts of West Bengal, Darjeeling and Kalimpong, are mainly included in the Eastern Himalayan range, due to which it is included in the Himalayan states. Under border area development, the 60 km long and 17-22 km wide Siliguri Corridor Chicken (Neck) located in the Indo-Nepal-Bhutan-Bangladesh

border is a sensitive strategic, economic and security-important area. Apart from this, Gorkha Land Territorial Administration, Siliguri-Jalpaiguri area, Pradhan MantriKrishiSinchaiYojana Watershed Component are the major remote hill Himalayan development schemes. Water conservation and land-drought management programmes are being run in the mountainous regions through the bowl-based scheme. Apart from this, there are plans to effectively implement the schemes in remote and tribal areas in hilly and border districts under China-map technology-based beneficiary targeting.

8.3.1.Strategic and socio-political significance of border areas- The Indian Himalayan border area not only determines the geographical boundaries for India and the Himalayan states, but it also provides impenetrable protection to all of us Indians from the Indian monsoon, climate and neighbouring countries. Due to which the cultural heritage, national security and social diversity of the Himalayan regions also get protection in this western era. The Himalayan mountain range, along with being the water tower of Asia, acts as the second heart for India and Indians. Therefore, the development of the Himalayan regions should be based on the priority of nation-building.

If seen from a strategic point of view, the Indian Himalayan region also plays a very important role in the strategic security, ecological balance, and socio-economic development of the country. Due to its mountainous structure with inaccessible and uneven physical features, it has been neglected from the development point of view for a long time, as a result of which many types of strategic problems keep occurring here from countries like Pakistan, China and Bangladesh, in which the states of Jammu-Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh and Assam are the most affected because there are many areas in these states where there is very less population, human basic facilities, means of employment, migration and village desolation and lack of communication services on a large scale, whereas these are sensitive areas from the strategic point of view. The strategic importance of these areas is sensitive from the point of view of both national security and danger. Where the work of monitoring the human settlements and living habits in the villages is done, on the other hand, migration from the villages makes infiltration easy for enemy countries. Especially at present, the villages bordering China and Pakistan are in a very sensitive situation where the absence of citizens makes terrorist activities, arms smuggling and narco-trafficking activities easily carried out. On the other hand, due to a lack of infrastructure in these areas, it is no less than a risk to transport items of military need in times of emergency, like during the Galwan, Doklamdisputes; all these crises were faced by the Indian forces. It has also been observed in the border areas that where the human

population is zero or less, it is difficult for the army and construction organisations to create a buffer zone from a strategic point of view.

8.3.2. Strategic importance of Indian Himalayan state border areas- The border areas of the Himalayan states are most important in the form of political representation, which provides security to the residents of the entire country because when the borders of our country are safe, then all of us citizens who live in the interior parts of the country remain safe, while migration from the border areas affects the density and balance of the population, while the citizens of the border area are well aware of the geographical diversities of a local area, which are the most secure means of confidential information for the security forces. They work for the service and security of the country without any economic benefit. The remote Indian Himalayan regions provide their distinct identity at the world level in terms of cultural heritage and tribal diversity. They are giving their invaluable contribution in the service of the country by living their lives even in the absence of facilities. Therefore, the strategic and national importance of all these border areas is providing unity, integrity and security from external invaders to the entire country. Because of the Sino-Indian dispute, China's bilateral trade policy, India-Nepal immigration problem, insurgency, rebellion, external interference, demographic deficiency, cultural erosion, natural disasters and climate crisis sensitivity in the north-eastern states have been creating imbalance in the border areas for the past several decades.

8.3.3.Contribution of Border Area Development Programme (BADP) and Border Roads Organisation (BRO) in Himalayan border area development-Indian Himalayan Region (IHR) carries out the overall development of all Himalayan border areas under the Border Area Development Scheme of Government of India with the objective of strategic and tribal community welfare, which mainly includes overall socio-economic development of border districts, infrastructure development from security point of view (road, electricity, drinking water, medical and education), self-employment to the community of border area, improvement in living standards by developing livelihood means, training programs, coordination between developed and developing areas, providing special development package to the eastern states and expanding all basic services in backward and strategically sensitive areas. In the initial phase, this scheme has been implemented in the states of Jammu & Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Manipur and Mizoram. The Border Roads Organisation (BRO) has been continuously constructing roads in the strategic and inaccessible border areas of the country since its inception in 1960. At present, it has provided its services in 11 states and 3 union territories through two projects,Daskar and Beacon. This organisation establishes a unique coordination of civil and military personnel, which gives priority to national

interests. It gives priority to the construction of infrastructure in the most complex and challenging geographical locations of the country, especially the Ministry of Defence, the Ministry of Home Affairs, the Ministry of Road Transport and Highways, the Ministry of External Affairs and others.

This organisation works for allied agencies in which the connectivity of security forces is uninterrupted. Border Roads Organisation works for the construction and maintenance of roads, bridges, tunnels, airports and sea works, especially in challenging areas. In the Indian Himalayan region, it has become a major agency for infrastructure projects to promote the operation of BROs in the dense forests of the high Himalayas, the Northeast and socio-economic development of the country. To date, it has built more than 62,906 kilometres of roads, 1056 bridges, 6 tunnels and 21 air bases. This organisation is rapidly working throughout the country to strengthen the advanced technology, sustainable development and infrastructure for the future in the national interest. Especially in the Himalayan states, road construction in the inaccessible areas of Ladakh, Arunachal Pradesh, and Uttarakhand, the strategic road Darbuk-Shyok-DBO road and Bharatmala Project have been given priority to some major projects. Other projects include border development work, socio-economic development of residents of mountainous areas under Nehru Hill Development Scheme, development activities in villages along the Indo-China border under Vibrant Village Program, tourism development in more than 4000 villages, skill development, health services and agricultural reforms, and education, health, agriculture and water resources development in border Himalayan districts under Special District Program, tribal sub-plan through central special assistance, works of Himalayan community development are being given priority by providing backward area grant funds.

8.3.4. Himalayan state community livelihood means and problems- The physical structures of Indian Himalayan states are mostly similar, but to some extent, the north-eastern states have some differences in forest and water resources as compared to the states of North India. The means of livelihood of the communities living in the border areas of the Himalayan states are mainly driven by agriculture, horticulture and animal husbandry. Traditional crops like wheat, maize, paddy, barley, koda, jhangora in farming and apple, pear, peach, walnut, orange, plum in horticulture and cow, buffalo, goat, sheep and yak in animal husbandry are the main means of livelihood. Apart from this, there are forest-based wild products, handicrafts and handloom (woollen clothes, blankets, shawls, vests, other warm clothes), tourism and wage work, etc. As a livelihood resource problem, the border areas are extremely inaccessible and have adverse physical conditions; hence, farming work here is full of challenges. The unstable weather here, snow-covered areas, waterlogging of the north-eastern states, and shifting agriculture, tribal

society's systems provide adverse climatic and physical conditions for agricultural production. Mountain slopes, lack of irrigation, agricultural crop damage by wild animals, traditional farming, low income level, migratory life, climate change, abundance of diseases, lack of market, lack of education and health services and complexities of forest laws create obstacles in livelihood for the residents here. Because in the remote areas of Himalayan states, the means of livelihood are basically based on natural resources in traditional form, where problems are a normal thing, because even today, this area is located far away from developed cities and rural areas.

Even in the communities settled in these remote areas, aware and economically capable people are migrating and settling in easy cities, due to villages are becoming more backwards. Because the policy imbalance of the state governments and the natural disasters and painful weather occurring here do not allow the natives to move towards a developed society, but also create a life crisis by endangering the livelihood of the communities. Indian Himalayan region security challenges- The Indian Himalayan region is a sensitive, mountainous, diverse and geographically complex region situated in the north of India. The infrastructure here has not been developed, due to which the border communities living here have to face many types of socio-economic, livelihood and security challenges. From the security point of view, being a border region, it remains unsafe from infiltration and terrorism from Pakistan, China, Nepal, Bhutan, Bangladesh and Myanmar. Many times, due to border disputes and terrorist activities with Pakistan and China, the common citizens of the border region have to become victims of war and loss of life and property. On the other hand, being a newly formed mountain, the Himalayas are not in a stable state even today from the geological point of view, due to which earthquakes, landslides, avalanches, cloudbursts, floods, cold winds and problems of climate change occur at their peak from time to time, which greatly affect life and traffic here.

Apart from this, lack of economic resources, health, and education affects all the essential elements of living. Apart from this, the communities of the border region are also affected by their traditional methods, culture, customs, languages and lifestyle, and hence they are not able to save their own culture, because due to the inclusion of external culture, they are abandoning their culture and leaving their homes and communities through migration. Thus, the security challenges of the communities of the Indian Himalayan region are becoming multidimensional at present, which is a good sign for the national interest and the communities living in the Himalayan complex region.

8.4 SUMMARY

Border and remote area development takes place within the boundaries of a nation through all the plans, policies and activities which are being implemented in the developed and accessible areas. All those plans are to be implemented in the border and remote Himalayan areas, which are generally very sensitive and backwards from the mainstream from the geographical, socio-economic and political point of view. Whereas remote areas mean those which are very backwards and geographically far from the administrative, economic, industrial, urban or population centres, where it is difficult to reach and the reach of development has also reached only a very limited area. Border and remote area development also refers to those plans, policies and activities in which physical infrastructure (roads, electricity, water), social services like health, education and communication means, and economic activities like agriculture, industry are deprived of human security and sustainable development. Providing all these aspects to the border and remote areas is border development.

Himalayan State Border and Remote Area Development Scheme is a scheme of India whose main objective is to develop the border and remote areas of the Himalayan region by improving infrastructure, education, health care and means of livelihood and to connect the people living in the highly complex geographical areas of the Himalayas with the stream of development and self-employment by explaining the utility and importance of local resources and also to improve their lives by making them self-reliant. These are steps to manage the natural resources of the Indian Himalayan region internally for human welfare in the economy of the Indian Himalayan region, which is an effort to develop the approximately 2400 km long area of the Himalayan mountain range under sustainable development where regulating the ecological balance, protecting biodiversity, tribal diversity living here, unique cultures, languages, traditions, religious places, beliefs display the rich cultural characteristics of the Himalayan region as well as pave the way for reaching the dimensions of modern development in areas with uneven mountain structure. The difference in the physical diversity of all the Indian Himalayan states is also making efforts for social and economic improvement through different schemes in border development by the Central Government itself.

At present, under border development, many schemes of Border Area Development Programme, Border Roads Organisation and North Eastern Tribal Development have been made to connect the people living in remote areas to the stream of development and border security, but geographical, means of livelihood, social, political and tribal barriers are creating obstacles in border development, due to which the Central and State Governments are failing to implement the schemes completely.

8.5 GLOSSARY

Indian Himalayan Region (IHR)- The mountainous region spread over 2400 km of the Himalayan mountain range, from the bend of the Indus River to the Myanmar border, is called the Indian Himalayan Region.

Frontier-Frontier is the last part of the country's borders, which is deprived of modern facilities and developmental activities and plays a special role in the security of the country from a strategic point of view.

Basic Services- To ensure/take care of housing, education, health services and communication facilities provided to the community residing in the border and frontier areas.

Prathama Gaon-The last village situated on the country's border, has been given the title of PrathamGaon by the Prime Minister. For example- Mana

Himalayan states- Jammu-Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Arunachal Pradesh, Nagaland, Assam, Manipur, Tripura, Sikkim, Meghalaya, Mizoram and hill districts of West Bengal, etc. are included.

Border Area Development Program- Strategic and backwards class development work done by the Central Government in border areas through financial assistance in the ratio of 90:10.

All-weather road network- A 2 to 4-lane road being built with the help of the Government of India for year-round connectivity in difficult geographical and inaccessible areas.

DeenDayalAntyodayaYojana- Under this scheme, the Central Government is providing a package for the development of rural areas, rural women self-help groups and self-employment.

Water Tower of Asia- The Himalayan Mountains are called the Water Tower of Asia on the basis of the water resources provided to the entire Asian continent by the glaciers deposited in the Himalayas and the rivers originating from here, and the water supply is providedto the vast plains.

Border Roads Organisation (BRO) is a central organisation which has been continuously constructing roads in the strategic and border-inaccessible areas of the country since 1960.

8.6. *ANSWER TO CHECK YOUR PROGRESS*

- The general meaning of border is taken as the last border of the country, state, district and village.

- The geographical area of the Indian Himalayan states has the speciality of assimilating its unique and complex ecological systems.
- Efforts are being made in remote areas to develop the last village situated on the border of the country as the first village of the nation and establish it as an ideal model village.
- Development of border areas is also done from the point of view of security and strategic, social inclusion of tribes and traditional communities deprived of development.
- North-East region development in border area development programs
- Ministry, Pradhan Mantri Gram SadakYojana, National e-Governance Scheme, VanbandhuKalyanYojana are being implemented at the grassroots level.
- Under the Border Area Development Program (BADP) in Union Territories, priority is given to roads, electricity, health and education and communication facilities in border rural areas.
- Border area development in the Himalayan states was started in the year 1998-99.
- Under the Vibrant Village Program, basic services are to be expanded in border villages, especially in residential areas along the India-China border.
- Under border development, infrastructure is to be provided to areas up to 0-10 kilometres along the country's border.
- Border scholarships to economically backwards Scheduled Caste and Scheduled Tribe students are being provided by the Border Development Department Organisationof the Mizoram State Government since the year 1973.
- Himalayan infrastructure, tribal society, geological imbalance, natural calamities, climatic variations and political discontent act as obstacles in border development in the Indian Himalayan Region (IHR).
- Border Roads Organisation (BRO) has been continuously constructing roads in strategic and border-inaccessible areas in the country since 1960.

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8.8 TERMINAL QUESTIONS

1. Long Answer Questions

Question-01: What do you understand by border and remote development? Describe in detail the plans and policies formulated by the Central and Himalayan state governments for border area development in the Indian Himalayan region?

2. Short Answer Questions

Question-01: Explain the meaning and definition of border and remote area development?

Question-02: Explain the necessity of development in border areas**?**

Question-03: Explain the strategic and socio-political importance of border areas?

Question-04: What is the Border Roads Organisation? Mention its role in border development?

Question-05: What are the challenges of tribal development in border areas? Explain in your own words?

Question-06: Briefly describe the problems of border development, livelihood means and development in the Indian Himalayan regions?

Question-07: Explain in detail the policies and plans adopted by the state of Uttarakhand for border area development?

Question-09: Explain that the state of Arunachal is more sensitive in border areas than all the Himalayan regions. What are the security challenges in the Indian Himalayan region?

Question-10: What is the Border Area Development Programme (BADAP) in the Himalayan border area development?

Question-11: What is the strategic importance of the border areas of the Indian Himalayan region?

Question 12: What is the social-political importance of the border areas?

3. Multiple Choice Questions

Q.1: The characteristics of the Indian Himalayan region include?

A. Physical diversity
B. Ecological diversity
C. Population deficiency
D. All of the above

Answer: D

Q.2: Which of the following is not included in the Indian Himalayan states?

A. 7. Uttarakhand
B. 8. Uttar Pradesh
C. 9. Arunachal Pradesh
D. 10. Nagaland

Answer: B

Q.3: Which of the following is not included in the schemes run by the Central and State Governments for border area development?

A. Border Area Development Programme
B. Ministry of Development of North-Eastern Region
C. VanbandhuKalyanYojana
D. All of the above

Answer: D

Q.4: When was the Border Area Development Programme started in the Himalayan states?

A. Year 1998-99
B. Year 2000
C. Year 2002
D. Year 2010

Answer: A

Q.5: What is the ratio of financial contribution of the State and Central Government in the development of border areas?

A. 50:50per cent
B. 30:70 percent
C. 20:80 percent
D. 90:10 percent

Answer: D

Q.6: How many villages were included in the first phase of basic service expansion of the Vibrant Village Programme?

A. 662 villages
B. 650 villages
C. 680 villages
D. 690 villages

Answer: A

Q.7: How far from the border are the areas included in the International Border Development Programme?

A. 0-20 km
B. 0-10 km
C. 0-25 km
D. 0-50 km

Answer: B

Q.8: From which year, border scholarships been provided to economically backwards Scheduled Caste and Scheduled Tribe students?

A. Year 1973
B. Year 1974
C. Year 1975
D. Year 1976

Answer: A

Q.9: How many border districts were included in the first phase under DeenDayalAntyodayaYojana?

A. 12 Districts
B. 11 Districts
C. 13 Districts
D. 25 Districts

Answer: B

Q.10: In which year was the Border Roads Organisation (BRO) established?

A. 1960
B. 1970
C. 1965
D. 1980

Answer: A

Q.11: The total length of roads constructed in the country by the Border Roads Organisation till the year 2025 was?

A. 62,906 km

B. 65000 km

C. 100000 km

D. 50000 km

Answer: A

BLOCK- III CHALLENGES, INTERVENTIONS AND SUSTAINABLE DEVELOPMENT

UNIT-9 ENVIRONMENTAL CONSTRAINTS AND DEVELOPMENT

9.1 OBJECTIVES

9.2 INTRODUCTION

***9.3* ENVIRONMENTAL CONSTRAINTS AND DEVELOPMENT**

9.1 Fragile ecosystems and carrying capacity,

9.2 Deforestation, land degradation and biodiversity loss

9.3 Climate change and natural disasters (flash floods, landslides)

9.4 Environmental vs. developmental priorities

9.4 SUMMARY

9.5 GLOSSARY

9.6 ANSWER TO CHECK YOUR PROGRESS

9.7 REFERENCES

9.8 TERMINAL QUESTIONS

9.1 OBJECTIVES

After reading this unit, you will be able to:

- To study the geographical and natural landscape of the Himalayan states.
- To identify dams that are located in the Indian Himalayanregion (IHR).
- To assess the impact of man-made development and analyse the Himalayan region's development and equilibrium balance.

9.2 INTRODUCTION

The Himalayas are among the youngest mountain ranges in the world, and they remain in a state of constant change even today. The Himalayas are still in their youth and are constantly growing, as evidenced by the rivers originating from the Himalayas, which continue to deepen the river valleys even today. The second proof is that the lakes located here are shallow and are filling up in a short time. Apart from this, incidents of landslides, earthquakes and avalanches keep happening in many places in the Himalayan region, which a natural disasters. Every year, some or the other crisis keeps happening in some or the other part of the entire Himalayas. The current unscientific development (multipurpose hydroelectric projects, road construction, urbanization, tourism development and uncontrolled natural resource exploitation) is working to convert the natural crises of the Himalayan region into man-made crises, which have been occurring in the entire Himalayan region for the last two decades (in the form of cloudburst and floods), in which the maximum incidents are in Himachal Pradesh, Uttarakhand and Sikkim and the northeastern state of Assam.

The area of the Indian Himalayan region (IHR) currently covers about 16.2 percent of the total Himalayan geographical area, which includes Jammu and Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya and two hill districts of West Bengal. This physical region is not only naturally sensitive but is also an integral part of India in terms of geopolitical, strategic, environmental, biodiversity, water resources, cultural and spiritual heritage. Because from a demographic point of view, this is the world's most densely populated mountainous region and human-inhabited area. As per the 2011 census, an average of 189 persons live per square kilometre in the 5,33,000 sq. km. area of the Himalayan region, who earn their livelihood by engaging in agriculture and animal husbandry in the mountain terraced fields. Even in the current era, 70 percent of the Himalayan local community has only agriculture and allied

activities as their means of livelihood. According to wig.com, approximately 52.7 million people live in the Himalayan mountain range, which has provided stability to human activities and human habitation in the presence of complex geographical conditions of the mountains, difficult access and lack of modern facilities, where many types of natural and human disasters destabilise human life and damage cultural landscapes, forcing them to migrate.

In terms of natural disasters, the Himalayan region is included in high-risk earthquake zones 3 and 4. According to a study, 54 percent of the Himalayan region is considered highly sensitive. The Himalayan glaciers are melting rapidly due to the effects of climate change. According to ISRO, in the last 50 years, about 18 percent of the glaciers have shrunk, and many small lakes are being formed here, due to which, with a slight increase in the amount of rainfall, these lakes have broken and have taken the form of floods and landslides (Himachal Rampur, Shimla, Thunag, Mandi, Kiyas village, Rohru village, BharmourKullu, Saloni, ChambaKandaiwala village and Sirmour and Uttarakhand's Kedarnath, Tapovan, Dharali, Malpa, Nainital). Studies being conducted in the Himalayan region also reveal that the temperature of the Himalayan region is increasing by about 0.6 degrees Celsius per century due to the effect of climate change, which is creating favorable conditions for natural disasters, while in environmental damage (FAO 2021), the Himalayan region has been found to have higher deforestation and biodiversity loss rate than the national average.

In all these natural disasters and diverse geographical diversities, it is a complex task to bring Himalayan region development to the surface level because due to the complex physical structure, it is a big challenge to establish basic services like roads, means of communication, drinking water, means of energy, health services and economic development centers, while being a border area, additional investment is required for security and infrastructure development. But unplanned development, environmental degradation, climate change, natural calamities, water resource depletion, soil erosion, mining, agricultural expansion, urbanisation and infrastructural development remain major obstacles. However, considering the importance of sustainable development and the unique physical conditions and resources of the Himalayan region, environmental balance and developmental activities can be effectively implemented.

9.3 ENVIRONMENTAL CONSTRAINTS AND DEVELOPMENT

Himalayan States Environmental Barriers and Development- Not only Himalayan States, but the geographical and geological conditions of the entire Himalayan mountain range

are facing many kinds of natural and man-made crises from the time of the rise of Himalayas till date, in which natural barriers have contributed the most, such as earthquakes, landslides, avalanches, soil erosion, floods and forest fires etc. Besides, in the last two decades, due to the effect of climate change becoming more active, incidents of cloud bursts haveoccurred more frequently. In the entire Himalayan States, there is a huge loss of life and property due to natural calamities, which are becoming more frequent due to the abundance of unplanned developmental works being carried out in the Himalayan region. The incidents of Kullu, Manali, Kedarnath, Reni village,Tapovan and Dharali, Joshimath and Malpa are new Himalayan environmental barriers, because the carrying capacity of the sensitive Himalayan ecosystem, deforestation, land degradation and biodiversity are making the physical structure, relief features, climate system and natural resources of the entire Himalayan region more sensitive.

The Indian Himalayan region (IHR) is currently more affected by the effects of climate change and natural disasters, which have become a matter of concern for the Himalayan states. The natural disasters that used to occur only nominally in the last two to three decades are now becoming human and environmental disasters, in which all the mountainous and plain areas from the Himalayan state of Jammu-Kashmir, Ladakh, to Arunachal Pradesh and the neighbouring countries Nepal, Bhutan are affected. The highest number of natural hazards in the form of natural barriers in the Himalayan regions has been experienced in the year 2021, the Chungthag dam damage due to the bursting of the Lhonark glacial lake in Sikkim in October 2023, Harsil, Dharali and Tharali incidents in August 2025 have been heartbreaking, while the vulnerability of the Himalayan region affects both ecological and strategic dimensions. It includes about 16.2 percent of the total geographical area in which the largest population of the world resides. According to the 2011 census, about 5 crore people live in the Indian Himalayan region, where millions of travellers come from other countries for religious and environmental tourism and are disturbing the population pressure and density balance. Apart from this, unplanned urban development, shifting farming, construction of roads and hydroelectric projects, destruction of forests are inviting a big disaster by destroying the Himalayan ecology, as a result of which about 15 percent of the land in the Himalayas is getting affected by landslides every year and Himalayan wildlife ecosystem like musk deer, red panda and snow leopard are fighting for their existence. Studies conducted from 1951 to 2010 have revealed that the average temperature in the Himalayan region has increased by 1.5 degrees Celsius due to the effect of climate change. Due to this, the Himalayan glaciers have moved back by 15-20 meters, which is happening gradually. Nevertheless, developmental activities are being sped up in the entire Himalayan region, which are unfavourable from the point of view of Himalayan topography and ecology,

for which ecologists and environmentalists have been warning the state and central governments from time to time through various movements and public conferences.

Because the Himalayan region is not capable of withstanding the present reckless and unplanned development and at present, in the name of development in the Himalayan region, many schemes are being implemented for tourism development, hydropower development, strategic development, backward area infrastructure development, urbanization, agricultural development and transport means rail, road and air transport services are being expanded on a large scale, as in the expansion of rail transport in the north-eastern states, mountain rail development in the states of Uttarakhand and Shimla, widening of all-weather roads and the work of ripping the chest of the Himalayas under the ManasMandir Mala, in which the major projects are Tehri Dam, ChardhamYatra route widening and border road construction. The power projects contribute to about 485 Gigawatt, i.e. 10 percent of the total power generation capacity of the State/Union Territory, where immense possibilities for power generation naturally exist. The state of Uttarakhand alone has the capacity to generate 45000 MW of power, for which many power projects are currently under construction and proposed. The major hydroelectric projects of the Himalayan region include Salal, Dulhasti, Uri, Kishanganga, Ratle, Pakal, Dul, Kiru and Kwar in Jammu and Kashmir, Nimo-Bazgo and Chutak in Ladakh, NathpaJhakri, Rampur, Karcham-Wangtu in Himachal Pradesh and Tehri, Koteshwar, Srinagar, ManeriBhali, Pancheshwar, Glogi, Tapovan and Jamrani in the entire Uttarakhand state, Teesta in Sikkim, Ranganadi, Pare, Kameng, Subansiri, Dibang etc. which are providing electricity supply not only to the Himalayan regions but also to the plain states of Delhi, Uttar Pradesh and Haryana.

Other developmental schemes in the Himalayan region include road and bridge construction, which are being built with the help of the Central and State Governments. The Border Roads Organisation is building roads and bridges in the most inaccessible areas. Under the perennial road schemes, 2 to 4-lane roads are being built in all Himalayan states for road traffic and strategic security throughout the year. Apart from this, roads are being constructed in border areas through the Pradhan MantriGraminSadakYojana and Chardham Road Expansion. Among the rail projects, the big rail project in Kashmir, the Rishikesh-Karnprayag rail line in Uttarakhand, the North Eastern State Rail Development Project have been built as developmental works in the Himalayan regions, the latest example of which is the world's highest railway bridge built on the Chenab River, because the Himalayan mountainous region is known for natural tourism as well as horticultural agriculture and delicious fruits and food products. The way to reach there can be done only through road development and basic

infrastructure development, which is currently being done by the government through zero-waste tribal festivals and bridge projects.

9.3.1 Himalaya Fragile ecosystems and carrying capacity-Himalayas are the newest and youngest on the earth and the highest mountainous region of the world, which is believed to have been formed 50-70 million years ago through the process of collision and compression of Indian and Eurasian plates, which are continuously in an unstable state today, hence this mountain range is considered fragile and sensitive for geological, environmental and human activities. Due to the instability of the Asian and Indian plates in the Himalayas, many destructive earthquakes and seismic shocks, landslides, floods and forest fires naturally affect the animals living in the Himalayan mountain range. The Himalayas are also known as the Third Pole of the world because of their vast glaciers, which are melting rapidly due to global warming. Due to the formation of ice lakes, glacier bursts, and sudden floods have become a common occurrence every year in the entire North and North-Eastern Himalayas. In this way, despite the rich biodiversity of the Himalayan region, a fragile, sensitive ecosystem is being formed in which deforestation, urbanisation, unplanned land use, soil erosion, infrastructure construction, landslides, forest fires and environmental degradation are mainly occurring. The same heavy monsoon rains are causing intense rainfall in the Himalayan region, which is being seen in the form of natural events like landslides and cloud bursts in the Himalayan region due to the man-made climate change effect after the industrial revolution, due to which the crisis in the livelihood means of the Himalayan region, agriculture and animal husbandry business is increasing. Due to tourism development, Himalayan cities have developed on a large scale from Jammu and Kashmir to Arunachal Pradesh, which is the result of excessive exploitation of Himalayan resources.

The same youth of the Himalayas, steep slopes reveal more destruction in natural and human development due to human interference. Because in the mountain region, basic infrastructure development can be achieved only in accordance with the goals of sustainable development. Due to a lack of construction work in accordance with sustainable development, people are migrating from remote mountainous regions of the Himalaya to the plains, due to and the population geography of the plains is also changing. Whereas the Himalayan mountains and the people residing here provide strategic security and resources to the entire country, but due to natural disasters and being away from modern development, these regions have gradually reached a state of being deserted, the best example of which is the state of Uttarakhand. Features of the Indian Himalayan Ecosystem

1. Geographical Diversity
2. Climatic Variation
3. Biodiversity
4. Cultural and Social Importance
5. Environmental Crisis

Due to the high activity of human developmental activities in the Himalayan regions, the states of Himachal Pradesh and Uttarakhand have faced 15 cloudburst incidents and disasters till the mid-monsoon period in the current year 2025, which have caused heavy damage to human life and infrastructure in the disaster-affected areas. The natural events of Mandi, Dharamshala, Kallu, Kedarnath, Rishiganga, Kheerganga, BageshwarSumgarhPithoragarh are examples of crisis which are examples of the fragile state of ecological sensitivity of the Himalayan regions. After analysing the fragile ecological condition of the Himalayan states, we studied the carrying capacity of the Himalayan states. Considering the importance and utility of the Himalayan people and the Himalayan mountains for the country of India, the Supreme Court has directed the Central and State Governments to prepare an action plan for the assessment of the natural and cultural-economic potential of the Himalayas in 12 Himalayan states with ecological sensitivity. This is an essential dimension to ensure sustainable development and conservation of the fragile Himalayan ecosystem. Carrying capacity refers to the size of the maximum population residing in the Himalayan regions, which ensures long-term stability in the Himalayan regions without environmental damage and determines the conservation and capacity assessment of human activities and natural ecosystems.

To maintain the Himalayan ecosystem, the NationalThe Central Mission 2010 is being implemented in 12 Himalayan States as a part of National Action Plan on Climate Change which comprises of eight missions namely Indian Himalayan Climate Adaptation Programme (strengthening capacities of Indian institutions in climate change impacts, with special focus on glaciology and related areas and enhancing resilience capacity of vulnerable communities in Indian Himalaya), Secure Himalaya Project (funded by Global Partnership on Wildlife Conservation and Crime Prevention for Sustainable Development i.e. Environment Facility) for Global Wildlife Programme and Mishra Committee Report (prohibiting heavy construction work, blasting, digging and felling of trees for road repair and other construction activities in Himalayan regions). Apart from this, at present, the Safe Himalaya Project was implemented by the Government of India in the Climate Optimization Program in the Himalayan region on 30

January 2020 for carrying capacity development in the Indian Himalayan region, in which on 19 May 2023, the Ministry of Environment and Forests has included all the states in this scheme and issued guidelines for presenting the carrying capacity of each state, it not only evaluates the capacity of urban and towns of the Indian Himalayan region but also controls the entire mountainous and backward areas, whose main objective is to focus on sustainable development and population development of the Himalayan states, which strictly implement sustainable plans by including all biological species, food, water, housing, ecology and agricultural work with priority. Since 1988-89, GB Pant National Institute of Environment, an autonomous institute under the Ministry of Environment, Forest and Climate Change, Government of India, has been solving many environmental issues in the Indian Himalayan region by advancing scientific knowledge, formulating integrated management strategies and formulating effective action plans for conservation of natural resources.

The main objective of this institute is to establish harmony between socio-cultural, ecological, economic and physical systems in the Himalayan community, which emphasizes the interrelationship of natural and social sciences and is involving local communities and their indigenous knowledge by promoting conservation of fragile mountain ecosystems, indigenous local knowledge systems and sustainable use of natural resources, whose main functions are to include community training, environmental education and awareness as an integral part of research and development programs.

9.3.2Deforestation, land degradation and biodiversity loss

The Indian Himalayan region, with its vast biodiversity, landscapes and cultural heritage, is a physical unit that determines the environment and life of the country as well as the continent of Asia. It covers 18per cent of the total area of India and about 50 percent of the forest cover, i.e. biodiversity in the country. Himalayan forest cover. The forest ecology in India is playing an important role in the development and economy of the country. The importance of forests has increased a lot in the last 3-4 decades because only through forest cover, economic, social and cultural benefits can be made more useful in human interest. Forests have been the life companions of humans since the primitive age of human civilisation till the present time, and from time immemorial, humans haveremained dependent on forests, which will be directly and indirectly. Whereas the Indian Himalayas and the vegetation cover present here give direction to the climate and weather system here, and are the biggest protectors of Indian agriculture, and along with the Himalayan community, the mountainous and plain areas of North and North-East India also determine the physical conditions of the Himalayas. Thus, Indian Himalayan forests

are the shield of India's ecological security and are a huge storehouse of various forest products and means of human development. They are playing an important role in maintaining ecological balance and environmental stability in the Himalayan states. Therefore, the Indian National Forest Policy (NFP) has been implemented since 1988 to maintain 66 percent forest cover in the mountainous regions. But according to the current research and survey results, only 31.05 percent forest cover has remained in the Himalayan region, which is less than the National Forest Policy, due to which the effects of climate change are more visible in the Himalayan regions, while in the Himalayan regions, various types of forest cover are seen in areas of different heights, respectively, evergreen forests from 1200 to 2400 meters, coniferous forests from 2500 to 3900 meters and alpine vegetation and soft grasslands are found in areas above 3900 meters. While in the Western Himalayas, this height is 100 to 200 meters higher, the areas with a height of more than 4500 meters have snow cover throughout the year. But at present, due to Himalayan region development, climate change and Himalayan natural disasters, the Himalayan forest wealth is being damaged in many ways, due to forest loss, land erosion and biodiversity loss on a large scale. Indian Himalayan region: Forest loss, land degradation and biodiversity loss

1. Impact on the climate system
2. Depletion of water resources
3. Land erosion, landslides, glacier breakage and cloudburst
4. Flooding
5. Decrease in wildlife and flora
6. Ecological imbalance
7. Livelihood and food security crisis

Deforestation- Indian Himalayan region is an example of an important ecosystem where due to human activities and other environmental changes, forest areas in the Himalayan region are rapidly shrinking and losing their density and natural quality, which is not only hurting the biodiversity here but also the livelihood threats of the local Himalayan community are looming, according to the Forest Survey of India (FSI) 2021, in the total forest area of the Indian Himalayan region, about 1.2 percent of natural forest area has been reduced in the last 10 years, in which in the state of Uttarakhand since the year 2015 By 2020, more than 5000 hectares of forest land has been used for the development of various types of projects.

The main reasons for forest destruction in the Himalayan region are population growth, agricultural land expansion, illegal cutting of forests, infrastructure development and

urbanisation, uncontrolled tourism development, animal grazing and excessive exploitation of firewood, in which population growth is considered to be the most effective factor. The total population in the Himalayan regions was approximately 2.5 crores in the year 1951, which has increased to more than 5 crores in the year 2011, due to which residential land has been expanded by clearing forest land for fuel, fodder and housing. In the same northeastern states (Arunachal, Nagaland, Mizoram, Tripura, Manipur and Meghalaya), Jhum farming is still prevalent on a large scale, due to which this farming is done in a large area, causing damage to forests. According to the Forest Survey of India (FSI) 2019, 22400sq km of land in the northeastern states has been affected by Jhum cultivation. Apart from this, Himalayan forests are also being destroyed by multi-purpose dam projects. 10,000 hectares of forest land have been destroyed by the Tehri Lake Project alone. Apart from this, mining done in the Himalayan regions, mining of sandstone, limestone, magnesium, slate, coal, etc., from rivers has also been the cause of forest land destruction. Apart from this, road construction and tourist accommodation and basic facility development have been the second main reason for Himalayan forest destruction.

Land Erosion-TheIndian Himalayas are a unique example of ecological wealth which is vulnerable to severe environmental degradation due to various human and natural factors. Rapid industrialisation and urbanisation induced by population growth and economic development have put a lot of pressure on the fragile ecosystem of this region. In which infrastructure development, agricultural work, livelihood means, cutting of wood, clearing of forests and housing are being done. As a result of unplanned development, the wealth received as a gift of nature is getting damaged, which has resulted in the damage of cultural landscapes due to climate change effects in the Himalayan region, rapid melting of Himalayan glaciers and cloudbursts. In which infrastructure development, uncontrolled waste production, and tourist pollution present many environmental and soil erosion challenges in the Indian Himalayan region in a severe form for the Himalayan community.

Because the long-term exploitation of Himalayan forest wealth and forest fires in the forests every year are causing soil erosion. Thus, the land degradation taking place in the Himalayan region is becoming a matter of concern not only locally but also globally. The results of research being conducted in the Himalayan region have revealed that the soil of all the 12 Himalayan states is being damaged on a large scale due to climate change and anthropogenic pressure and shifting cultivation, which includes loss of soil fertility, biological degradation, changes in acidity, salinity and physico-chemical properties, desertification and agricultural land barrenness, etc., which have been observed to have the highest impact in the states of Arunachal Pradesh,

Manipur, Nagaland, Mizoram, Meghalaya and West Bengal. Studies conducted in the Hindu Kush Himalaya (HKH) have revealed that land degradation in the lower Himalayan regions has affected the food security of about 1.3 billion people. According to SAC-ISRO 2016, Joshi et al., 219, about 1,33,03,736 hectares of land have been destroyed due to land degradation in the Indian Himalayan region, due to which human-wildlife conflict and reduction in means of livelihood have also been observed, and all the mountain states are facing problems like migration. Thus, deforestation and forest degradation in the Himalayan regions have become a serious environmental challenge, the long-term consequences of which are not only endangering the unique biodiversity of this region but also increasing the livelihood means, water security and sensitivity of the local community towards natural disasters.

Thus, many problems are arising with one problem, due to which it will become almost impossible for many people to live in this inaccessible and difficult geographical area in the future. Thus, only by assessing the environmental and human impact in the Indian Himalayan regions in time, will we have to face the problems in expanding human and developmental plans in a sensitive region like the Himalayas, because the Himalayan disasters that occurred in the last 2-3 decades give us a warning that by anti-environment development, we endanger ourselves and the security of the ecology and natural wealth of the Himalayan regions. Therefore, we need to consider a pan-Himalayan strategy for protection from natural and man-made crises of the Himalayan region, a national mission like Sustainable Himalayan Ecosystem and sustainable tourism development along with sustainable infrastructure projects, which can be developed jointly in all the Himalayan states.

Biodiversity loss -The Indian Himalayan region is a hotspot in terms of biodiversity, which has the potential to affect the entire Asian continent. This land area is spread from east to west in an area of about 2400 km from Arunachal Pradesh to Jammu and Kashmir state, in which a 53,3000 sq. km area of the Himalayan region is spread over 16.2 percent area, where botanical, medicinal and faunal diversity is prominently seen. In terms of botanical diversity, about 30 percent of the Himalayan floral species are found here, which includes about 18,440 plant species, 1,748 medicinal plants (in tropical, temperate, sub-alpine and alpine forests) and 280 mammalian species, which are 40 percent of the total species. The bird species include about 940 species, which is 6 percent of the country's, 175 species of reptiles, 80 species of amphibians and more than 300 species of fish. The country's special animals (flagship species) such as snow leopard, musk deer, red panda, Tibetan wild ass, Monal and Darjeeling hill mynah, Honuill, etc., are also found here. Apart from this, about 3160 species of endemic species are endemic in this

vast region, and most of the habitats of medicinal plants and birds are found in the eastern Himalayan regions, as a result of which the wildlife in this Himalayan region is very rich.

Till date, 1022center's have been established in the form of sanctuaries, national wildlife sanctuaries and global hotspots, mainly divided into Himalayan hotspots (Jammu-Kashmir, Himachal, Uttarakhand, Nepal border, Bhutan and North East region) and Indo-Burma hotspots (Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura and Meghalaya) which are famous for the world's most amazing and beautiful natural biodiversity, but at present, indiscriminate cutting of forests, land degradation, illegal hunting, wildlife smuggling and trade, multipurpose projects, Himalayan tourism and tourist development, modernFarming, overexploitation of Himalayan bio-wealth, climate change and melting of glaciers have endangered the biodiversity here. While this bio-wealth and natural heritage was a huge storehouse of livelihood, food security and medicines for the Himalayan communities, which had the potential of permanent residence of millions of Himalayan communities, it has been the most affected at present, which was making an invaluable contribution in preventing climate change and global warming.

Himalayan region studies, surveys and research reveal that for the last 2-3 decades, Himalayan forests have been damaged on a large scale due to multipurpose projects, excessive tourist traffic and unwise infrastructural development, due to which many species are extinct and many species are on the verge of extinction. Apart from this, the changing climate in the Himalayan regions is constantly changing biodiversity and ecosystem services, the maximum impact of which has been seen in the Indian region where the temperature of the Western and Eastern Himalayas has increased by 0.28-0.80 degrees Celsius and 0.20-1 degrees Celsius, on the other hand, the population directly and indirectly dependent on the Himalayan ecology has also been affected in terms of food and livelihood dependence, where the United Nations has also expressed concern and has made recommendations to implement the goals of sustainable development and Indian Himalayan region development policies to prevent ecological loss in the Himalayan region. At present, 1.78 lakh square kilometresof area has been kept as a protected area by the state and central government for the conservation of biodiversity.

In the same forest cover, a 25.17 percent increase in forest and tree cover has been recorded in the year 2023 as compared to the year 2021, which has happened more in the form of plantations, yet tree-cover loss estimates the increase in the loss of natural forests in the northeastern states. In the year 2024, 5.63 thousand hectares of forest were recorded in Arunachal Pradesh, 3,400 thousand hectares of forest were recorded in Assam from the year 2001 to 2024, while in Uttarakhand, this reduction of 1442 square km was recorded till the year

2009, whereas between the years 2009 to 2014, this area was only 260 km. Studies in the Central Himalayas have revealed that in the last 25 years, an area of 112.5 sq. km has been included in the highly sensitive and high-risk areas. This risk has been found in the form of the extinction of local species and habitat change in different areas of the Himalayas. IUCN has released a red list in which red panda, musk deer and snow leopard are in danger in the mountainous/northeastern regions. The reason for this is the change in Himalayan land use patterns, expansion of roads/cities/tourism and infrastructure, mining, hydroelectric projects and increasing temperature due to climate change, effect is affecting the Himalayan ecosystem, which has become the biggest challenge for the species living in cold weather. In the Himalayan region, about 17 types of natural vegetation (Aconitum heterophyllum, Alpinia, Podophyllum, Hexandrum, Panaxsioudi ginseng, Picrorhizakurroa, Discoreadettodia, Angelica glauca, Allium stachyi, Podophyllumhexandrumnardostachys, Grandiflora, Aconitum and Hantagieria) are in danger, which were originally from the Himalayas. These are plants found in the high Himalayan region, which belong to the aromatic plant category and are used in medicines (for stomach diseases, liver, physical weakness), etc.

9.3.3 Climate Change and Natural Disasters (Surface Floods, Landslides)

Climate Change- Climate and life on Earth have started toexisted not just today but since the origin of the Earth. Climate change is not a new phenomenon, but has occurred since the origin of the Earth. Evidence of this is found in the sediments of glacial lakes, warm and cold periods, and all these evidences indicate that climate change is a naturally occurring process. The history of climate is as old as our earth because whenever there have been changes in the earth, there have been changes in the climate as well, and the process of birth and destruction of various types of living beings has also continued continuously. Where old species were destroyed, the process of development of new plant and animal species continued and provided stability to the existence of the living world on earth.

If the climate changes are natural or according to nature, then their consequences do not seem to be more fatal or harmful than the changes caused by human activities. Thus, generally, climate change is felt when there is a large-scale, long-term change in the weather conditions in any area or region. Such as the presence of a dry climate in place of a hot and humid climate, a change of hot and humid climate to humid and cold climate, etc. Climate change is related to the quick and sudden short-term and long-term changes in the heat balance, humidity, cloudiness and rainfall in the atmosphere. Such climate changes are caused by changes in the orbital characteristics of the Earth, solar variability, fluctuations in radiation from the sun's photosphere,

i.e. less or more radiation, tectonic processes, mainly plate tectonics and displacement of continents and ocean basins, volcanic activity, atmospheric aerosols, amount of carbon dioxide, etc.

According to the principle of uniformitarianism, all those physical processes and laws which are operative today, the past events of the Odyssey ice age, Carboniferous ice age, and Pleistocene ice age prove the cyclical nature of climate change very well. Climate Change. This is not always true that the change is not sudden and rapid; the rate of climate change depends on the nature of the factors causing climate change. J.E. Hobbs (1980) has clarified that "There have been changes in the world's climate in the past and there will be changes even now. If change is the law of nature, then climate change is a reality". Thus, the climate of any region is not stable and permanent, but is dynamic and keeps changing, which is Cyclic and Rhythmic Change.

In the same sequence, Hooke (1688) and Buffon (1778) presented the explanation of a cycle of climate change based on "subsidence of the sea floor and land mass", in which three stages of climate change have been described. (1) Initial stage of the Ice Age (2) Glacial stage (Interglacial Age) (3) Present Ice Age. R. Ewing (2007) and Books (2008) have considered the changing form of the Pleistocene and Permacarboniferous era as climate change according to the level change theory. While Dow and Buchner have considered the changing form of the Pleistocene and Permacarboniferous era as climate change. 2014. has described the period of modern climate change as "There was a cold age in Europe from 1300 AD to 1500 AD.

At present, the indicators of climate change are indicated by the rapid speed of snowfall due to global warming and atmospheric heating, the shrinkage in glaciers, changes in species of animals and plants. In the last 50 years, the global temperature has increased by 0.5 degrees Celsius, which has been recorded more in winter than in summer. The current climate change started in the 18th century, on the basis of the study of seasonal temperature variations, which is leading to an increase in the global temperature and a decrease in rainfall.If we look at the effects of climate change in the context of the Indian Himalayan region, then in recent times, mainly population growth, better access, growing market, and expansionist economy, urbanisation, and tourism activities have changed the structure of resources along with the increase in exploitation of natural resources in the Himalayas. The Himalayan states have been a region having a distinct identity at the global level in terms of climate, which remained away from the present climate change till the last 200 years, but now it has been included in the category of highly vulnerable to climate change effects, which has been analyzed by the ICT

Research Institute (IRI) 2003, IIT Roorkee 2014, IIT Roorkee 2003, IIT Roorkee 2012, IIT Roorkee 2008. It has also been stated that "The Himalayas represent one of the most environmentally fragile, economically underdeveloped and densely populated mountain ecosystems on the planet and hence are highly vulnerable to the effects of climate change". In the past years, the Himalayan region has been hit by industrialisation, urbanization, agricultural scientification and has been emitting carbon dioxide, pollution, greenhouse gases and also toxic gases horizontally. It is accelerating the conditions of climate change by reaching the atmosphere through circulation. According to J.V. Singh (2008), the average temperature of the Himalayan regions is 17.40 (plains and adjoining mountainous regions), whereas it should have been 150. The average temperature of December 2008 has been recorded 2.40C °C higher. The trend of increase in temperature in the plains and mountainous regions for the last 100 years, after 1953 AD, has seen a rise in temperature in 2008, and in the mountainous regions, an increase of 1.70C in average temperature has been recorded. This is reducing the water level in the Himalayan blocks, because while the glaciers are melting due to the increase in temperature, the pattern of rainfall is also changing, due to which the water level of the Himalayan rivers is continuously decreasing. This has been clarified by Prof. Jeevan Singh Rawat (2018) that "After studies being conducted since 1992 in Kumaon's life-giving Kosiriver, its water level is continuously decreasing. In which the effects of climate change are being seen, due to irregularity and lack of sufficient rainfall, water sources are drying up prematurely due to lack of recharge and continuous increase in heat and human activities, this river will turn into a desert in future."

The same ICIMOD (2007) has stated that "the Himalayas, the centre of major rivers of South Asia, are becoming extremely sensitive due to climate change". In this way, the increasing temperature in the Himalayan regions is affecting the main water dividers of the Himalayas as well as destroying biodiversity. According to former ISRO scientist Dr. M.C. Pokhal (2015), Dr. Hukam Singh (2015), "The forests of the Himalayan region are getting hot due to climate change caused by global warming. The mood of the forests is getting hot due to the shifting of the time of rain and snowfall.

The life cycle of plants and small animals is getting disrupted. In January and February, the atmosphere of the forests is getting warmer instead of getting colder. Due to the heat of the forests, there is a shortage of water in the soil and trees, due to which their life cycle is also changing. The plants are either changing themselves or some species are getting destroyed, which is affecting both the plants and the animals. And this climate change is affecting humanity around the mountains and is giving rise to food insecurity and water crisis, with intense pressure on the primary ecosystem in the plains and mountain areas. It has also become clear in the study

of Prof. P.C. Tiwari and Bhagwati Joshi 2012 that "The world's most famous biodiversity, ecosystems and bugyals are completely dependent on the climate and geographical conditions of the newly formed Himalayas. The famous organic agriculture and animal husbandry done in the terraced fields in the mountainous regions of the Himalayas, and the main traditional foundation of the life of the community living there and the famous herbs, local food Materials and local production methods, traditional knowledge are the main products of the Himalayan climate. But at present, the region is facing the threat of climate change, while the Himalayan region already has limited agricultural land for subsistence, a reduction in agricultural land, and a lack of agricultural food productivity, which has been the main source of livelihood. Thus, the Himalayan regions are bearing the brunt of the current man-made climate change, due to which (incidents of cloud burst, unseasonal floods, low water level of rivers and reduction in the size of glaciers, destruction of natural flora and fauna and gradual extinction of many species, extinction of habitats and species of organisms found in some regions and specific climates, emergence of new vegetation, changes in local weather, change in crop cycle, decrease in crop production, extinction of local traditional seeds and indigenous knowledge, migration of local birds, livelihood crisis in rural farmer and animal husbandry communities, migration, drying up of local natural water sources (Naunlo), changes in human activities) are occurring. Effects of Climate Change in the Himalayan Regions.

1. Increase in Temperature
2. Shrinking of Glaciers
3. Change in Rainfall Pattern
4. Change in Water Resources
5. Hot and cold winds
6. Loss of Wildlife and Fauna Ecosystem
7. Natural Disasters (Surface Floods, Landslides)

Natural disasters are those hazards which are unforeseen by nature causing immense damage to human, animal and plant communities and which occur suddenly, it is an extreme event which can be in the form of tectonic (earthquakes, volcanoes, tsunamis, landslides) atmospheric (cyclone, hurricane, tornadoes, lightning, hailstorms and cumulative atmospheric disasters (floods, drought, cold and hot winds) and earth and meteorite etc. Generally, environmental disasters are natural; that is, any sudden event is a natural disaster, which can happen anywhere at any time without any warning, the effects and consequences of which are very painful. It does not happen by asking developed, developing, rich-poor or any caste or religion. Thus, there is a gradual increase in the trend of natural disasters at the global level, which are occurring untimely

at local, regional and global levels, due to which the unplanned use of nature to fulfil the economic activities being adopted by humans has been the main reason. At the global level, due to global temperature and climate change, continuous increase in temperature and increase in population, changes are taking place in the natural balance of our earth, where, due to population growth, development of human settlements and infrastructure, the incidence and risks of natural disasters have increased in the Himalayan regions. Since the time man has done the work of mechanising the civilisation of science in nature, many changes have been recorded in the natural processes. Due to this, natural disasters seem to be more man-made, and due to this, the number of affected people is also increasing, who are more affected by mountain slopes, seismic areas and storms. Especially in the Himalayan regions, incidents of landslides, avalanches, surface floods and cloud bursts are being repeated more. While this region is in a highly sensitive seismic zone, it is not as much affected by earthquakes as it is by disasters like floods, landslides, mudslides and cloud bursts. Disasters have started occurring here naturally throughout the year.

Thus, among the natural disasters occurring in the Himalayan regions, tectonic activity and, movement of faults affect the areas with steep slopes more.And in the category of earthquakes, this region falls in earthquake zones3 and 4,due to which sudden floods and destruction can occur due to landslides and avalanches.The earthquakes that occur every year are Kashmir earthquake of 7.6 magnitude in 2005, Nepal earthquake of 7.8 magnitude in 2015, Lhonak lake in south Sikkim 2023, Ladakh cloudburst in 2010, 2021, Malpa in 1998, Kedarnath in 2013, Uttarkashi, Chamoli and Pithoragarh cloudburst in 2021, Joshimath landslide in 2023, floods in Assam every year are direct evidence of natural disasters in Indian Himalayan regions. According to NDMA 2013, about 4.2 lakh sq km of the Himalayan region is affected by landslides because more than 900 glacial lakes have been estimated in the Himalayan region by the year 2020, which is an indication of a major disaster in this region. Similarly, incidents of avalanches keep occurring from time to time in Jammu-Kashmir, Himachal and Uttarakhand. The 2019 Kupwara and 2020 Siachen avalanches are examples of recent natural events. Hence, the Indian Himalayan region is becoming more vulnerableto natural disasters due to geological instability as well as steep slopes, snowfall, cloud bursts, landslides and human intervention. The Himalayan region has major natural disasters.

1. Earthquake
2. Landslide
3. Avalanche
4. Flood

5. Forest fire
6. Cloudburst

Flash Floods-TheHimalayas are sensitive to sudden floods and landslides due to their characteristic mountain structure. There are sudden cloudbursts, floods and landslides, which are common occurrences and are attributed to changes in rainfall patterns due to climate change. From the analysis of remote sensing technology from the year 2000 to the year 2021, it has been found that most of the floods and landslides in the Himalayan region have occurred due to excessive rainfall and extreme weather conditions. Due to its physical diversity, the Indian Himalayan region is sensitive from the viewpoint of environmental systems to the disasters of floods, cloudbursts, outbursts of glacier lakes and landslides. Especially during the monsoon season, the incidence of cloudbursts is high in the Himalayan regions, as a result of which life and property, cultural infrastructure, agriculture, forests and communication systems are affected on a large scale. Especially Himachal Pradesh, Uttarakhand, Sikkim and all the states of the North East are affected by the problem of floods. While the states of Himachal and Uttarakhand are being affected the most by the Himalayan flash floods for the last two decades, year 2013 Kedarnath, 7 February 2021 Chamoli Reni village Rishi Ganga flood, 5 August year 2025 Dharali Uttarkashi flood and Tharali Chamoli landslide are the biggest floods, but long-term analysis of floods shows that in the state 1970, 1986, 1991, 1998, 2001, 2002, 2004, 2005, 2008, 2009, 2010, 2012, 2013, 2016, 2017, 2019, 2020, 2021, 2023, 2025 have been consecutive years of floods, whereas in the Himalayan and Tibetan region The pattern of rainfall has also changed due to the increase in temperature by 0.2 degree Celsius from 1951-2014.

According to the report of the National Disaster Management Authority (NDMA) 2022, flash floods due to cloudburst in the Himalayan states have seen an increase of about 30 per cent in the last 20 years, with these incidents being seen more in the states of Uttarakhand, Himachal Pradesh, Ladakh and Sikkim. According to the Wadia Institute of Himalayan Geology, more than 350 glacial lakes have been formed in the Indian Himalayan region, which is a sign of great danger to the Himalayan region. The major floods in the Himalayan regions in the last 10 years include the Kedarnath flood 2013 in which about 4200 villages and 5,748 people were killed and Guptkashi was destroyed, Kinnaur and Kullu 2021 floods killed 200 people, 2022 Amarnath cave floods killed 16 people, 2023 Lhonak Lake Sikkim glacier lake breaking killed 80 people, 2024 Rampur Himachal Pradesh cloudburst killed 20 people and 2025 Dharali Uttarkashi Uttarakhand floods killed about 100 people and the Indian Army base camp was destroyed. Thus, due to cloudbursts in the Himalayan region, the number of sudden surface floods is increasing year after year, which is not a good sign for this mountainous region. Therefore, to

prevent incidents like floods in the Himalayan regions and to protect people from loss of life, human activities in the Himalayan regions have to be controlled. It is also necessary to prevent human habitation and encroachment on the routes of rivers and water channels. Apart from this, sustainable development and modern technology, geographical information systems and remote sensing, radar and other such technologies should be used more and more to protect the Himalayan ecology from disasters.

Landslide-A Landslide is a natural and man-made disaster. Landslide originates mainly in hilly, mountainous and steep-sloped areas. Under a landslide, rocks break and are transported en masse towards the lower slope due to the effect of gravity, which is given intense force by the presence of rain and snow water. In simple words, a landslide means the process of the sliding of a part of the land from its original place and the debris getting deposited at another place. The presence of water during the rainy season and the weakening of the bedrock are considered to be the main reasons for the origin of landslide disasters. The mountainous regions of the Himalayas are included in the vulnerable areas of the world in terms of landslides. The Indian Himalayan region is highly sensitive from the viewpoint of landslides because these mountains are young and geologically active and tectonically unstable.

Due to the structural structure, high seismic frequency, forest fires and steep slopes, landslides occur here naturally, on the other hand, due to the reckless and unplanned construction work (roads, urbanization, power projects and tourism development) going on in the Himalayan region, man-made landslides occur because the geographical and geological structure of the Himalayan regions is weak and is not capable of bearing human activities because the technology and explosive materials being used here for infrastructure development and other works are not capable of bearing the ecology of the Himalayas in any way. The steep slopes of the Himalayas are naturally prone to landslides, in which heavy rainfall, cloudburst and glacier melting, forest fires, deforestation and mining work are creating serious dangers, in which the most erosion and landslides are being caused by the roads being built in the Himalayan region and the sedimentary material produced in the construction of the roads.

According to a study, 12.5 to 13.2 percent of the Himalayas are classified as landslide-prone, which mainly includes the north-west and north-east parts. According to the ISSRO and NRSC Landslide Atlas of India 2023, the survey report conducted from 1998 to 2022 has clarified that 80,000 areas in the Himalayan region are prone to landslides. The NDMA has classified the north-east and central Himalayan ranges as more landslide-prone, and a large part is included in the scope of landslide hazard mapping. In the state of Himachal Pradesh, about 28 major

incidents of landslides in the year 2023-24, Malpa landslide 1998 is the biggest incident in Shimla, Mandi, Kullu Uttarakhand, in which the entire Malpa village was buried, apart from this, Gohna Lake Landslide Chamoli 1868, Nainital Landslide, Tapovan Flood/Landslide 2021, Joshimath Landslide 2023, Garhwal Landslide 1998 and Dharali Kheer Ganga Flood/Landslide 2025 have been the major landslides.

More than 60 major landslide incidents have occurred in the state from the year 1970 to 2002, due to which more than 35,000 people have died. If the short-term of landslide disasters is studied in the Himalayan region, then from the year 2015 to 11 August 2023, about 3601 landslide incidents occurred in which 266 people were killed, whereas in the year 2023, 87 people have died with 1173 landslides. The highest number of landslide incidents has occurred in the North East Himalayas, Sikkim. 100 districts have been identified as high landslide areas in the entire Himalayan region, due to which immense damage is caused to the natural form and human cultural landscapes every year. Thus, to protect the Himalayas and the Himalayan community from the above-mentioned landslide incidents and disasters, work should be done according to the concept of eco-development in the Himalayan region. Along with this, modern techniques and the geological conditions and instability of the Himalayas will have to be incorporated in all small and large construction works. Along with this, there is a need to control the construction of big projects in the Himalayan regions and to pay special attention to the establishment of dumping zones for road construction because road waste material is contributing the most to landslides. The fires that occur in the Himalayan region every year loosen the upper surface of the soil, and due to this, during the monsoon season, large amounts of soil, gravel, stones, grass, etc., are brought along by small streams, giving rise to big landslides and floods. For the control of which, forest fires need to be stopped and controlled. Apart from this, complete control over construction and human activities in landslide-prone areas, plantation of trees, slope stabilisation works and display of landslide areas on maps should be done.

9.3.4 Environmental versus Developmental Priorities

The Himalayan region is mountainous and has a complex physical structure; hence, implementing developmental policies and plans is a difficult task compared to other parts of the country. Because on the one hand, there are difficult geographical conditions, and on the other hand, high financial costs and low economic benefits act as a hindrance to developmental activities. The environmental conditions and challenges here are beyond human capability, and it is difficult to achieve sustainable development. However, our central and state governments are

trying to bring about development works of employment, livelihood improvement and economic development in the hilly areas, keeping in mind the goals of sustainable development. The environmental diversities of different ranges of the Himalayan region have their own special importance.

While the Great Himalayas remain snow-clad throughout the year, the middle Himalayas spread the beauty of nature according to the season, while the Shivalik range is extremely rich in terms of human settlement and forest cover, it also provides the means of livelihood of the mountain community as well as all types of livelihood means like agriculture, animal husbandry and permanent residence to the humans. The Bhabar region at the foot of the mountain provides suitable natural conditions for human health with dense forest cover, while the Terai region, being a plain area, provides suitable conditions for food grain storage and economic development. But the foundation pillar of the Shivalik, Bhabar and Terai Himalayan regions is determined by the conditions of the Lesser and Great Himalayas because the snow cover in the Great Himalayas affects the economic system of the entire India as well as the continent of Asia. Because the Himalayan mountain range determines the direction and condition of the entire Indian monsoon, which determines the monsoon and climate system of the entire Asia, the importance of the Himalayan environment is not limited to the Indian Himalayan region only, but it also determines the climate in the neighbouring countries.

To control the effect of development on the Himalayan environment, at present, many national parks and sanctuaries have been established in the Indian Himalayan region, which include Kanchenjunga, Valley of Flowers, Nadadevi, Namdapha and Salim Ali and Kedarnath Wildlife Sanctuaries, etc. To reduce environmental crises, glacial lake outburst floods, Gangotri Glacier, recognition of rights against climate change, the Central Ground Water Board, and the National Mission to maintain the Himalayan ecosystem, and the Indian Himalayan Climate Adaptation Programs have been started. This Indian economy is internally determined by the Himalayan natural resources and their exploitation.This happens because this region is home to a rich diversity of natural flora and fauna, and also protects the citizens of India from the cold winds coming from Central Asia. But the Himalayan ecosystem has been disrupted by developmental plans, due to which many types of environmental crises are arising here, and local communities are being displaced on a large scale, and many forest species are on the verge of extinction due to deforestation in the Himalayas. A decrease of 1072 square kilometres of forest area has been detected from the year 2019 to 2021 due to developmental plans.

Environmental versus developmental prioritiesare a serious issue in the Indian Himalayan region. The ecosystem here is extremely fragile as well as important areas for development, energy production, tourism and livelihood. Where eco-friendly development is done by establishing coordination between development and environmental protection, in which priorities can be given to developmental works by assessing forest replanting, water resource management, disaster management and ecological carrying capacity to compensate for forests, which will establish a balance between environment and development works, and in conclusion it can be said that regional development can be expanded and environment can be protected by developing development plans as per ecological carrying capacity, sustainable development, community based development and early disaster warning systems.

9.4 SUMMARY

Himalayan States Environmental Barriers and Development Geographical and geological position of the Himalayas, natural and man-made barriers like earthquake, landslide, avalanche, land erosion, flood and forest fire and Himalayan region cultural landscape, unplanned developmental works have become a matter of concern for the Himalayan states, which include all mountainous and plain regions from Jammu & Kashmir, Ladakh to Arunachal Pradesh and neighbouring countries Nepal and Bhutan. The maximum natural crises in the form of natural barriers have been experienced in the year 2021 in the Himalayan regions, which include about 16.2 percent of the total geographical area and according to the 2011 census, the world's largest population of about 5 crore resides in the Himalayan region. Despite being rich in biodiversity, this region has become a part of a delicate, sensitive ecosystem, the reasons for which are deforestation, urbanisation, unplanned land use, soil erosion, infrastructure construction, landslide, forest fire and environmental issues. According to the Forest Survey of India (FSI) 2021, the total forest area of the Indian Himalayan region has recorded a decrease of about 1.2 percent of natural forest area in the last 10 years, in which in the state of Uttarakhand alone, from the year 2015 to 2020, more than 5000 hectares of forest land has been used for the development of various types of projects. The main reasons for forest destruction in the Himalayan region are population growth, agricultural land expansion, illegal cutting of forests, infrastructure development and urbanisation, uncontrolled tourist development, animal grazing and excessive exploitation of firewood. Apart from this, Himalayan forests are also being destroyed by multipurpose dam projects, the biggest example of which is the Tehri Lake project, in which 10,000 hectares of forest land have been destroyed. In land degradation, climate change and human population pressure and shifting farming in 12 Himalayan states are causing huge damage to the soil in the lower regions. Land degradation in the Himalayan region has affected

the food security of about 1.3 billion people. Ecological risks include the extinction of local species and habitat change in different regions of the Himalayas. To date, about 17 types of natural vegetation (Aconitum hentrophylum, Alpinia, Podophyllum, Hexandrum, Panaxpseudoginseng, Picrorhizakurroa, Discoreadetodea, Angelica glauca, Allium stachyi, Podophyllumhexandrumnardostachys, Gradiflora, Aconitum and Hantaigeria) are endangered in the Himalayan region. According to NDMA 2013, about 4.2 lakh sq. km. of the Himalayas is affected by landslides. Thus, many kinds of challenges are seen in environmental and developmental activities in the Himalayan region. Therefore, sustainable development and eco-friendly environmental management are the only options that can realise the concept of sustainable development in the Indian Himalayan regions.

9.5 GLOSSARY

Environmental barriers-Those natural calamities whose arrival and impact are not known to man.

Strategic areas- Areas sharing the country's border, like India-Pakistan, India-China, and India-Nepal borders.

Environmental impact- Negative impact of economic, social, and developmental activities done by man, which are harmful to man and living beings.

Landslide- The process of a land with a steep slope breaking and falling due to gravitational force, or breaking and separating from the main part, is called a landslide.

Earthquake- The vibration caused in the surface of the earth due to natural and man-made reasons is called an earthquake.

Avalanche- The sudden breaking and falling of the frozen glaciers in the high Himalayan region.

Mountain urbanisation- The increasing population pressure in mountainous areas and the construction of concrete buildings and roads for housing are examples of mountain urbanisation, such as Almora, Shimla, and Gangtok.

Biodiversity-The biological and plant diversity found within a geographical unit is called biodiversity.

Unplanned development- The infrastructural development done in the Himalayan region without environmental impact and geological testing, such as multipurpose projects, perennial road scheme, railway line and mountain urbanisation, etc.

Environmental degradation- The reduction in forests, ecology and livelihood means and changes in natural elements in the Himalayan region due to human activities, is environmental degradation.

Climate change- The long-term change in weather elements due to natural and human processes is called climate change.

Glacier- Snow cover deposited in thousands of square kilometres in the high Himalayan region, such as Gangotri, Yamunotri, Milan

Tehri Dam-A man-made artificial lake in the middle Himalayas, Asia's highest dam, located at the confluence of the Bhagirathi and Bhilangana rivers.

Sustainable development- Development done for a long time without environmental and human damage based on proper planning from an environmental, geographical and geological point of view or resource-friendly development, is called sustainable or continuous sustainable development.

9.6 ANSWER TO CHECK YOUR PROGRESS

- Not only the Himalayan states but the entire Himalayan range is facing environmental and developmental crises as a result of geographical, geological and human developmental activities.
- Natural crises have become environmental outbreaks due to unplanned developmental work in the Himalayan states.
- Natural barriers mainly include earthquakes, landslides, avalanches, land erosion, floods and forest fires.
- The latest natural disasters in the Himalayan states are Kullu, Manali, Kedarnath, Reni village,Tapovan and Dharali, Joshimath and Malpa.
- The highest number of natural crises in the form of natural barriers in the Himalayan regions occurred in the year 2021.
- The Himalayan mountain range was formed 50–70 million years ago due to the collision of the Indian and Eurasian plates. The Supreme Court has directed 12 Himalayan states to prepare an action plan for the assessment of the natural and cultural-economic potential of the Himalayas after ecological sensitivity.
- National Mission 2010 has been implemented in 12 Himalayan states.
- The Himalayan region covers about 50percent of the total biodiversity of India.

- Shifting farming is prevalent in the Himalayan northeastern states (Arunachal, Nagaland, Mizoram, Tripura, Manipur and Meghalaya).
- Presently, 1.78 lakh square kilometresof area has been protected by the state and central government for biodiversity conservation.
- In the category of earthquakes, the entire Himalayan region has been included in earthquake zones3 and 4.
- Landslides, avalanches and sudden floods are the biggest disasters in the Himalayas. According to the report of the National Disaster Management Authority NDMA 2022, floods caused by cloudburst in the Himalayan states have increased by about 30per cent in the last 20 years.

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9.8 TERMINAL QUESTIONS

1. Long Answer Questions

Question-01 Write an essay on environmental barriers and developmental activities of the Himalayan states?

Question-02 How is the sensitive geo-structure of the Himalayas susceptible to ecological disasters? Describe in detail the disasters occurring in the Himalayan states?

2. Short Answer Questions

Question-01 : What do you understand by environmental barriers?

Question-02 : What are the major natural disasters occurring in the Himalayan states?

Question-03 How is human development making the Himalayan residents sensitive? Explain in your own words?

Question-04 Is the carrying capacity of the Himalayan ecosystem conducive to developmental activities? Explain?

Question-05 What is meant by environmental degradation? Which factors are responsible for forest destruction in the Himalayan regions?

Question-06 What is land degradation?

Question-07 How are the Himalayan infrastructure and multipurpose projects causing harm to biodiversity?

Question-08 What is climate change? What effects of climate change have been observed in the Himalayan regions?

Question-09 What do you understand by surface flooding in the Himalayan region?

Question-10 : What is a landslide? Explain?

Question-11 : What are the environmental versus developmental priorities in the Himalayan region? Explain?

3.Multiple Choice Questions

Q-01 What are the major environmental obstacles of the Himalayan states?

A. Earthquake
B. Landslide
C. Flood
D. All of the above

Answer: D

Q- 02 How much percentage of land in the Himalayas is affected by landslides every year?

A. 15per cent
B. 20per cent
C. 25per cent
D. 50per cent

Answer: A

Q- 03 How much increase has been recorded in the average temperature of the Himalayan regions due to the effect of climate change?

A. Average 2 degrees Celsius
B. Average 1.5 degrees Celsius
C. Average 1 degree Celsius
D. Average .5 degrees Celsius

Answer: B

Q-04 In which state is the Pancheshwar Hydroelectric Project located?

A. Sikkim
B. Uttarakhand
C. Himachal
D. Ladakh

Answer: B

Q-05 What are the features of the Indian Himalayan ecosystem?

A. Geographical diversity
B. Climatic diversity
C. Bio & Cultural diversity
D. All of the above

Answer: D

Q-06 What is included in the National Mission on Climate Change Action Plan 2010?

A. Strengthening the capacities of Indian institutions in climate change impacts
B. iv. Special focus on glaciology and related areas
C. v. Enhancing resilience of vulnerable communities in the Indian Himalayas
D. v. All of the above

Answer: D

Q-07 When was the G.B. Pant National Institute of Environment established?

A. Year 1978-79
B. Year 1998-99
C. Year 1988-89
D. Year 2008-09

Answer: C

Q-08 According to the Indian National Forest Policy (NFP) 1988, what should be the total percentage of forest cover in hilly areas?

A. 66per cent
B. 33per cent
C. 50per cent
D. 25 percent

Answer: A

Q-09 What are the effects of deforestation seen in the Indian Himalayan region?

A. Effect on the climate system
B. Soil erosion and landslides
C. Glacier breakage and cloud burst

D. All of the above

Answer: 4

Q-10 In which of the following northeastern states is shifting farming prevalent?

A. Arunachal, Nagaland
B. Than Mizoram, Tripura
C. B Manipur and Meghalaya
D. Q. All of the above

Answer: D

Question- 11 In which seismic zone have the Indian Himalayan states been placed?

A. Zone 3 and 4
B. Zone 2 and 3
C. Zone 1 and 4
D. Zone 1 and 2

Answer: A

UNIT 10: POLICY INTERVENTIONS AND GOVERNMENT PROGRAMS

10.1 OBJECTIVES

10.2 INTRODUCTION

10.3 MAJOR TYPES OF CENTRAL AND STATE GOVERNMENT INITIATIVES PMGSY, MNREGA, NHM, ETC.

10.3.1 PRADHAN MANTRI GRAM SADAK YOJANA (PMGSY)

10.3.2 MANREGA (MAHATMA GANDHI NATIONAL RURAL EMPLOYMENT GUARANTEE ACT)

10.3.3 NATIONAL HEALTH MISSION (NHM)

10.4 SUMMARY

10.5 GLOSSARY

10.6 ANSWER TO CHECK YOUR PROGRESS

10.7 REFERENCES

10.8 TERMINAL QUESTIONS

10.1 OBJECTIVES

After reading this unit

- Students will be able to analyse the role of programmes like PMGSY and MANREGA in infrastructure development and employment generation in rural areas.
- Students will be able to assess the effectiveness of policy interventions and government schemes for inclusive and sustainable development.
- Students will be able to explore the possibilities of empowering rural communities through policy reforms and grassroots programmes.
- Students will be able to analyse the effectiveness of key NHM initiatives that improve public health outcomes and enhance service delivery.

10.2 INTRODUCTION

Policy intervention: Policy intervention is the process by which governments or government institutions formulate and implement policies to solve a particular problem, ensure social justice, reduce economic inequality, protect the environment, or improve public welfare.

Government programs: Government programs are plans and projects that the government implements to achieve specific social, economic, or environmental.

Policy interventions and government programmes are two important pillars of social, economic and environmental progress of any nation. Through policy interventions, governments set the direction and objectives, thereby laying the foundation for overall reforms. Government programmes, on the other hand, are the means of implementing these policies at the ground level, which directly impact the lives of citizens. While policies are comprehensive, visionary and long-term, programmes are practical, goal-oriented and time-bound. Both complement each other—policies give shape to the thinking and programmes implement it and convert it into results. Therefore, for an effective governance system, it is essential that there is coordination between policy making and programme implementation, so that every citizen of the country gets equal opportunities, facilities and security. Development in hill states requires a tailored approach that balances ecological sensitivity with socio-economic upliftment. While central and state initiatives have laid a strong foundation, continuous evaluation, adaptive strategies, and people-centric governance are crucial for inclusive and sustainable growth.

10.3 MAJOR TYPES OF CENTRAL AND STATE GOVERNMENT INITIATIVES PMGSY, MNREGA, NHM, ETC.

10.3.1 Pradhan Mantri Gram Sadak Yojana (PMGSY)

Rural road connectivity is not only a key component of rural development by promoting access to economic and social services and thus increasing agricultural income and productive employment opportunities in India, but it is also a vital component in ensuring sustainable poverty alleviation. The Government has formulated a dedicated scheme called Pradhan Mantri Gram Sadak Yojana (PMGSY) for improvement and construction of roads in rural areas. It was launched on 25 December 2000 by the then Prime Minister Atal Bihari Vajpayee. Pradhan Mantri Gram Sadak Yojana 1 (PMGSY) is a fully centrally sponsored scheme. Its main objective is to provide all-weather road connectivity to eligible unconnected habitations in rural areas, thereby enhancing access to social and economic services and improving the quality of life of rural residents. Subsequently, new sections of PMGSY were launched for up gradation/strengthening of rural roads, which are as follows:



Source: Google image

PMGSY Phase I

Launched in December 2000, the first phase of the Pradhan Mantri Gram Sadak Yojana (PMGSY) was a 100% centrally sponsored scheme aimed at providing all-weather road connectivity to unconnected habitations. Eligibility was determined by population size, with

thresholds of 500+ in plain areas and 250+ in North-Eastern, hill, tribal, and desert regions, based on the 2001 Census. The scheme targeted socio-economic development by connecting 1,35,436 habitations and upgrading 3.68 lakh km of rural roads, including farm-to-market routes and 40% renewal of rural roads funded by states.

PMGSY Phase II

Approved in May 2013 during the 12th Five Year Plan, Phase II focused on upgrading existing roads to enhance village connectivity. The scheme targeted the improvement of 50,000 km of roads, with cost-sharing between the Centre and states at a 75:25 ratio. In hill states, desert areas, Schedule V regions, and Naxal-affected districts, the Centre contributed 90% of the costs. The extension of PMGSY-I and II, approved by the Cabinet Committee on Economic Affairs, allowed road and bridge works to continue until September 2022.

Road Connectivity Project for Left Wing Extremism Affected Areas (RCPLWEA) was launched in the year 2016 to improve the road connectivity in 44 worst affected Left Wing Extremism (LWE) districts and some adjoining districts in 9 States, viz. Andhra Pradesh, Bihar, Chhattisgarh, Jharkhand, Madhya Pradesh, Maharashtra, Odisha, Telangana, and Uttar Pradesh. The scheme has twin objectives of enabling smooth and seamless anti-LWE operations by the security forces and also ensuring socio-economic development of the area.

PMGSY-III

In July 2019, the Cabinet approved PMGSY Phase III, aiming to consolidate 1,25,000 km of road networks connecting settlements to higher secondary schools, hospitals, and Gramin agricultural markets (GrAMs). The scheme, operational from 2019-20 to 2024-25, emphasizes rural infrastructure enhancement and socio-economic development. Cost-sharing for most states is set at a 60:40 ratio, while North-Eastern and Himalayan states follow a 90:10 ratio. This phase prioritizes improving rural connectivity and fostering economic growth through better infrastructure.

Further, The Union Cabinet has approved the launch of phase -IV of Pradhan Mantri Gram Sadak Yojana on 11.09.2024 for providing new connectivity to eligible 25,000 unconnected habitations which have become eligible due to their population increase. A total of 62,500 Kms road for providing new connectivity to eligible unconnected habitations are proposed to be constructed at a cost of Rs. 70,125 crore during the period of 2024-25 to 2028-29.

Objectives:

1. Ensuring connectivity to habitations with population as per norms:

The primary objective of the PMGSY is to provide Connectivity, by way of an All-weather Road (with necessary culverts and cross-drainage structures, which is operable throughout the year), to the eligible unconnected Habitations in the rural areas with a population of 500 persons and

above in Plain areas. In respect of the Hill States (North-East, Sikkim, Himachal Pradesh, Jammu & Kashmir and Uttarakhand), the Desert Areas (as identified in the Desert Development Programme), the Tribal (Schedule V) areas and Selected Tribal and Backward Districts (as identified by the Ministry of Home Affairs and Planning Commission)* the objective be to connect eligible unconnected Habitations with a population of 250 persons and above.

2. Strengthening rural infrastructure:

(Improving access to markets, schools, health facilities as well as other essential services)

3. Economic development and employment generation:

(Providing better access to markets for agricultural produce through road network, improving rural economy and increasing employment opportunities)

4. Social integration:

(Connecting remote habitations to the mainstream, thereby increasing social inclusion and harmony)

4. Sustainability and environmental protection:

(Increasing green cover through roadside plantation and adopting sustainable practices in construction)

Significance of PMGSY (Pradhan Mantri Gram Sadak Yojana):

Boosting Socio-Economic Access: Rural road connectivity significantly enhances access to social and economic services, leading to increased farm incomes, employment opportunities, and effective poverty alleviation.

Addressing Gaps in Rural Infrastructure: Historically, rural road development was the responsibility of state governments. However, limited funds and diverted planning priorities led to neglect. The MGSY scheme bridges this gap, ensuring development reaches even the most remote areas.

Improving Access to Essential Services: Enhanced connectivity enables rural populations to access employment, healthcare, education, and government welfare programs. Reliable roads facilitate faster transportation of agricultural produce to markets, especially for perishable goods, and attract industries to rural regions.

Encouraging Rural Service Delivery: Improved infrastructure motivates government personnel, such as health workers, teachers, and agricultural extension workers, to serve rural communities more effectively, fostering prosperity and sustainable employment.

By focusing on rural road connectivity, the PMGSY scheme aims to drive inclusive development, improve livelihoods, and empower rural communities, laying a strong foundation for sustainable growth in India.

The details of the roads constructed during the last five years in the various States/UTs are as under:-

Verticals	**Road length constructed/upgraded (in km)**					
	2020-2021	2021-2022	2022-2023	2023-2024	2024-2025	2025-2026 (till date 13.08.2025)
PMGSY-I	16856	9821	6012	2251	866	133
PMGSY-II	8341	3867	1355	435	114	11
RCPLWEA	1720	2383	1787	1326	489	228
PMGSY-III	9756	25933	20584	22087	16289	4354
Total	**36,673**	**42,004**	**29,738**	**26,099**	**17,758**	**4,726**

10.3.2 MANREGA (Mahatma Gandhi National Rural Employment Guarantee Act):

The MANREGA scheme is known as the Mahatma Gandhi National Rural Employment Guarantee Act. It is a legal scheme of the Government of India whose objective is to ensure a minimum of 100 days of employment to deprived and unorganized workers in rural areas. This scheme was started on 7 September 2005 by a bill passed in Parliament. After which it was started in 200 districts of the country from 2 February 2006 and it was expanded to the whole country from 1 April 2008. The Act gives legal guarantee of a hundred days of wage employment in a financial year to adult members of a rural household who demand employment and are willing to do unskilled manual work. The Act will be applicable to areas notified by the Central Government. The objective of the Act is to enhance the livelihood security of the people in the rural areas by generating wage employment through works that develop the infrastructure base of that area.

Initially the scheme was known as the National Rural Employment Guarantee Act (NREGA), but on 2 October 2009 its name was changed and the new name of this scheme was Mahatma Gandhi National Rural Employment Guarantee Act (MANREGA). In this scheme financial assistance shall be provided by Central and State Governments in the ratio of 90:10 respectively.




Source: Google image

Vision and Goals of MANREGA:

Vision and Goals:

1. Livelihood Security: Mahatma Gandhi NREGA recognizes the importance of strengthening the livelihood resource base of the poor by reaching the most vulnerable sections of rural areas, including Scheduled Castes, Scheduled Tribes, women-headed households, and other marginalized groups.

2. Community Empowerment: The scheme encourages a sense of community and collective responsibility by strengthening Panchayat Raj institutions. Mahatma Gandhi NREGA promotes a bottom-up approach to planning and execution, empowering local communities to take charge of their development. Through the creation of productive assets of prescribed quality and durability, the scheme addresses immediate economic needs while laying the foundation for long-term prosperity.

3. Environmental Sustainability: Mahatma Gandhi NREGA prioritizes sustainable development and environmental stewardship, striving to create a greener, more sustainable future for generations to come by prioritizing works that contribute to ecological conservation and rural infrastructure development.

4. Transparency and Accountability: Central to the scheme's vision is a commitment to transparency and accountability, ensuring that funds are utilized efficiently and beneficiaries' rights are upheld through mechanisms such as social audits, grievance redressed, and proactive public disclosure.

Target Group:

1. Scheme is open to all rural households who are in need of wage employment and desire to do manual and unskilled work.

2. Period of employment should ordinarily be at least fourteen days continuously with not more than six days in a week.

3. Priority to works where at least one third of wage seekers are women.

4. Persons desirous for work may submit their applications to the Gram Panchayat.

5. Gram Panchayat shall register the household. After verification, job card is to be issued to the applicant household.

6. Gram Panchayat or Block Programme Officer shall provide unskilled manual work to the applicant within fifteen days of receipt of application preferably within a radius of 5 kilometers of the village, where the applicant resides. In case the employment is provided outside such radius, it must be provided within the Block and the laborers shall be paid 10% of the wage rate as extra wages to meet additional transportation and living expenses.

Programme Strategy:

The programme will be implemented through Panchayati Raj Institutions. The Block Programme Officer shall allot fifty-percent works in terms cost to the Gram Panchayat. Gram Sabha shall recommend works and the Gram Panchayat shall identify/approve the works for implementation. The Block Programme Officer will scrutinize the Annual Plan. The Panchayat Samiti will maintain the priority of works indicated by the Gram Panchayat and approve the Block level Plan. The Chief Executive Officer is designated as District Programme Coordinator for implementation of the Act/Scheme in the district. The DPC shall scrutinize the plan proposals of the Panchayat Samitis. The whole exercise shall be completed by DPC before end of December each year.

Permissible Works:

The following works are permissible under MGNREGA:-

1. water conservation and water harvesting including contour trenches, contour bunds, boulder checks, gabion structures, underground dykes, earthen dams, stop dams and springshed development;

2. Drought proofing including Afforestation and tree plantation;

3. Irrigation canals, including micro and minor irrigation works;

4. Provision of irrigation facility, dug out farm pond, horticulture, plantation, and farm bunding and land development on land owned by households specified in paragraph IC;

5. Renovation of traditional water bodies including desalting of tanks;

6. Land development;

7.Flood control and protection works including drainage in water logged areas including deepening and repairing of flood channels, chaur renovation, construction of storm water drains for coastal protection;

8. Rural connectivity to provide all weather access, including culverts and roads within a village, wherever necessary;

9. Construction of Bharat Nirman Rajiv Gandhi Sewa Kendra as Knowledge Resource Centre at the Block level and as Gram Panchayat Bhawan at the Gram Panchayat level;

10. Agriculture related works, such as, NADEP composting, vermicomposting, liquid bio-manures;

11. Livestock related works, such as, poultry shelter, goat shelter, construction of pucca floor, urine tank and fodder trough for cattle, azolla as cattle-feed supplement;

12. Fisheries related works, such as, fisheries in seasonal water bodies on public land;

13. Works in coastal areas, such as, fish drying yards, belt vegetation;

14. Rural drinking water related works, such as, soak pits, recharge pits;

15. Rural sanitation related works, such as, individual household latrines, school toilet units, anganwadi toilets, solid and liquid waste management;

15.1. Construction of anganwadi centers

15.2. Constructions of play fields"

16. Construction & maintenance of approach roads for level crossings;/ railway stations, repairs of earthwork to the existing railway embankments/cuttings/ Plantation of trees at extreme boundary of railway land

17. Construction of Food Grain Storage Structures

18. Any other work which may be notified by the Central Government in consultation with the State Government;

Wages:

Under the scheme, minimum wages of Rs. 374/- per manday notified by the Ministry of Rural Development, Govt of India w.e.f. 1st April, 2024 are being paid equal to men and women workers. The payment of wages is being made through Saving Bank/Post Offices accounts of workers on weekly or fortnightly basis.

Unemployment Allowance:

Unemployment allowance shall be payable if employment is not provided within 15 days of the receipt of the application. The rate of unemployment allowance shall be one fourth of the wage rate for the first thirty days and not less than one half of the wage rate for the remaining period. Unemployment allowance shall not be paid if the applicant does not report for work within fifteen days or adult members of the household received at least one hundred days of work during the financial year.

10.3.3 National Health Mission (NHM):

National Health Mission is a flagship health scheme launched by the Government of India in the year 2005, with the aim of providing quality, accessible and affordable healthcare services in rural and urban areas of the country.

NHM has two major components:

(A) National Rural Health Mission (NRHM):

NRHM Launched in 2005, focused on rural areas seeks to provide equitable, affordable, and quality health care to the rural population, especially the vulnerable groups. Under the NRHM, the Empowered Action Group (EAG) States, as well as the North Eastern States, Jammu and Kashmir and Himachal Pradesh, have been given special focus. The thrust of the mission is on establishing a fully functional, community-owned, decentralized health delivery system with inter-sectoral convergence at all levels, to ensure simultaneous action on a wide range of determinants of health such as water, sanitation, education, nutrition, social and gender equality. Institutional integration within the fragmented health sector was expected to provide a focus on outcomes, measured against Indian Public Health Standards for all health facilities.

Objectives, Goals & Strategies of NRHM:

Objectives:

1. Increasing access to health services in rural areas.

2. Developing health infrastructure.

3. Promoting community participation.

4. Reducing maternal and infant mortality rate.

5. Addressing human resource shortages.

6. Ensuring social and gender equality.

7. Continuous monitoring and improvement in health service quality

Goals;

1. Reduction in Maternal Mortality Rate (MMR).

2. Reduction in Infant Mortality Rate (IMR).

3. Accessible and effective delivery of health services.

4. MSafe Delivery and Postnatal Care.

5. Increasing Immunization Coverage.

6. Improving Newborn and Maternal Care.

7. Increasing the number and quality of health workers.

8. Community based monitoring and participation.

(B) National Urban Health Mission (NUHM):

The National Urban Health Mission (NUHM) as a sub-mission of National Health Mission (NHM) has been approved by the Cabinet on 1st May 2013.NUHM envisages to meet health care needs of the urban population with the focus on urban poor, by making available to them essential primary health care services and reducing their out of pocket expenses for treatment. This will be achieved by strengthening the existing health care service delivery system, targeting the people living in slums and converging with various schemes relating to wider determinants of health like drinking water, sanitation, school education, etc. implemented by the Ministries of Urban Development, Housing & Urban Poverty Alleviation, Human Resource Development and Women & Child Development.

Objectives and Goals of National Urban Health Mission (NUHM)

Objectives;

1. Identify marginalized and vulnerable areas and improve the status of healthcare delivery services to cover the entire urban population.

2. Link urban health with other social determinants of health such as clean drinking water, sanitation, pollution, solid waste management, nutrition, education etc.

3. Provide accessible, affordable and quality primary healthcare services to the urban poor.

4. Give priority to slums and vulnerable sections.

5. Ensure active participation of private sector, NGOs and community.

6. Strengthen urban health systems.

Goals:

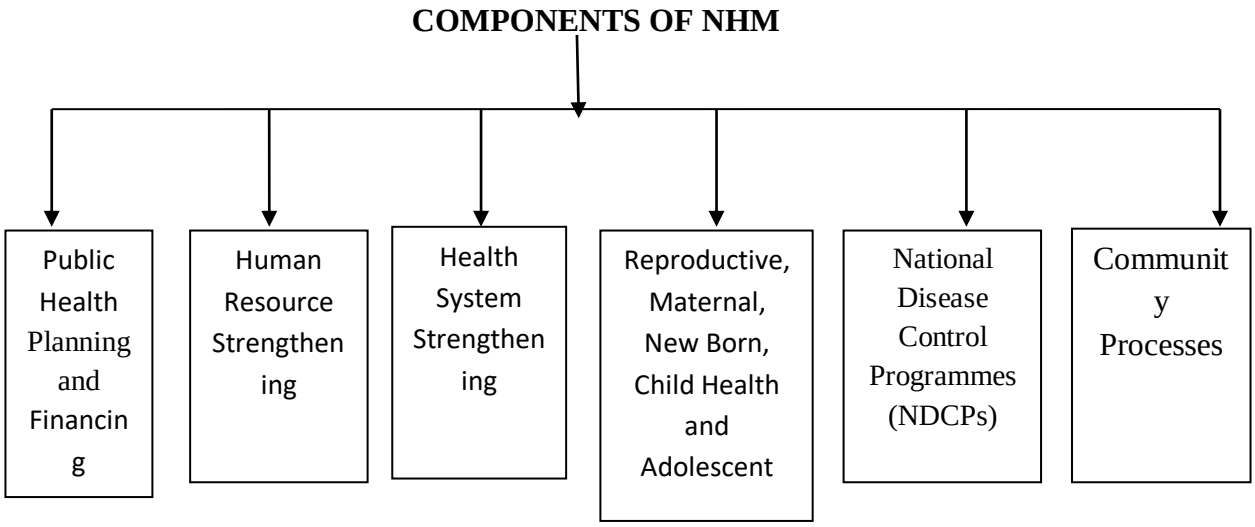
1. Operationalising program management units at State, District and city level.

2. Mapping of vulnerable population & health facilities.

3. Setting up urban health facilities (Urban Primary Health Centres UPHCs, Urban Community Health Centres- UCHC) as per the population norms.

4. Developing a network of community healthcare workers (ASHAs and Mahila Arogya Samities - MAS).

5. Convergence83 with Urban Local Bodies (ULBs) and other Ministries at State and ward level.



Major running programmes in NHM:

Reproductive, Maternal, New Born, Child Health and Adolescent (RMNCH+ A) Services:

This programme was launched in 2013 to address increasing maternal and child health mortality, associated causes and to bring in improvement in access and utilization of health care services by the vulnerable population. The subcomponents of this Scheme are as follows:

1. Reducing Maternal Mortality Rate Maternal Health:

National Rural Health Mission (NRHM) is an important program launched by the Government of India, which aims to improve health services in rural areas, especially to improve the condition of maternal and child health. This mission started in 2005 and in 2013 it was merged into National Health Mission (NHM), which has two components – NRHM (for rural areas) and NUHM (for urban areas).

The primary national maternal health programs under the National Health Mission (NHM) (which subsumed the National Rural Health Mission (NRHM)) are the Janani Suraksha Yojana (JSY), which promotes institutional deliveries with cash incentives, and the Janani Shishu Suraksha Karyakaram (JSSK), which ensures free and no-cost services for pregnant women and newborns in public health facilities. These initiatives, along with others under the broader RMNCHA+A (Reproductive, Maternal, Newborn, Child, Adolescent Health + Adolescent Health) strategy, aim to reduce maternal and neonatal mortality by providing comprehensive, dignified, and quality healthcare.

1.1. Janani Suraksha Yojana (JSY):

Janani Suraksha Yojana is a new maternity benefit scheme launched by Government of India with the main objective of reducing maternal and neonatal mortality by promoting institutional delivery among poor pregnant women. This scheme is a safe maternal care intervention under National Rural Health Mission (NRHM). Under this scheme, along with providing care to the pregnant and postpartum women, cash incentives are also provided to the women. The eligibility criteria for cash assistance is all pregnant women who have undergone delivery should have used any of the sub-centres, primary health centres, community health centres, sub-district hospitals, district and state hospitals and recognized or private institutions. Any woman belonging to rural area who fulfils these criteria is given cash assistance of Rs.1400 for institutional delivery.

1.2. Free Patient Entitlements: Janani Shishu Suraksha Karyakram (JSSK):

This scheme was started by the Government of India on 1 June 2011. Under this scheme, there is a provision to provide free general and operational delivery, useful blood, urine and ultrasound tests to pregnant women. Facilities available under this scheme are: If the newborn child falls ill, free treatment facility is provided for up to 30 days and if there is a need for treatment after 30 days, then free treatment is provided for that institution and even after that, home referral facilities are provided. The scheme covers free food for 3 days during normal delivery and free food for 7 days during caesarean delivery. The scheme also provides free transport from home to health institution, to other health institutions in referral situations and in case of drop back home. Since 2014, it has been extended to cover antenatal and postnatal

complications during pregnancy and extends access to public health institutions for treatment of all sick newborns (up to one year of age).

1.3. Accredited Social Health Activist (ASHA) Program:

The ASHA programme is a key component of the community processes element of National Health Mission intended to achieve the goal of increasing community engagement with the health system. ASHAs are the key drivers of community-based care introduced with the key objective of bridging the gap between health services and community by functioning as a healthcare facilitator, a service provider and a health activist at the community level.

The programme has evolved in many significant ways since its launch in 2005, responding to local context and national priorities. Key programme components that have contributed to the sustainability of programme include mechanisms built for regular modular training and on the job mentoring, creation of strong support structures and performance linked monetary and non-monetary incentives.

Key milestones that shaped the discourse of the programme leading it to its current status, where ASHAs are being considered an important member of the primary health teams at Ayushman Arogya Mandir are as follows –In the current context of Comprehensive Primary Health Care, ASHAs are being viewed as the key member of the primary healthcare team to support delivery of the expanded package of services at community level. This requires expansion of the tasks performed by them from maternal and child health and communicable diseases to newer service areas like emergency and trauma care, oral health, eye and ENT care and chronic diseases like mental health, palliative and elderly care.

2. Universal Immunization Programme for Children (UIP):

India's Immunization programme is one of the largest public health programmes in the world. Launched as Expanded programme on Immunization in 1978, it was renamed as Universal Immunization programme in 1985 when it was expanded beyond urban areas.

It targets 3.04 crore pregnant women and 2.7 crore newborns annually. More than 1.2 crore immunization sessions are being conducted annually. Under UIP, immunization is being provided free of cost against 12 vaccine preventable diseases: Nationally against 11 diseases Diphtheria, Pertussis, Tetanus, Polio, Measles, Rubella, severe form of Childhood Tuberculosis, Rotavirus diarrhea, Hepatitis B, Meningitis & Pneumonia caused by Homophiles Influenza type B and Pneumococcal Pneumonia and sub-nationally against 1 disease - Japanese Encephalitis (JE vaccine is provided only in endemic districts).

It is the most cost-effective public health intervention, largely responsible for reduction of vaccine preventable diseases and, thus, contributing to decrease in India's Under 5 mortality rate from 45 per 1000 live births in 2014 to 35 per 1000 live births in 2019. A system of cold

chain equipment is utilized to store vaccine and deliver the immunization services from fixed centres or out-reach sessions utilizing the following infrastructure.

3. Rashtriya Kishor Swasthya Karyakram (RKSK):

To ensure holistic development of the adolescent population, the Ministry of Health and Family Welfare launched the Rashtriya Kishor Swasthya Karyakram (RKSK) on 7 January 2014 to reach out to 253 million adolescents – male and female, rural and urban, married and unmarried, school-going and out-of-school, with a special focus on marginalized and underprivileged groups. The programme expands the scope of adolescent health programming in India – which was limited to sexual and reproductive health, to now include nutrition, injuries and violence (including gender-based violence), non-communicable diseases, mental health and substance abuse. The strength of the programme is its health promotion approach. It is a paradigm shift from existing clinic-based services to promotion and prevention and reaching out to adolescents in their own environments such as schools, families and communities.

Adolescents often do not have the autonomy or capacity to make their own decisions. RKSK takes cognizance of this and involves parents and the community. The focus is on restructuring the existing public health system to meet the service needs of adolescents. It includes a core package of services that includes preventive, promotive, curative and counseling services, regular check-ups and care at the primary, secondary and tertiary levels, and regular care is provided to adolescents, married and unmarried, girls and boys during clinic sessions.

4. National Disease Control Programme:

A national disease control programme refers to government-backed initiatives in India to prevent and manage both communicable (like vector-borne diseases and tuberculosis) and non-communicable (like cancer, diabetes, and cardiovascular diseases) diseases. These programmes, such as the National Vector Borne Disease Control Programme (NVBDCP), the Revised National Tuberculosis Control Programme (RNTCP), and the National Programme for Prevention and Control of Non Communicable Diseases (NP-NCD), involve strengthening surveillance, improving diagnosis, and promoting health at national, state, and local levels. The National Centre for Disease Control (NCDC) serves as a key nodal agency for implementing some of these programs and provides training in epidemiology.

5. Mobile Medical Units (MMU):

Support to Mobile Medical Units (MMUs) under NHM, now encompassing both NRHM and NUHM is a key strategy to facilitate access to public health care particularly to people living in remote, difficult, under-served and unreached areas. The objective of this strategy is to take healthcare to the doorstep of populations, particularly rural, vulnerable and under-served areas. This is not meant to transfer patients.

MMU services are envisaged to meet the technical and service quality standards for a Primary health Centre through provision of a suggested package of services under 12 thematic areas- Maternal Health, Neonatal and Infant Health, Child and Adolescent health, Reproductive Health and Contraceptive Services, Management of Chronic Communicable Diseases, Management of Common Communicable Diseases & basic OPD care (acute simple illnesses), management of Common Non-Communicable Diseases, Management of mental Illness, Dental Care, Eye Care/ENT Care, Geriatric Care and Emergency Medicine. These services are provided free of cost through MMUs, besides enabling referrals.

6. Family Welfare Programme:

India was the first country in the world to start a National Family Planning Programme in 1956. The programme remained centred around adopting permanent methods, with very little adoption of spacing methods. In 1997, the Government of India adopted the Reproductive and Child Health (RCH) Programme which advocates a client-centred, demand-driven and target-free approach with emphasis on spacing methods for quality reproductive life and promotes responsible and Planned Parenthood. In 2005, the Government of India launched the National Rural Health Mission (NRHM), which subsumes the second phase of RCH Programme, advocating the same approach for achieving quality reproductive life.

The National Population Policy 2000 has recognized as its immediate objective the task of addressing the unmet need for contraception to achieve the medium term objective of bringing the Total Fertility Rate (TFR) to replacement level of 2.1 by 2010 so as to achieve the long-term goal of population stabilization by 2045. As per National Family Health Survey (NFHS-3), the contraceptive prevalence rate in India is 56.3%, which varies widely between different States. The unmet need for family planning is high at 13%, with unmet need in spacing. Methods at 6%. The current approach in family planning emphasizes on offering high quality contraceptive services among eligible clients on a voluntary basis with spacing methods as an important component. However, the acceptance of spacing methods still remains low in the country. It is an established fact that use of spacing methods can effectively reduce Infant Mortality Rate (IMR) and Maternal Mortality Ratio (MMR). Studies indicate that children born less than two years after a previous birth are nearly three times at greater risk of death than children whose mothers waited three years between births (NFHS-3). Hence, promotion of spacing methods would not only contribute towards reduction in TFR but also in reduction of MMR and IMR.

7. Mission Indhanush:

Mission Indhanush was launched on 25 December 2014. Under this scheme, vaccination against eight vaccine preventable diseases (diphtheria, whooping cough, tetanus, polio, measles, childhood tuberculosis and hepatitis B, severe form of hematopoietic influenza type B causing meningitis, dengue and pneumonia) is being done at national level. Also, fighting against rotavirus encephalitis, diarrhea and Japanese is the main objective of this scheme.

8. Mothers' Absolute Affection (MAA):

MAA – "Mothers' Absolute Affection" is a nationwide program of the Ministry of Health and Family Welfare in an attempt to bring undiluted focus on the promotion of breastfeeding and the provision of counseling services for supporting breastfeeding through health systems.This scheme was launched in the year 2010. Previously known as Indira Gandhi Matru Sahyog Yojana, a maternal benefit program run by the Government of India was renamed as Pradhan Mantri Matru Vandana Yojana in the year 2017 and is the first survival delivery scheme with conditional cash incentives for pregnant and lactating women aged 19 years and above. This scheme provides wages to women during pregnancy and child care, as well as partial wage compensation for the loss suffered and also provides food and nutrition to women under this scheme.

9. Pradhan Mantri Matru Vandana Yojana:

This scheme was launched in the year 2010. Previously known as Indira Gandhi Matru Sahyog Yojana, a maternal benefit program run by the Government of India was renamed as Pradhan Mantri Matru Vandana Yojana in the year 2017 and is the first survival delivery scheme with conditional cash incentives for pregnant and lactating women aged 19 years and above. This scheme provides wages to women during pregnancy and child care, as well as partial wage compensation for the loss suffered and also provides food and nutrition to women under this scheme.

10. Poshan Abhiyan:

Samagra Poshan Yojana/Campaign or National Nutrition Mission is a flagship programme to improve the health of pregnant women and lactating mothers and to achieve positive nutritional outcomes. It was launched on International Women's Day, March 2018. The main objective of this Abhiyan was to address the problem of malnutrition.

11. Ayushman Bharat:

This is a national public health insurance fund of the Government of India. This scheme was launched on 25 December 2018. There is a provision to provide free treatment up to Rs 5 lakh per year to every below poverty line family for treatment in covered hospitals under Atal Ayushman Yojana for the treatment of diseases in all the families of country . Its objective is to provide free health insurance coverage to families of low income group in the country.

12. National Ambulance Service (NAS):

One of the achievements of NHM is the patient transport ambulances operating under Dial 108/102 ambulance services. At the time of launch of NRHM (a sub-mission of NHM) in 2005, such ambulances networks were non-existent. Now 35 States/UTs have the facility where

people can Dial 108 or 102 telephone number for calling an ambulance. Dial 108 is predominantly an emergency response system, primarily designed to attend to patients of critical care, trauma and accident victims etc. Dial 102 services essentially consist of basic patient transport aimed to cater the needs of pregnant women and children though other categories are also taking benefit and are not excluded. JSSK entitlements e.g. free transfer from home to facility, inter facility transfer in case of referral and drop back for mother and children are the key focus of 102 service. For Dial 102 Service and Dial 108 Service, operational cost is supported under NHM. Implementation of National Ambulance Service (NAS) guidelines has been made mandatory for all the ambulances whose Operational Cost is supported under NHM. Presently ALS-3,044, BLS-15,283, PTV-3,918, Boat-19, Bike-81, Emergency Response Service Vehicles are supported under NHM, 6485 empanelled vehicles are also being used in some States to provide transport to pregnant women and children e.g. Janani express in MP, Odisha, Mamta Vahan in Jharkhand, Nishchay Yan Prakalpa in West Bengal and Khushiyo ki Sawari in Uttarakhand.

10.4 SUMMARY

Effective governance requires strong coordination between policy-making and program implementation to ensure equal opportunities, access to essential services, and security for all citizens. This becomes especially important in hill states, where development must balance ecological sensitivity with socio-economic progress. Sustainable and inclusive growth in such regions depends on adaptive strategies, continuous evaluation, and people-centric governance.

The Government of India has launched several major initiatives to support this vision:

Pradhan Mantri Gramin Sadak Yojana (PMGSY) – Launched in 2000, this centrally sponsored scheme aims to connect rural areas through all-weather roads, thereby improving access to education, healthcare, markets, and employment. Implemented in four major phases, including special efforts in Naxal-affected regions, the program has significantly contributed to rural development and poverty alleviation.

Mahatma Gandhi National Rural Employment Guarantee Act (MNREGA) – Enacted in 2005 and expanded nationwide in 2008, MNREGA guarantees at least 100 days of unskilled labor employment annually to rural households. It promotes livelihood security, community participation, and environmental conservation, with projects including rural infrastructure, water conservation, and sanitation, all overseen by local Panchayati Raj Institutions.

National Health Mission (NHM) – Also launched in 2005, NHM aims to ensure affordable, accessible, and quality healthcare in both rural and urban areas. It focuses on strengthening health services across all age groups, especially maternal and child health, and plays a critical role in improving healthcare delivery and awareness.

Together, these initiatives reflect the government's policy commitment and programmatic efforts to achieve inclusive, sustainable development—particularly in rural and ecologically sensitive regions.

10.5 GLOSSARY

Community Empowerment; Community Empowerment refers to the process of enabling individuals and groups within a community to take control of their circumstances and achieve their own goals.

Livelihood security; Livelihood security refers to the ability of individuals, households, or communities to sustainably secure the necessities of life — such as food, water, shelter, health care, education, and income — through access to and control over resources and opportunities.

MAA ; "Mothers' Absolute Affection" (MAA) is a nationwide program of the Ministry of Health and Family Welfare in an attempt to bring undiluted focus on the promotion of breastfeeding and the provision of counseling services for supporting breastfeeding through health systems.

MGNREGA; MANREGA stands for Mahatma Gandhi National Rural Employment Guarantee Act. It's a labor law and social security measure in India that aims to guarantee the 'right to work' to rural households.

NAS; The National Ambulance Service (NAS) refers to the nationwide patient transport system in India, primarily operating under the National Health Mission (NHM) through the 108 and 102 emergency numbers for critical emergencies and basic patient transport, respectively.

NHM; The National Health Mission (NHM) encompasses its two Sub-Missions, The National Rural Health Mission (NRHM) and The National Urban Health Mission (NUHM). The main programmatic components include Health System Strengthening, Reproductive-Maternal-Neonatal-Child and Adolescent Health (RMNCH+A), and Communicable and Non-Communicable Diseases.

PMGSY; The Pradhan Mantri Gram Sadak Yojana (PMGSY) was launched by the Govt. of India to provide connectivity to unconnected Habitations as part of a poverty reduction strategy. Govt. of India is endeavoring to set high & uniform technical & management standards & facilitating policy development and planning at State level in order to ensure sustainable management of the rural roads network.

10.6 ANSWER TO CHECK YOUR PROGRESS

1: When was the Pradhan Mantri Gram Sadak Yojana (PMGSY) launched?

A. 15 August 1997

B. 26 January 2001

C. 25 December 2000

D. 1 July 2005

Answer: C.

2: What was the main objective of PMGSY-I?

A. Construction of new bridges

B. Connecting urban areas

C. Connecting non-connected habitations by all-weather rural roads

D. Construction of national highways

Answer: C.

3: What was the cost sharing ratio between the central and state governments in PMGSY-II?

A. 100:0

B. 90:10

C. 75:25

D. 60:40

Answer: C.

4: What was the goal of PMGSY-III?

A. Construction of agricultural roads only

B. Repair of old bridges

C. Connecting villages to higher secondary schools, hospitals and agricultural markets

D. Construction of roads only in hilly areas

Answer: C.

5: Which settlements are given priority in hilly and tribal areas under PMGSY scheme?

A. Those with a population of more than 1000

B. Those with a population of more than 250

C. Those with a population of more than 100

D. There is no population criterion

Answer: B.

6: In which year was the National Health Mission (NHM) launched?

A. 2000

B. 2003

C. 2005

D. 2013

Answer: C.

7: What are the two main components of the National Health Mission (NHM)?

A. RCH and UIP

B. NRHM and NUHM

C. RMNCH+A and RKSK

D. JSY and JSSK

Answer: B.

8: What is the main objective of the National Rural Health Mission (NRHM)?

A. Construction of hospitals in urban areas

B. Making health services accessible in rural areas

C. Promoting only immunization programs

D. Providing mental health services

Answer: B.

9: Which of the following schemes is related to the protection of motherhood and newborn child?

A. Mission Indradhanush

B. Janani Suraksha Yojana (JSY)

C. Rashtriya Kishor Swasthya Karyakram (RKSK)

D. Ayushman Bharat

Answer: B.

10: What is the objective of National Urban Health Mission (NUHM)?

A. To provide only vaccination in rural areas

B. To provide accessible and affordable primary health services to the urban poor

C. To treat only mental patients

D. To provide only ambulance services

Answer: B.

11: When was the MNREGA scheme implemented across the country?

A. 2 October 2009

B. 2 February 2006

C. 1 April 2008

D. 7 September 2005

Answer: C. 1

12: Under the MNREGA scheme, how many days of employment per year is legally guaranteed to eligible families in rural areas?

A. 150 days

B. 50 days

C. 100 days

D. 200 days

Answer: C.

13: What is the minimum prescribed rate for payment of wages in the MNREGA scheme (from 1 April 2024)?

A. ₹300 per man day

B. ₹400 per man day

C. ₹374 per man day

D. ₹350 per man day

Answer: C.

14: Which institution plays a major role in the implementation of MNREGA scheme?

A. Governor

B. Parliament

C. Gram Panchayat

D. District Collector

Answer: C.

15: What is the basic objective of MNREGA scheme?

A. Providing employment to urban poor

B. Recruitment of government employees

C. Increasing livelihood security in rural areas

D. Providing benefits only to women laborers

Answer: C.

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10.8 TERMINAL QUESTIONS

(A) LONG QUESTION

1. Describe the various phases (I to IV) of Pradhan Mantri Gram Sadak Yojana (PMGSY) and highlight their objectives.

2. How has Pradhan Mantri Gram Sadak Yojana been helpful in the social and economic development of rural India? Explain with examples.

3. What are the major objectives, goals and strategies of the National Rural Health Mission (NRHM)? Explain in detail.

4. Describe the major schemes operated under the National Health Mission (NHM), such as – Janani Suraksha Yojana, Janani Shishu Suraksha Karyakram, ASHA Workers Scheme, and Universal Immunization Program.

5. Under the MANREGA scheme, importance has also been given to objectives such as providing employment to unorganized workers in rural areas, environmental protection, women empowerment and strengthening Panchayati Raj institutions. Explain all of them.

(B) SHORT QUESTION

1. Why Pradhan Mantri Gram Sadak Yojana (PMGSY) was launched, and explains its main objectives?

2. Mention what new features have been added in PMGSY-III and PMGSY-IV compare to PMGSY, I, II?

3. Explain in detail the vision and objectives of Mahatma Gandhi National Rural Employment Guarantee Act (MANREGA).

4. Detailed Explain all the objectives of MGNREGA scheme.

5. Explain the permissible works are under MGNREGA scheme?

6. Explain the key objectives and strategies of the National Rural Health Mission (NRHM).

7. Discuss the role and importance of the ASHA program under NRHM and contribute to community-based healthcare delivery.

8. Describe the initiatives (JSY, JSSK, and PMMVY) launched under NHM to reduce maternal and infant mortality rates.

9. What is the Universal Immunization Programme (UIP)? Highlight its significance, coverage, and the diseases targeted under this initiative.

UNIT-11 SUTAINABLE AND INCLUSIVE REGIONAL DEVELOPMENT

11.1 OBJECTIVES

11.2 INTRODUCTION

11.3 SUSTAINABLE MOUNTAIN DEVELOPMENT (ICIMOD GUIDELINES)

11.4 SUMMARY

11.5 GLOSSARY

11.6 ANSWER TO CHECK YOUR PROGRESS

11.7 REFERENCES

11.8 TERMINAL QUESTIONS

11.1 OBJECTIVES

After reading this unit

- Students will be able to understand the need and strategies for sustainable development in mountain ecosystems.
- Students will understand the involvement of local communities in conservation and management of resources.
- Students will understand the importance of gender equality and youth participation in the development process.

11.2 INTRODUCTION

Over the past four decades, the World have become increasingly aware of environmental problems. The environmental issues since 1972 (when the first international conference on the environment problems was hold), has been only growing worldwide. The world population, which had passed 7 billion by the year 2015, is expected to grow to around 9 billion by 2030.Under urgent pressure of environmental destruction, scientists and politicians have begun to work on finding solutions for sustainable development. How to prevent irreversible damage to the planetary systems that supports life? How to avoid high environmental price caused by non responsible behavior of businesses? How to find a balance between economic development and environment operating the "environment-friendly" development concept? The notion of sustainable development encompasses both economic and environmental goals with the use of sustainable techniques for better agricultural production, energy use, natural resource management, and industrial production. Today we have enough evidence to state that these techniques have significant potential, but have yet to be widely adopted. A sustainable global economy also implies limits on population growth and material consumption. The question of economic activity sustainability has already become the major issue, and will be even more important in the coming decades. Today when the world is passing through a period of scientific revolution, the mountains have still remained shrouded in the mists of confusion myths, romance and misinformation. Mankind has yet to make a deeper probe into its own resources, socio-

cultural milieu and to construction alternative strategy of region plaiting rather than hastily advocating a stereotype and conventional management of resources the reality pertaining to the sustainable development especially in mountain environment has revealed that in spite of the several efforts of modernization. Westernization and concentration of investment in different sectors the vast hill area, remained in a condition of stagnation, even also the situation is similar in the case of economic development too. In most part of the hill areas several kinds of spatial gaps can he observed. it is thus necessary to plan all the development activities in such a way so as to cause a minimal damage to the environment or, in the other words, all development should be in conformity with the environment - sustainable development . Then only we can hope to sustain and improve the quality of human life in the long run. Sustainable development has been defined in a variety of ways, but in practice it has three dimensions – economic, environmental and social ones. The word "sustainability" has become a global buzzword as a potential solution for many international, regional, and local problems facing society today: overpopulation, diseases, political conflicts, infrastructure deterioration, pollution, and unlimited urban expansion under limited resources' availability. The United Nations World Commission on Environment and Development (WECD, 1987) coined a definition of sustainable development, which is probably the most well-known in all of sustainability literature: "development that meets the needs of the present without compromising the ability of future generations to meet their own needs".

11.2.1: SUSTAINABLE MOUNTAIN DEVELOPMENT (ICIMOD GUIDELINES)

During recent years, population dynamics, new economic growth, and climate change in the Himalayan region have occurred so intensely and so rapidly that traditional and balanced adaptations mechanisms are losing their efficacy. The vast ice reserve that is the earth's 'third pole' is in peril. Accelerated glacial melting and environmental degradation threaten the role that this mountain Region has always played as water reservoir for one third of the earth's population and as an ecological mediator between the countries of the region. The once self sufficient people of this region now face dire economic poverty. There is an urgent need to investigate, to develop adaptation and coping mechanisms and to prepare the communities and nations of the region to successfully manage the changes that are taking place so they can derive maximum

benefits from their environment and minimize the risk of disasters. Stability and prosperity in this region have implications for all of Asia and for the world.

ICIMOD aims to contribute to upholding the treasure of diversity, exchange and wealth that the Hindu Kush-Himalayas have to offer by building awareness within the region and in the world of the unique function that this mountain system serves and must continue to serve. ICIMOD aims to help preserve the legacy of the region for all mankind by gathering adequate knowledge and developing the necessary institutional capacity to highlight and promote the region's unique potential for mitigation and to strengthen its people's adaptation mechanisms. This holistic approach favors trans-disciplinary problem analysis, design, implementation, and monitoring of social as well as technical aspects. In particular it includes the crosscutting criteria of policy, governance, equity and gender, and mainstreaming information and knowledge management principles.

11.2.2: Community-Based Natural Resource Management

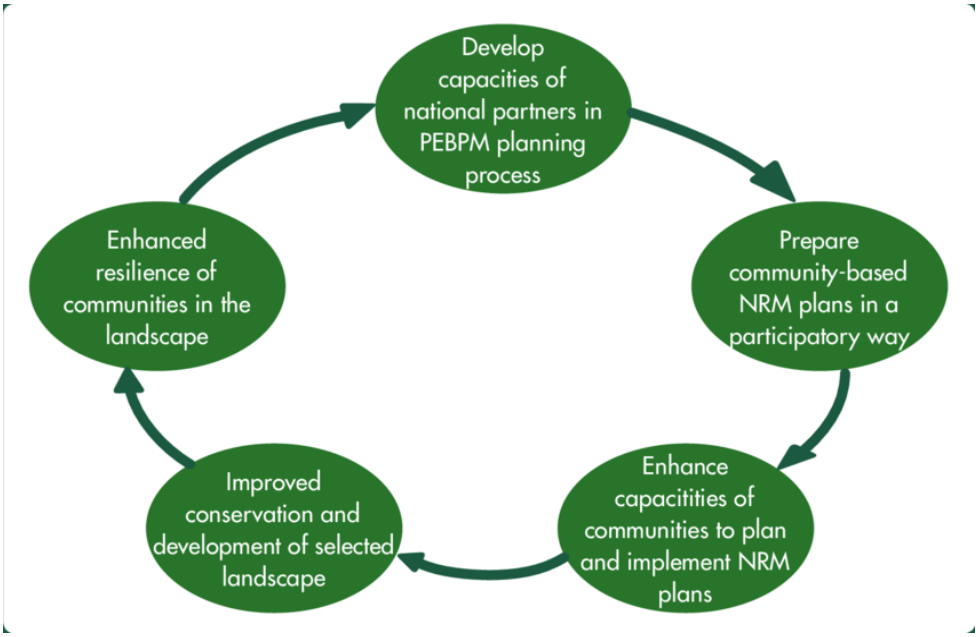
Resources are placed under the most important category among all the things found on the earth. They are capable of fulfilling all the needs and desires of humans. In simple terms, anything that is capable of satisfying the needs and desires of the living world is called a resource. For example, food, water, air and clothing. Resources are divided into natural and human resources on the basis of their characteristics. Innumerable resources of various types are found on the earth, underground etc. But most of the essential resources are found in limited quantity and in only a few places. Most of the resources are non-renewable. At present, due to problems like pollution etc., the quality of non-renewable resources has started declining.

The Himalayas are known all over the world for their various resources. For the reasons like forests, water and scenery, the Himalayas have been a centre of attraction for everyone since ancient times. First, hunters settled here, and then came herders and farmers. Later, pilgrims, tourists and traders also started settling here, as a result of which the resources started to deplete gradually. In the present times, the task of accelerating the depletion of resources is resource exploitation from a commercial point of view.

Although the process of conservation has existed in the Himalayas in some form or the other among the mountain people since ancient times, such as terraced farming, protection of

water sources and worship of trees. But due to indiscriminate resource exploitation in the modern era, both from commercial and non-commercial perspectives, decreasing interest in agriculture and permanent settlement in the plains, proper conservation and management of resources in the Himalayas, especially in Uttarakhand, has become a serious problem. Global warming and climate change have also become a serious challenge for the resources of the Himalayas today.

As we all know that resources are important for the prosperity of the country and the local community who use them. In this, some people use the resources for their luxuries and some people use them for their livelihood. Therefore, it is necessary to understand the conservation, management and use of these resources in the right context. To understand this burning problem of resources in the right context, there is a need to work together with the administrative, political, social and local people. At present, due to excessive exploitation of resources, misuse, and abnormal monsoon arrival unplanned water management, land and forests are being destroyed rapidly. At this level, important changes can be made in the conservation and management of resources through the participation of local community, social organizations, individual workers, local administration along with traditional and scientific techniques (remote sensing, GPS, GIS, information technology). Therefore, it is necessary to assess the optimal utility and quality of resources in the context of mountain areas.



Community-based planning process for enhancing participatory natural resources management

The continuous loss of biodiversity due to the impracticality of coercive conservation practices has led to the emergence of participatory approaches such as Community-based Conservation (CBC) and Community-based Natural Resource Management (CBNRM). CBC "includes natural resource or biodiversity protection by, for and with the local community" and CBNRM has been defined as "a rigorous process of institutional reform that combines the devolution and delineation of property rights with collective action in rural communities to improve the value and sustainability of wild resources". Such approaches have been recognized for contributing to improved environmental conditions and more resilient social-ecological systems, improved forest conditions, species conservation and pasture management. These approaches have increased the support of local people for conservation and improved household income. CBNRM also promotes sustainability by harmonizing development, conservation, and sustainable livelihoods.

Key Components of community based natural resource management (CBNRM) Approach:

1. Community Participation:

- Encourages local ownership of natural resource management.
- Engages local groups in planning, monitoring, and decision-making.
- Uses tools like Participatory Rural Appraisal (PRA), resource mapping, and seasonal calendars.

2. Strengthening Local Institutions:

- Builds and supports Natural Resource Management Groups (NaRMGs), community forest user groups, and women's groups.
- Enhances governance capacity at the village and local government level.

3. Gender Equality and Social Inclusion (GESI)

- Ensures active participation of women, youth, and marginalized communities in every step.
- Implements gender-sensitive budgeting and planning.

- Promotes equal benefit-sharing from natural resources.

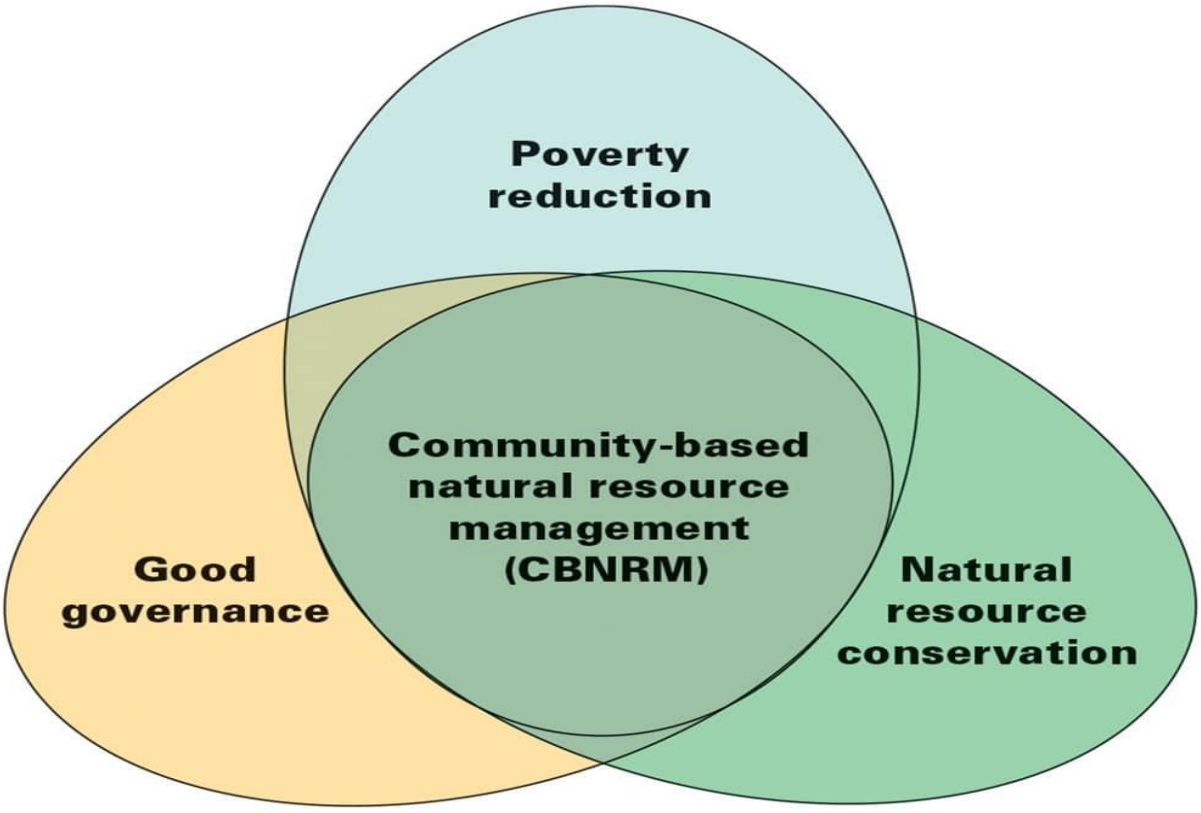
4. Capacity Building and Training: Conducts hands-on training in areas like:

- Forest restoration
- Spring revival and water governance
- Biodiversity monitoring
- Climate-resilient agriculture

5. Policy Integration

- Supports governments in integrating community voices into policies.
- Provides technical and scientific knowledge to help scale up successful models.

Tools & Methods Used by ICIMOD:



Source: Google image

Tool/Method Purpose: PRA (Participatory Rural Appraisal) Understand community needs and local knowledge, Stakeholder Mapping Identify actors, power structures, and partnerships, Resource Mapping Visualize land, water, forest, and other resources, GESI Audits Assess and improve inclusion and equity, Impacts and Achievements, Restored degraded forests and revived springs, Improved water access and irrigation, Enhanced women's participation in resource governance, Developed inclusive five-year NRM plans at local levels, Strengthened climate resilience in mountain communities.

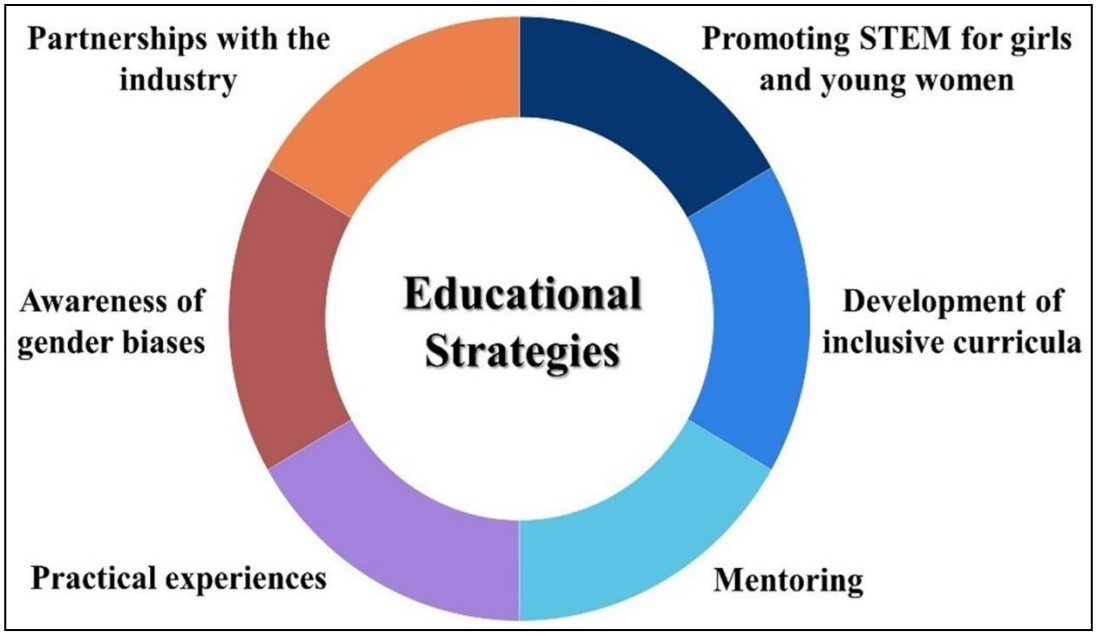
Example: Participatory Spring shed Management in Sikkim ICIMOD trained local government staff and communities in spring revival. Used scientific mapping and community input to design recharge plans. Resulted in improved water security and local ownership of water sources.

11.2.2: Gender-Sensitive and Youth- Inclusive Development Strategies

ICIMOD is a regional intergovernmental learning and knowledge-sharing center serving the Hindu Kush Himalayas. Their work focuses on sustainable mountain development and improving the lives of people living in these mountainous regions. Because these communities are diverse and complex, ICIMOD emphasizes inclusive development approaches, particularly integrating gender sensitivity and youth inclusion.

1. Gender-sensitive Development Strategies

Gender-sensitive development means recognizing and addressing the different needs, roles, and challenges faced by women, men, and non-binary groups in the community to ensure equal opportunities and benefits from development interventions.



Source: Google image

Key Aspects of Gender Sensitivity Approach:

Recognition of Gender Roles and Norms:

- Understand the socially constructed roles and responsibilities assigned to different genders in mountain communities.
- Acknowledge how these roles impact access to resources, decision-making, and participation in development processes.

Gender Analysis and Data Disaggregation:

- Collect and analyze sex-disaggregated data (data separated by gender).
- Use gender analysis tools to identify specific constraints and opportunities faced by women, men, and other gender groups.

Empowerment of Women and Marginalized Genders:

- Promote women's participation in leadership and decision-making roles within community and project governance.
- Support capacity-building and training for women to enhance their skills and agency.

Addressing Gender Inequities in Resource Access:

- Ensure equitable access to natural resources, technologies, financial services, and information.
- Mitigate gender-based barriers in land ownership, credit, education, and employment opportunities.

Gender-responsive Policy and Program Design:

- Integrate gender considerations explicitly in project planning, implementation, and monitoring.
- Develop gender-sensitive indicators to track progress and impact on different gender groups.

Gender Transformative Approaches:

- Challenge and transform harmful gender norms and power imbalances.
- Promote shared responsibilities in household and community work, such as natural resource management.

2. Youth-inclusive Development Strategies

Youth inclusion focuses on engaging young people (typically aged 15-35) as active participants and beneficiaries in development processes, recognizing their unique needs, aspirations, and potential contributions.

Key Elements of Youth Inclusion Framework:

Understanding Youth Diversity and Needs:

- Recognize the heterogeneity among youth based on gender, ethnicity, education, socio-economic status, and geographic location.
- Identify youth-specific challenges such as unemployment, lack of access to education and technology, and vulnerability to migration pressures.

Youth Participation and Leadership:

- Involve youth in planning, decision-making, and implementation of development projects.
- Create platforms for youth voices to be heard in community forums, policy dialogues, and governance structures.

Capacity Building and Skill Development:

- Provide training and education that enhance youth's technical, entrepreneurial, and leadership skills.
- Promote innovative and youth-friendly approaches, including use of ICTs (Information and Communication Technologies).

Creating Economic Opportunities:

- Support youth-led enterprises, access to finance, and market linkages.
- Facilitate sustainable livelihood options that are adapted to mountain ecosystems and cultures.

Addressing Social and Cultural Barriers:

- Challenge societal norms that limit youth participation, especially for young women and marginalized groups.
- Promote intergenerational dialogue to bridge gaps between youth and elders.

Promoting Environmental Stewardship and Innovation:

- Engage youth in environmental conservation and climate change adaptation activities.
- Encourage youth-led innovations in sustainable mountain development.

3. Integration of Gender and Youth in Mountain Development

Intersectionality:

- Consider overlapping identities such as young women, ethnic minorities, or disabled youth to address compounded vulnerabilities.

Co-creation and Partnership:

Facilitate collaboration between women, youth groups, government, NGOs, and other stakeholders.

- Monitoring, Evaluation, and Learning (MEL):
- Use participatory MEL tools that reflect gender and youth perspectives.
- Adapt strategies based on continuous feedback from women and youth beneficiaries.

11.2.3 Education, skill development, and employment generation

The Indian Himalayan Region (IHR) covers 10 mountain states and four hill districts of India that make up our north and north-eastern borders. It stretches from the mountains in the northern states of Jammu and Kashmir, Uttarakhand, and Himachal Pradesh, to north eastern states of Sikkim, Arunachal Pradesh, Meghalaya, Manipur, Mizoram, Nagaland and Tripura, and the hill districts of Dima Hasao and Karbi Anglong in Assam and Darjeeling and Kalimpong in West Bengal. The IHR is characterized by diverse demographic, economic, environmental, social and political systems.

The IHR presents both challenges and opportunities for skill development and building an entrepreneurial culture. The region has distinct advantages of forest and biodiversity richness, sacred destinations, landscapes of unparalleled beauty, diverse languages and cultures, crafts, agro-ecosystems and niche products that present opportunities for nurturing sustainable development and entrepreneurship. The youth in the IHR aspire for dignified employment. Nevertheless, providing gainful and sustainable employment to these youth continues to be a challenge. Utilization of mountain specific resources, with a focus on women and youth, can vitalize mountain economies and create new opportunities for entrepreneurship and employment of skilled youth. Skill and enterprise development contribute to achieving the Sustainable Development Goals (SDGs).

Mountain specificities of inaccessibility, fragility and marginality create several challenges for skill and entrepreneurship development in the IHR. These include the inadequacy of training centres, lack of quality assessors and trainers, variance between qualities of training and prescribed industry standards, limited awareness of skill and entrepreneurship development

programmes difficult terrain, weak infrastructure, and low economies of scale, limited local demand, and lack of market access. Moreover, the National Occupational Standards and Qualification Packs are yet to be fully developed for many of the emerging priority sectors for the IHR as they fall in nonconventional domains. Skill and entrepreneurship development in the IHR needs to focus on supporting emerging priority sectors and suitably empower the executive committee of Skill India Mission at the Centre and similar committees of the IHR States to ensure convergence of central and state schemes/programmes/projects/ missions that could boost skill and entrepreneurial initiatives.

Factors affecting skill development in mountain states

- Skill training continues to be institutionally scattered:
- Demand vs. supply driven approaches:
- Perception about vocational education:
- Lack of training infrastructure:
- Skill training for workers in the informal sectors:
- Lack of access to alternative training mechanisms:
- Lack of access among vulnerable and marginalized population groups:
- Gender stereotyping in skill training:

Factors affecting entrepreneurship development in mountain states

- Difficult terrain and lack of infrastructure:
- Limited market:
- Lack of Access to finance:
- Shortage of Skilled Resources:
- Absence of Big Industries:
- Lack of Entrepreneurship Culture:
- Lack of new idea entrepreneurs Identification :
- Need for Government schemes to understand the IHR context:

Priority sectors in Himalayas for skill and entrepreneurship development

Based on secondary research and inputs received from IHR states on gaps in skill and entrepreneurship, the working group has identified five priority areas:

Agri-entrepreneurship: This could be developed as a sub-sector within the larger agriculture sector, building on niche mountain products and reinforcing traditional skills with modern technology needs. The products could include off-season vegetables, medicinal and aromatic plants, spices, health food, and mountain handlooms and handicrafts.

Sustainable mountain tourism: Support skill development and entrepreneurship associated with adventure tourism, culture and heritage tourism, wildlife tourism, and rural tourism, including craft circuits and religious/sacred circuits.

Ecosystem services based employment: Afforestation, eco-restoration, use of wood as construction material, new wood based products and assessment of various ecosystem services could provide opportunities to blend traditional skills with state of the art technological innovations to develop an ecosystem services based skill and entrepreneurial landscape.

Information Technology enabled services and digital health: There is a huge potential for creation of skilled employment opportunities for the local youth by promoting ITES in banking, e-commerce, insurance, financial services, healthcare, mobile applications, storage, security and telecommunication.

Skilling in construction sector: Skilled construction workers are needed in large numbers for projects associated with urban development and renewal (e.g. smart cities and public transportation), development of major infrastructure (e.g. hydropower, road transport, power stations and railways), and rapidly expanding real estate sector within the IHR and other parts of India.

Building capacities for skill and entrepreneurship

Strengthen network of skill centres across the IHR, including setting up of regional centres: Develop regional training centres in IHR based on geographical contiguity and standardized

training curriculum. Explore strategic partnership between private sector, international development agencies and skill centres in building skills and capacities.

Assessors and trainers: Encourage private and public universities to establish facilities for training of assessors and trainers in the region. Training of trainers in the state-level skill centres will ensure that the trainers are certified for the job roles, which may be either specific to the state or in demand in labour markets that are popular among migrant workers from the state. The States could gain from a structured rainer's programme developed for IHR. The regional training centres could play a key role in developing a training programme for trainers from IHR states.

Creating enabling conditions for skilling and entrepreneurship training: Make relevant Qualification Packs and National Occupational Standards aligned skill based programme as mandatory credits for high school and college students. Increase the number of apprenticeships, scholarships or interest-free loans for the trainees. This would help them to cover training expenses. Promote higher-order skill training on project management (e.g. managers and supervisors) for candidates with diplomas and graduate degrees. Provide skill training to women – who often find employment in low-skill category – to facilitate their transition to high skilled category.

Developing Qualification Packs and National Occupational Standards for mountain specific job roles: Based on the comprehensive gap assessment, public and private institutions could jointly formulate Qualification Packs and National Occupational Standards for identified priority sectors in IHR. Develop qualified human resources necessary for the development of mountain specific Qualification Packs and job roles.

Skilling for migrant workers and returnees: In places where the local labour absorption capacity is limited, the employment opportunities in other places (i.e. within IHR, other parts of India or abroad) need to be considered. To ensure safe and favorable conditions for workers moving from rural areas to urban centres, it is important to create opportunities for them to transition from unskilled or semi-skilled workers to skilled workers. Moreover, there is often limited scope and several challenges for returnees tousle their skills or pursue entrepreneurial ventures in migrant sending communities.

11.4 SUMMARY

The multifaceted challenges faced by the global environment, especially in the context of the Himalayan region, have brought sustainable development to the forefront of international, regional, and local agendas. Over the past few decades, despite increasing awareness and action, environmental degradation, unsustainable resource exploitation, and socio-economic disparities persist. This calls for a shift from conventional, one-size-fits-all models of development to more inclusive, region-specific, and sustainability-focused strategies.

The Himalayan region, often referred to as the "third pole" due to its vast ice reserves, is not only ecologically fragile but also socio-economically complex. It plays a critical role in water security and ecological balance for a significant portion of the world's population. However, climate change, population pressures, and unplanned development have disrupted traditional adaptive mechanisms and pushed many communities into economic hardship.

To address these challenges, a holistic and integrated approach to sustainable mountain development is essential. This includes:

Sustainable Natural Resource Management: Through Community-Based Natural Resource Management (CBNRM), local communities are empowered to take ownership of their resources. Participatory planning, gender and social inclusion, and use of both traditional knowledge and modern tools (like GIS, remote sensing) have shown promising outcomes in resource conservation and livelihood improvement.

Inclusive Development Strategies: Gender-sensitive and youth-inclusive approaches are vital for ensuring that all segments of the population benefit from and contribute to development efforts. Recognizing and transforming structural barriers—such as unequal access to resources, decision-making, and skills training—can unlock the full potential of mountain communities.

Skill Development and Employment Generation: The Indian Himalayan Region (IHR) holds untapped potential in niche sectors such as Agri-entrepreneurship, sustainable tourism, ecosystem-based employment, IT services, and construction. However, infrastructural, institutional, and cultural challenges must be addressed to build a robust skill and entrepreneurial ecosystem tailored to mountain realities.

Policy and Institutional Reforms: Stronger integration of local voices into policy-making, support for decentralized governance, and capacity building of local institutions are necessary to scale up successful models and ensure long-term sustainability.

In essence, sustainable development in the Himalayas and other mountain regions cannot be achieved without a strong foundation in equity, inclusion, environmental stewardship, and community empowerment. The path forward lies in balancing economic growth with ecological preservation through adaptive, participatory, and resilient strategies—ensuring that both present and future generations can thrive in harmony with nature.

11.5. GLOSSARY

STEM: For girls and young women is Science, Technology, Engineering, and Mathematics It refers to the educational and career fields that emphasize these disciplines. Encouraging girls and young women to pursue STEM fields is crucial for promoting gender equality.

MEL: A MEL Framework is a systematic approach to tracking a project's progress (Monitoring), understand its impact (Evaluation), and use those insights to improve your implementation and future initiatives (Learning).

NGO: Non-governmental organization (NGO) is defined as a non-profit organization, group or institution that operates independently from a Government and has humanitarian or development objectives.

ICIMOD: The International Centre for Integrated Mountain Development (ICIMOD) is a regional intergovernmental learning and knowledge sharing centre serving the eight regional member countries of the Hindu Kush Himalayas – Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan.

GSD: Gender-sensitive development means recognizing and addressing the different needs, roles, and challenges faced by women, men, and non-binary groups in the community to ensure equal opportunities and benefits from development interventions.

PRA: Participatory Rural Appraisal (PRA) is a method used in development work to involve local communities in the assessment, planning, and management of projects that affect them.

ITES: ITES (Information Technology Enabled Services) term describes a wide range of operations that use information technology to improve the efficiency and functioning of organizations.

IHR: The Indian Himalayan Region (IHR) is spread across 13 Indian States/Union Territories (namely Jammu and Kashmir, Ladakh, Uttarakhand, Himachal Pradesh, Arunachal Pradesh, Manipur, Meghalaya, Mizoram, Nagaland, Sikkim, Tripura, Assam and West Bengal), and covered something 2500 km area.

11.6 ANSWER TO CHECK YOUR PROGRESS

1. What is the main objective of Sustainable Development?

A. only economic development

B. only environmental protection

C. Not compromising the needs of future generations while fulfilling the needs of the present

D. Promoting population growth

Answer: C

2. What are the three main dimensions of sustainable development?

A. Environment, society and politics

B. Economic, environmental and social

C. Agriculture, science and culture

D. Energy, education and technology

Answer: B

3. When was the first international conference on environmental problems held in the world?

A. 1987

B. 2015

C. 1972

D. 1990

Answer: C

4. ICIMOD works on the sustainable development of which region?

A. Andaman Islands

B. Himalayan region

C. Coastal region

D. Thar Desert

Answer: B

5. What is the main benefit of Community Based Natural Resource Management (CBNRM)?

A. Government control only

B. Rapid exploitation of resources

C. Balancing resource conservation and livelihood

D. Benefiting industries only

Answer: C

6. Which tools are used under community participation?

A. Census and elections

B. Geo-mapping, PRA and seasonal calendar

C. Scientific experiments only

D. News writing

Answer: B

7. Why is the Hindu Kush-Himalayan region called the 'Third Pole'?

A. It receives the highest rainfall

B. It has the highest temperature

C. It has a large reserve of ice

D. It has the highest mineral reserves

Answer: C

8. Which aspects are specifically included for sustainable mountain development?

A. Economic development only

B. Industrialization only

C. Policy, governance, equity and gender-sensitivity

D. Tourism development only

Answer: C

9. What is the main objective of gender-sensitive development strategy?

A. Giving benefits to women only

B. Recognizing and addressing the different needs of all genders

C. Giving the lead role to men

D. Ignoring the youth

Answer: B

10. Which of the following is included in 'Gender Analysis'?

A. Statistics for men only

B. Caste-based statistics

C. Collection and analysis of gender-segregated statistics

D. Study of cultural aspects only

Answer: C

11. Which measure is suitable to reduce gender inequality?

A. Including only men in leadership

B. Depriving women of land ownership

C. Promoting women in leadership and decision-making roles

D. Giving equal work to everyone without understanding their needs

Answer: C

12. What is given special attention in youth-inclusive development strategy?

A. Ignoring youth

B. Limiting youth only to wage work

C. Recognizing the diversity, needs and aspirations of youth

D. Limiting youth only to agricultural work

Answer: C

13. Which measure is effective for increasing youth participation?

A. Keeping them away from decision-making

B. Organizing youth forums and dialogue sessions

C. Making plans based only on the opinions of elders

D. Engaging youth in work without training them

Answer: B

14. What is the aim of ‘Gender Transformative Approach’?

A. Maintaining traditional gender roles

B. Restricting women to domestic work only

C. Challenging harmful gender norms and power imbalances

D. Keeping women and youth out of society

Answer: D

15. Which is a key element of the inclusive development strategy adopted by ICIMOD?

A. Running only male-dominated projects

B. Ignoring youth and women

C. Promoting the participation of all stakeholders

D. Following traditional rules

Answer: C

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11.8 TERMINAL QUESTIONS

(A) LONG QUESTION

1. Why is sustainable mountain development needed? Explain the major strategies adopted by ICIMOD for this.

2. Explain the key components of Community Based Natural Resource Management (CBNRM) and its benefits in the Himalayan region.

3. Discuss in detail the three major dimensions of sustainable development – economic, social and environmental.

4. What are the priority areas identified for promoting skill development and entrepreneurship in the Indian Himalayan Region (IHR)? Explain in detail.

(B) SHORT QUESTION

1. What is the general meaning of sustainable development? Explain.

2. Mention in detailed Why is the Himalayan region called the "third pole" of the Earth? .

3. Explained the main objective of ICIMOD?

4. detailed Explain; what is the importance of 'Participatory Rural Appraisal' (PRA) in Community Based Natural Resource Management (CBNRM)?

5. Write a short note; what are the major problems that have arisen in the Himalayan region due to excessive exploitation of resources?

6. Explain; How can youth participation be included in development?

7. How can the Himalayan region benefit from sustainable tourism?

8. What challenges affect skill development in mountain states?

UNIT-12FUTURE STRATEGIES AND BEST PRACTICES

12.1 OBJECTIVES

12.2 INTRODUCTION

12.3 INTEGRATING TRADITIONAL KNOWLEDGE WITH MODERN DEVELOPMENT

12.4 USE OF GIS AND REMOTESENSING FOR PLANNING

12.5 BEST PRACTICES FROM OTHER MOUNTAON REGIONS (NEPAL, BHUTAN ETC.)

12.6 ROADMAP FOR BALANCED AND RESILIENT DEVELOPMENT

12.7 SUMMARY

12.8 GLOSSORY

12.9 ANSWER TO CHECK YOUR PROGRESS

12.10REFERENCES

12.11TERMINAL QUESTIONS

12.1 OBJECTIVES

After completing this unit, learners will be able to:

- To understand the integration of traditional knowledge with modern development strategies in the Himalayan context.
- To explore the role of GIS and Remote Sensing in sustainable mountain planning.
- To examine best practices from other mountain regions like Nepal and Bhutan.
- To develop strategies for balanced and climate-resilient development in the Himalayas.
- To promote inclusive, community-based approaches for sustainable regional planning.

12.2 INTRODUCTION

The Indian Himalayan Region (IHR), known for its ecological sensitivity, cultural richness, and geographic complexity, faces unique challenges in achieving sustainable and inclusive development. Despite decades of developmental interventions, the region continues to grapple with issues such as environmental degradation, socio-economic disparities, and the marginalization of traditional knowledge systems.In this unit, you will delve into strategies focused on fostering sustainable and resilient development within the Himalayan region. The unit highlights the importance of integrating traditional knowledge with scientific tools like GIS and remote sensing to enhance planning effectiveness. Additionally, you will examine successful practices from other mountainous areas such as Nepal and Bhutan, which provide valuable lessons for the Indian Himalayan context. The unit also presents a strategic plan aimed at achieving balanced regional growth that protects both livelihoods and ecosystems. The Indian Himalayan Region (IHR) has historically been marginalized both geographically and socio-economically. Despite various development efforts targeting these areas, disparities continue due to challenging terrain, ecological sensitivity, and the insufficient integration of local knowledge systems into mainstream planning. This unit proposes future strategies to bridge these gaps by fostering resilience, inclusivity, and sustainability in the Himalayan states of India.

12.3 INTEGRATING TRADITIONAL KNOWLEDGE WITH MODERN DEVELOPMENT

The Himalayan region, characterized by its varied ethnic groups, ecological sensitivity, and distinct socio-cultural traditions, serves as a rich source of traditional knowledge (TK) intricately linked to local ecosystems. This knowledge, encompassing areas such as agriculture,

forestry, water management, architecture, and healing practices, has developed over many centuries of interaction between humans and nature, forming a fundamental aspect of sustainable living in the area.

Despite the introduction of modern developmental initiatives, such as infrastructure expansion, hydroelectric projects, tourism, and urbanization, indigenous practices have often been neglected or marginalized, leading to environmental degradation and cultural erosion. There is an increasing acknowledgment of the necessity to integrate traditional knowledge with scientific and technological advancements to foster resilient and inclusive regional development in the Himalayan states (Negi & Joshi, 2019; IPCC, 2022).

Traditional knowledge encompasses inter-generational, place-based knowledge systems maintained by indigenous or local communities. It is characterized by its holistic and experiential nature, covering areas such as environmental management, medicinal plant use, weather forecasting, construction, and community governance. As noted by UNESCO (2017), traditional knowledge is not merely a vestige of the past; rather, it is a dynamic body of knowledge that is continually refined and adapted to new environmental and socio-economic conditions.

12.3.1. Domains of Traditional knowledge in the Himalayas

The Himalayan region, characterized by its ecological fragility, climatic variability, and cultural diversity, has fostered a diverse array of traditional knowledge systems. These systems are grounded in the sustainable utilization of natural resources, community-based decision-making processes, and a profound understanding of local environments. The principal domains are delineated below:

a. Agricultural Practices

- **The Barahnaja System (Uttarakhand):**Barahnaja, which translates to "twelve grains," is a traditional mixed cropping system predominantly practiced in the mid-Himalayan regions of Uttarakhand. In this system, farmers cultivate a diverse array of cereals, pulses, oilseeds, and millets (such as mandua, jhangora, and bhat) concurrently within the same field. This approach enhances agrobiodiversity, sustains soil fertility, mitigates the risk of crop failure, and ensures food and nutritional security without reliance on chemical inputs (Negi, 2010).
- **Apatani paddy-cum-fish cultivation in Arunachal Pradesh:**Within the Apatani community of the Ziro Valley, a sophisticated method of integrated agriculture is employed. The paddy fields serve a dual purpose, facilitating both rice cultivation and fish

rearing, thereby establishing a mutually beneficial relationship between the two. The rice plants offer shade and help regulate the water temperature, while fish species such as common carp contribute to pest control and enhance soil fertility through their excreta. This self-sustaining system not only ensures food security but also fosters biodiversity (Singh et al., 2010).

b. Water Management Systems

- **Kuls and Guhlsin Himachal Pradesh:**These are traditional gravity-based irrigation channels that harness glacial or spring water from upstream sources and distribute it across agricultural fields. They are managed by the community, with the rights and responsibilities for their upkeep often codified in customary law. Kul systems exemplify a profound understanding of hydrology and community collaboration.
- **Zabo system in Nagaland:**The Zabo system, implemented in Nagaland's Phek district, exemplifies an integrated method of land management. This approach skillfully merges water collection, forest preservation, farming, and animal husbandry. Rainwater is systematically gathered in ponds, then filtered through sedimentation tanks, and used for irrigation and household purposes. This technique guarantees a steady water supply year-round in an area that mainly depends on rainfall.

c. Architecture and Settlement Design

- **Kath-Kuni Architecture (Himachal Pradesh)**: This construction technique, designed to withstand earthquakes, uses alternating layers of wood (kath) and stone (kuni) without incorporating mortar. This approach allows for flexibility during seismic activity and offers insulation against cold temperatures. The sloped slate roofs are crafted to effectively manage snow and rain, showcasing an adaptation to the climate.
- **Climatic Settlement Planning:** In many Himalayan communities, villages are intentionally situated on slopes facing south to optimize the absorption of solar heat and shield against harsh winter winds. The close grouping of homes helps reduce heat loss and encourages social interaction during the long winter season. This arrangement of villages is strategically planned based on the slope and orientation to boost solar heat intake and provide wind protection.

d. Ethnomedicine and Herbal Knowledge

- **Medicinal Plant Use**: The Himalayan region is renowned for its diverse array of medicinal herbs. Indigenous communities have meticulously identified and preserved knowledge of various plants, including Kutki*(Picrorhizakurroa)*, recognized for its hepatoprotective properties; Jatamansi*(Nardostachysjatamansi)*, utilized in the treatment of insomnia and anxiety; and Yarsagumba*(Ophiocordyceps sinensis)*, a high-altitude fungus esteemed for its aphrodisiac and energy-enhancing attributes.
- **Traditional Healers**: Traditional healers, such as Vaidyas in Uttarakhand and Amchis in Ladakh, engage in the practice of herbal medicine, drawing upon knowledge systems that have been preserved through centuries-old texts and oral traditions. These systems integrate botanical science, astrology, and spiritual healing methodologies.

e. Disaster Resilience and Early Warning

- **Indigenous Forecasting**: Communities frequently employ non-instrumental methods to forecast weather events. For instance, the atypical behavior of birds and insects is often regarded as a precursor to impending rainfall. Similarly, the early or late blooming of specific plants is interpreted as an indicator of seasonal transitions. Additionally, the observation of cloud formations and wind patterns is utilized to predict storms or snowfall.
- **Collective Memory and Safe Settlements**: Historical understanding of previous landslides, avalanches, and glacial outburst floods significantly informs contemporary settlement planning. Communities tend to avoid constructing in areas known to be susceptible to such disasters, and this knowledge is often transmitted across generations through rituals or oral traditions.

12.3.2. Challenges to integration

Although traditional knowledge (TK) systems in the Himalayan region are characterized by their richness and resilience, their incorporation into mainstream development, education, and planning remains both limited and problematic. Several challenges impede the effective utilization and preservation of this valuable heritage:

- The marginalization and decline of traditional practices in rural Himalayan regions are increasingly evident due to the outmigration of younger generations. This migration, motivated by aspirations for education, employment, and modern lifestyles, has resulted in a reduction of traditional occupations such as farming, herding, and herbal medicine. The influence of modernization and the adoption of homogenized global cultural norms have led

to the abandonment or replacement of many traditional practices with externally promoted techniques and materials. Consequently, traditional knowledge systems are often perceived as outdated rather than adaptive and sustainable. As noted by Pandey and Singh (2012), "Traditional knowledge is eroding fast under the pressure of modernization, changing values, and lack of institutional support."

- **Policy Disconnect and Institutional Neglect:**Development policies at both national and state levels in India predominantly adhere to a top-down technocratic framework. Consequently, these policies frequently marginalize local perspectives, disregarding the experiential knowledge of communities concerning land, water, biodiversity, and risk management. Even within the realms of environmental or disaster planning, traditional knowledge (TK) is seldom incorporated into formal decision-making processes, resulting in solutions that may be unsuitable or unsustainable for the Himalayan region. Agarwal (1995) posits that the neglect of local knowledge systems in environmental management is indicative of a profound bias within science-policy institutions.
- **Intellectual Property Rights (IPR) and Legal Protection Issues:** Traditional knowledge is often characterized by its collective, informal, and orally transmitted nature, which poses challenges for its codification and protection under conventional intellectual property rights (IPR) regimes that prioritize individual ownership and documented innovation. Consequently, TK holders encounter difficulties in asserting rights over herbal formulations or agricultural practices. Instances of biopiracy and unauthorized commercial exploitation of community knowledge, without equitable benefit-sharing, continue to be reported. Furthermore, there is a notable absence of community-based legal frameworks to safeguard this cultural heritage. Although the Convention on Biological Diversity (CBD, 1992) and the Nagoya Protocol (2010) establish international frameworks for recognizing community rights over Traditional knowledge, their implementation at national and state levels remains insufficient.
- **Fragmentation and Generational Discontinuity**: In the Himalayan region, traditional knowledge systems are primarily conveyed through oral means, including apprenticeship, storytelling, and observation. This method of transmission is inherently fragile and heavily reliant on the continuity within familial or clan structures. The erosion of joint family systems, coupled with urbanization and the declining use of indigenous languages and dialects, poses significant challenges to this mode of knowledge preservation.Knowledge transmission is

breaking down. Youth frequently exhibit a lack of interest in or access to traditional knowledge, primarily due to formal education systems that neither value nor incorporate such knowledge. As a result, extensive repositories of ecological and cultural knowledge are at risk of being permanently lost.

12.3.3. Synergizing traditional and modern approach

The advancement of sustainable development in the Indian Himalayan Region (IHR) necessitates an approach that transcends the dichotomy between tradition and modernity, advocating instead for a strategic integration of both. The amalgamation of traditional knowledge systems (TKS) with contemporary scientific methodologies and policy frameworks facilitates the creation of solutions that are contextually relevant, community-oriented, and resilient. This section elucidates emerging domains where such integration is not only feasible but imperative.

a. Agroecological Innovation

The traditional agricultural practices of the Himalayan region, characterized by biodiversity, self-sufficiency, and ecological equilibrium, can be substantially improved through the judicious integration of modern technological tools:

- **Baranaja Cropping + Soil Testing & Certification**: The Baranaja system, which entails the simultaneous cultivation of multiple food crops such as millets, legumes, and oilseeds, can be enhanced through the implementation of soil health cards, organic certification, and market linkage platforms. These practices contribute to increased yields, the restoration of soil fertility, and the viability of traditional crops in contemporary markets.
- **Revival of Traditional Seeds with Genetic Documentation**: Numerous indigenous varieties of millets, pulses, and vegetables demonstrate resilience to climate change and possess superior nutritional qualities. Collaborative efforts among local seed banks, agricultural universities, and genebanks (e.g., NBPGR) are crucial for the in-situ conservation and genetic characterization of these traditional seeds, thereby preventing their displacement by modern monocultures. As noted by the FAO (2018), "Agroecology rooted in traditional wisdom, when supported by modern science, offers a pathway to food security and ecological sustainability."

b. Eco-friendly Infrastructure

Architectural design in mountainous regions should be responsive to climatic conditions, energy-efficient, and culturally appropriate. Traditional methods offer a solid foundation for achieving these objectives:

- **Kath-Kuni + Green Building Norms**: The Kath-Kuni architectural design of Himachal Pradesh, renowned for its earthquake resistance, when integrated with solar panels, thermal insulation, and rainwater harvesting systems, presents an exemplary model for low-carbon rural housing.

Retrofitting Heritage Structures: Traditional structures constructed with indigenous materials can be enhanced through the integration of sustainable technologies, thereby extending their longevity, comfort, and resilience to disasters while preserving their cultural identity. This approach is consistent with the objectives of Sustainable Development Goal 11 (Sustainable Cities and Communities), which emphasizes the preservation of cultural heritage alongside the enhancement of resilience.

c. Water Resource Management

Traditional water harvesting systems are intricately integrated into the hydrological framework of Himalayan micro-watersheds. The incorporation of technology in their revitalization enhances both their scalability and functionality.:

- **GIS Mapping and Restoration of Naulas, Kuls, Zabo, etc.**: Utilizing remote sensing and Geographic Information System (GIS) technologies, planners are able to identify, monitor, and prioritize the restoration of degraded traditional water structures, particularly in regions experiencing water stress.
- **Smart Monitoring + Community Governance**; The integration of Internet of Things (IoT)-based water flow sensors, in conjunction with traditional water-sharing practices and village-level water committees, facilitates efficient and equitable water utilization. According to ICIMOD (2021), "Combining tradition with innovation in water management is essential for adapting to the hydrological impacts of climate change in the Himalayas."

d. Sustainable Tourism Models

Tourism in the Himalayas should transition from mass-based models to community-based approaches that honor cultural heritage while ensuring environmental conservation.

- **Homestays and Cultural Tourism**: Encouraging community-operated homestays and trekking routes that comply with carrying capacity guidelines while providing genuine local experiences, such as architecture, cuisine, and folklore, yields benefits for both hosts and visitors.
- **Integration of Traditional Crafts and Festivals:** Local crafts, such as wool weaving and bamboo art, along with seasonal festivals like Losar and Phool Dei, and indigenous cuisines, can

be integrated into eco-cultural tourism circuits. This integration offers alternative livelihoods and aids in the preservation of intangible cultural heritage.

e. Climate Resilience and Adaptation

Communities residing in the Himalayan region have devised distinctive adaptive strategies to endure climatic extremes. It is imperative that these strategies be acknowledged and incorporated into formal climate planning initiatives:

- **Co-production of Climate Resilient Strategies**: Collaborative initiatives involving scientists, local communities, non-governmental organizations (NGOs), and government agencies can develop climate-resilient action plans that are grounded in local contexts and adaptive knowledge.
- **Integration with Disaster Risk Reduction (DRR) Frameworks**: Integrating indigenous early warning signs, like bird calls and plant growth patterns, along with community memories of past disasters, can be successfully incorporated into multi-hazard risk maps, local contingency strategies, and capacity-building programs. This approach is in line with India's obligations under the Sendai Framework for Disaster Risk Reduction (2015–2030).

12.3.4. Policy and institutional fromeworks supporting integration of traditional knowledge

To successfully blend traditional knowledge with modern development strategies in the Himalayas, it is essential to establish comprehensive policy frameworks and institutional support systems. In recent years, India has launched various programs aimed at safeguarding and leveraging community knowledge for biodiversity conservation, enhancing climate resilience, and promoting sustainable livelihoods. This section outlines significant national and regional initiatives that support this integration.

- **National Mission on Sustaining the Himalayan Ecosystem (NMSHE)** :Launched as a component of the National Action Plan on Climate Change (NAPCC), the National Mission for Sustaining the Himalayan Ecosystem (NMSHE) focuses on addressing the vulnerabilities of the Himalayan ecosystem, which plays a crucial role in ensuring water security, preserving biodiversity, and maintaining climate stability. The mission recognizes the importance of community-based adaptation (CBA) and stresses the need to integrate traditional ecological knowledge (TEK) into climate resilience strategies.
- The initiative promotes the creation of knowledge networks, boosts capacity building in traditional agricultural systems, and aids in setting up data observatories in high-altitude

areas. As stated by the Ministry of Science & Technology, Government of India (2010), utilizing local knowledge and practices is crucial for understanding the effects of climate change on vulnerable ecosystems like the Himalayas.

b. Biodiversity Management Committees (BMCs) under the **Biological Diversity Act, 2002:** The Biological Diversity Act (2002) establishes a legal framework aimed at the conservation and sustainable utilization of biological resources, as well as the protection of associated traditional knowledge:

- BMCs are established at the levels of panchayat, municipality, and district.
- Their responsibilities encompass the documentation of traditional knowledge, the maintenance of biodiversity registers, and the provision of guidance on access and benefit-sharing (ABS) concerning bioresources.
- BMCs play an essential role in democratizing environmental governance by formally involving local communities in biodiversity conservation efforts.

As of 2023, over 250,000 BMCs have been established throughout India, with a significant number located in Himalayan states such as Uttarakhand, Himachal Pradesh, and Sikkim.

c. People's Biodiversity Registers (PBRs): PBRs serve as essential institutional instruments employed by BMCs to document ecological knowledge at the community level. These registers encompass local nomenclature and applications of flora, fauna, fungi, and landscapes, as well as knowledge pertaining to medicinal practices, traditional agriculture, and water harvesting systems. Additionally, they include oral histories, folklore, and customary conservation practices. PBRs play a crucial role in preventing biopiracy, promoting the legal protection of community knowledge, and facilitating benefit-sharing from commercial applications.

The concept of PBRs embodies a grassroots methodology for the documentation of biodiversity, thereby empowering local knowledge holders. — National Biodiversity Authority (NBA)

d. Tribal Cooperative Marketing Development Federation of India (TRIFED) and Van Dhan Yojana: The TRIFED, operating under the Ministry of Tribal Affairs, administers initiatives that promote indigenous knowledge and support forest-based economies in remote areas, including the Himalayan states.

The Van Dhan Yojana is a prominent initiative designed to empower tribal communities through the establishment of Van Dhan Vikas Kendras (VDVKs). These centers aim to enhance the value addition, processing, and marketing of Minor Forest Produce (MFP), including medicinal herbs, honey, and wild fruits. The initiative provides training on sustainable harvesting practices, packaging, and market linkage, while also supporting women's self-help groups and tribal entrepreneurs. This model not only strengthens livelihoods but also preserves traditional knowledge regarding forest products and their sustainable use.

12.3.5. Case studies: traditional knowledge in action

The successful integration of traditional knowledge systems with modern development models has been evident in several areas of the Indian Himalayan Region.The subsequent case studies exemplify how community engagement, institutional support, and innovation have revitalized traditional practices while simultaneously addressing modern challenges.

a. Apatani Valley, Arunachal Pradesh: A Living Agricultural Heritage: The Apatani tribe of the Ziro Valley in Arunachal Pradesh exemplifies a comprehensive traditional agroecological system. Recognized by the Food and Agriculture Organization (FAO) as a potential Globally Important Agricultural Heritage System (GIAHS), the Apatani land-use model integrates several key components: Paddy-cum-fish cultivation, wherein common carp are raised in paddy fields, contributing to pest control and natural fertilization; complex irrigation channels that distribute spring water across terraced fields; sacred groves, bamboo forestry, and livestock rearing, forming a closed-loop economy; and strong cultural norms that regulate harvesting, water use, and land management. According to the FAO GIAHS Secretariat, "The Apatani system is a rare example of sustainable intensification, balancing productivity, ecology, and culture." This model demonstrates how traditional ecological knowledge can support biodiversity conservation, food security, and cultural identity in a fragile mountain ecosystem.

b. Naula Revival in Kumaon, Uttarakhand: Restoring Sacred Waters: In Uttarakhand's Kumaon area, traditional Naulas, which are stone-encased spring water structures often built near temples, have long provided local communities with fresh drinking water. However, many of these Naulas have become neglected due to urban growth, deforestation, and changing lifestyles.

Recently, initiatives led by communities, with the backing of NGOs, local government bodies, and hydrogeologists, have spearheaded their restoration through a comprehensive strategy: utilizing GIS and scientific hydrology to identify areas where springs are replenished.

Traditional ceremonies and celebrations act as tools to boost community involvement and encourage responsible management. Involving local youth in the maintenance and preservation of these water sources.

The restoration of Naula extends beyond simple water management; it embodies the revival of trust, cultural heritage, and responsibilities handed down through generations (Jalagam Trust, 2021). This case illustrates the benefits of integrating sacred geography with contemporary hydrological science to achieve water security capable of withstanding climate challenges.

c. Amchi System in Ladakh: Bridging Traditional and Institutional Medicine: The Amchi medical system, practiced by Tibetan Buddhist communities in Ladakh, embodies a comprehensive healing tradition rooted in the Sowa-Rigpa philosophy. Amchis, the practitioners, rely on locally sourced medicinal plants, use pulse diagnosis, and consult ancient manuscripts that have been preserved over the centuries. Although it faces challenges from modern biomedical systems and the pressures of modernization, the Amchi tradition has seen a resurgence through:

- The Ministry of AYUSH, Government of India, has acknowledged the Sowa-Rigpa system.
- Joint research initiatives involving Amchi practitioners and organizations like AIIMS and CCRAS are focused on scientifically validating herbal formulations.
- The development of training programs for young Amchis, the integration of these practitioners into rural healthcare outreach initiatives, and the conservation of high-altitude medicinal plants through the establishment of community herbal gardens.

The AYUSH Annual Report (2022) underscores the significance of Amchi medicine in contributing to preventive and ecological healthcare frameworks, particularly in remote mountainous regions. This case exemplifies the potential benefits of formal institutional support in sustaining and legitimizing traditional healthcare systems, especially in areas that are remote and underserved.

12.3.6. Recommendations: pathways for integrating traditional knowledge in the Himalayas

The traditional knowledge systems of the Himalayan region embody centuries of co-evolution between human communities and their natural environment. These systems provide valuable insights for addressing contemporary challenges such as climate change, biodiversity

loss, livelihood insecurity, and socio-cultural erosion. To fully leverage their potential, the following actionable recommendations are proposed:

a. Community Participation: The traditional knowledge systems of the Himalayan region embody centuries of co-evolution between local communities and their natural environment. These systems provide valuable insights for addressing contemporary challenges such as climate change, biodiversity loss, livelihood insecurity, and socio-cultural erosion. To fully leverage their potential, the following actionable recommendations are proposed:

- Promote participatory rural appraisal (PRA) and community-led conservation mapping.
- Enhance traditional governance frameworks and acknowledge customary entitlements to resources.

Development is most effective when communities actively participate as co-creators of solutions, rather than merely serving as beneficiaries.

b. Capacity Building: There is an imperative to revitalize the transmission of intergenerational knowledge by equipping younger generations with both traditional skills and contemporary scientific methodologies.

- Design training programs that integrate ethno-agricultural practices, herbal medicine, and architectural techniques with remote sensing, digital mapping, and climate modeling.
- It is recommended that local universities, non-governmental organizations (NGOs), and research institutes facilitate exchange programs between traditional knowledge holders and formal educators.
- This dual literacy will cultivate a new group of hybrid practitioners proficient in managing both heritage and innovation.

c. Documentation & Digitization: The systematic documentation of oral traditions, local practices, and indigenous techniques is essential for their preservation and broader dissemination.

- Establish open-access databases, digital archives, and mobile applications to facilitate the storage and dissemination of community knowledge.
- Encourage the utilization of People's Biodiversity Registers (PBRs) and the geo-tagging of traditional sites, such as sacred groves and water temples, for purposes of education, research, and planning.

- The process of digitization facilitates equitable access and ensures the preservation and adaptation of traditional knowledge for contemporary relevance.

d. Legal Safeguards and Intellectual Property Rights (IPRs): It is imperative to safeguard traditional knowledge systems through legal frameworks that prioritize community involvement, ensuring the protection of collective ownership and the equitable distribution of benefits.

- Strengthen the enforcement of the Biological Diversity Act (2002) and ensure the successful execution of the Access and Benefit Sharing (ABS) provisions.
- Develop community-based intellectual property rights (IPR) frameworks to safeguard bioresources, traditional medicinal knowledge, and agricultural practices from commercial exploitation.
- The legal empowerment of communities is essential for the ethical integration of knowledge.

e. Transdisciplinary Research and Dialogue: Foster a transdisciplinary research environment that promotes mutual respect and collaborative engagement among scientists, policymakers, traditional practitioners, and local communities.

- Establish knowledge hubs or living laboratories within the Himalayan states to explore integrated methodologies in agriculture, water management, and disaster resilience.
- Promote collaborative field research that integrates ethnography, ecological science, and participatory design.

Incorporating traditional knowledge systems into modern development strategies offers a diverse and context-aware approach to regional growth in the Himalayas. This integration promotes ecological sustainability, cultural preservation, and socio-economic strength. The main challenge lies not in substituting one system for another but in encouraging productive exchanges between age-old wisdom and contemporary innovation.

The destiny of the Himalayas depends on respecting age-old customs while also encouraging modern advancements. — Dr. R.S. Tolia, Former Chief Secretary, Uttarakhand

12.4 USE OF GIS AND REMOTESENSING FOR PLANNING

The Indian Himalayan Region (IHR), which includes 13 mountain states and union territories like Jammu & Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, and Arunachal Pradesh, is marked by a variety of ecosystems, rugged landscapes, and changing climates. Effective planning and development in this area require approaches that are both spatially

informed and ecologically considerate. Geographic Information Systems (GIS) and Remote Sensing have become crucial for gathering data, monitoring, modeling, and aiding in decision-making processes.

Geospatial technologies have added a new layer to regional planning in mountainous regions by offering real-time, comprehensive, and multi-temporal data support (ISRO, 2019). These technologies, especially Geographic Information Systems (GIS) and Remote Sensing (RS), have revolutionized spatial planning and resource management in mountainous areas. They enable real-time observation, hazard mapping, and land-use planning.

The National Mission on Sustaining the Himalayan Ecosystem (NMSHE) supports the use of such tools in planning for climate resilience. For instance, the Bhuvan platform, created by ISRO, has been instrumental in providing satellite images and geospatial data for developmental planning.

Lillesand, Kiefer, and Chipman (2015) fittingly characterize remote sensing and GIS as the "eyes and the brain of spatial planning." Planning is fundamentally a forward-thinking activity that requires accurate, timely, and spatially referenced information. GIS and Remote Sensing technologies act as versatile tools for analyzing spatial patterns, tracking temporal changes, and supporting data-driven decision-making. These technologies enable planners to effectively visualize, model, and manage geographic data.

12.4.1. Importance of Geospatial Tools in the Himalayas: The Indian Himalayan Region is distinguished by its complex topography, environmental vulnerability, and diverse socio-political context, which present considerable challenges to planning, monitoring, and development initiatives. Geospatial technologies, particularly Remote Sensing (RS) and Geographic Information Systems (GIS), offer effective solutions to these challenges. Their importance is increasingly recognized in areas such as disaster management, resource mapping, climate research, and sustainable development planning.

a. **Accessibility issues:** Numerous regions within the Himalayas remain inaccessible due to their rugged terrain, inadequate transportation infrastructure, and severe weather conditions. These factors hinder on-ground data collection and impede timely responses during emergencies.

- **Satellite-based remote sensing (RS)** enables planners and researchers to observe land use, vegetation cover, glacial transformations, and human settlements without requiring physical access.

- High-resolution imagery from platforms such as Sentinel, Landsat, Cartosat, and Google Earth Engine offers current data, even in regions characterized by border disputes or conflict.

In areas where field surveys are limited by challenging terrain, remote sensing serves as an aerial observational tool, as noted by the National Remote Sensing Centre (NRSC), ISRO.

b. Ecological Fragility and the Need for Non-Invasive Monitoring: The Himalayan ecosystem is characterized by biodiversity hotspots, glaciers, alpine meadows, and sacred groves, all of which are ecologically sensitive and susceptible to disturbance from human activities.

- Remote sensing technologies facilitate non-invasive and repeated observations for the assessment of deforestation, glacial retreat, forest fires, and wetland degradation.
- Tools such as the Normalized Difference Vegetation Index (NDVI) and Land Surface Temperature (LST) facilitate precise ecological evaluations over extended periods.
- This is consistent with the Convention on Biological Diversity (CBD) principle of advancing conservation through technology that maintains a minimal ecological footprint.

c. **Disaster Risk Reduction and Vulnerability Mapping:** The Himalayan region is particularly susceptible to natural hazards, including landslides, earthquakes, flash floods, glacial lake outburst floods (GLOFs), and avalanches.

- GIS are widely employed for hazard zonation, vulnerability mapping, and risk assessment across various spatial scales.
- Early warning systems are increasingly incorporating real-time satellite data, ground-based sensors, and mobile alert mechanisms, thereby facilitating timely evacuation procedures and effective risk communication.
- Platforms such as SANDRP, UN-SPIDER, and ICIMOD's DRR portal have established integrated geospatial frameworks to address disasters in the Himalayan region.

d. **Addressing Data Scarcity and Continuity:** Datasets derived from fieldwork in the Himalayan region are frequently fragmented, outdated, or entirely lacking, particularly in high-altitude and border areas.

- Remote sensing offers synoptic, repetitive, and scalable data that can be calibrated across various temporal and spatial resolutions.
- The application of RS in time-series analysis enables the investigation of the impacts of climate change, urban expansion, land degradation, and hydrological cycles.

- Initiatives like Bhuvan (ISRO) and NRSC's National Geospatial Portal have made such datasets openly available for planning and academic purposes.

12.4.2. Key application of GIS and Remote Sensing in Himalayan planning

a. Land Use and Land Cover (LULC) Mapping: Remote sensing is extensively employed for detecting alterations in forested regions, agricultural lands, snow cover, and urbanized areas.

- Enables the detection of illegal deforestation, encroachment, and shifting cultivation.
- This supports the planning of urban expansion, road alignments, and afforestation programs. For instance, the Forest Survey of India (FSI) utilizes satellite data to monitor changes in forest cover.

b. Watershed and Water Resource Management: Geographic Information System (GIS)-based watershed delineation and Remote Sensing (RS)-based rainfall and snowmelt data contribute to:

- Planning irrigation systems and check dams.
- Monitoring glacier retreat and lake outburst risks.

c. Landslide and Disaster Risk Zonation: Himalayan states face frequent landslides, earthquakes, and floods.

- GIS integrate data on slope, soil, rainfall, and geological features to generate maps indicating landslide susceptibility.
- RS facilitates real-time flood mapping through the utilization of radar data, such as that provided by Sentinel-1. For instance, the Uttarakhand State Disaster Management Authority (USDMA) GIS for multi-hazard vulnerability mapping.

d. Urban and Infrastructure Planning: Geospatial tools support:

- Smart city planning (e.g., Shimla and Dehradun).
- Transportation corridor alignment considering slope and vegetation.
- Monitoring urban sprawl and illegal constructions.

e. Biodiversity and Wildlife Habitat Monitoring: Satellite data and GIS models are employed to monitor protected areas, ecological corridors, and biodiversity hotspots in the Himalayan region.

- Habitat suitability models for species (e.g., snow leopard, red panda).

- Corridor planning is conducted through least-cost path analysis. For instance, the Wildlife Institute of India employs GIS for habitat mapping in the Western Himalayas.

f. Climate Change Monitoring: Satellite data tracks changes in:

- Snow and glacier extent.
- Vegetation greenness (NDVI).
- Carbon stocks in forests (via LiDAR or multispectral data).

12.4.3. Institutional framework and support

- **ISRO (Indian Space Research Organisation):** Provides satellite data through platforms like Bhuvan and NNRMS.
- **NRSC and State Remote Sensing Centres:** Develop thematic maps and decision support tools.
- **Disaster Management Authorities and State Planning Boards:** Use geospatial data for regional development planning.

12.4.4. Integration of GIS and Remote Sensing: When combined, GIS and Remote Sensing become powerful tools for:

- **Change Detection Studies**: Analyzing temporal satellite data to comprehend transformations in urban or ecological landscapes.
- **Site Suitability Analysis**: The application of multi-criteria evaluation within GIS, utilizing layers derived from remote sensing, facilitates the identification of optimal locations for the establishment of industries, dams, schools, or hospitals.
- **Disaster Preparedness and Early Warning**: Utilizing data on rainfall, slope, land use, and soil to forecast landslide risks, particularly in Himalayan regions.
- **Climate Change Planning**: Analyzing glacier retreat, snow cover variability, and vegetation stress to inform adaptation strategies.

12.4.5. Challenges in Implementation

The hill districts face challenges due to insufficient technical capacity. The difficult terrain limits the extent of ground-truthing. There are issues related to the availability and accessibility of high-resolution and real-time imagery data. Additionally, there are coordination gaps among various departments utilizing GIS data.

12.4.6. Way forward

Enhancing capacity within local government departments is essential. The implementation of community-based participatory GIS (PGIS) facilitates inclusive planning processes. Furthermore, the integration of artificial intelligence and machine learning (AI/ML) can improve predictive capabilities, such as in landslide forecasting. Additionally, the adoption of open-data policies is crucial for promoting data sharing across various departments.

Geospatial technologies should extend beyond laboratory confines and be integrated into decision-making processes at the panchayat level (NITI Aayog, 2021). The incorporation of GIS and RS into planning processes within Himalayan states has significantly transformed approaches to development, conservation, and disaster management. Despite existing challenges, their contribution to sustainable mountain development is indispensable. A future-ready Himalayan region necessitates the comprehensive integration of geospatial intelligence across all planning levels.

12.5 BEST PRACTICES FROM OTHER MOUNTAON REGIONS (NEPAL, BHUTAN etc.)

Effective strategies from other mountainous regions, such as Nepal and Bhutan, can be successfully applied in the Indian Himalayan States to promote sustainable regional development, ecological preservation, and socio-economic advancement. These strategies encompass areas including community-based tourism, environmental conservation, disaster management, agriculture, and governance.

12.5.1. Bhutan: Gross National Happiness (GNH) and Environmental Policy

- **Best Practice:** Bhutan prioritizes GNH as its principal development objective, focusing on ecological balance, cultural preservation, good governance, and sustainable socio-economic development. The nation's constitution mandates that a minimum of 60% of the country must remain under forest cover.
- **Applicability in the Indian Himalayas:** The integration of happiness and well-being indices into planning processes, particularly in states such as Sikkim and Himachal Pradesh, is recommended. Additionally, it is crucial to enhance legal frameworks to ensure the long-term maintenance of forest cover in ecologically sensitive regions like Uttarakhand and Arunachal Pradesh.

12.5.2. Nepal: Community-Based Forest Management (CFM)

- **Best Practice:** Nepal has been a pioneer in establishing Community Forest User Groups (CFUGs) to manage degraded forests. Currently, over 20,000 CFUGs are responsible for managing more than 1.7 million hectares of forest, with legal rights and community ownership.
- **Applicability in the Indian Himalayas:** It is advised to advance Joint Forest Management (JFM) and Van Panchayats by establishing local institutions that are legally authorized and financially backed. Furthermore, fostering forest user groups led by women can strengthen community resilience and engagement.

12.5.3. Bhutan & Nepal: Eco-tourism and homestays

- **Best Practice:** Bhutan follows a tourism strategy that emphasizes high value and minimal impact, integrating measures to protect its culture and environment. In contrast, Nepal's homestay tourism, as demonstrated by the Ghale Gaun model, has empowered local communities and aided in preserving cultural traditions.
- **Applicability in the Indian Himalayas:** Encouraging the establishment of regulated eco-tourism areas in Uttarakhand, Himachal Pradesh, and Sikkim is advisable. Furthermore, offering support for community-based homestays in isolated areas through training, certification, and digital marketing aid is essential.

12.5.4. Nepal: Resilient Mountain Agriculture

- **Best Practice:** To support sustainable farming in the Himalayan region, it's important to adopt climate-smart practices such as terracing, organic methods, and using traditional crop varieties suited to local conditions. Protecting agro-biodiversity and setting up community seed banks can help farmers build resilience and preserve valuable native resources for future generations.
- **Applicability in the Indian Himalayas:** Encouraging the development of local food systems and the cultivation of high-value niche crops like millets, amaranth, and buckwheat is recommended. Furthermore, promoting organic certification and cooperative farming in areas such as Ladakh, Kinnaur, and the North-East Himalayan states is crucial.

12.5.5. Bhutan: Hydropower for Development with Low Carbon Footprint

- **Best Practice:** Bhutan successfully supplies clean hydropower to India while also meeting its own energy needs in an environmentally friendly way. The income from these exports is wisely reinvested into rural development, education, and healthcare sectors.

- **Applicability in the Indian Himalayas:** It is recommended to develop run-of-the-river hydroelectric projects in Himachal Pradesh and Arunachal Pradesh, ensuring the implementation of stringent environmental safeguards. Additionally, it is crucial to strengthen local benefit-sharing mechanisms in regions affected by hydroelectric projects.

12.5.6. Nepal: Earthquake-Resilient Infrastructure and DDR

Following the 2015 earthquake, Nepal implemented the Build Back Better (BBB) approach in its reconstruction efforts, utilizing local materials and adhering to seismic safety codes. This initiative included community training in disaster preparedness, early warning systems, and first response strategies. In the context of the Indian Himalayas, it is recommended to introduce seismic building codes across all Himalayan states, particularly in Zones IV and V. Additionally, it is crucial to empower community-level DRR teams and establish early warning systems in areas susceptible to landslides and floods.

12.5.7. Bhutan: Organic Farming Policy

- Best Practice: Bhutan is endeavoring to become the world's first entirely organic nation by implementing a ban on chemical fertilizers and pesticides, while promoting traditional ecological knowledge.
- **Applicability in the Indian Himalayas:** There is potential to expand organic zones in Uttarakhand and Sikkim, with the latter already recognized as India's first organic state. Efforts should focus on promoting certified organic branding and establishing connections with national and international markets.

12.5.8. Nepal & Bhutan: Cultural Heritage in Development

- **Best Practice:** Development should be harmonized with cultural traditions, sacred landscapes, and indigenous knowledge systems. Local festivals, languages, and architectural styles are preserved through planning regulations.
- **Applicability in the Indian Himalayas:** Incorporate sacred landscapes and pilgrimage routes into planning processes (e.g., Kedarnath, Tawang). Establish Heritage Conservation Zones (HCZs) and allocate funding for the preservation of Himalayan monasteries, oral traditions, and traditional dwellings.

12.5.9. Recommendations for Policy Transfer

Area	Best Practice	Suggested Indian State
Forest	Community Forests (Nepal)	Uttarakhand, Nagaland

Area	Best Practice	Suggested Indian State
Governance		
Tourism	Eco-homestays (Nepal), Low-impact tourism (Bhutan)	Sikkim, Himachal, Ladakh
Agriculture	Organic farming, local crops	Sikkim, Mizoram, Himachal
Infrastructure	Earthquake-resilient designs	NE states, Uttarakhand
Happiness Index	GNH (Bhutan)	Sikkim, Himachal
Hydropower	Low-carbon model (Bhutan)	Himachal, Arunachal

12.6 ROADMAP FOR BALANCED AND RESILIENT DEVELOPMENT

This document presents a comprehensive roadmap for the balanced and resilient development of the Himalayan States of India, taking into account ecological fragility, socio-economic challenges, and climate vulnerabilities. It is intended for use in academic writing, planning, or policy frameworks. To effectively develop the Himalayan region, it is essential to base the strategy on sustainability, fairness, and climate resilience. Although the National Action Plan on Climate Change (NAPCC) and the State Action Plans on Climate Change (SAPCCs) offer existing guidelines, there is a pressing need for more specific initiatives.

- The Indian Himalayan Region includes 13 mountain states and Union Territories, such as Jammu and Kashmir, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam, and the Darjeeling hills in West Bengal.
- These regions are characterized by ecological sensitivity and are susceptible to natural disasters such as landslides, flash floods, and glacial lake outburst floods. Additionally, they face significant challenges related to developmental deficits.
- An effective and robust development strategy must encompass environmental sustainability, socio-economic equity, and regional connectivity.

12.6.1. Guiding Principles

- **Sustainability**: Long-term preservation of ecological integrity.
- **Inclusiveness**: Participation of local communities, especially women, indigenous groups.
- **Resilience**: Capacity to bounce back from environmental, economic, and social shocks.
- **Decentralization**: Empowering panchayats, municipalities, and local governance

12.6.2. Strategic Pillars of the Roadmap

a. Environmental Security and Ecological Restoration

- Implementing Environmental Impact Assessments (EIA) and enforcing land use regulations are essential for eco-sensitive zoning.
- Efforts to conserve forests and biodiversity should focus on adopting participatory forest management approaches and increasing the number of protected areas and biosphere reserves.
- River and Watershed Protection: Support the concept of Integrated River Basin Management, as demonstrated by programs like the National Mission for Clean Ganga (NMCG) and Amrit Dharohar.
- In the realm of Disaster Risk Reduction (DRR), it is crucial to utilize geo-technology for landslide zoning, to create early warning systems, and to restore traditional knowledge systems.

b. Climate Adaptation and Mitigation

Advancing climate-resilient agriculture can be achieved by encouraging agroforestry, utilizing traditional crop varieties, and adopting organic farming methods. In the field of glacier monitoring and cryosphere research, it is crucial to enhance programs like HIMAP under ICIMOD. Efforts to promote renewable energy should prioritize the establishment of solar microgrids, small-scale hydroelectric projects, and wind energy in appropriate areas. Furthermore, expanding forest cover is vital to develop carbon sinks that support India's Nationally Determined Contributions (NDCs) as outlined in the Paris Agreement.

c. Socio-Economic Development and Livelihood Diversification

Efforts in eco-tourism and cultural tourism should focus on advancing community-based tourism, eco-friendly hotels, and homestay options. In terms of skill enhancement and entrepreneurship, priority should be given to creating handicrafts, herbal goods, and digital services. Infrastructure projects need to be carried out with an awareness of environmental impact, using methods like slope stabilization and bio-engineering in road building. To tackle migration management, initiatives should aim to rejuvenate rural economies to reduce distress migration, as demonstrated by the reverse migration strategy used in Uttarakhand.

d. Integrated Use of Technology and GIS-Based Planning

Remote sensing plays a crucial role in monitoring various environmental phenomena, including forest cover, snowline, and Glacial Lake Outburst Floods (GLOFs). Geospatial

planning is essential for identifying development hotspots and vulnerability zones. Mobile-based extension services offer valuable resources such as weather updates, crop advisory, and health alerts. Digital connectivity initiatives aim to enhance e-Governance, e-education, and telemedicine in remote villages. For instance, the NISAR Mission, a collaboration between NASA and ISRO, is expected to provide critical data for mapping terrain deformation and land subsidence in the Himalayan region.

e. Participatory Governance and Institutional Strengthening

Enhancing Panchayati Raj Institutions (PRIs) involves decentralizing planning and budgeting to address local needs effectively. Engagement of women and youth can be facilitated through Self-Help Groups (SHGs), eco-clubs, and youth volunteer organizations. Capacity building for disaster response and planning necessitates regular training for local leaders and officials. Inter-state and transboundary cooperation is essential for effective river basin management and the establishment of forest corridors. Bhutan's Gross National Happiness (GNH) model serves as an inspirational framework for integrated well-being and ecological governance.

As stated in the *NITI Aayog Report on Sustainable Development in the Himalayan Region* (2018), "A regionally differentiated and locally responsive development approach is key to securing the ecological future of the Indian Himalayan Region."

12.6.3. Special Focus Areas

- Infrastructure development in border regions, including roads, bridges, and tunnels, should incorporate climate-resilient designs, as exemplified by BRO projects. Additionally, the promotion of border tourism should adhere to ecological standards.
- Urban planning in hill towns necessitates a compact urban form, the implementation of eco-sanitation systems, and the development of efficient public transportation options, such as ropeways and electric vehicles (EVs). The initiative to establish smart hill cities under the AMRUT 2.0 scheme also emphasizes the importance of heritage protection.

12.6.4. Monitoring, Evaluation and Finance

- **Mountain-Specific SDG Index**: Tailored indicators by NITI Aayog.
- **Green Budgeting**: Introduce Natural Capital Accounting in state finances.
- **Public-Private Partnerships**: Eco-tourism, renewable energy, infrastructure.
- **International Funding**: Leverage GCF, Adaptation Fund, GEF for climate projects.

Balanced and resilient development in the Himalayan States of India requires a holistic**, inclusive and climate-informed approach**. Policies must be locally rooted, ecologically sound and economically viable. A Mountain Development Authority under the Ministry of Environment, Forest and Climate Change could be a strategic institutional step.

12.7 SUMMARY

This unit explored strategic approaches for fostering sustainable and resilient development in the Indian Himalayan Region (IHR). It emphasized the integration of traditional ecological knowledge with modern scientific tools such as GIS and Remote Sensing to address the region's unique socio-environmental challenges. The unit reviewed best practices from other mountain regions like Nepal and Bhutan, highlighting community-based forestry, eco-tourism, and climate-resilient agriculture. A roadmap for balanced regional development was presented, focusing on environmental conservation, climate adaptation, livelihood diversification, and participatory governance. Overall, the unit advocates for a holistic, inclusive, and context-sensitive approach to planning that strengthens ecological integrity while enhancing the well-being of Himalayan communities.

12.8 GLOSSARY

- **Anthropogenic Elements**: Human-made or human-influenced components in the environment, such as buildings, roads, and infrastructure.
- **Traditional Ecological Knowledge (TEK)**: Indigenous and local knowledge systems developed over generations through interaction with the natural environment.
- **Geographic Information System (GIS)**: A digital tool designed to collect, store, interpret, and present spatial or geographic information for use in planning and decision-making processes.
- **Remote Sensing (RS)**: The science of obtaining information about the Earth's surface through satellite or aerial imagery without direct contact.
- **Sustainable Development**: Development that meets present needs without compromising the ability of future generations to meet their own needs, balancing economic, social, and environmental goals.

- **Community-Based Tourism (CBT)**: A form of tourism that is owned and managed by local communities, aiming to provide authentic experiences while promoting environmental and cultural conservation.
- **Climate Resilience**: The ability of a system or community to anticipate, prepare for, respond to, and recover from climate-related shocks and stresses.
- **Biodiversity Management Committee (BMC)**: A legally recognized body at the local level in India responsible for documenting and managing biological resources and associated traditional knowledge.
- **People's Biodiversity Register (PBR)**: A document maintained by local communities to record traditional knowledge, uses of biodiversity, and conservation practices.
- **Disaster Risk Reduction (DRR)**: Strategies and actions aimed at minimizing vulnerabilities and disaster risks to reduce the loss of life and property.

12.9 ANSWER TO CHECK YOUR PROGRESS

1. **What is the primary objective of integrating traditional knowledge with modern development in the Himalayas?**
    A. To promote urban expansion
    B. To preserve historical texts
    C. To enhance resilience and sustainability
    D. To increase industrial output

Answer: C

2. **Which of the following tools helps in mapping and monitoring land use in mountainous regions?**
    A. Thermometer
    B. GIS (Geographic Information System)
    C. Barometer
    D. Seismograph

Answer: B

3. **Barahnaja, a traditional practice in Uttarakhand, is associated with:**
    A. Tourism promotion
    B. Herbal medicine
    C. Mixed cropping system

D. Forest conservation

Answer: C

4. The Zabo system in Nagaland is primarily used for:

A. Earthquake prediction

B. Urban transportation

C. Integrated water and land management

D. Solar energy generation

Answer: C

5. Which country emphasizes Gross National Happiness (GNH) in its development planning?

A. Nepal

B. India

C. Bhutan

D. Bangladesh

Answer: C

6. What is the function of Biodiversity Management Committees (BMCs)?

A. Managing national parks

B. Exporting herbal products

C. Documenting and protecting local biodiversity and traditional knowledge

D. Regulating industrial licenses

Answer: C

7. Remote Sensing technology is most useful in the Himalayas for:

A. Conducting opinion polls

B. Monitoring ecological changes and hazards

C. Promoting local handicrafts

D. Legal documentation

Answer: B

8. Which practice involves combining fish rearing with rice cultivation, as seen in Arunachal Pradesh?

A. Aquaponics

B. Apatani paddy-cum-fish system

C. Terrace farming

D. Drip irrigation

Answer: B

9. Kath-Kuni is a traditional architectural technique known for its:

A. Wind resistance

B. Fireproof walls

C. Earthquake resilience

D. Water drainage system

Answer: C

10. Which international protocol addresses benefit-sharing related to traditional knowledge?

A. Kyoto Protocol

B. Nagoya Protocol

C. Montreal Protocol

D. Cartagena Protocol

Answer: B

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1.10 TERMINAL QUESTIONS

1. What is the role of traditional ecological knowledge in sustainable Himalayan development?
2. How do GIS and Remote Sensing support planning and disaster management in mountain regions?

3. What are the key challenges in preserving traditional knowledge systems in the Himalayas?
4. Describe the Barahnaja and Zabo systems and their benefits for local communities.
5. What lessons can Indian Himalayan states learn from Nepal and Bhutan's mountain development practices?
6. How do PBRs and BMCs help conserve biodiversity and traditional knowledge?
7. Outline a roadmap for balanced and resilient development in the Himalayan region.
8. How can sustainable and community-based tourism benefit Himalayan development?
9. What problems do geospatial technologies help solve in the Himalayan region? Give examples.
10. Why is community participation important in Himalayan development planning?

BLOCK IV: REGIONAL DEVELOPMENT AND DEISPARITIES IN HIMALAYAN STATES

UNIT-13 INTRODUCTION TO REGIONA; DEVELOPMENT IN HIMALAYAS

13.1 OBJECTIVES

13.2 INTRODUCTION

13.3 OVERVIEW OF THE HIMALAYAN REGION : PYSIOGRAPHY, SOCIO-ECONOMIC CHARACTERISTICS AND POLITICAL DEVISION

13.4 HISTORICAL CONTEXT OF DEVELOPMENT IN HIMALAYAN STATE (PRE-INDEPENDENCE TO POST-LIBERALIZATION)

13.5 DEVELOPMENT INDICATORS : HDI, GDI, MPI – APPLICATION TO HIMALAYAN

13.6 SUMMARY

13.7 GLOSSORY

13.8 ANSWER TO CHECK YOUR PROGRESS

13.9 REFERENCES

13.10TERMINAL QUESTIONS

13.1 OBJECTIVES

After completing this unit, learners will be able to:

1. Understand the key physiographic, socio-economic, and political features of the Indian Himalayan Region (IHR).
2. Trace the historical development of the Himalayan states from pre-independence to post-liberalization.
3. Apply HDI, GDI, and MPI to assess development and disparities in the region.
4. Identify challenges and opportunities in mountain-specific development planning.
5. Evaluate policies for inclusive, sustainable, and gender-sensitive development in the Himalayas.

13.2 INTRODUCTION

The Indian Himalayan Region (IHR), comprising 13 states and union territories, represents one of the most ecologically sensitive and culturally diverse regions in the world. This unit introduces the concept of regional development within the Himalayan context, where physical inaccessibility, fragile ecosystems, and socio-cultural complexity pose unique development challenges. Beginning with an overview of the IHR's physiographic and socio-economic characteristics, the unit examines the historical evolution of development in the region, from colonial neglect to post-independence planning and post-liberalization reforms. It further explores the application of key development indicators such as the Human Development Index (HDI), Gender Development Index (GDI), and Multidimensional Poverty Index (MPI) to evaluate disparities across the region. Through critical analysis, learners will gain insights into the dynamics of inclusive, sustainable, and region-specific development in the Indian Himalayas.

13.3 OVERVIEW OF THE HIMALYAN REGION : PHYSIOGRAPHY, SOCIO-ECONOMIC CHARACTERISTICS AND POLITICAL DEVISION

13.3.1 Physiographic Features

The Indian Himalayan Region (IHR) represents a geostrategically and ecologically significant mountain system that delineates the northern boundary of India. As an integral component of the broader Himalayan arc, the IHR spans over 2,500 kilometers, extending from Jammu & Kashmir and Ladakh in the northwest to Arunachal Pradesh in the east. This region encompasses 13 Indian states and union territories, specifically Jammu & Kashmir, Ladakh, Himachal Pradesh, Uttarakhand, Sikkim, Arunachal Pradesh, Nagaland, Manipur, Mizoram, Tripura, Meghalaya, Assam (partially), and the hill districts of West Bengal.

The Indian Himalayan Region (IHR), characterized by its geological youth and structural activity, constitutes a segment of the Alpine-Himalayan orogenic belt. This belt has been formed as a result of the ongoing tectonic collision between the Indian Plate and the Eurasian Plate. This dynamic interaction has resulted in a complex topography, high seismic activity, fragile slopes, and diverse ecological niches.

a. Physiographic Division of the Himalayas

The Indian Himalayas are conventionally categorized into three primary longitudinal zones, each characterized by unique physical, geological, and environmental attributes. These zones are:

i. Greater Himalayas (Himadri)
ii. Lesser Himalayas (Himachal)
iii. Siwalik Hills (Outer Himalayas)

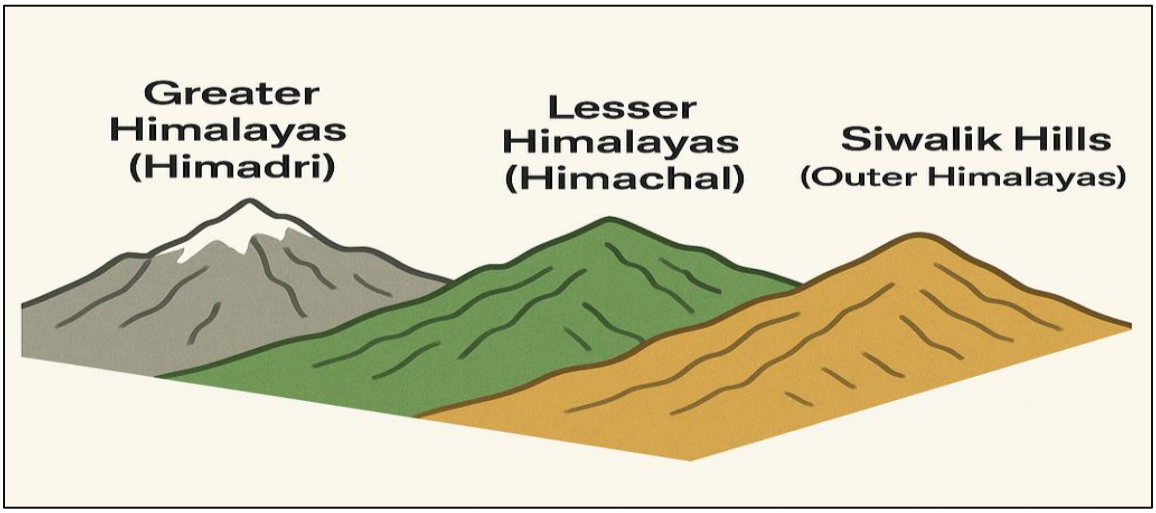


Fig. 13.1. Devision of Himalaya

Source: Google

i. Greater Himalayas (Himadri)

The Greater Himalayas, also referred to as Himadri, constitute the northernmost and highest range within the Himalayan Mountain system. This range forms the central core of the Himalayan belt and encompasses some of the world's most elevated and rugged mountain peaks. The elevations in this region typically range from 6,000 to over 8,000 meters above sea level. Notable peaks within this area include Kanchenjunga (8,586 m) in Sikkim (shared with Nepal), Nanda Devi (7,816 m), and Kamet (7,756 m) in Uttarakhand. The region is distinguished by extensive glacial systems, such as the Gangotri, Zemu, Siachen, and Milam glaciers, which are critical sources for many perennial rivers originating in this zone. Rivers including the Ganga, Yamuna, Satluj, Indus, and Brahmaputra derive their flow predominantly from glacial and snowmelt, rendering the Himadri essential for water security across the Indian subcontinent. Due to its harsh climatic conditions, extreme altitudes, and low oxygen levels, the region remains sparsely populated, with human habitation primarily consisting of pastoral communities and military outposts.

Furthermore, the Himadri lies within a zone of high seismic activity. Movements along major geological faults such as the Main Central Thrust (MCT) make this belt particularly prone to earthquakes and other forms of geological instability.

ii. Lesser Himalayas (Himachal)

Positioned immediately south of the Greater Himalayas, the Lesser Himalayas—or Himachal range—form a transitional belt between the towering Himadri peaks and the Siwalik foothills. Compared to the Himadri, this zone supports a denser population but is also more geologically unstable. The altitudes here generally range between 2,000 and 5,000 metres and are marked by rugged ridges, steep slopes, and deeply incised valleys carved by rivers such as the Beas, Alaknanda, and Teesta. The climate shifts from temperate to cool, with significant rainfall and winter snowfall at higher elevations, fostering varied ecological zones. Popular hill towns like Shimla, Mussoorie, Nainital, Darjeeling, and Gangtok drive the region’s tourism economy. Residents rely on horticulture, terraced cultivation, animal rearing, and tourism-based livelihoods. However, this area is highly vulnerable to environmental hazards, landslides, flash floods, cloudbursts, and soil erosion, conditions worsened by unplanned infrastructure projects, especially road-building on unstable slopes. From a geological standpoint, the presence of

structural features such as the Main Boundary Thrust (MBT) heightens the risk of seismic disturbances.

iii. Siwalik Hills (Outer Himalayas)

The Siwalik range, often referred to as the Outer Himalayas, forms the youngest and southernmost section of the Himalayan mountain system. This range was formed through the accumulation of erosional debris (alluvium) transported from the higher Himalayan regions, resulting in unconsolidated sedimentary rock formations that render it geologically fragile and highly susceptible to erosion. Elevations within the Siwalik zone typically range from 600 to 1,200 meters above sea level. The area supports dense subtropical forests, which are currently under severe threat due to deforestation, agricultural encroachment, and urban expansion. The Siwaliks experience significant soil and water instability, making them prone to mass wasting, stream migration, and seasonal flooding, particularly in the adjacent Terai and Duars foothill zones. Due to their proximity to the Indo-Gangetic plains, numerous rapidly growing towns have emerged in this region, exacerbating environmental stress and the degradation of natural ecosystems. Notably, the Siwalik Range serves as a critical ecological transition zone (ecotone) between the plains and the high mountain ecosystems, playing a vital role in biodiversity conservation and landscape connectivity.

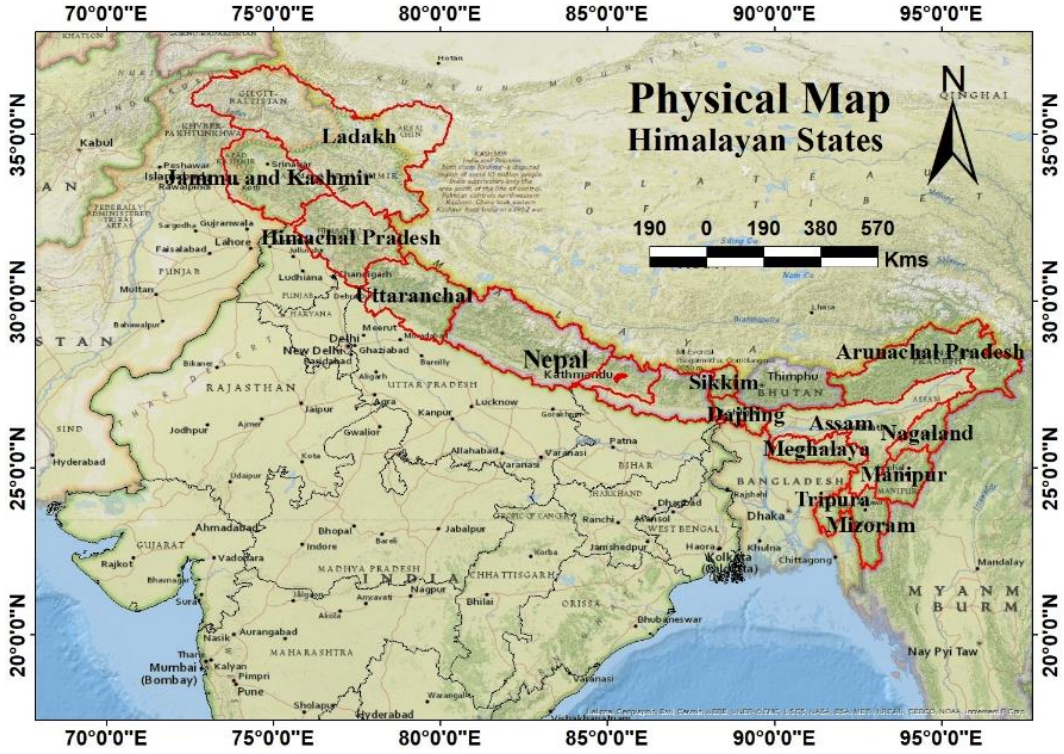


Fig. 13.2. Physical Map of Himalayan States

Sources: Generated by Author

13.3.2 Socio-Economic Characteristics

The Indian Himalayan Region represents not only a remarkable physical landscape characterized by significant elevation and ecological diversity but also a complex human mosaic enriched by cultural plurality and adaptive socio-economic practices. It serves as the habitat for a diverse array of indigenous communities, including, but not limited to, the Bhotias, Monpas, Lepchas, Nagas, Kukis, and Garhwalis. These communities have developed distinctive lifestyles, traditional ecological knowledge systems, and adaptive livelihoods in response to the mountainous terrain, harsh climatic conditions, and limited economic opportunities. The socio-economic characteristics of the region are influenced by both geographical constraints and cultural resilience.

a. Key Economic Activities

- **Agriculture**:Agriculture in the Himalayan region is predominantly characterized by subsistence farming practices. Cultivation is generally conducted on narrow terraced fields, necessitated by the steep slopes and limited availability of arable land. The agricultural productivity in this region is constrained by a short growing season, fragile soils, and erratic weather patterns. Farmers predominantly rely on traditional cropping systems, with principal crops including maize, barley, buckwheat, potatoes, and pulses. Soil fertility is often sustained through organic practices, and crop diversity plays a crucial role in ensuring food security in these isolated regions.
- **Horticulture**:Horticulture has become a crucial economic sector, particularly in mid and high-altitude regions. States such as Himachal Pradesh, Uttarakhand, and Sikkim have leveraged the agro-climatic advantages of these areas to cultivate high-value fruit crops, including apples, apricots, cherries, oranges, and large cardamom. Horticulture not only contributes to income generation but also offers a viable alternative to traditional cereal farming, especially under initiatives like the Mission for Integrated Development of Horticulture (MIDH).
- **Animal Husbandry**:Livestock rearing forms a vital component of the rural economy across the Himalayan belt. In high-altitude zones, such as Ladakh and select areas of Sikkim and Arunachal Pradesh, yaks, sheep, and goats dominate the pastoral landscape. These animals supply essential products including meat, milk, wool, and hides, forming the backbone of

pastoral livelihoods. A traditional practice known as *transhumance,* where herders move seasonally between summer and winter pastures, remains an important livelihood strategy in many parts of the western Himalayas.

- **Handicrafts and Cottage Industries**:Craft traditions not only preserve cultural identity but also provide supplementary income to mountain households. Local artisans produce woollen carpets, shawls, wooden carvings, baskets, and metal artefacts. Women are often at the forefront of these activities, crafting goods for both domestic use and the tourism market. Encouraging handicraft production is also viewed as a means of promoting rural development and empowering women economically.
- **Tourism**:Tourism is among the fastest-growing economic activities in the Indian Himalayan Region, fuelled by its spectacular landscapes, biodiversity, cultural richness, and spiritual destinations. Visitors are drawn to ecotourism sites, pilgrimage routes such as the Char Dham Yatra and Tawang Monastery, and adventure activities including trekking and mountaineering. However, unchecked tourism growth has contributed to environmental degradation, solid waste problems, and strain on local infrastructure—issues particularly visible in sensitive destinations like Manali, Shimla, Gangtok, and Mussoorie.

b. Development Challenges

Despite its abundant natural wealth and vibrant cultural heritage, the Himalayan region remains economically and infrastructurally disadvantaged. Several structural issues continue to hinder its progress:

- **Infrastructure Deficits**: The development of infrastructure in mountainous and remote regions presents significant financial and technical challenges. Road connectivity is often limited, the supply of electricity is inconsistent, and digital infrastructure is particularly underdeveloped, especially in villages situated at high altitudes.
- **Outmigration**: The absence of educational and employment opportunities contributes to the phenomenon of outmigration, particularly among the youth, leading to the emergence of "ghost villages" in regions such as Uttarakhand and Himachal Pradesh. This trend disrupts traditional economic structures and accelerates socio-cultural transformations.
- **Disaster Vulnerability**: The Indian Himalayan Region (IHR) faces a high degree of exposure to natural disasters such as earthquakes, landslides, flash floods, glacial lake outburst floods (GLOFs), and sudden cloudbursts. In recent years, the influence of climate change has

heightened both the occurrence and the intensity of these events, making it even more challenging to sustain and safeguard developmental initiatives in the region.

- **Low Human Development**: Human Development Indicators (HDI) in the northeastern and eastern Himalayan states are consistently below the national average. The distribution of health services is inadequate, and educational institutions frequently suffer from understaffing or are rendered inaccessible due to challenging terrain.
- **Gender Disparity**: Women in the Himalayan region are integral to agriculture, livestock management, and domestic responsibilities, including the collection of firewood and water. Despite their significant contributions, they face restricted access to education, healthcare, financial services, and participation in decision-making processes. Gender inequality persists as a barrier to comprehensive development.

As Sati (2020) elucidates, the socio-economic marginalization of the Himalayan region is exacerbated by a center-periphery divide in national development planning. Policies are frequently formulated without sufficient comprehension of regional specificities, resulting in underinvestment and policy mismatches. To address these disparities, it is imperative to implement decentralized planning, develop mountain-specific policy frameworks, and initiate capacity-building measures grounded in sustainability and resilience.

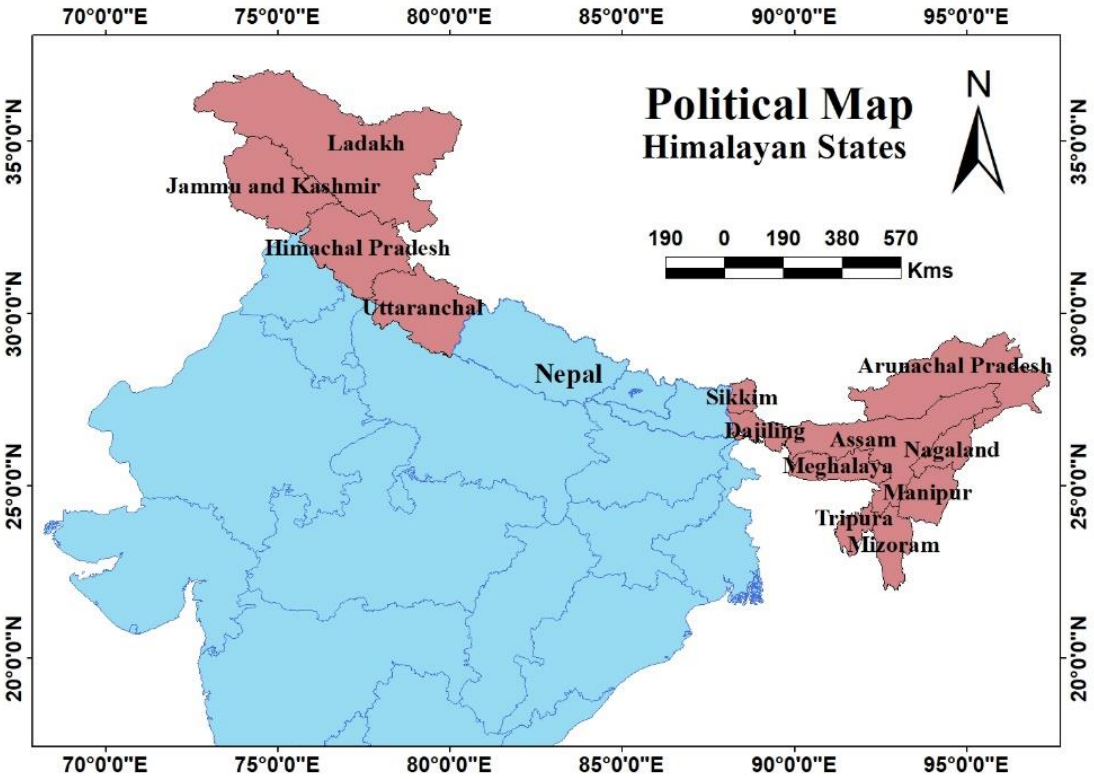
13.3.3 Political Divisions

The Indian Himalayan Region (IHR) constitutes not only a geophysical entity but also a politically intricate area encompassing 13 states and union territories (UTs) of India. This region is integral to India's national security, ecological stability, and cultural heritage. Its administrative divisions significantly impact governance, development strategies, and local identities. The 13 states/UTs comprising the IHR are:

State/UT	Special Characteristics
Jammu & Kashmir	Following the abrogation of Article 370 in 2019, the region was reconstituted as a Union Territory. It encompasses a variety of landscapes, ranging from plains to high mountains, and remains sensitive due to concerns related to cross-border security.
Ladakh	The region, designated as a Union Territory in 2019, was carved out from Jammu and Kashmir. It encompasses the districts of Leh and Kargil. This area is

	characterized by its ecological fragility, sparse population, and significant geopolitical importance due to its border with China.
Himachal Pradesh	This state is noted for having a relatively stable administrative framework and for its thriving horticulture sector—especially the cultivation of apples—alongside a strong tourism economy and commendably high literacy levels. It has also been successful in adopting decentralised governance approaches, most notably through the Panchayati Raj system.
Uttarakhand	Formed in the year 2000, this state remains prone to major natural calamities, including events like the Kedarnath floods and the Chamoli avalanche. It is the origin point of important rivers such as the Ganga and Yamuna, and its economy is strongly supported by pilgrimage-based tourism.
Sikkim	Bordering Nepal, Bhutan, and China, this state has achieved the milestone of becoming entirely organic in its agricultural practices. It is widely acknowledged for its fragile ecological balance and occupies an important position in terms of strategic geography.
Arunachal Pradesh	As the easternmost state of India, it is marked by sparse population, a predominance of tribal communities, and considerable strategic value. The region continues to face persistent difficulties in terms of connectivity and the development of essential infrastructure.
Nagaland	Nagaland, with its largely tribal population, is well known for its system of traditional village councils and the practice of community-based forest management. The state's history includes prolonged periods of insurgency followed by ongoing efforts at peace building through negotiations.
Manipur	This state features a mix of plains and hilly terrain, with the hill areas primarily home to tribal populations. It periodically faces socio-political unrest but also holds considerable potential for cross-border trade with Southeast Asia.
Mizoram	This area is largely mountainous, and the traditional practice of shifting cultivation—locally referred to as *jhum*—remains in use. Although connectivity

	remains a challenge, the state is recognised for its high literacy levels and a generally peaceful social environment.
Tripura	Although Tripura is included within the IHR classification, most of its land area lies in the plains. It has a substantial tribal population and comparatively strong social indicators, but progress is constrained by gaps in infrastructure development.
Meghalaya	This region experiences some of the highest levels of precipitation globally. It operates under a matrilineal social structure and is partially governed by the provisions of the Sixth Schedule of the Constitution.
Assam (Hill districts)	The regions of Karbi Anglong and Dima Hasao require increased autonomy and are experiencing ethnic tensions.
West Bengal (Darjeeling)	The region is recognized for the Gorkhaland movement, which advocates for the establishment of a separate state. It is characterized by a strong Nepali-speaking identity and distinct political aspirations.



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Fig. 13.3. Political Map of Indian Himalayn States

Source: Generated by Author

a. Governance and Development Implications

- **Sixth Schedule Provisions**: The North Eastern states, such as Meghalaya, Mizoram, and certain regions of Assam, benefit from a degree of autonomy facilitated by the establishment of Autonomous District Councils (ADCs).
- **Resource Allocation**: The allocation of resources varies significantly based on state priorities and central government initiatives. Central programs, such as the Border Area Development Programme (BADP) and Special Central Assistance to Hill Areas, are specifically designed to address the needs of border and remote districts. Regions with ecological sensitivity, including Sikkim, Ladakh, and Arunachal Pradesh, receive funding aimed at biodiversity conservation, disaster mitigation, and infrastructure development.
- **Decentralization**: In states like Himachal Pradesh and Sikkim, efforts to strengthen decentralised bodies, such as Panchayati Raj institutions and Eco-Development Committees, have improved planning at the grassroots level, encouraged greater involvement of women, and enabled more effective use of funds for hill area development.
- **Inter-State Disparities**: Some Himalayan states, such as Himachal Pradesh and Sikkim, exhibit superior development indicators compared to others, including Arunachal Pradesh and Nagaland. Himachal Pradesh, Sikkim, and Uttarakhand demonstrate relatively higher levels of development in terms of the Human Development Index (HDI), access to roads and electricity, as well as education and health services. Conversely, Arunachal Pradesh, Nagaland, and Manipur experience developmental challenges due to factors such as difficult terrain, lower investment in infrastructure, and socio-political unrest.

b. **Geopolitical and Security Dimensions :** Border regions such as Ladakh, Arunachal Pradesh, Sikkim, and Nagaland hold significant importance in India's foreign policy and national defense strategy. The existence of international borders in these areas necessitates the development of robust infrastructure, including roads and telecommunications, the active presence of military and paramilitary forces, and the collaboration between civil and military entities in development planning.

The political divisions within the Indian Himalayan Region (IHR) present a complex tapestry of administrative diversity, ranging from highly autonomous tribal councils to Union

Territories directly governed by the central government. This complexity, coupled with ecological vulnerability and cultural distinctiveness, significantly influences the developmental perspective of the IHR. Any regional development strategy must incorporate constitutional decentralization, leverage local governance strengths, address border-area concerns, respect socio-cultural diversity, and adopt environmentally sustainable approaches.

13.4 HISTORICAL CONTEXT OF DEVELOPMENT UN HIMALAYAN STATES (PRE-INDEPENDENCE TO POST-LIBERALIZATION)

The course of regional development in the Indian Himalayan Region (IHR) has been influenced by a long history of socio-political change, environmental constraints, and evolving policy directions. Comprising 13 states and union territories, the IHR displays a wide range of physical features, cultural traditions, and political frameworks.A comprehensive understanding of development patterns in this ecologically fragile and geopolitically sensitive region necessitates a diachronic perspective, spanning from the pre-colonial and colonial periods to the post-independence and post-liberalization eras. This section elucidates the manner in which historical developments have impacted the socio-economic landscape of the Himalayan states, generating both opportunities and enduring disparities.

13.4.1 Pre-Independence Scenario

Prior to India's independence in 1947, the Himalayan region experienced limited and fragmented development. This area was characterized by a combination of feudal governance, colonial exploitation, and tribal autonomy. It was largely neglected in terms of state-building, education, healthcare, and infrastructure, except in regions of strategic interest to the British. The British colonial administration prioritized strategic interests and resource extraction over regional development (Rangan & Kull, 2009).

During the pre-independence era, development within the Himalayan region was characterized by its limited scope and fragmented nature. The governance of the region was conducted under a combination of:

a. Administrative Structure and Political Divisions

- **Feudal Kingdoms and Princely States:** Regions such as Sikkim, Bhutan, and Kashmir were historically governed by local monarchies or chieftains. These rulers maintained socio-political autonomy; however, they lacked modern administrative institutions. Development

efforts were primarily directed towards the needs of the ruling elite, rather than the broader population.

- **Colonial Hill Stations and Strategic Towns:** The British established administrative centers in cooler, elevated regions such as Shimla, Mussoorie, Darjeeling, and Nainital, which served as summer capitals or military cantonments. However, these hill stations were primarily designed for colonial officials and did not significantly contribute to the development of the surrounding rural areas.
- **Tribal and Autonomous Regions:** In the eastern Himalayas, encompassing regions such as Nagaland, Mizoram, and Arunachal Pradesh, indigenous tribal communities have maintained their distinct socio-political systems with minimal external intervention. These regions largely remained outside the purview of mainstream colonial governance, thereby limiting their integration into broader developmental frameworks.

b. Socio-Economic Features

- **Subsistence-Based Economy:** The economic structure was predominantly reliant on agriculture, animal husbandry, shifting cultivation, particularly in the northeastern regions, and the collection of forest products. Both terraced farming and pastoralism were extensively practiced.
- **Limited Infrastructure:** The availability of roads, healthcare, and educational facilities was minimal. This lack of infrastructure significantly impeded accessibility, thereby isolating communities from external markets and governmental services.
- **Colonial Priorities:**

The construction of military routes to Tibet and Central Asia was undertaken for strategic purposes. Additionally, there was the exploitation of natural resources, including timber extraction from the Himalayan forests and the development of tea plantations in Assam and Darjeeling. Furthermore, cinchona plantations were established, particularly in Kalimpong, for the production of quinine. The creation of hill retreats for British officials was also notable, with investments being concentrated in specific urban enclaves.

c. Impact of Colonialism

The British perspective on the Himalayas was primarily strategic and extractive rather than developmental.Rangan and Kull (2009) argue that, during the colonial period, mountain regions were administered primarily with military and economic objectives in mind, rather than

with a focus on improving human welfare.This approach resulted in the economic marginalization of local communities, limited public services, and the creation of regional disparities that persisted post-independence.

13.4.2 Post-Independence Initiatives

Following independence, the Government of India implemented various development initiatives, including Community Development Blocks, hill area development programs, and border area development schemes. These initiatives, however, were predominantly top-down in nature and lacked participatory planning. The attainment of statehood for Himachal Pradesh (1971), Sikkim (1975), and Uttarakhand (2000) facilitated improved access to central funding and governance reforms, although the impact was uneven. Post-1947, India adopted a planned development model, extending several central schemes to hilly and border regions. Nonetheless, early efforts were characterized by centralized planning with limited local participation.

1. Early Post-Independence Programmes

a. **Community Development Programme (1952)**:The initiative to promote rural development at the grassroots level encountered limited success in the inaccessible hilly terrains. It was launched with the objective of initiating grassroots-level rural development through Block Development Offices (BDOs), aiming to address issues such as poverty, illiteracy, and poor health. However, in the Indian Himalayan Region (IHR), poor road access and scattered settlements impeded outreach efforts. Additionally, bureaucratic inefficiencies and a lack of trained personnel diminished the initiative's impact.

b.**Hill Area Development Programme (HADP)**:Initiated during the Fourth Five-Year Plan, targeted development efforts were implemented in selected hill districts, such as those in Assam, Uttar Pradesh, and Tamil Nadu. These efforts concentrated on soil and water conservation, horticulture, and infrastructure development, including rural roads and electricity. However, the approach faced criticism for its top-down implementation, limited community involvement, and failure to incorporate traditional ecological knowledge.

c.**Border Area Development Programme (BADP)** (from 1980s):Intended to improve **security, infrastructure**, and **livelihoods** in sensitive border areas, especially in Arunachal, Ladakh, and Uttarakhand.

d.**Establishment of New States**:**Statehood and Regional Empowerment**

- **Himachal Pradesh (1971):**Following a gradual process of administrative development, the region attained statehood after transitioning from a union territory. This change facilitated increased central funding, which significantly benefited sectors such as tourism, horticulture (notably apple cultivation), and education.
- **Sikkim (1975):**India incorporated the region through a democratic referendum, with a focus on promoting organic farming, sustainable tourism, and environmental conservation.
- **Uttarakhand (2000):**Uttarakhand was established as a separate entity from Uttar Pradesh to specifically address the developmental needs unique to its hilly regions. The state has implemented innovative governance systems tailored to these areas, such as the establishment of Van Panchayats, and has prioritized initiatives in eco-tourism and renewable energy.

Persistent Challenges

- Top-down planning: Although well-intentioned, the majority of schemes were formulated in New Delhi and consequently lacked relevance to local contexts.
- Traditional knowledge systems, such as Baranaja farming, Kuls/Guhls, and Zabo systems, have frequently been overlooked in policy-making, despite their sustainable practices.
- Environmental oversight in infrastructure development, including projects such as hydropower facilities, roads, and hotels, has been insufficient, particularly in the execution of comprehensive Environmental Impact Assessments (EIAs). This deficiency heightens the susceptibility to environmental disasters, notably landslides and floods.
- Disparities Among States: While Himachal Pradesh and Sikkim have made significant progress in Human Development Index (HDI) indicators, Arunachal Pradesh, Nagaland, and Jammu & Kashmir have experienced slower advancements in health and education services.

13.4.3 Post-Liberalization Phase (Post-1991)

India's economic liberalization in 1991 introduced new dynamics to the discourse on Himalayan development. The processes of globalization, tourism, environmental activism, and regional autonomy significantly influenced development planning. The market reforms and global linkages initiated during the economic liberalization of the 1990s had varied impacts on the Himalayan region.

a. Positive Developments:

- The promotion of eco-tourism by states such as Sikkim, Himachal Pradesh, and Uttarakhand represents a strategic approach to sustainable economic development.
- Since the 1990s, there has been a notable increase in the involvement of non-governmental organizations (NGOs) in areas such as education, forest conservation, women's empowerment, and disaster risk reduction.
- Organic and niche agriculture have gained prominence, as evidenced by Sikkim's declaration of itself as a 100% organic state. Similar initiatives have been observed in Uttarakhand and various regions of the Northeast.
- The increased devolution of power through decentralized planning mechanisms, such as Panchayati Raj Institutions (PRIs) and Autonomous Councils (e.g., in the northeastern states), has facilitated the implementation of development initiatives that are tailored to specific regional needs.

b. Persistent Challenges:

- Infrastructural deficiencies, such as substandard road networks and insufficient health and education facilities, continue to pose significant challenges.
- The rapid expansion of tourism, particularly in the regions of Himachal and Uttarakhand, has resulted in significant challenges, including a surge in construction activities, increased pressure on local resources, and a rise in solid waste and vehicular pollution.
- The ecological fragility of the region has been exacerbated by hydroelectric projects, road expansion, and deforestation, resulting in frequent environmental disasters, such as the Kedarnath floods and the land subsidence in Joshimath.
- Market disparities are evident as states such as Sikkim and Himachal Pradesh have reaped the benefits of targeted investments, whereas the North Eastern states continue to experience developmental delays due to their geographical remoteness and ongoing conflicts.

According to NITI Aayog (2018), mountain areas still lag behind the plains in meeting the Sustainable Development Goals (SDGs), largely because of deep-rooted structural challenges and environmental vulnerability. Thus, although economic liberalisation has opened up fresh prospects, it has also highlighted the need for region-specific development approaches that prioritise both ecological balance and inclusive growth.

13.5 DEVELOPMENT INDICATORS: HDI, GDI, MPI – APPLICATION TO HIMALAYAN STATES

Assessing development in the Indian Himalayan Region (IHR) requires the use of measures that go beyond simple economic growth. In mountain areas, human development is influenced by unique challenges such as difficult access, environmentally fragile landscapes, extreme weather conditions, and diverse ethnic compositions. Composite measures like the Human Development Index (HDI), Gender Development Index (GDI), and Multidimensional Poverty Index (MPI) provide a broader view of progress and inequalities across Himalayan states. These indices are particularly valuable for regional planning in sensitive mountain environments, where disparities may occur between rural and urban areas, among different ethnic groups, or across genders, and where remoteness can hide severe deprivation.

13.5.1 Human Development Index (HDI)

Developed by the United Nations Development Programme (UNDP), the Human Development Index (HDI) is a composite measure that captures three core dimensions of development: **health**, indicated by life expectancy at birth; **education**, measured through both the average years of schooling and the expected years of schooling; and **income**, reflected in Gross National Income (GNI) per capita. HDI scores range from 0 to 1, with higher values signifying greater levels of human development.

a. HDI Application in the Himalayas:

While the Himalayan states occupy broadly comparable ecological settings, their Human Development Index (HDI) scores vary significantly. These differences arise from factors such as the level of infrastructure, the quality and reach of education and healthcare, variations in state policies and governance, and the degree of connectivity to surrounding regions, including access to the plains or major trade corridors. Findings from the India Human Development Report (IHDR, 2011) and later state-level studies highlight the extent of these disparities.

Performance Overview (based on India Human Development Report, 2011 and updates)

State/UT	HDI Category (2011)	Key Characteristics
Himachal Pradesh	High (0.652)	Strong education, health infrastructure, rural outreach

State/UT	HDI Category (2011)	Key Characteristics
Sikkim	High (0.636)	Urban-focused development, tourism, organic farming
Uttarakhand	Medium (0.595)	Urban-rural divide, improved education, healthcare lag
Arunachal Pradesh	Low (0.543)	Remote tribal belts, infrastructure deficit
Nagaland	Medium (0.569)	Educated population but economic underdevelopment
Jammu & Kashmir	Medium (0.570)	Conflict zones affect health and mobility
Ladakh (new UT)	Data not separated in 2011; likely low due to harsh terrain and sparse services	

b. Limitations of HDI in the Himalayan Context

Although the Human Development Index (HDI) provides a broad measure of overall development, its use in mountainous areas like the Indian Himalayan Region (IHR) comes with certain methodological and contextual constraints.

1. The computation of the Human Development Index (HDI) at the state level often conceals significant intra-state disparities, particularly between urban centers such as Shimla, Dehradun, and Gangtok, and remote villages located in high-altitude, forested, or tribal regions.
2. The income component of the Human Development Index (HDI) predominantly relies on data from the formal sector and Gross National Income (GNI) per capita. This approach tends to underrepresent non-monetized livelihoods, such as subsistence agriculture, pastoralism, and informal labor, which are prevalent in these regions.
3. Calculating the Human Development Index (HDI) at the state level can mask substantial differences within states, especially between well-connected urban hubs—like Shimla, Dehradun, and Gangtok—and remote settlements in high-altitude, forested, or predominantly tribal areas.
4. The income dimension of the HDI largely draws on formal sector data and Gross National Income (GNI) per capita. As a result, it often overlooks non-monetary forms of livelihood, including subsistence farming, pastoral activities, and informal work, which remain widespread in these mountainous regions.
5. The Human Development Index (HDI) fails to account for essential elements such as ecological sustainability, including forest cover and biodiversity, as well as disaster risks like

landslides and glacial lake outburst floods (GLOFs). Furthermore, it does not consider exposure to climate change, which is a crucial factor influencing the livelihoods and well-being of communities in the Himalayan region.

6. The Human Development Index (HDI) does not incorporate critical aspects such as environmental sustainability—covering factors like forest cover and biodiversity—or the risks posed by natural hazards, including landslides and glacial lake outburst floods (GLOFs). It also overlooks vulnerability to climate change, which plays a decisive role in shaping livelihoods and overall well-being in the Himalayan region.
7. The uniform framework used for calculating the Human Development Index (HDI) often fails to reflect development indicators that are culturally specific, particularly those pertinent to tribal and indigenous populations in the Northeastern and Trans-Himalayan areas.
8. Both seasonal and long-term migration are common in the hill regions, yet the HDI gives limited consideration to how remittances and population outflow influence household prosperity, community dynamics, and shifting gender roles.

c. The Need for Mountain-Sensitive Development Indicators

In response to these limitations, scholars and institutions have called for the adoption of **mountain-specific development indicators**. These indicators include access to transportation and communication infrastructure, disaster preparedness, livelihood security linked to agriculture and forestry, gender-equitable access to natural resources, and the strengthening of cultural resilience and social capital.

Several mountain development frameworks, such as those proposed by ICIMOD and the Mountain Partnership, advocate for region-specific adaptations to the Human Development Index (HDI) by incorporating elements of environmental sustainability and community resilience. While the HDI remains a fundamental instrument for assessing well-being across Himalayan states, its effectiveness is constrained unless it is augmented with localized indicators that capture the distinct geographic, cultural, and ecological characteristics of mountain life. Consequently, policymakers must interpret the HDI within its specific context and supplement it with disaggregated data and participatory assessments to promote inclusive and sustainable development in the Himalayas.

13.5.2 Gender Development Index (GDI)

The Gender Development Index (GDI), introduced by the United Nations Development Programme (UNDP), is a gender-focused variation of the Human Development Index (HDI). It measures differences in human development between women and men across the same three dimensions used in the HDI—health, education, and income. As a tool, the GDI is vital for revealing gender gaps in development, showing how far women and men enjoy equal access to healthcare, education, and economic opportunities.

a. GDI in the Himalayan Context:

In the Indian Himalayan Region (IHR), gender development is shaped by a complex interplay of geographical isolation, cultural norms, tribal practices, and policy interventions. While some Himalayan states demonstrate progressive gender indicators in areas such as education and health, the economic and political empowerment of women often remains limited due to entrenched structural inequalities and persistent patriarchal traditions.

- Himachal Pradesh has made notable progress in female literacy and maternal health, with several districts achieving educational parity. However, women's participation in governance and skilled employment remains limited. In many rural areas, traditional gender roles persist, with women predominantly engaged in unpaid agricultural labor and domestic responsibilities. Policy gaps continue to exist, particularly in the areas of targeted skill development and the representation of women in decision-making processes.
- Meghalaya is distinguished by its matrilineal societal structure, particularly among the Khasi and Garo tribes, where women inherit property and often play a central role in household decision-making. This cultural framework contributes to greater gender parity within domestic spheres. However, women's economic empowerment remains limited, largely due to the scarcity of employment opportunities in the formal sector. In rural areas, traditional gender roles persist, with women primarily engaged in unpaid agricultural work and domestic duties. Policy gaps are evident in the absence of targeted skill development programs and the underrepresentation of women in formal decision-making bodies.
- Sikkim has demonstrated notable progress in promoting gender development, particularly through improved access to education and reproductive health services for women. Gender-inclusive initiatives, such as the formation of women's self-help groups (SHGs) and access to microcredit, have positively influenced women's socio-economic empowerment, especially in rural areas. The state has also taken a proactive approach in integrating women into

agricultural and organic farming sectors through gender-responsive planning. However, despite these advancements, significant gaps remain. Employment in high-skill and formal sectors continues to be predominantly male-dominated, and women's representation in policy formulation and implementation processes remains limited, indicating the need for more targeted efforts to achieve comprehensive gender equity.

- In several Northeastern states such as Nagaland and Manipur, cultural autonomy has contributed to a relatively better social status for women, with female literacy rates in some regions surpassing the national average. However, persistent challenges remain. Women's political representation is notably low, and economic exclusion continues due to limited access to formal markets, land ownership, and entrepreneurship ecosystems. While customary laws play a crucial role in preserving indigenous traditions, they often restrict women's participation in clan councils and other public decision-making forums. As a result, despite social and educational gains, women in these states continue to face significant barriers to economic empowerment and political inclusion within formal governance structures

Although the Himalayan states have recorded clear gains in basic human development measures, the Gender Development Index (GDI) still points to marked inequalities in opportunities and outcomes for women. Evidence from data and case studies shows recurring trends: gains have been achieved in female literacy, healthcare access, and women's participation in self-help groups (SHGs), cooperatives, and civil society organisations. Yet, significant barriers remain. Women are still underrepresented in decision-making spaces such as Panchayati Raj Institutions, state legislatures, and development planning bodies. Their engagement with formal credit systems and influence in financial decisions is limited, and the considerable unpaid work they perform—especially in farming and gathering natural resources—is not reflected in income measures. In addition, gender gaps in land ownership persist, even though women play a crucial role in maintaining mountain-based livelihoods.

The Gender Development Index (GDI) highlights that numerical indicators of access—such as school enrolment—do not always translate into genuine empowerment. It offers valuable insights into women's lived realities in the Himalayan context, revealing both the progressive aspects of tribal and matrilineal traditions and the deep-rooted structural constraints that limit women's economic and political participation. For regional development to be truly inclusive,

gender must be recognised not only as a social category but also as a key factor shaping fair and sustainable growth, especially in mountain regions where women are central to agriculture, forest management, and household well-being.

13.5.3 Multidimensional Poverty Index (MPI)

The Multidimensional Poverty Index (MPI), developed jointly by the Oxford Poverty and Human Development Initiative (OPHI) and the United Nations Development Programme (UNDP), evaluates poverty by examining various forms of deprivation across three key dimensions:

Dimension	Indicators
Education	Years of schooling, school attendance
Health	Nutrition, child mortality
Living Standards	Access to cooking fuel, sanitation, drinking water, electricity, housing, assets

Unlike poverty measures based solely on income, the Multidimensional Poverty Index (MPI) presents a broader picture of deprivation, making it particularly relevant for remote and rural areas where informal economic activities dominate.

a. MPI in the Himalayas (Based on NFHS-5 Data, 2019–21):

- **High MPI Scores**:In Arunachal Pradesh, Nagaland, and parts of Mizoram, inadequate access to healthcare, poor sanitation facilities, and substandard housing conditions remain persistent challenges. Tribal communities in these states frequently reside in remote and geographically inaccessible areas, where the delivery of essential public services is limited or altogether absent. These structural disadvantages contribute to continued disparities in health and overall well-being, despite broader regional improvements in human development indicators.
- **Moderate to Low MPI Scores**:Himachal Pradesh and Sikkim have demonstrated relatively better human development outcomes in rural areas, largely due to successful rural electrification initiatives, effective public health schemes, and improved access to safe drinking water.

- **Urban-Rural Disparity**:Within states like Uttarakhand, there are marked disparities in MPI outcomes. For instance, districts such as Dehradun and Haridwar fare much better on these indicators than the more isolated and mountainous districts of Chamoli, Pithoragarh, and Uttarkashi.

According to Alkire et al. (2015), the Multidimensional Poverty Index (MPI) provides a more comprehensive understanding of deprivation in complex environments such as mountainous regions, where income alone does not accurately represent true well-being.

13.6 SUMMARY

This unit provides a detailed exploration of regional development in the Indian Himalayan Region (IHR), highlighting its unique physical, socio-economic, and political characteristics. It traces the region's developmental journey from the pre-independence era through the post-liberalisation period, examining the role of both central and state-level initiatives in shaping growth trends. The analysis addresses development disparities through the use of composite measures such as the Human Development Index (HDI), Gender Development Index (GDI), and Multidimensional Poverty Index (MPI), while also considering the limitations of these tools in a mountainous setting. Key themes include gender inequality, migration, ecological vulnerability, and variations in governance systems. The discussion underscores the need for mountain-specific indicators, participatory planning processes, and sustainable strategies that align with the ecological conditions and cultural diversity of the Himalayan states.

13.7 GLOSSARY

- **Indian Himalayan Region (IHR):** A geostrategic and ecologically fragile region in northern India comprising 13 states and union territories, extending across the Himalayas from Jammu & Kashmir to Arunachal Pradesh.
- **Regional Development:** A process aimed at improving the economic, social, and environmental conditions of specific geographic areas, often involving targeted policies and planning interventions.
- **Human Development Index (HDI):** A combined measure created by the UNDP that evaluates average achievements in health, education, and income, providing an overall assessment of human development levels across different regions.

- **Gender Development Index (GDI):** A comparative measure that examines differences between women and men in health, education, and income, drawing attention to existing gender gaps in development outcomes.
- **Multidimensional Poverty Index (MPI):** A tool designed by OPHI and UNDP to capture multiple, overlapping deprivations in areas such as health, education, and living standards, assessed at the household level.
- **MatrilinealSociety:** A social system where lineage, inheritance, and property pass through the female line, as observed among the Khasi and Garo tribes in Meghalaya.
- **DecentralizedPlanning:** A governance approach that delegates planning authority to local bodies (e.g., Panchayats) to ensure more region-specific and participatory development.
- **Outmigration:** The movement of people from rural or remote regions to urban areas, often due to lack of opportunities, resulting in demographic and socio-economic shifts.
- **Ecological Fragility:** A condition where ecosystems are highly sensitive to disturbance, common in mountain regions due to steep slopes, deforestation, and climate change.
- **Hill Area Development Programme (HADP):** A central government initiative launched to address the development needs of hill areas through targeted investments in infrastructure, agriculture, and basic services.

13.8 ANSWER TO CHECK YOUR PROGRESS

1. Which of the following is NOT part of the Indian Himalayan Region (IHR)?

A. Sikkim
B. Nagalan
C. Kerala
D. Uttarakhand

Answer: C

2. The Human Development Index (HDI) measures development using which three components?

A. Health, Gender, Employment
B. Education, Income, Health
C. Agriculture, Education, Sanitation

D. Infrastructure, Population, Literacy

Answer: B

3. The matrilineal society is predominantly found among which tribes in Meghalaya?

A. Bhotias and Monpas

B. Kukis and Nagas

C. Khasi and Garo

D. Lepchas and Garhwalis

Answer: C

4. Which of the following states has declared itself a 100% organic farming state?

A. Uttarakhand

B. Himachal Pradesh

C. Sikkim

D. Arunachal Pradesh

Answer: C

5. Which development program was launched in 1952 to promote grassroots-level rural development?

A. HADP

B. BADP

C. Community Development Programme

D. National Rural Livelihood Mission

Answer: C

6. What is a major limitation of the HDI in the Himalayan context?

A. It overestimates tribal welfare

B. It excludes ecological and cultural dimensions

C. It does not measure health indicators

D. It is based on outdated data

Answer: C

7. The practice of shifting cultivation (jhum) is commonly found in which Himalayan state?

A. Himachal Pradesh
B. Mizoram
C. Sikkim
D. Jammu & Kashmir

Answer: B

8. The Gender Development Index (GDI) evaluates disparities in which dimensions?

A. Education, Nutrition, Land Ownership
B. Health, Education, Income
C. Labor, Governance, Livelihoods
D. Culture, Politics, Employment

Answer: B

9. The phenomenon of "ghost villages" in states like Uttarakhand is primarily due to:

A. Earthquakes
B. Outmigration
C. Tourism saturation
D. Floods

Answer: B

10. Which of the following is a key objective of decentralized planning in the Himalayan region?

A. Increase foreign investment
B. Strengthen border defense
C. Promote local participation in development
D. Privatize public services

Answer: C

13.9 REFERENCES

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13.10 TERMINAL QUESTIONS

1. What are the main physical and socio-economic characteristics of the Indian Himalayan Region (IHR)?
2. How have the Himalayan states evolved from the pre-independence period to the post-liberalization era?
3. In the Himalayan context, how useful is the Human Development Index (HDI), and what are its limitations?
4. How do gender disparities appear in the Himalayan region when viewed through the Gender Development Index (GDI)?
5. Why is the Multidimensional Poverty Index (MPI) important for assessing poverty in the Himalayan states?
6. What are the major development challenges in the Himalayas, and how might they be addressed?
7. How can decentralized planning help promote development in the hill states?
8. In what ways does climate change influence development in the Himalayan region?
9. How do tourism and organic farming contribute to regional development in the Himalayas?
10. What strategies could ensure inclusive and sustainable development in the Himalayan region?

UNIT 14: SPATIAL AND SECTORAL DISPARITIES IN THE HIMALAYAN REGION

14.1 OBJECTIVES

14.2 INTRODUCTION

14.3 INTER-STATE AND INTRA-STATE DISPARITIES

14.4 AGRICULTURE AND RURAL LIVELIHOODS

14.5 INFRASTRUCTURE

14.6 SUMMARY

14.7 GLOSSARY

14.8 ANSWER TO CHECK YOUR PROGRESS

14.9 REFERENCES

14.10 TERMINAL QUESTIONS

14.1 OBJECTIVES

After studying this chapter you will be able to:

- Analyze the opportunities and difficulties for integrated hill area development after reading this chapter.
- Recognize the differences in infrastructure, livelihoods, and essential services between and within states in the Himalayan region.
- Examine conventional farming practices and evaluate how contemporary interventions affect rural livelihoods.
- Assess the causes and effects of gender inequality, youth outmigration, and migration in Himalayan states.
- Find policy gaps unique to a given region and offer inclusive, long-term fixes for balanced regional growth.

14.2 INTRODUCTION

The Himalayan region, which includes Himachal Pradesh, Uttarakhand, and the northeastern states, is one of India's most culturally and ecologically diverse areas. Notwithstanding its importance, the area still experiences pervasive sectoral and spatial inequalities that impede balanced development. The complex interaction of topographical limitations, inadequate infrastructure, socioeconomic marginalization, and policy neglect is the cause of these disparities.

This chapter explores how uneven development is manifested in the form of inter-state and intra-state differences in access to agriculture, healthcare, education, roads, communication, and employment opportunities**.** Special focus is given to the traditional versus modern approaches in agriculture and rural livelihoods, and how modernization has brought both opportunities and ecological challenges. The discussion also highlights the migratory trends, especially youth outmigration**,** and the resulting feminization of agriculture in many Himalayan communities. Using real-world case studies from key Himalayan states, this unit helps learners analyze why certain areas remain underdeveloped while others advance, and how integrated, inclusive, and ecologically sensitive planning can bridge these gaps. The chapter encourages

critical thinking about the need for a region-specific development approach**,** blending traditional knowledge with appropriate modern interventions.

14.3 INTER-STATE AND INTRA-STATE DISPARITIES

The Indian Himalayan Region (IHR) is ecologically fragile, geographically diverse, and culturally rich. However, despite its significance, it experiences wide disparities in development -both between states (inter-state) and within states (intra-state). These disparities manifest in economic indicators, infrastructure, healthcare, education, and accessibility.

The Himalayan region, though rich in ecological and cultural diversity, faces significant spatial and sectoral disparities that hinder balanced development. These disparities manifest across various sectors such as agriculture, infrastructure, education, health, and employment. In this unit, we examine inter-state and intra-state inequalities, particularly in Himachal Pradesh, Uttarakhand, and North-Eastern states. The analysis focuses on rural livelihoods, infrastructure gaps, demographic challenges, and development interventions to address regional imbalances.

Inter-State Disparities

These refer to differences in development indicators such as income, health, education, infrastructure, etc., between two or more states. For example, one state may have better road networks and educational facilities than its neighboring state. Different Himalayan states have experienced uneven development due to variations in governance, geographic accessibility, and investment patterns.

- **Himachal Pradesh** has shown better progress in health and education indicators due to stable governance and infrastructure development.
- **Uttarakhand** faces challenges due to its fragile ecology and difficult terrain, leading to uneven growth between its plains (e.g., Dehradun, Haridwar) and hill districts (e.g., Pithoragarh, Chamoli).
- **North-Eastern states** The North-Eastern states remain varied—Sikkim has succeeded in areas like organic farming, while states like Arunachal Pradesh and Manipur struggle with isolation and insurgency.

Intra-State Disparities

These involve regional inequalities within the same state, such as between rural and urban areas, plains and hills, or tribal and non-tribal regions. Even a well-performing state might have backward districts suffering from poor services and low development.

Even within a single state, significant disparities exist:

- In Uttarakhand, districts in the plains receive more development funds and facilities compared to remote hill regions.
- In Himachal Pradesh, lower areas like Kangra and Mandi are better connected and developed than upper districts like Lahaul-Spiti or Kinnaur.
- Assam shows a gap between the relatively developed Brahmaputra Valley and underdeveloped hill areas like Karbi Anglong.

Each state has internal regions of imbalance. In Uttarakhand, Dehradun and Haridwar have far outpaced the hill districts in development. Himachal's Kangra and Shimla are better developed compared to remote areas like Lahaul-Spiti. Assam presents a stark contrast between Guwahati and the Barak Valley. These differences often align with accessibility and administrative priority.

Sectoral Disparities

The disparities extend across various sectors such as agriculture, infrastructure, employment, and social development.

Agriculture and Rural Livelihoods

Traditional farming practices like terrace cultivation and rain-fed agriculture dominate. Though biodiversity is maintained, yields are often low. Modern interventions such as poly-houses, organic farming, and scientific cultivation (initiated under MOVCDNER and RKVY schemes) are improving productivity in places like Sikkim and Himachal. Still, challenges like small landholdings, market inaccessibility, and youth migration persist.

Infrastructure (Roads, Communication, Health, Education)

Infrastructure is a major indicator of development disparity. Himachal shows good road and school access in many areas, while states like Arunachal and Nagaland face seasonal

isolation. Internet and mobile networks remain unreliable in many border districts. Initiatives such as Bharatmala (launched 2017) and PMGSY (launched 2000) aims to improve connectivity.

Employment and Migration

Lack of employment opportunities is driving large-scale outmigration in hill states. This leads to ghost villages and feminization of agriculture, where women shoulder more responsibilities without proportional income or authority. The 2019 UNDP report notes high migration rates in Uttarakhand hill districts.

Comparative Study of Spatial, Sectoral, and Socio-Economic Disparities in the Himalayan States

There are notable internal and regional differences in the Himalayan place, which includes states like Himachal Pradesh, Uttarakhand, and the North-Eastern states.

Table-14.1:
Comparative Socio-Economic Indicators (as of 2021)

Indicator	Himachal Pradesh	Uttarakhand	North-East States (Avg.)	Source
Literacy Rate (%)	83%	79%	73% (avg.; Mizoram 91%, Arunachal 66%)	Estimated: NSS/ASER, 2021
Road Density (km/100 sq.km)	50	38	20–25 (varies by state; lowest in Arunachal, 2020)	MoRTH, 2020
Urban Population (%)	10.0%	30.2%	~18%	Estimated: NSS/Planning Dept., 2021
GDP per capita (INR)	₹2,10,000	₹1,90,000	₹1,50,000	NSO, 2022

***Source**: Compiled by author using data from MoRTH (2020), NSO (2022), NSS/ASER estimates (2021), and Census 2011 projections. Official Census 2021 data is pending release.*

These variations can be seen in sectoral performance, spatial development patterns, and socioeconomic indicators. Through the lenses of intra-state disparities, inter-state contrasts, and socioeconomic data, the following tables offer a comparative framework for understanding these disparities.

This table presents key quantitative indicators such as literacy rate, road density, urbanization, and per capita GDP. It compares the overall socio-economic status of Himachal Pradesh, Uttarakhand, and the North-Eastern states, highlighting developmental gaps and variations in infrastructure, education, and income levels.

Table-14.2:
Intra-State Disparities in the Himalayan States

State/Region	Disparity Type	Example(s)	Disparity Description	Key Sectoral Gaps
Himachal Pradesh	Intra-State	Kangra vs. Lahaul-Spiti Shimla vs. Chamba	Developed tourism/agriculture vs. tribal isolation and poor maternal health	Health, transport, governance
	Inter-State	With J&K and Punjab	Better in education/health than J&K, but industrially behind Punjab	Industrial sector
Uttarakhand	Intra-State	Plains vs. Hills Haridwar vs. Bageshwar Dehradun blocks	Plains urbanized; hills poor in services and outmigration. Haridwar shows hidden poverty.	Employment, health, urban planning
	Inter-State	With Himachal & Sikkim	Strong plains but poor hill policy; eco-tourism mismanaged	Environment, regulation
North-East States	Intra-State	Assam (Brahmaputra vs. Barak) Meghalaya (blocks) Nagaland (districts)	Disparities in infrastructure, poverty, climate vulnerability, and employment schemes	Jobs, health, livelihood
	Inter-State	Sikkim vs. others	Sikkim leads in literacy and farming; others struggle with roads, insurgency, economy	Governance, infrastructure

Source: Compiled from NITI Aayog, ICIMOD, State Development Reports, Census of India, and relevant academic studies on Himalayan disparities.

This section identifies internal regional disparities within each Himalayan state. Examples like Kangra vs. Lahaul-Spiti in Himachal or Haridwar vs. Bageshwar in Uttarakhand illustrate how development is unevenly distributed due to geography, accessibility, and policy focus. The table links these disparities to sectoral gaps in health, transport, employment, and governance.

14.4 AGRICULTURE AND RURAL LIVELIHOODS

Agriculture in the Himalayan region is deeply connected to its geography, climate, and traditional knowledge systems**.** However, with growing challenges like climate change, soil degradation, and rural outmigration, there has been a shift toward modern agricultural interventions**.** This has led to both opportunities and new disparities.

1. Traditional Agricultural Practices

a) **Subsistence Farming and Small Landholdings**

- Agriculture in the Himalayas is primarily subsistence-based, meaning farmers grow crops mainly for household consumption rather than commercial sale.
- Land fragmentation is common due to inheritance patterns and the mountainous terrain, making large-scale farming impractical.
- This model ensures food security but offers limited cash income, contributing to rural poverty in some regions.

b) Terrace Farming and Soil Conservation

- The steep slopes of the Himalayan terrain have led to the innovation of terrace farming, where flat plots are carved into hillsides.
- This prevents soil erosion, enhances water retention, and makes cultivation possible on otherwise unworkable land.
- It reflects an intimate understanding of local ecology and resource management.

c) **Use of Indigenous Crop Varieties**

- Traditional farmers use native crops such as millets, barley, buckwheat, and pulses, which are suited to the harsh climate.
- These crops are pest-resistant, drought-tolerant, and help in maintaining soil fertility.
- The preservation and exchange of seeds across generations contributes to agro-biodiversity and food resilience.

d) Mixed Farming Systems

- Most households practice mixed farming, combining crop cultivation with animal husbandry.
- Livestock such as cows, goats, and poultry provide milk, meat, wool, and manure, creating a self-sustaining agricultural cycle.
- This system minimizes dependence on external inputs and supports ecological balance.

e) Community-Based Resource Management

- Traditional agriculture is closely tied to communal living. Shared irrigation systems, grazing lands, and forest management (e.g., Van Panchayats in Uttarakhand) highlight a cooperative approach.
- Barter systems and informal labor exchange reinforce social cohesion and allow marginal farmers to participate meaningfully.

2. Modern Agricultural Practices

a) Introduction of High-Yielding Varieties (HYVs) and Hybrid Seeds

- Modern agriculture introduced HYVs and hybrids to increase productivity.
- These are frequently inappropriate for mountain ecosystems and require more water, chemical fertilizers, and pesticides.
- Reliance on outside seed markets diminishes crop diversity and threatens local seed sovereignty.

b) Use of Chemical Fertilizers and Pesticides

- Chemical inputs were promoted to boost yields but often result in:
    - Soil degradation
    - Water pollution
    - Loss of beneficial insects and pollinators
- These effects are magnified in ecologically sensitive mountain zones.

c) Mechanization and Technological Tools

- Tools like power tillers, threshers, and small tractors are promoted in valleys.
- But large-scale mechanization is limited by:
    - Narrow fields
    - Steep gradients
    - Lack of access roads
- Technological interventions are therefore unevenly distributed.

d) Policy Interventions and Government Schemes

- Programs like PM-KISAN, Rashtriya Krishi Vikas Yojana (RKVY), and subsidies for organic inputs aim to support farmers.
- However, remote villages often miss out due to poor implementation and geographic isolation.
- Bureaucratic hurdles and lack of awareness prevent full benefit realization.

e) Shift to Cash Crops and Commercial Farming

- Farmers increasingly grow apples (Himachal), tea (Assam), spices (Sikkim) for better income.
- While these offer market access and profit, they:
    - Increase input costs
    - Expose farmers to market volatility
    - Monoculture risks reduce ecological resilience

f) Promotion of Organic Farming

- States like Sikkim have embraced organic agriculture, banning chemical inputs.
- Benefits include:
    - Soil regeneration
    - Healthier produce
    - Ecotourism potential
- Yet challenges persist in:
    - Obtaining certification

- Marketing produce
- Farmer training and support

3. Disparities and Challenges in Rural Livelihoods

Rural livelihoods in the Himalayan region are shaped by a unique blend of ecological constraints, traditional practices, and evolving modern interventions. While agriculture remains the backbone of the rural economy, communities face a range of challenges that vary by geography, access to infrastructure, policy outreach, and social dynamics. The table below outlines the key disparities and constraints that hinder sustainable and equitable rural development in this fragile mountain environment.

Table-14.3:

Disparities and Challenges in Rural Livelihoods – Himalayan Region

Category	Issues/Challenges	Impacts/Consequences
Geographical & Infrastructure Disparities	- Uneven access to roads, markets, storage, irrigation - Isolation of high-altitude villages	- Limited access to inputs and markets - Regional imbalance in development
Lack of Awareness & Extension Services	- Poor agricultural training - Weak extension networks in hilly areas	- Low adoption of modern methods - Farmers miss government benefits and schemes
Ecological Fragility & Climate Vulnerability	- Landslides, floods, droughts - Climate change impacts	- Soil erosion - Biodiversity loss - Water scarcity
Outmigration & Labor Shortage	- Youth migration for jobs - Feminization of agriculture	- Aging population left to farm - Women lack access to tools, training, and credit

Source: Compiled from academic curriculum (Unit 14), government schemes (PMGSY, NHM, Bharat Net), and regional data from Planning Commission, NITI Aayog, Census of India, and Ministry of Rural Development.

In summary, the disparities in Table 14.3 reveal that rural livelihood challenges in the Himalayan region are deeply interconnected. Addressing them requires integrated strategies that improve infrastructure, strengthen extension services, build climate resilience, and create local

employment, thereby fostering sustainable and inclusive development in these fragile mountain areas.

14.5 INFRASTRUCTURE

1. Roads and Transportation

a) Topographical Barriers

The Himalayan terrain, with its high-altitude slopes, deep valleys, and fragile geology, creates significant challenges for road construction. Natural hazards such as landslides, avalanches, flash floods, and earthquakes frequently disrupt transportation routes. Steep gradients increase construction costs and make maintenance an ongoing burden. These barriers not only delay infrastructure projects but also isolate many villages from year-round access, especially during the monsoon and winter seasons. As a result, communities remain disconnected from essential services, markets, and emergency facilities.

b) Intra-state Disparities

Even within individual Himalayan states, infrastructure development is uneven. While urban centers and tourist destinations like Shimla, Dehradun, or Gangtok are relatively well-connected, interior villages in tribal or higher altitude areas often lack basic road access. In Uttarakhand, for example, remote villages in districts like Pithoragarh or Chamoli face much poorer connectivity compared to the plains of Haridwar or Dehradun. Intra-state disparities are further widened by political and administrative neglect, where development is concentrated in accessible areas, leaving peripheral zones underdeveloped.

c) Developmental Impact of Poor Road Connectivity

The absence of reliable road infrastructure severely limits rural development. Farmers struggle to transport perishable goods to markets, affecting their income. Children have difficulty accessing schools, and medical emergencies become life-threatening due to travel delays. Poor connectivity also hampers the delivery of government welfare schemes and discourages tourism, which could otherwise be a source of livelihood. Ultimately, road disparity reinforces the cycle of poverty and isolation in the region.

d) Government Schemes and Implementation Gaps

National-level programs such as the **Pradhan Mantri Gram Sadak Yojana (PMGSY)** were designed to connect all-weather roads to rural villages. Although this scheme has had notable success in the plains, implementation in the Himalayan region faces challenges such as high project costs, frequent weather-related damage, and difficulty in mobilizing construction equipment. Many road projects are delayed or abandoned, and maintenance is irregular, highlighting a gap between policy and ground reality.

2. Communication Infrastructure

a) Digital Divide and Connectivity Challenges

Digital infrastructure is weak in the Himalayan states, especially in high-altitude, forested, or border areas. Mobile towers are sparse, and internet speed is unreliable. Power outages and network failures are common, especially during adverse weather conditions. This creates a digital divide where people in remote areas are left out of the benefits of online services like e-governance, digital banking, online education, and telemedicine. The lack of digital access widens the knowledge gap and deepens existing socio-economic inequalities.

b) Regional Disparities in Access

Urban centers such as Shimla, Dehradun, and Itanagar have comparatively better connectivity, while rural and tribal areas lag far behind. States like Sikkim and Nagaland have made some digital progress, but remote areas in Arunachal Pradesh or eastern Uttarakhand still remain poorly served. In such areas, digital illiteracy and lack of infrastructure reinforce exclusion.

c) Impacts on Socio-Economic Development

Poor communication networks hinder the timely dissemination of weather alerts, market price updates, health advisories, and education-related notifications. During disasters, lack of communication infrastructure severely restricts rescue and relief operations. In a digital economy, being unconnected equates to being disadvantaged, especially for youth and farmers.

d) Initiatives and Roadblocks

Programs like Bharat Net aim to bring fiber-optic internet to rural India, including the Himalayan states. However, the actual rollout is slow due to terrain-related difficulties, lack of local manpower, and delays in coordination between agencies. Even where hardware is installed, power shortages and technical maintenance issues limit its use.

3. Education Infrastructure

a) Limited Availability of Educational Institutions

The geographical spread of population in the Himalayas means that many villages do not have access to secondary or higher education. Most schools are limited to primary education, forcing students to travel long distances—often by foot—to attend higher classes. In tribal regions of the North-East and upper Himalayan belts, there may be no school at all within a 5-10 km radius. This discourages attendance, particularly among girls, and contributes to high dropout rates.

b) Staff Shortages and Poor Facilities

A chronic lack of trained teachers, especially in science and mathematics, plagues rural schools. Many positions remain unfilled due to unwillingness of teachers to work in remote areas with limited amenities. Schools often operate in poor buildings, with inadequate furniture, toilets, drinking water, and learning materials. Multi-grade teaching (one teacher managing multiple classes) is common, which compromises the quality of education.

c) Gender and Social Disparities in Education

In areas with poor transport and unsafe routes, parents often hesitate to send girls to school. The lack of female teachers also discourages girl students. Tribal and marginalized communities, due to economic pressures and cultural factors, may prioritize child labor or domestic help over education. As a result, these groups remain excluded from upward mobility opportunities.

d) Government Schemes and Limitations

Efforts like Sarva Shiksha Abhiyan (SSA) and Mid-Day Meal Schemes have improved enrolment, but the quality of education remains low. Residential schools like Kasturba Gandhi Balika Vidyalayas aim to support girls' education, but accessibility remains an issue. Scholarships and financial support often do not reach the most deserving due to bureaucratic delays or lack of awareness.

4. Healthcare Access

a) Lack of Health Infrastructure in Remote Areas

Primary health infrastructure—such as Sub-Centres, PHCs, and CHCs—is absent or dysfunctional in many parts of the Himalayas. Villages located in far-flung valleys may have no medical facility within a 10–20 km radius. Emergency services like ambulances are either unavailable or cannot reach due to poor road conditions. This results in high maternal mortality, delayed treatment, and reliance on unqualified practitioners.

b) Shortage of Trained Medical Personnel

Doctors and paramedics are reluctant to work in remote or high-altitude areas due to professional isolation, lack of housing, and limited career growth. Many sanctioned posts remain vacant, and facilities often run without specialists or even nurses. This shortage severely impacts maternal and child healthcare, vaccination programs, and disease control measures.

c) Dependence on Traditional Healing Practices

Many tribal and rural populations rely on herbal remedies, spiritual rituals, or local healers because modern healthcare is inaccessible to them. Even though some traditional knowledge systems work well, in severe cases, the lack of a formal diagnosis and emergency care can be lethal. The lack of access to or mistrust of contemporary healthcare services is also reflected in this dependence.

d) Efforts under National Health Schemes

Ayushman Bharat and the National Health Mission (NHM) are two programs that seek to provide insurance coverage and improve public health systems. However, in the most remote

Himalayan regions, such programs remain largely ineffective without basic infrastructure like roads, electricity, and internet connectivity.

5. Employment Challenges and Livelihood Opportunities

a) Limited Non-Farm Employment

The majority of jobs in the Himalayan region are reliant on livelihoods derived from agriculture, animal husbandry, or forests. However, these sectors frequently fall short of producing enough revenue because of small landholdings, dwindling productivity, and limited market access. Due to inadequate infrastructure, low investment, and a dearth of skill development initiatives, there are few non-farm employment opportunities in sectors like manufacturing, services, or industries.

b) Seasonal and Informal Work

When there are non-agricultural jobs, they are frequently low-paying and seasonal. Many people work in low-skilled tourism, road construction, or construction jobs that don't provide healthcare, retirement benefits, or job security. This leads to underemployment and a dependence on irregular incomes, especially among the youth and marginalized communities.

c) State-wise Employment Disparities

Himachal Pradesh has relatively better employment opportunities due to tourism and horticulture (like apple farming), while states like Arunachal Pradesh or Nagaland struggle with fewer economic alternatives. Even within states, towns fare better than remote villages.

6. Migration Patterns and Their Effects

a) Youth Outmigration

One of the most critical demographic trends in the Himalayan region is the outmigration of youth—particularly males—to urban centers for work, education, or better living conditions. This is driven by the lack of local employment opportunities, poor infrastructure, and the aspiration for better lifestyles. Rural areas are left with an ageing population and a shortage of active labor, which directly affects farming and local economies.

b) Feminization of Agriculture

As men migrate to cities, women are left behind to manage agricultural work, livestock, and household responsibilities. This has led to the **feminization of agriculture**, where women are the primary cultivators but often without access to land ownership, credit, training, or modern farming tools. This increases their workload and economic vulnerability.

c) Remittance Economy and Its Limits

Migrants often send money back to their families, creating a remittance-based rural economy. While this helps with household expenses, it also creates dependence and does not address the root causes of migration. Moreover, migration often leads to the breakdown of traditional social structures and weakening of community ties.

7. Gender Disparities and Social Imbalances

a) Unequal Access to Resources

In the Himalayan region, women play an important role in household management, agriculture, and even the gathering of forest resources. They hardly ever have access to credit and extensions services, though, or are the legitimate owners of land. Even though their contribution to economic activity has grown, they are still underrepresented in the formulation of policies and decision-making processes.

b) Barriers to Education and Skill Development

Due to a lack of local institutions, a shortage of female teachers, safety concerns, or household duties, girls in isolated Himalayan villages frequently drop out of school after primary school. Additionally, women and girls are underrepresented in skill-development a program, which restricts their access to higher-paying occupations.

c) Health and Nutritional Disparities

Women and girls are more susceptible to under nutrition, anemia, reproductive health problems, and inadequate maternal care because of social norms, poverty, and a lack of health infrastructure. Inequality is further reinforced by the gender disparity in health outcomes.

8. Demographic Imbalances and Social Change

a) Ageing Rural Population

The elderly and children now make up the majority of the population in many villages in the Himalayan states due to persistent youth outmigration. In addition to causing labor shortages, decreased productivity, and challenges upholding cultural customs and agricultural methods, this places a burden of dependency on women.

b) Ghost Villages and Rural Decline

The term "ghost villages" refers to the entire villages that have been abandoned as a result of migration in parts of Himachal Pradesh and Uttarakhand. Local economies are collapsing, schools and health facilities are closing, and people's quality of life is generally declining in these areas.

c) Cultural and Psychological Impacts

Long-term migration can lead to identity crises, disrupt social networks, and upend community life, particularly for young people who feel cut off from their heritage. Loneliness, social insecurity, and psychological stress are prevalent but frequently ignored problems for women and older people who are left behind.

14.6 SUMMARY

This Unit provides a detailed examination of the spatial and sectoral disparities in the Indian Himalayan region. It begins with an analysis of agriculture and rural livelihoods**,** comparing sustainable traditional practices like terrace farming and mixed farming with the challenges introduced by modern interventions such as hybrid seeds, chemical inputs, and cash cropping. The chapter then shifts focus to infrastructure gaps**,** revealing how uneven access to roads, education, healthcare, and communication services leads to regional imbalances and isolation, especially in remote or high-altitude villages.

Further, it examines employment-related challenges**,** highlighting the problems of seasonal migration, youth outmigration, and gender disparities in labor. The role of policy initiatives, government schemes, and organic farming promotion is also discussed, alongside the ecological fragility of the region and increasing vulnerability due to climate change**.**

In conclusion, the chapter emphasizes that no one-size-fits-all solution will work for the Himalayas. Development must be location-specific, inclusive of traditional wisdom**,** and supported by appropriate modern technologies and infrastructure**.** Only a balanced and sustainable approach can reduce disparities and ensure resilience and prosperity for Himalayan communities.

14.7 GLOSSARY

1. **Spatial Disparities** – Unequal development across different regions or geographic areas.
2. **Sectoral Disparities** – Imbalance in growth between economic sectors like agriculture, industry, and services.
3. **Subsistence Farming** – Farming mainly for family consumption rather than for sale.
4. **Terrace Farming** – Step-like farming on hills to prevent soil erosion and retain water.
5. **Agro-biodiversity** – Variety of crops and livestock used in farming systems.
6. **Van Panchayat** – Community-managed forest system in Himalayan villages.
7. **High-Yielding Varieties (HYVs)** – Improved crop seeds designed to increase productivity.
8. **Monoculture** – Cultivation of a single crop over large land area.
9. **Ecological Fragility** – The sensitivity of mountain ecosystems to environmental changes.
10. **Feminization of Agriculture** – Increasing role of women in farming due to male migration.
11. **Outmigration** – Movement of people from rural to urban areas for better opportunities.
12. **Integrated Hill Area Development** – Holistic planning approach tailored to mountain regions.
13. **Organic Farming** – Farming without synthetic fertilizers or pesticides.
14. **Intra-State Disparities** – Uneven development between different parts of the same state.

14.8 ANSWER TO CHECK YOUR PROGRESS

1. Topographical barriers and fragile ecology make infrastructure development in the Himalayan region difficult and uneven.

2. Traditional farming practices like terrace cultivation and mixed cropping support ecological balance but face challenges due to modernization.

3. There is a wide gap in infrastructure and basic services between the hill and plain regions within the same state, such as in Uttarakhand and Himachal Pradesh.
4. Outmigration from hill regions leads to depopulation, feminization of agriculture, and labor shortages.
5. Community-based systems like Van Panchayati help manage forest resources and support local livelihoods sustainably.
6. Integrated Hill Area Development promotes region-specific planning that considers socio-economic, cultural, and environmental dimensions.
7. The education and healthcare sectors in the Himalayan region are limited by poor accessibility and lack of skilled manpower.

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14.10 TERMINAL QUESTIONS

Long Questions

1. Explain the nature and causes of inter-state and intra-state disparities in the Himalayan region with examples from Himachal Pradesh, Uttarakhand, and the North-East.
2. Discuss the role of traditional agricultural practices and their relevance in sustaining rural livelihoods in the Himalayan region.
3. Analyze the infrastructural challenges in the Himalayan region related to roads, communication, education, and healthcare.
4. How do a migration impact rural society, economy, and gender relation in the Himalayan hill states?
5. Evaluate the effectiveness of modern interventions in agriculture and compare them with traditional methods.
6. What are the key components of Integrated Hill Area Development, and why is it essential for balanced regional development?

Short Questions

1. Define spatial disparities with reference to the Himalayan region.
2. What are the key features of traditional farming in hill areas?

3. Mention any two infrastructural challenges faced by Himalayan states.
4. What is the meaning of "feminization of agriculture"?
5. How does topography affect rural infrastructure development?
6. What role do Van Panchayats play in forest management?
7. Give two reasons for high rates of outmigration in the Himalayas.
8. Name any two government initiatives supporting hill development.
9. What are intra-state disparities? Give one example.
10. How is the healthcare system affected by remoteness in hill areas?

Multiple Choice Questions

1. Which of the following is a major reason for outmigration in Himalayan regions?
   a) Better roads
   b) Fertile soil
   c) Lack of employment opportunities
   d) Urban pollution

2. Terrace farming is practiced in the Himalayan region to:
   a) Increase rainfall
   b) Prevent soil erosion
   c) Improve export quality
   d) Reduce mechanization

3. Which Himalayan state is India's first fully organic state?
   a) Himachal Pradesh
   b) Uttarakhand
   c) Sikkim
   d) Arunachal Pradesh

4. Van Panchayats are community-managed forests found in:
   a) Sikkim
   b) Manipur
   c) Uttarakhand

d) Meghalaya

5. What is the main cause of intra-state disparities in the Himalayan region?

a) Language barriers

b) Topographical variations

c) Uniform climate

d) Urban proximity

6. Which of the following sectors dominates the rural economy of the Himalayas?

a) Mining

b) Heavy industries

c) Agriculture

d) IT sector

7. Which traditional practice conserves biodiversity in Himalayan farming?

a) Monoculture

b) Slash-and-burn

c) Agro-biodiversity

d) Drip irrigation

8. One of the major infrastructure challenges in hill areas is:

a) High population density

b) Easy connectivity

c) Fragile terrain

d) Over-irrigation

9. Feminization of agriculture refers to:

a) Women leaving agriculture

b) Men taking over farms

c) More women managing farms due to male migration

d) Gender-neutral farming

10. Which sector shows a clear disparity between hills and plains?

a) Tourism

b) Infrastructure

c) Defense

d) Software

11. Which state is used as a case study for infrastructure disparity in the chapter?

a) Gujarat

b) Himachal Pradesh

c) Tamil Nadu

d) Odisha

12. Which factor limits road construction in hilly areas?

a) High population

b) Dense forests

c) Steep slopes and landslides

d) Political instability

13. Migration from Himalayan regions leads to:

a) Urban unemployment

b) Over-farming

c) Aging rural population

d) More tourism

14. Which initiative promotes organic farming in Himalayan regions?

a) PM-KUSUM

b) Sikkim Organic Mission

c) MIDH

d) AMRUT

15. Integrated Hill Area Development aims to:

a) Isolate villages

b) Focus on only agriculture

c) Combine social, economic, and environmental development

d) Privatize rural land

Answer. 1.c) 2.b) 3.c) 4.c) 5.b) 6.c) 7.c) 8.c) 9.c) 10.b) 11.b) 12.c) 13.c) 14.b) 15.c)

UNIT 15: ENVIRONMENTAL CONSTRAINTS AND DEVELOPMENT CHALLENGES

15.1 OBJECTIVES

15.2 INTRODUCTION

15.3 ENVIRONMENTAL CONSTRAINTS IN DEVELOPMENT

15.3.1 NATURAL RESOURCE LIMITATIONS

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15.4 DEVELOPMENT CHALLENGES

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15.5 GLOBAL AND NATIONAL PERSPECTIVES

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15.8 SUMMARY

15.9 UNIT END QUESTIONS

15.10 REFERENCES / SUGGESTED READINGS

15.1. OBJECTIVES

After reading this unit you willbe able to:

- Learnt about Environmental Constraints in Development
- ExplainNatural Resource Limitations
- Gain knowledge aboutPollution and Environmental Degradation
- Explain sustainable Development Dilemma

15.2 INTRODUCTION

The basis of all life and economic activity on Earth is the environment. It includes the natural resources that are necessary for human survival and development, including air, water, land, forests, minerals, and biodiversity. Development, on the other hand, refers to the process of improving the quality of life, economic prosperity, and social well-being of people.

However, the environment is frequently under tremendous strain as a result of the pursuit of development. Deforestation, urbanisation, industrialisation, and overuse of resources have all contributed to serious environmental deterioration. This leads to a paradox: although development is necessary for human advancement, if environmental constraints are disregarded, it may jeopardise its very basis. Understanding environmental constraints has become essential for attaining sustainable development in the current climate of resource depletion, ecological crises, and climate change.

15.3 ENVIRONMENTAL CONSTRAINTS IN DEVELOPMENT

Environmental constraints, which frequently result from the need to maintain ecological balance and guarantee sustainability, are the inherent limitations that have an impact on human activities and development projects. These limitations include things like pollution, soil erosion, water scarcity, biodiversity loss, climate change, and the limited supply of natural resources. Development initiatives may cause environmental deterioration if they are not properly thought out, which could have long-term negative effects on the economy and society. Urbanisation of wetlands or wooded areas, for instance, can upset ecosystems and make people more susceptible to natural disasters like floods. To ensure that

growth does not come at the expense of the planet's health and the well-being of future generations, sustainable development practices must incorporate environmental considerations into planning and decision-making processes.

15.3.1 Natural Resource Limitations

The availability of vital inputs for economic activity and human well-being is directly impacted by natural resource limitations, making them one of the most important constraints facing sustainable development. Most development processes are based on land, water, forests, and minerals, but these resources are limited and frequently under increasing strain from urbanisation, industrialisation, and population growth. A vital resource for industry, housing, infrastructure, and agriculture is land. However, the amount of arable land is limited and frequently deteriorated by soil erosion, deforestation, and overuse, which lowers its productivity and jeopardises food security.

Another essential resource is water, which is required for industrial operations, drinking, irrigation, and sanitation. But because of over-extraction, pollution, and climate change, many areas are experiencing water scarcity, which fuels competition and conflict for access. Because of logging, agriculture, and urban sprawl, forests—which offer timber, non-timber products, habitat for biodiversity, and vital ecosystem services like carbon sequestration and water regulation—are rapidly disappearing.

In addition to affecting climate stability, deforestation endangers rural and indigenous communities' means of subsistence. In a similar vein, while minerals like coal, iron, copper, and rare earth elements are necessary for technology, building, and energy production, their extraction frequently leads to habitat loss, environmental damage, and socioeconomic inequality. Furthermore, access to and control over mineral reserves are geopolitical issues because they are non-renewable and concentrated in particular areas. These constraints on natural resources emphasise how urgently responsible management, conservation, and the shift to more equitable and sustainable development systems that respect ecological boundaries and guarantee resource availability over the long term are needed. For instance, excessive irrigation for agriculture is causing serious groundwater depletion in Indian states like Punjab and Haryana.

15.3.2 Pollution and Environmental Degradation

Environmental deterioration and pollution have grown to be worldwide issues that endanger life as we know it. The environment is seriously out of balance as a result of human activities like industrialisation, urbanisation, deforestation, and excessive resource consumption. For example, in cities like Delhi, Beijing, and Los Angeles, where smog, vehicle emissions, and industrial smoke frequently make the air unsafe to breathe, air pollution has reached dangerous levels. Heart problems, respiratory ailments, and even early deaths have resulted from this. Another major problem is water pollution; rivers like the Ganges and the Yamuna in India are heavily contaminated by plastics, industrial effluents, and untreated sewage, rendering the water unfit for human consumption and destroying aquatic ecosystems. In a similar vein, marine pollution has jeopardised fisheries and coral reefs in nations like Bangladesh and Indonesia, upsetting the livelihood of coastal communities.

Deforestation, mining, and the excessive use of chemical pesticides and fertilisers all contribute to soil degradation, which is a serious concern. For instance, soil erosion and desertification are causing food insecurity and decreasing agricultural productivity in large portions of Africa and India. Sea levels are rising as a result of global warming brought on by greenhouse gas emissions, which is melting glaciers in the Arctic and Himalayas and endangering low-lying nations like Bangladesh and the Maldives. The Amazon rainforest and Australia's 2019–2020 forest fires have brought attention to how quickly biodiversity can be lost and how delicate ecosystems are.

Climate change, biodiversity loss, a lack of clean resources, and an increase in natural disasters are the results of these problems taken together. Ignoring these issues could cause the planet to enter an irreversible decline. Nonetheless, initiatives like the 2015 Paris Agreement, the prohibition of single-use plastics in numerous nations, the encouragement of renewable energy sources like solar and wind, afforestation drives, and campaigns like the "Clean India Mission (Swachh Bharat Abhiyan)" demonstrate that constructive change is achievable when citizens and governments collaborate. Restoring environmental balance requires eco-friendly technology, sustainable development, stronger regulations, and personal accountability through actions like cutting back on waste, conserving water, and implementing green practices. Preserving the environment is not only our obligation, but also essential to future generations' survival.

15.3.3 Biodiversity Loss

A major threat to ecological balance and human survival is biodiversity loss, which is defined as the reduction in the variety of life forms—plants, animals, and microorganisms—that exist on Earth. The primary reasons for the decline in species diversity are pollution, overfishing, poaching, urbanisation, rapid deforestation, and climate change. For instance, logging, mining, and agriculture have destroyed large tracts of the Amazon rainforest, sometimes referred to as the "lungs of the planet," putting numerous species, including tree frogs, macaws, and jaguars, in jeopardy.

Similar to this, increasing ocean temperatures and acidification are destroying coral reefs, which are home to almost 25% of marine life. In recent decades, Australia's Great Barrier Reef has experienced severe coral bleaching events. Due to human interference, many once-abundant species—like the dodo bird, the Asiatic cheetah, and the Yangtze river dolphin—are now critically endangered or extinct. In addition to diminishing the beauty of nature, biodiversity loss erodes ecosystems that support vital functions like pollination, oxygen production, soil fertility, and climate regulation. For example, because bees are essential crop pollinators, the global decline in bee populations has sparked worries about global agriculture. Humanity runs the risk of losing not only species but also food security, medical resources, and ecosystems' inherent resilience if biodiversity continues to decline. To stop this loss and maintain the rich web of life that all living things rely on, it is imperative to conserve forests, save endangered species, reduce pollution, and support sustainable development.

15.3.4 Population Pressure

Population pressure is a condition that is brought about by the population of a place increasing to an extent where it becomes larger compared to the available facilities and resources. It leaves human needs in a state of imbalance with regard to the capacity of the environment to provide for these needs. As numbers go up, humans need more land for accommodation, agriculture, and industries, which in turn results in deforestation, loss of arable land, and reducing green cover. Consequently, demand for water, food, and energy increases manifold, leading to over-extraction of rivers, groundwater, and fossil fuels. In cities, population pressure is experienced in population-congested cities, traffic congestion, slum population settlements, poor sanitation, and overload on healthcare and educational

centres. For example, urban centres such as Delhi, Mumbai, and Lagos are suffering from acute problems of pollution, waste disposal, and lack of living space because of huge population growth. The countryside is also not exempt, as population pressure tends to result in splitting up of holdings and movement to the cities in the hope of employment. Internationally, countries like Sub-Saharan Africa and South Asia are experiencing high birth rates, which are a cause of poverty, unemployment, and food insecurity. Without control via education, family planning, and responsible use of resources, population pressure can decelerate economic growth, damage ecosystems, and jeopardize the well-being of current and future generations.

15.4 DEVELOPMENT CHALLENGES

Development challenges are the problems and hindrances that societies encounter in their attempts to attain progress in economic development, social welfare, and environmental sustainability. As development seeks to enhance living standards, generate jobs, and eradicate poverty, it is usually thwarted by issues like high population growth, uneven resource distribution, poverty, unemployment, illiteracy, poor health, and corruption. In most developing nations, rural regions continue to lack facilities such as clean drinking water, electricity, good roads, and quality education, which is gradually slowing down progress overall. Urban areas, however, have issues of overpopulation, pollution, and insufficient infrastructure to accommodate increasing numbers of people. International issues like climate change, natural resource depletion, and increasing economic disparities also hamper the process of development. For instance, though India has progressed outstandingly in technology and industry, it continues to have problems of poverty, malnutrition, joblessness, and environmental degradation. The greatest challenge for developing and developed countries alike is balancing economic development with social justice and environmental sustainability. Therefore, to overcome these challenges, there has to be long-term planning, good governance, human development investment, and global cooperation.

15.4.1 Sustainable Development Dilemma

Development objectives usually clash with conservation of the environment. For example, dam construction produces power but can drown forests and evict peoples. Balancing growth and sustainability is a key challenge. The sustainable development problem is the tricky balance between meeting current human demands and preserving the

environment for the future. On the one hand, there is a need to develop to alleviate poverty, generate employment, construct infrastructure, and enhance living conditions; on the other hand, uncontrolled industrialization, urbanization, and exploitation of resources tend to lead to deforestation, pollution, loss of biodiversity, and global warming.This leads to a dilemma between economic development and environmental conservation. For instance, a developing nation might have to construct more factories to create jobs, but this can result in increased emissions of carbon and health risks. Likewise, large dams or mining operations can produce power and revenue but also displace people and hurt the environment. The dilemma is most clearly evident in countries of high growth such as India and China, where development demand is extremely high, while environmental degradation also threatens sustainability drastically. At the global level, this challenge is being tackled through Sustainable Development Goals (SDGs) in which there is focus on inclusive growth, green energy, resource preservation, and social equality. Hence, the sustainable development conundrum is in the middle route where development and prosperity can march hand in hand with environmental stewardship and intergenerational equity.

15.4.2 Technological and Financial Constraints

It takes high investment and technical know-how to switch to clean technologies like renewable energy, which most developing nations do not possess.

Technological and financial limits are principal obstacles that restrain the speed and extent of development in most nations. Contemporary growth entails sophisticated technologies for agriculture, industries, medicine, education, and environmental conservation, but a majority of developing countries do not have access to such technologies because they are expensive or reliant on outside expertise. For example, small-scale farmers cannot afford advanced irrigation technology, high-yielding seeds, or computer-based equipment, which limits agricultural output.Likewise, factories in developing nations will keep using old machinery since it takes enormous capital investment to procure sophisticated technology. Budgets also restrict the capacity of governments to offer quality infrastructure such as roads, electricity, schools, and health facilities. Tight budgets, budget deficits, and absence of foreign investment hinder large-scale development projects from being financed. Poverty, joblessness, and inequality linger due to this. By contrast, industrialized nations with robust economies and sophisticated technologies develop more rapidly, and an international development gap ensues. Transcending these difficulties depends on international

collaboration, technology transfer, cheap capital availability, and creative solutions adapted to specific needs. Without overcoming technological and cost challenges, sustainable and inclusive development is hard to attain.

15.4.3 Policy and Governance Issues

Weak implementation of environmental regulations, poor coordination between agencies, and corruption are factors that contribute to ineffective environmental management.

Example: Illicit mining persists in most areas of India in spite of stringent rules.

Policy and governance concerns are major hindrances to ensuring inclusive and balanced development. Good governance means clear decision-making, good policies, accountability, and efficient implementation, but weak institutions, political instability, corruption, and absence of long-term vision in most countries slow down progress. Misframed policies or uneven regulations most of the time create wastage of resources and unequal benefit distribution. For instance, delays in the construction of infrastructures as a result of red tape, abuse of public resources, or changes in government policies from time to time will deter investment and decelerate development.

In most developing countries, rural regions continue to be left behind due to policy biases towards urban areas, enhancing the gap between urban and rural areas. Likewise, poor enforcement of labor and environmental laws leads to exploitation of the community and resources. Good governance is also attributed to the participation of people—unless there are inclusive policies addressing the concerns of the marginalized, inequality keeps increasing. Nations with robust governance frameworks, such as Singapore or the Scandinavian countries, demonstrate how transparent institutions and citizen-centered policies can drive swift development. Therefore, overcoming policy and governance challenges is necessary to guarantee equitable distribution of resources, sustainable development, and social justice.

15.4.4 Social and Equity Issues

Environmental costs tend to fall disproportionately on marginalized peoples. Displacement by infrastructure projects, inaccessibility to clean water, and pollution generate concerns of environmental justice.

Social and equity problems crop up when development gains are not equitably distributed between various sections of society, causing inequality, exclusion, and social

tension. Economic development has failed to bring along many vulnerable segments like women, children, rural dwellers, minorities, and the poor, who remain left behind in access to education, health, jobs, and decision-making.

This generates a vast disparity in the rich and poor, urban and rural, and privileged and marginalized. For instance, while cities can boast of well-equipped schools, hospitals, and employment opportunities, most villages are still far behind in basic amenities such as clean water, electricity, and quality education. The same goes with the disparity in gender, where there is inequality in wages, political empowerment, and control over resources. Caste and class discrimination in certain societies even further entrench social cleavages. These disparities not just retard overall development, but also imperil social peace and justice. Inclusive growth can only be achieved through policies aimed at equal opportunities, social welfare programs, empowerment of weaker sections, and human rights protection. Real development can be evaluated only when its gains percolate down to all segments of society on equitable and fair terms.

15.5 GLOBAL AND NATIONAL PERSPECTIVES

Development must be understood in global and national terms since challenges and solutions are interlinked in the modern world. Globally, problems like climate change, poverty, migration, pandemics, and economic inequality hit more than one country at the same time and demand global action through international agencies such as the United Nations, World Bank, and World Health Organization. The Sustainable Development Goals (SDGs), for example, offer a shared platform on which all nations work towards eliminating poverty, providing education and healthcare, advancing gender equality, and conserving the environment. At the national level, however, each country experiences challenges that are specific to its history, economy, culture, and system of governance. For instance, whereas rich countries emphasize high-technology advances, clean energy, and innovation, developing nations such as India or Nigeria give importance to poverty alleviation, generation of employment, and primary infrastructure. National policies should complement international commitments in catering to domestic needs for promoting balanced growth. Therefore, global and national visions go hand in hand—global collaboration offers suggestions and resources, whereas national actions ensure that development is pragmatic, equitable, and appropriate for local context.

Global Efforts:

International cooperation is important for tackling development issues that transcend the ability of any individual country. Issues like climate change, poverty, hunger, health emergencies, and inequality are all global in scope and need international cooperation. Global bodies such as the United Nations (UN), World Bank, International Monetary Fund (IMF), and World Health Organization (WHO) collaborate to formulate policies, offer financial support, and ensure sustainable development globally. The Paris Climate Accord, Sustainable Development Goals (SDGs), and international trade alliances are some of the cooperative efforts directed towards establishing a more sustainable and equitable future. Developed countries also assist developing nations through foreign aid, technology transfer, and capacity-building initiatives. For example, during the time of the COVID-19 pandemic, programs such as COVAX were initiated to provide equitable vaccine distribution among countries. Nevertheless, disparities in economic strength, political agendas, and distribution of resources tend to create problems for effective global collaboration. Despite all these challenges, international efforts are still crucial to promote peace, promote greater equality, safeguard the environment, and make development dividends available to all parts of the globe.

India's Initiatives:

India has made various efforts to meet its development challenges and ensure inclusive and sustainable development. Acknowledging the burden of population, poverty, lack of employment, and environmental degradation, the government has launched a variety of policies and programs at national and local levels. In rural regions, programs such as the Mahatma Gandhi National Rural Employment Guarantee Act (MGNREGA) ensure employment and enhance livelihoods, while Pradhan Mantri Gram Sadak Yojana enhances rural connectivity. In the education and health sectors, programs like the Right to Education Act, Mid-Day Meal Scheme, Ayushman Bharat, and National Health Mission work on decreasing inequalities and enhancing the quality of life. To tackle housing and city problems, initiatives such as Pradhan Mantri Awas Yojana and Smart Cities Mission focus on offering affordable homes and state-of-the-art infrastructure. India is also wedded to environmental sustainability by means of International Solar Alliance, National Electric Mobility Mission, and massive afforestation campaigns. Moreover, digital efforts such as Digital India, Startup India, and Skill India promote entrepreneurship, youth empowerment,

and innovation. These efforts demonstrate India's attempt to harmonize national development agendas with international frameworks such as the Sustainable Development Goals (SDGs) for growth that is inclusive, people-oriented, and environmentally friendly.

15.6 STRATEGIES TO OVERCOME CHALLENGES

Addressing development challenges calls for carefully designed strategies to balance economic growth, social justice, and environmental sustainability. Governments at the policy level need to ensure good governance, transparency, and proper implementation of development programs. Education, healthcare, and skill development need to be invested in to develop human capital and eliminate poverty and unemployment. Sustainable agriculture, renewable energy, and green industries can be encouraged to resolve environmental issues and create livelihoods.

Financial inclusion in the form of microfinance, cheap credit, and digital banking can empower the poor, women, and rural communities. Technology is to be utilized not merely for industrial development but also for enhancing public services such as e-governance, online education, and telemedicine. Good social welfare programs and affirmative measures are required to break barriers between the rich and poor, urban and rural, and privileged and marginalized sections. At the international level, cooperation, technology transfer, and climate action commitments are needed to address global issues. People's participation and participatory initiatives are also important in order to provide accountability and local relevance. By integrating these approaches, countries can provide avenues for inclusive, equitable, and sustainable development.

15.7 CASE STUDIES/EXAMPLES

India’s Solar Energy Expansion under the International Solar Alliance:

India's solar energy drive under the International Solar Alliance (ISA) has been an international example for driving renewable energy and sustainable development. It was launched in 2015 with its headquarters in Gurugram, Haryana, as an alliance of more than 100 nations, mostly nations of the tropics, aiming to utilize solar energy to keep pace with mounting energy needs while lessening reliance on fossil fuels. India has taken the lead by not only launching the partnership but also ambitious domestic goals, including developing

500 GW of renewable energy capacity by 2030. By large-scale initiatives like the world's largest solar park in Karnataka (Pavagada Solar Park) and huge rooftop solar schemes, India has shown how solar can be brought down the cost curve, made accessible, and scaled up. The ISA also aims at mobilizing finance, exchanging technology, and strengthening capacity among member states, particularly developing nations, to use clean energy technologies. The program has assisted in decreasing the cost of solar energy worldwide, promoted global coordination, and made India a leader in the climate change battle worldwide. By championing solar power, India not only satisfies its national energy requirements but also helps achieve the United Nations' Sustainable Development Goals (SDGs) immensely, thus being a success story in the promotion of renewable energy globally.

The 1984 Bhopal Gas Tragedy is still one of the worst industrial accidents in the world and a stark reminder of industrial complacency coupled with lax environmental and safety regulations. On the evening of 2–3 December 1984, a toxic leak of methyl isocyanate (MIC) gas from the Union Carbide India Limited (UCIL) pesticide plant in Bhopal, Madhya Pradesh, reached all over the city and exposed hundreds of thousands of individuals to poisonous fumes. Within days, more than 3,000 people were killed. Eventually, long-term death and health issues caused over 15,000 lives to be affected. Survivors experienced chronic respiratory ailments, ocular diseases, neurological injury, and congenital malformation in later generations. The disaster exposed serious shortcomings of industrial safety protocols, emergency unpreparedness, and the failure of the government to monitor risky industries. Furthermore, undue delays in compensation, inadequate rehabilitation, and incomplete medical care intensified the pain of victims. Internationally, the tragedy was a wake-up call to increase awareness of corporate responsibility, environmental justice, and the imperative for more stringent regulations of risky industries. For India, it resulted in the enforcement of stronger environmental controls, formulation of the Environment Protection Act (1986), and the institution of disaster management institutions, but it is also a reminder, painful in nature, that human welfare and safety should never be sacrificed at the altar of industrial development.

15.8 SUMMARY

The way to development has to go hand in hand with environmental sustainability. Unsustainable use of nature results in irreversible destruction that may endanger future generations. A balance has to be found between economic growth, social justice, and

ecological preservation. By combined efforts at the global level, strong policies, technological change, and popular participation, humankind can break through environmental limitations and create real sustainable development.

Development is a multifaceted process that requires balancing economic growth, social equity, and environmental sustainability. As opportunities like technological progress, growth in renewable energy, and international cooperation provide new avenues for progress, challenges like population pressure, financial and governance limitations, social inequality, and environmental degradation continue to retard inclusive growth. Success stories, including India's solar energy leadership through the International Solar Alliance, prove that novel approaches and international collaborations can build sustainable options. Equally, disasters like the Bhopal Gas Tragedy teach us about the risks of complacency, poor regulation, and uneven priorities. The path ahead consists of embracing people-oriented policies, good governance, equitable resource distribution, and adoptive sustainable measures that safeguard both current and future generations. Development is only meaningful if it is inclusive, equitable, and responsible towards the environment, so that the gains of progress are shared by all segments of society while protecting the planet.

15.9 UNIT END QUESTIONS

1. Define environment and development. Discuss how the pursuit of development creates pressure on the environment, citing relevant examples.
2. What are environmental constraints in development? Explain with suitable examples how factors like climate change, biodiversity loss, and pollution can hinder sustainable growth.
3. Discuss the limitations of natural resources such as land, water, forests, and minerals. How do these limitations impact sustainable development in India? Give examples.
4. Examine the causes and consequences of pollution and environmental degradation at the global and national levels. Suggest measures to mitigate these challenges.
5. What is biodiversity loss? Explain its causes and impacts on ecological balance and human life with examples from around the world.

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UNIT 16: POLICIES, INSTITUTIONS, AND THE WAY FORWARD

16.1 OBJECTIVES

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16.3 NATIONAL AND STATE-LEVEL POLICIES FOR HILL DEVELOPMENT

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16.1 OBJECTIVES

After studying this chapter you will be able to:

- Understand the ecological and strategic importance of the Indian Himalayan Region (IHR).
- Learn about key policies such as NMSHE, HADP, and NEIDP for hill development.
- Identify the roles of major institutions involved in Himalayan development.
- Explore sustainable development methods like ecotourism and agro-forestry.
- Examine challenges and opportunities for integrated hill area development.

16.2 INTRODUCTION

The Indian Himalayan Region (IHR) is essential for water security, biodiversity, agriculture, and climate regulation. However, the region faces serious challenges like ecological fragility, climate change, natural disasters, migration, and economic inequalities. To tackle these problems, the government has introduced several national and state policies, including the National Mission on Sustaining the Himalayan Ecosystem (NMSHE), the Hill Area Development Programme (HADP), and the North East India Development Programme (NEIDP). These initiatives aim to support sustainable and inclusive development that fits the specific needs of hill areas. Key institutions like MDoNER, NITI Aayog, G.B. Pant Institute, and ICIMOD are important for planning, research, and coordinating policies. At the local level, Panchayati Raj Institutions (PRIs) and NGOs help ensure community involvement and execution.

This unit examines these policies, institutional roles, and community-led efforts to offer a clear understanding of sustainable development in the hills.

16.3 NATIONAL AND STATE-LEVEL POLICIES FOR HILL DEVELOPMENT

The Indian Himalayan Region (IHR) is ecologically fragile and economically important, contributing to water security, biodiversity, agriculture, and energy. However, it faces many

challenges, including climate change, natural hazards, social and economic inequalities, and migration. Several policies and programs have been introduced to meet the developmental needs of hill regions while ensuring environmental sustainability.

National Mission on Sustaining Himalayan Ecosystem (NMSHE)

This mission seeks to build long-term national capacity for monitoring the health of the Himalayan ecosystem, support policy-makers, and assist states in implementing sustainable development actions. The NMSHE started in June 2010 and received formal approval in 2014. It acknowledges the vulnerability of the Himalayan ecosystem and the importance of sustainable practices.

Launched as part of the National Action Plan on Climate Change (NAPCC), the NMSHE aims to:

- Understand and tackle the impacts of climate change on Himalayan glaciers, biodiversity, and traditional livelihoods.
- Build institutional and human capacities for ecosystem monitoring.
- Encourage regional cooperation among Himalayan states.
- Provide scientific support for policy development and sustainable growth.

Table-16.1
NMSHE Initiatives: Real-Life examples from Himalayan States

State	NMSHE Project	Outcomes
Sikkim	Climate-resilient farming (2018)	Increased local awareness; early warning for floods and landslides
Uttarakhand	Glacier monitoring (Gangotri Glacier)	Helped understand glacial retreat; improved community-based disaster preparedness
Himachal Pradesh	Alpine ecosystem monitoring in Lahaul–Spiti	Protected rare species; informed biodiversity conservation and eco-tourism plans

Source: Based on NMSHE reports by the Ministry of Science & Technology, DST, and GB Pant Institute of Himalayan Environment under NAPCC.

Sikkim – Climate-Resilient Farming

In 2018, a project initiated by NMSHE set out to promote climate-smart agriculture. The focus was on enhancing resilience against floods, erratic rainfall, and landslides in glacier-fed regions like the Teesta Basin.

Here are some of the outcomes:

- Farmers embraced improved practices for managing water and conserving soil.
- Early warning systems were established to notify communities about potential landslides and floods.
- There was a noticeable increase in local training and awareness.

Uttarakhand, Glacier Monitoring

NMSHE also backed scientific research in the Gangotri Glacier area. This project aimed to evaluate the rate at which glaciers are retreating and the implications for water flow and disaster risks.

Outcomes included:

- The establishment of baseline data for tracking long-term glacier changes;
- The provision of disaster preparedness training to nearby villages;
- Assistance to policymakers in developing climate adaptation strategies;

Himachal Pradesh, Alpine Ecosystem Monitoring

In Himachal Pradesh, specifically in the stunning Lahaul and Spiti region, a project funded by NMSHE is taking a closer look at high-altitude ecosystems that are feeling the heat from climate change. Researchers are keeping a close eye on how alpine plants and animals are faring, especially those rare medicinal plants and species that rely on snow.

Here's what they've achieved:

- They've made strides in conserving rare and endangered species.
- They've provided valuable insights for planning sustainable eco-tourism.
- They've fostered environmental education for both local communities and visitors.

Hill Area Development Programme (HADP)

HADP is a well-established program aimed at developing infrastructure, agriculture, horticulture, and a forestation in hilly regions. Its goal is to tackle regional disparities through thoughtful planning and resource distribution. The program provides special central assistance to these hill areas, typically on a 90:10 grant-loan basis, addressing the specific development challenges they face.

HADP has several key objectives:

- Focuses on the unique developmental needs of each region.
- Originally launched in the Western and Eastern Ghats, it has since been adapted for the Himalayan regions.
- Prioritizes infrastructure, agriculture, horticulture, and a forestation that are specifically suited to hill environments.

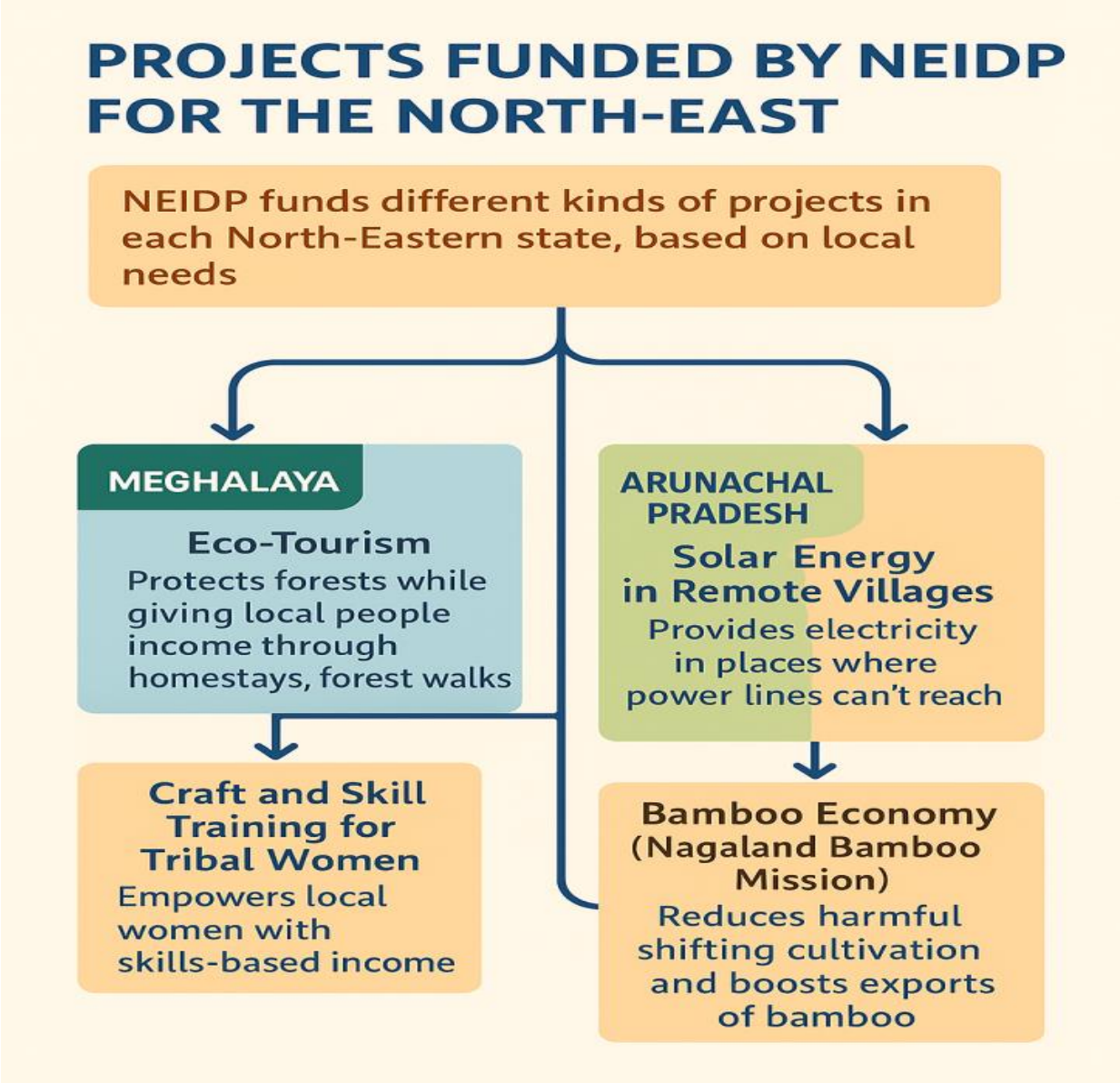
For example:

1. In Tamil Nadu's Nilgiri Hills, HADP supported the construction of roads and water pipelines designed for the hilly terrain. The program utilized topographic planning to steer clear of landslide-prone areas and ensure a reliable water supply for tribal villages.
2. HADP funding enabled Kullu in Himachal Pradesh to enhance its terraced farming system with improved irrigation, resulting in increased apple yields and higher incomes for local farmers.

North East India Development Programme (NEIDP)

The North East India Development Programme (NEIDP) is all about fostering inclusive growth and integrated development across the North Eastern Himalayan states. It backs a variety of projects that focus on generating livelihoods, promoting eco-tourism, enhancing infrastructure, and ensuring environmental sustainability. Rather than being a one-size-fits-all scheme, NEIDP is tailored to fund diverse projects in each North-Eastern state, taking into account the unique geography, culture, economy, and specific needs of each region.

Figure-16.1



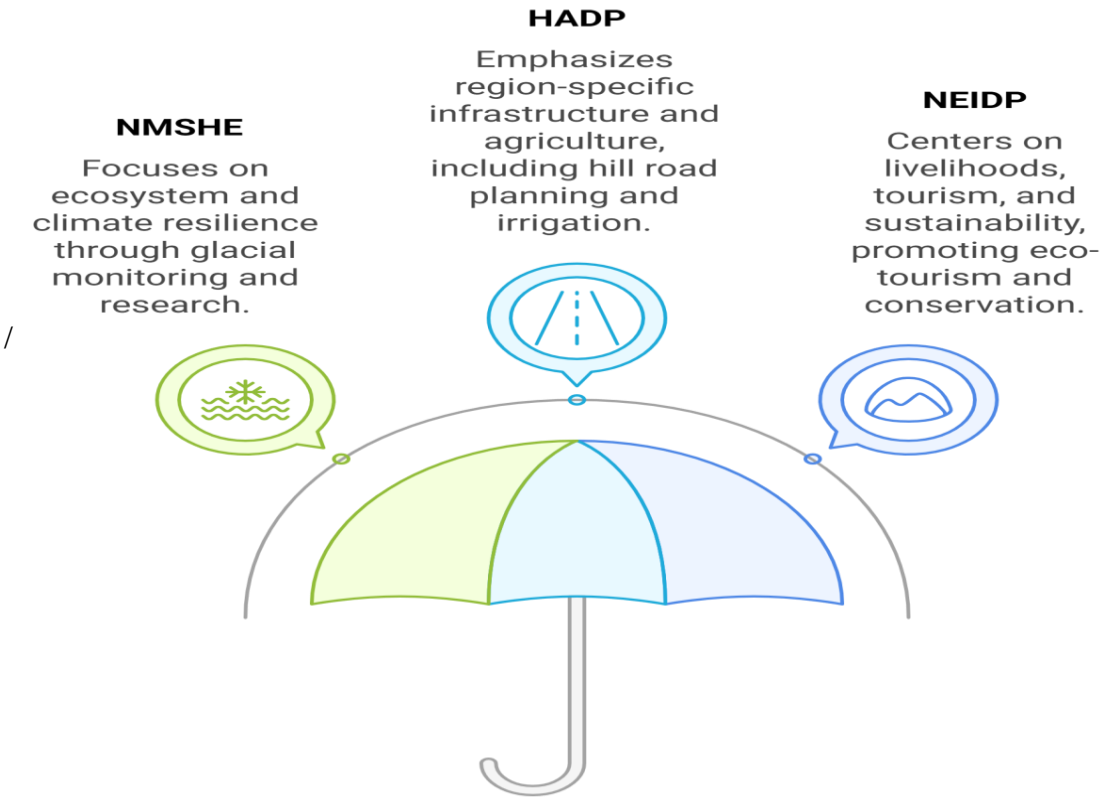
The goals of NEIDP include:

- Promoting inclusive growth in the Northeast Himalayan states.
- Supporting efforts in livelihood diversification, eco-tourism, infrastructure development, and conservation.

These initiatives work together to highlight the importance of ecological balance, sustainable resource management, and socio-economic upliftment in the hilly areas.

Figure-16.2

Comparative analysis of NMSHE, HADP, NEIDP:



Source: AI-generated info graphic (Napkin AI), 2025. Based on policy summaries of NMSHE, HADP, and NEIDP from official government documents.

16.4 ROLE OF INSTITUTIONS

Ministry of Development of North Eastern Region (MDoNER):

The Ministry of Development of North Eastern Region (MDoNER) was established as a department in 2001 and elevated to a full ministry in 2004, all with the aim of enhancing collaboration between Central Ministries and the North Eastern states. It stands out as the only ministry with a specific territorial focus, dedicated entirely to the comprehensive development of the North Eastern Region (NER). MDoNER plays a crucial role in coordinating efforts between the states and central ministries, although the actual execution of sector-specific programs is handled by the relevant ministries and departments.

Vision & Mission:

- Foster sustainable and inclusive growth in the Northeast.
- Ensure a better quality of life and overall development for the people of NER.
- Harmonize policies, work closely with states, and make the most of the 10% Gross Budgetary Support (GBS).
- Draw in investments from public, private, and multilateral sources.
- Tackle issues related to connectivity and social sectors, while bolstering institutions for livelihoods, skills, and capacity-building.

Key Functions:

- Serves as the primary ministry for development planning and policy coordination in NER.
- Oversees development initiatives through platforms like the "Poorvottar Sampark Setu" portal.
- Establishes special task forces, such as the Agarwood Task Force, to implement targeted interventions.
- Allocates funding through the North Eastern Council (NEC) and the Non-Lapsable Central Pool of Resources (NLCPR).

Example:

In 2021, as part of the North East Road Sector Development Scheme (NERSDS), more than 250 km of roads were constructed in Arunachal Pradesh and Manipur, significantly improving access to remote villages, schools, and healthcare services.

NITI Aayog:

NITI Aayog is at the heart of shaping policies and strategies for the Indian Himalayan Region (IHR). It plays a vital role in supporting thematic studies and uniting various stakeholders to create development frameworks tailored to specific regions.

Key Functions:

- It coordinates national policies focused on sustainable development.
- It has backed thematic reports concerning the Himalayas, covering topics like agro-ecology, eco-tourism, migration, and water conservation.
- It actively participates in multi-stakeholder consultations, such as workshops linked to the G20, to suggest strategies that cater to the region's unique needs.

Notable Initiative:

In 2018, NITI Aayog published the "Five Thematic Reports on the Indian Himalayan Region (IHR)," which included recommendations for:

- Organic farming practices
- A tourism code of conduct
- Partnerships between forests and panchayats
- Management of spring-shed water resources

G.B. Pant National Institute of Himalayan Environment (NIHE)

The G.B. Pant National Institute of Himalayan Environment (NIHE) is dedicated to conducting research and development projects throughout the Indian Himalayan Region (IHR). As an autonomous institute under the Ministry of Environment and Forests, the G.B. Pant Institute zeroes in on research and development that pertains to the Himalayan environment and its sustainable management.

- It serves as a key player in ecological conservation and sustainable development efforts in the IHR.
- The institute tackles issues related to biodiversity, climate change, water resource management, and community-based strategies.
- It runs regional centers across the Himalayas to facilitate decentralized research.

Project Highlight:

In 2019, NIHE launched a community-driven initiative to rejuvenate springs in Almora, Uttarakhand, and leveraging traditional knowledge alongside hydro-geological mapping.

International Centre for Integrated Mountain Development (ICIMOD)

The International Centre for Integrated Mountain Development (ICIMOD) is an intergovernmental hub dedicated to knowledge and learning, serving the people of the Hindu Kush Himalaya (HKH). It officially opened its doors on December 5, 1983.

Mission: Our goal is to create and share knowledge that influences regional policies and actions, attracting investments that help the diverse countries and communities of the HKH move towards greener, more inclusive, and climate-resilient development.

Member countries include Afghanistan, Bangladesh, Bhutan, China, India, Myanmar, Nepal, and Pakistan.

Functions:

- We support the region by generating and sharing information and knowledge to discover innovative solutions for pressing mountain challenges.
- We connect scientific research with policy-making and practical applications on the ground.
- We offer a regional platform where experts, planners, policymakers, and practitioners can share ideas and insights to achieve sustainable mountain development.

Indian Himalayan Central Universities Consortium (IHCUC)

The Indian Himalayan Central Universities Consortium (IHCUC) is part of this effort. The Himalayan University Consortium (HUC) is a vibrant network of academic and research institutions committed to promoting sustainable development in the HKH region. Launched by ICIMOD in 2007, HUC aims to close knowledge gaps, encourage interdisciplinary collaboration, and empower communities to tackle the unique challenges posed by mountain ecosystems.

Table-16.2

Comparative Framework of Himalayan Institutions: Focus, Functions, and Initiatives

Institution	*Region Focus*	*Key Functions*	*Example/Project*
MDoNER	North Eastern Himalaya	Planning, funding via NEC, NLCPR	Agarwood Task Force, Poorvottar Sampark Setu
NITI Aayog	Pan-Himalayan	National policy, strategy, thematic reports	G20 workshops, Reports on agroecology, migration
NIHE	Indian Himalayan Region	Research, biodiversity, climate, community action	Regional centres, water mgmt. programs
ICIMOD	Hindu Kush Himalaya (incl. India)	Cross-border knowledge, cryosphere, DRR	Cryosphere monitoring, livelihood projects
IHCUC	Central Himalayan Universities	Academic research, hill-specific topics	Women's labor in hills, eco-tourism studies

Source: Compiled from official websites and reports of MDoNER, NITI Aayog, NIHE, ICIMOD, and IHCUC.

16.5 ROLE OF PANCHAYATI RAJ INSTITUTIONS AND NGOs

Panchayati Raj Institutions (PRIs) and NGOs are key players in rolling out development programs right at the grassroots level.

Panchayati Raj Institutions (PRIs)

These local governance bodies are essential for fostering inclusive development by engaging communities in decision-making and ensuring that development efforts meet local needs.

- They are crucial in local planning, particularly for implementing schemes like MGNREGA, watershed development, and sanitation projects.
- Thanks to constitutional amendments, they have the authority to plan for agriculture, forestry, minor irrigation, and road development.
- They play a significant role in blending traditional knowledge with modern governance, especially in hilly regions.
- PRIs facilitate decentralized governance, empowering local communities to take part in planning and development initiatives.

Non-Governmental Organizations (NGOs)

NGOs contribute significantly to the development of the Himalayas through a variety of initiatives, including community-based projects, awareness campaigns, and advocacy work.

Vision for Integrated and Sustainable Himalayan Development:

- They serve as a bridge between government programs and local communities.
- Their focus areas include education, healthcare, women's empowerment, sustainable agriculture, and disaster preparedness.
- Organizations like the SDC Foundation and People's Science Institutes have been pivotal in promoting inclusive eco-tourism and renewable energy practices in Uttarakhand and Himachal Pradesh.
- NGOs help close the gap between policy and real-world application by addressing issues in education, health, environmental conservation, and women's empowerment. They are vital in mobilizing community involvement and encouraging sustainable practices.

16.6 VISION FOR INTEGRATED AND SUSTAINABLE HIMALAYAN DEVELOPMENT RAJ

To achieve lasting sustainability and fairness, development in the Himalayan region needs to blend environmental considerations with economic strategies. During India's G20

Presidency discussions, a cohesive policy vision for the Himalayas was put forward. This vision includes:

Ecotourism

Eco-friendly tourism not only supports conservation but also helps preserve cultural heritage and create local jobs. It focuses on getting the community involved and educating them about the environment.

- Supports livelihoods tied to conservation and cultural heritage.
- Encourages community involvement and planning based on carrying capacity.
- Establishes guidelines to mitigate the negative effects of mass tourism.

Renewable Energy

Utilizing hydropower, solar, and wind energy can help lessen our dependence on fossil fuels. Decentralized renewable energy systems can enhance access in remote areas and empower local communities.

- Sustainably harnessing hydropower, solar, and wind energy.
- Highlighting the need for decentralized solar energy in remote regions.
- Linking energy security to a decrease in biomass reliance, particularly for women.

Agroforestry and Sustainable Agriculture

Agroforestry combines tree farming with agriculture, boosting biodiversity and improving soil health. By promoting traditional crops and organic farming, we can ensure food security and sustainable livelihoods. The Himalayan region faces distinct challenges, such as ecological vulnerability, the effects of climate change, and socio-economic inequalities. A comprehensive approach that aligns national and state policies, strengthens institutional frameworks, empowers local communities, and encourages sustainable practices is crucial for the region's long-term prosperity.

- Supports traditional crops and indigenous knowledge to build climate resilience.

- Promotes organic farming, forest-based livelihoods, and soil-water conservation.
- Essential for reversing migration trends and bolstering the rural economy.

16.7 SUMMARY

This unit offered a deep dive into the various national and state-level initiatives aimed at promoting sustainable development in the Indian Himalayan Region (IHR). It shed light on how specific policies like NMSHE, HADP, and NEIDP cater to the unique needs of hill states by focusing on climate resilience, infrastructure, livelihood support, and ecological conservation. Students got to understand the pivotal roles played by key institutions such as MDoNER, NITI Aayog, ICIMOD, and NIHE, which are essential for research, planning, funding, and fostering regional collaboration. The comparative framework was particularly useful in showcasing how different institutions operate across diverse geographies and themes.

Additionally, the unit examined the crucial grassroots contributions of Panchayati Raj Institutions and NGOs in policy implementation and community empowerment. In conclusion, it highlighted a vision for integrated development through strategies like eco-tourism, renewable energy, and Agroforestry, all aimed at harmonizing environmental protection with socio-economic advancement.

16.8 GLOSSARY

1. **The Indian Himalayan Region (IHR)**- IHR is a delicate and ecologically significant mountain area in India, celebrated for its rich biodiversity, vital water sources, and vibrant cultural diversity.
2. **The National Mission on Sustaining Himalayan Ecosystem (NMSHE)**- It is a government initiative aimed at tackling climate change, preserving biodiversity, and promoting sustainable development throughout the Himalayas.
3. **The Hill Area Development Programme (HADP)**- HADP focuses on enhancing infrastructure, agriculture, and a forestation in hilly regions by addressing their specific challenges.

4. **The North East India Development Programme (NEIDP)**- NEIDP is a development effort that champions inclusive and environmentally friendly growth in Northeast India.
5. **The Ministry of Development of North Eastern Region (MDoNER)** - MDoNER is a central ministry dedicated to planning and funding development initiatives in the Northeastern states of India.
6. **NITI Aayog**- NITI Aayogserves as India's national policy think tank, crafting strategies and reports aimed at fostering sustainable regional development, including initiatives for the Himalayas.
7. **The G.B. Pant National Institute of Himalayan Environment (NIHE) -** NIHEis a research institution dedicated to studying biodiversity, climate change, and sustainable practices in the Himalayan region.
8. **The International Centre for Integrated Mountain Development (ICIMOD) -** ICIMOD is an intergovernmental organization that advocates for sustainable mountain development in the Hindu Kush Himalayas.
9. **The Indian Himalayan Central Universities Consortium (IHCUC) -** IHCUC is a collaborative network of central universities that promotes research and knowledge-sharing to advance Himalayan development.
10. **Panchayati Raj Institutions (PRIs) -** PRIs are local self-governments that implement development programs and ensure community involvement in rural areas.
11. **Non-Governmental Organizations (NGOs**) -NGOs are independent groups that focus on education, health, women's empowerment, and environmental conservation, particularly in remote hill regions.
12. **Ecotourism -** Itis a responsible travel approach that supports conservation efforts, benefits local communities, and honors local culture and the environment.
13. **Agroforestry** – A land-use system that combines agriculture and tree cultivation, improving biodiversity, soil health, and farmers' incomes.
14. **Decentralized Renewable Energy** – Small-scale energy solutions like solar or wind systems that operate independently in remote areas, improving local access to clean energy.
15. **Climate Resilience** – The ability of communities and ecosystems to prepare for, respond to, and recover from the impacts of climate change.

16.9 ANSWER TO CHECK YOUR PROGRESS

1. National policies like NMSHE, HADP, and NEIDP focus on sustainable and inclusive development tailored to the unique needs of Himalayan regions.
2. Key institutions such as MDoNER, NITI Aayog, ICIMOD, and G.B. Pant Institute play crucial roles in research, policy formulation, funding, and cross-border cooperation.
3. Panchayati Raj Institutions (PRIs) and NGOs help ensure grassroots participation and successful local-level implementation of development programs.
4. Integrated Himalayan development emphasizes ecotourism, renewable energy, and Agroforestry to align environmental sustainability with economic growth.
5. Vision for the future stresses climate resilience, organic farming, decentralized energy, and community-led conservation to reverse migration and protect fragile ecosystems.

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16.11 TERMINAL QUESTIONS

Long Questions

1. Discuss the key features, goals, and outcomes of the National Mission on Sustaining Himalayan Ecosystem (NMSHE). Provide examples from different states.
2. Explain the roles and comparative functions of major institutions like MDoNER, NITI Aayog, ICIMOD, and NIHE in Himalayan development. How do they complement each other?
3. Describe the importance of integrated and sustainable development in the Indian Himalayan Region. How can ecotourism, renewable energy, and agroforestry contribute to this vision?
4. Analyze the objectives and implementation strategies of the Hill Area Development Programme (HADP) and the North East India Development Programme (NEIDP). How do these programs address regional disparities?
5. Evaluate the significance of Panchayati Raj Institutions and NGOs in promoting inclusive and grassroots-level development in Himalayan states.

6. What are the main challenges faced by the Indian Himalayan Region, and how can a coordinated policy and institutional framework help overcome them?

Short Questions

1. Explain the main objectives of the National Mission on Sustaining Himalayan Ecosystem (NMSHE).
2. Describe the role of the Hill Area Development Programme (HADP) in promoting regional development.
3. What are the key functions of the Ministry of Development of North Eastern Region (MDoNER)?
4. How does NITI Aayog contribute to sustainable development in the Indian Himalayan Region (IHR)?
5. Write a brief note on the role of Panchayati Raj Institutions (PRIs) in hill development.
6. What kind of research and initiatives are undertaken by the G.B. Pant National Institute of Himalayan Environment (NIHE)?
7. How does the International Centre for Integrated Mountain Development (ICIMOD) support the Hindu Kush Himalaya (HKH) region?
8. What is the significance of promoting ecotourism in the Himalayan states?
9. How does agroforestry help in building climate resilience in hill areas?
10. Explain the purpose and working approach of the North East India Development Programme (NEIDP).

Multiple Choice Questions

1. What is the main objective of NMSHE?
   A. Urban development
   B. Industrial promotion
   C. Sustaining the Himalayan ecosystem
   D. Defense infrastructure

2. Which state implemented climate-resilient farming under NMSHE in 2018?

   A. Uttarakhand

B. Himachal Pradesh

C. Arunachal Pradesh

D. Sikkim

3. What does HADP primarily focus on?

A. Desert development

B. Port connectivity

C. Hill area infrastructure and agriculture

D. Urban slum renewal

4. Which institute is known for cryosphere monitoring in the Hindu Kush Himalaya?

A. MDoNER

B. NIHE

C. ICIMOD

D. IHCUC

5. NEIDP is aimed at the development of which region?

A. Western Himalaya

B. Eastern Ghats

C. North Eastern Himalaya

D. Indo-Gangetic Plain

6. When was the Ministry of DoNER elevated to full ministry status?

A. 2001

B.2004

C. 2010

D. 1998

7. What is the role of Panchayati Raj Institutions (PRIs) in Himalayan development?

A. Creating national policies

B. Managing international trade

C. Grassroots implementation of schemes

D. Supervising armed forces

8. Which program supports spring rejuvenation in Uttarakhand?

A. HADP

B. NEIDP

C. NIHE

D. MGNREGA

9. The IHCUC is a consortium of:

A. Government ministries

B. NGOs

C. Central universities in the Himalayas

D. Panchayats

10. Which mission was launched under the National Action Plan on Climate Change?

A. HADP

B. NMSHE

C. NEIDP

D. Swachh Bharat Mission

11. Which of the following promotes academic research on the Himalayas?

A. ICIMOD

B. NIHE

C. IHCUC

D. NEC

12. What is one major initiative of MDoNER?

A. Smart Cities

B. Poorvottar Sampark Setu

C. Namami Gange

D. Jan Dhan Yojana

13. Which Himalayan state is known for glacier monitoring at Gangotri?

A. Sikkim

B. Uttarakhand

C. Arunachal Pradesh

D. Himachal Pradesh

14. Which ministry provides Gross Budgetary Support (GBS) for the Northeast?

A. Ministry of Finance

B. NITI Aayog

C. MDoNER

D. Ministry of Environment

15. Which term best describes Agroforestry?

A. Only tree farming

B. Farming combined with livestock

C. Farming only in plains

D. Agriculture combined with tree cultivation

Answer. 1. C, 2.D, 3.C, 4.C, 5.C, 6.B, 7.C, 8.C, 9.C, 10.B, 11.C, 12.B, 13.B, 14.C, 15.D



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