

# UNIT 03

## Section 2 Geography of Pakistan

### Land of Pakistan and Environmental Hazards

In this unit the students will be able to:

#### (A) Land of Pakistan

- Locate Pakistan on the world map and access the significance of its geographical position in terms of its geopolitical and economic importance.
- Analyse the strategic significance of Pakistan's location in relation to its neighbouring countries and other countries in south and central Asia, and evaluate the impact of this on Pakistan's, economic, political, and social development.

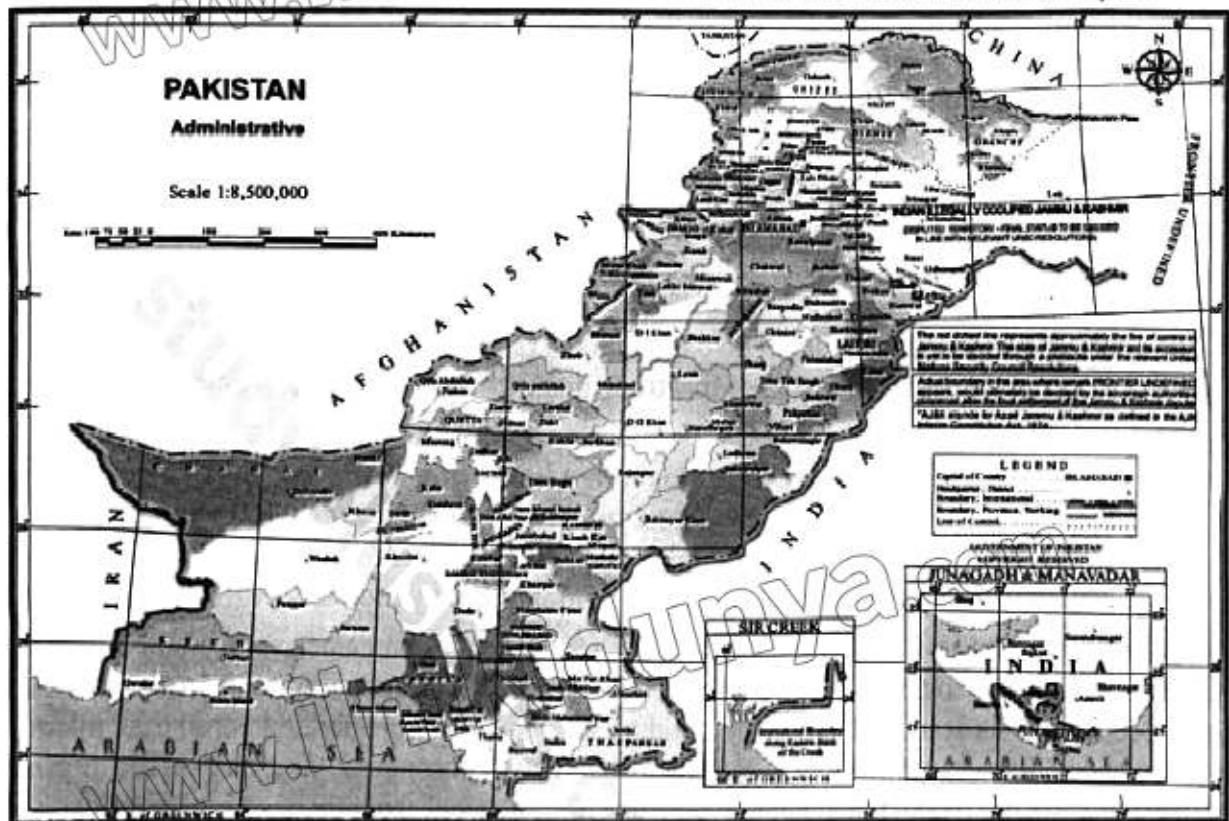
#### (B) Environmental Hazards

- Examine the impacts of climate change on South Asia spanning five decades, taking into consideration the consequences of sudden and severe weather events, as well as human actions that contribute to environmental risks.
- Analyse the factors that contribute to global warming, as well as resulting physical processes and phenomena that are linked to flooding, climate change, and other environmental hazards.
- Recognise the potential advantages and disadvantages of floods and propose ecological sustainable solutions to mitigate climate change and reduce the negative impacts of environmental hazards like floods and droughts.
- Evaluate the environmental impacts of fossil fuel consumption and suggest approaches to minimize the impacts of climate change and global warming, emphasising the roles of governments and societies in environmental management. [Case study: evaluate the effectiveness of Pakistan's National Disaster Management Authority (NDMA) in disaster management and propose measures to improve disaster preparedness and response.]
- Elaborate on the main sources of fresh water and ocean water pollution, such as agricultural and industrial sectors, and develop solutions to manage these issues.

## Administrative Map of Pakistan

### Location and Neighbouring Countries

Pakistan is located in Southern Asia bordering the Arabian Sea, between India to the east and Iran and Afghanistan to the west and China to the north. Pakistan covers an area of 796,096 sq km.



Location of Pakistan

Pakistan is located north of the Tropic of Cancer ( $23.5^{\circ}$  N), from latitude  $24.35^{\circ}$  N to  $37.05^{\circ}$  N. It extends east of the Prime Meridian ( $0^{\circ}$ ) from longitude  $61^{\circ}$  E to  $78^{\circ}$  E. The country stretches 1,600 km from south to north and about 885 km from west to east. The total area of the country is 796,096 km<sup>2</sup>.

Pakistan is surrounded on three sides by neighboring countries and has a coastline of 1,046 km along the Arabian Sea to the south, which further extends into the Indian Ocean.

Fig 1 shows the central location of Pakistan in South Asia. To the west, it shares a border with Iran that is 909 km long. To the northwest, it has a boundary of 2,252 km with Afghanistan, known as the Durand Line, which was demarcated in 1893 by mutual agreement of the Afghan and British governments.

The country has another long boundary line of about 2,912 km with India to the east. Pakistan is mostly mountainous in the north. Toward the northwest, a narrow strip of about 20 km, known as the Wakhan Border, separates it from Tajikistan. China is located to the northeast, with a 600 km long boundary line passing through the Karakoram Mountains.

### (A) Significance of Geographical Location of Pakistan

Pakistan's geographic location acts as a bridge connecting the South Asian subcontinent with Central Asia. This geographic linkage plays an important role for trade, transit, energy and connectivity routes which reflects on its economic, political and social development.

## Economic Importance

Pakistan enjoys a central location in South Asia. The warm water seaports of Karachi, Bin Qasim, and Gwadar provide transit trade services to the landlocked countries of Afghanistan and Central Asian States. Goods in transit are brought for temporary storage and re-export. Pakistan enjoys a central location in South Asia. The warm water seaports of Karachi, Bin Qasim, and Gwadar provide transit trade services to the landlocked countries of Afghanistan and Central Asian States. Goods in transit are brought for temporary storage and re-export. These ports are linked to most important North Atlantic trade route in the west and Asia Pacific route in the east.

- (i) North Atlantic Trade Route connects major economic regions of the world particularly NE. USA and NW Europe, (on both sides, along the sea shores of North Atlantic Ocean). This is one of the busiest trade routes, carrying more than one fourth of international trade. Variety of goods including, Petroleum products, chemicals, machinery, and electronics. Pakistan enjoys the benefits of this trade link with both of European Union Countries and NE USA, because of its sea ports.
- (ii) Asia Pacific Trade Route is another important route towards the east and south of Asia with the countries along the sea shores of Pacific Ocean. Korea, Indonesia, Malaysia, Philippines, Australia and Hong Kong are few examples. Pakistan established its trade links with these countries for new markets in agricultural products and raw materials.

On April 20, 2015, Pakistan and China signed an agreement to commence work on the \$46 billion project, which was to be developed by the end of 2018. This project aims to improve the lives of the people of Pakistan and China by building an economic corridor that promotes bilateral connectivity, explores potential bilateral investments, economics, and trade. The project, known as the China-Pakistan Economic Corridor (CPEC), spans from the western Chinese city of Kashgar to Pakistan's Arabian Sea port of Gwadar. It is a massive bilateral project to enhance infrastructure within Pakistan for better trade with China and to further integrate the countries of South Asia. It also aligns with the vision of the Belt and Road Initiative to gain deeper access to markets in mainland China, the Middle East, and Central and Eastern Europe.

Pakistan also has direct land transport links of roads and rail with its neighboring countries. The historic Khyber Pass in the northwest links it with Afghanistan and Central Asian states. The Khunjerab Pass in the north connects the country with China through the Karakoram Highway, built on the traces of the ancient and historic Silk Road for the mutual development of art, culture, trade, and technology. The Karakoram Highway (KKH) is 1,300 km long, with 887 km in Pakistan and 413 km in China. It was completed in 1979 and opened to the public in 1986, linking Kashgar, Xinjiang in China, and Hasan Abdal, Punjab, in Pakistan. The RCD highway is another route which connects the country with Iran and Turkey in the west. These road links are further connected to motorways and other standard roads in the country for faster and safer movement of goods and passengers. It has another road link in the east with India through the Wagah border.

Pakistan is also well connected by air with international airports in Karachi, Lahore, Islamabad, Peshawar, and Quetta. These airports connect the country not only with West Asia but also with other countries around the world. This transport network system reflects Pakistan's direct involvement in the mutual economic, geopolitical, and social progress with its neighboring countries. It is crucial for the country to maintain good relations with them.

Pakistan has great potential for economic progress. It possesses a variety of natural and physical



resources that could help it flourish as a self-sufficient country. Tourism is another important and growing industry. Pakistan is a land of ancient heritage, with archaeological sites such as the Indus Valley Civilization at Mohenjo-Daro in Larkana (Sindh), Harappa, about 25 km north of Sahiwal (Punjab), and Taxila representing the Gandhara-Buddhist civilization. Historical buildings in the country are reminders of unique art and architecture of the Muslim Rulers of Delhi Sultanate and the Mughal kings which lasted in this region for more than six hundred and fifty year. These include the Badshahi Mosque, Shalimar Gardens, Jahangir's Tomb in Lahore, the Mahabat Khan mosque in Peshwar.

The lofty mountains in the north and north west include, The Karakoram range (with the second highest in the world K2), the Himalayas and the Hindukush, with altitudes ranging from 1,000 to 8,000 meters above sea level. These serve as a major attraction for national and international tourists. These highly mountainous areas, with snow-capped peaks and beautiful valleys such as Chitral, Swat, Kaghan, Naran, Hunza, and Gilgit, have unique flora and fauna and fruit-laden orchards. These areas are popular with mountaineers, climbers, trekkers, and camping enthusiasts seeking adventure tourism. The people from these areas follow unique traditional cultures, with atypical ceremonies, dances, music, and sports like polo, skiing, and cold-water fishing for trout.

The Pakistan Tourism Development Corporation, with support from the government of Pakistan, is working to promote tourism according to international standards to attract more international tourists through websites and other media. It is responsible for boarding, lodging, tourist guides, transport facilities, and many other requirements of tourists. Tourism holds great potential for a variety of job opportunities and infrastructure development, providing cultural links to the country. This could lead to increased awareness of better education and health facilities, decreasing gaps between the haves and have-nots.

### Geopolitical Importance

At the level of international relations, geopolitics is the method of studying foreign policy to understand, explain, and predict international political behavior through geographical variables. Pakistan's central location in South Asia has increased its strategic importance due to the proximity of two world powers, Russia and China, in the north, and a 2,912 km unnatural boundary with India. Additionally, a long-standing conflict and a newly established government in the west in Afghanistan demands that Pakistan to be extremely supportive and cooperative.

The Pakistani government strives hard to maintain good diplomatic and trade relations with all its neighboring countries to preserve its own internal political, and economic stability. It joined the United Nations soon after its independence in order to establish its good diplomatic relations with the member countries according to UN objectives. Pakistan signed the Southeast Asia Treaty Organization (SEATO) in 1954, to align itself to US support for its defence and other matters.

After the Arab-Israel war in 1967 Pakistan played an important role in the formation of Organisation of Islamic Cooperation (OIC) in 1969. The organisation has its headquarters in Jeddah, Saudi Arabia. Pakistan has hosted about five OIC meetings for the goodwill cause of the Muslim World.

Pakistan established good diplomatic relations with People's Republic of China soon after its independence in 1949 Pakistan. Pakistan always supported Republic of China as permanent member of UN. On 25 October 1971 Peoples's Republic of China took the permanent seat in UN.

Pak-China friendship has led to the establishment of the China-Pakistan Economic Corridor, (CPEC).

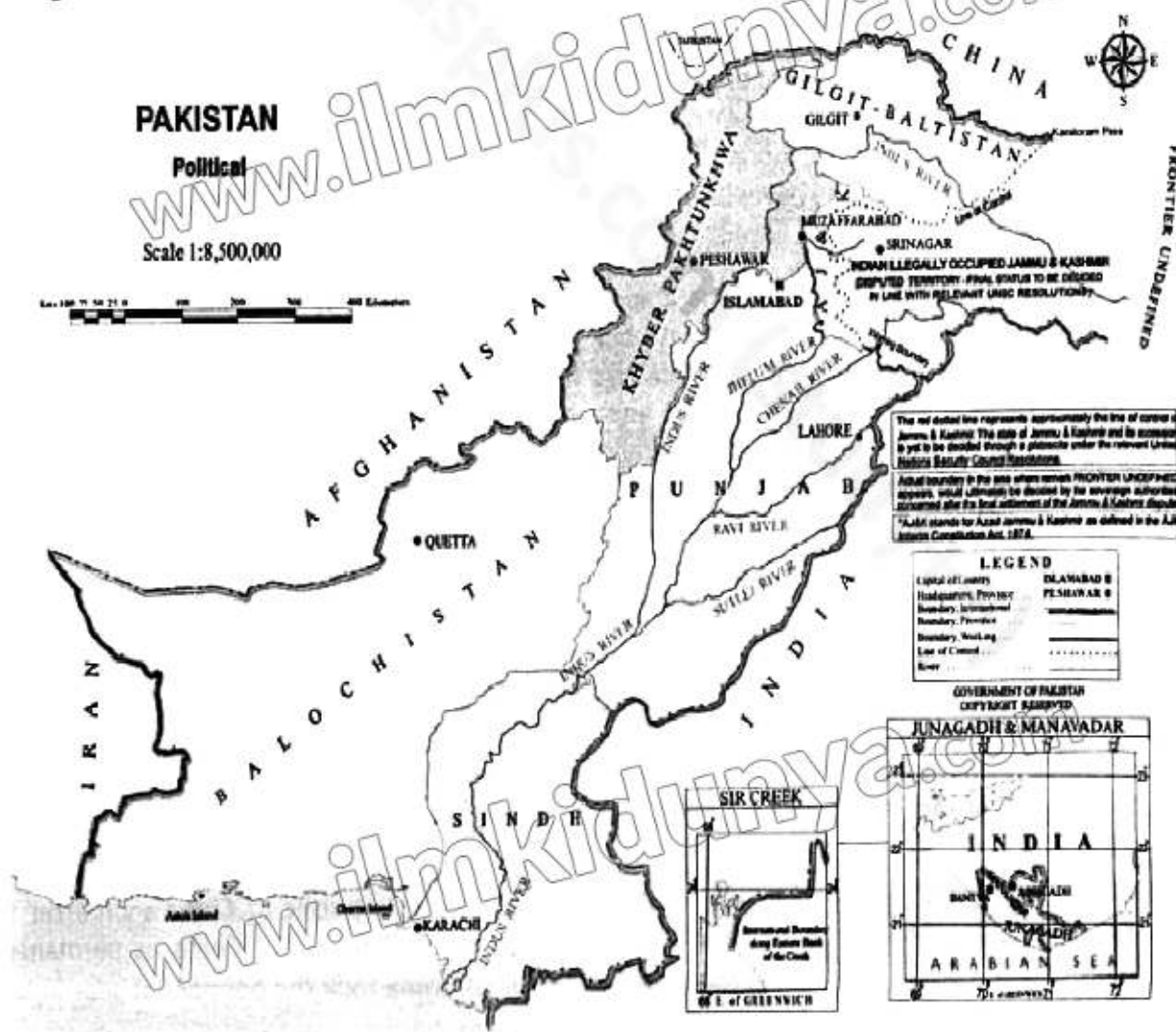
Economic Cooperation Organization (ECO) was established in 1985, with its headquarters in Tehran. Initially, three countries, Iran, Turkey and Pakistan, the founder members of RCD founded Regional Cooperation for Development (RCD) in 1964. Afghanistan and newly independent states of Azerbaijan, Kazakhstan, Kyrgyz Republic, Uzbekistan, Tajikistan, and Turkmenistan aimed to join in 1985 to form ECO for the welfare and wellbeing of all the member states.

SAARC, established in 1985, Head quarter in Kathmandu, Nepal. The member countries are, India, Pakistan, Bangladesh, Maldives, Sri Lanka, Bhutan, Afghanistan and Nepal.

The objectives of the forum are:

The objectives are to promote the welfare of the people of South Asia and to improve their quality of life through accelerated economic growth, social progress, and cultural development in the region. Pakistan has always been an active member and has hosted many SAARC meetings and took a strong stance to follow the objectives for friendly economic and social relations.

## Geographic and Economic Significance of the Provinces and Major cities



According to the constitution of the country there are three primary branches of the government.

- (i) Legislative powers are vested in bicameral parliament (National Assembly and Senate).
- (ii) Executive powers are vested in the Prime minister who is aided by his cabinet. The president is a ceremonial head.
- (iii) Judiciary has two offices. (a) Superior Judiciary which includes the Supreme Court, the Federal Sharia Court and the five High courts. (b) Subordinate Judiciary which includes District Courts, Session Courts, and Courts of Magistrate. The Judiciary is that branch of the government which interprets the law, settles disputes and administers justice to the citizens. They are also the guardians of the constitution.

The country has one Federal Territory as the Capital, Islamabad and four Provinces, Punjab, Sindh, Khyber Pakhtunkhwa and Baluchistan. The provincial governments have a high degree of autonomy and residuary powers. Azad Kashmir and Gilgit Baltistan are the two autonomously administrated states of the country.

### Islamabad

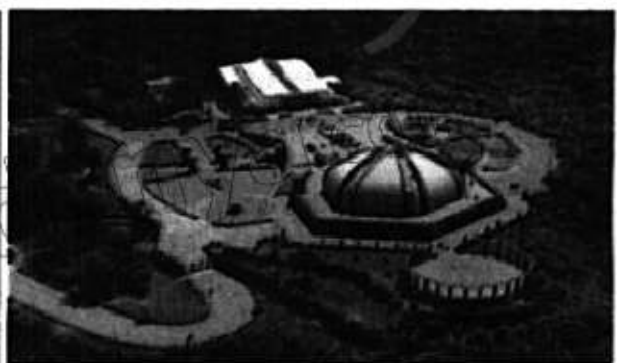
Islamabad is the Capital city of Islamic Republic of Pakistan. It is located in the north of the country, at the northern edge of Potohar plateau and south of Margalla hills. It enjoys a pleasant climate. It is renowned for its unique blend of modernity and natural beauty. Its general elevation is 540 metres. The capital territory borders Pakistan's provinces of Punjab and Khyber Pakhtunkhwa. It is the country's ninth most populous city with a population of more than 2 million people.

It was properly planned according to the requirements for the capital of the Country. The city is divided into zones: Administrative, Diplomatic enclave, Residential, Commercial, Rural and Green areas. Each sector has its own shopping areas and public parks.

Government offices are working for the major planning and development of the country. President house, Prime minister residence, Parliament house, Supreme court, Election commission, Different ministries of climate change, Foreign Affairs, Ministry of local government and rural development etc. Islamabad is also known for Parks and forests including Margalla National Park Shakarparian. It is home to many flagship marks including Country's Faisal Mosque. The mosque is the world's fifth largest mosque.



*Faisal Masjid*



*Pakistan Monument & Shakarparian Park*



## Lahore

The capital city of Punjab, Lahore, is located in the northeast of the upper Indus plain on the east bank of the River Ravi. It is a major industrial and economic hub of Pakistan, known for its historic buildings like the Shalimar Gardens, Jahangir's Tomb, Lahore Fort, and the Minar-e-Pakistan, which commemorates the Lahore Resolution

of 1940. The city is a center of education and learning. Punjab University Lahore, is the oldest university in Pakistan.

Lahore is a vibrant urban center, largely service-oriented. Important industries include textiles and a variety of engineering, chemical, and mechanical industries set up in the industrial estates around Lahore. Agriculture is mostly practiced on the fertile land of the active flood plain of the river Ravi. Wheat, rice, sugarcane, and cotton are important crops. Fruits and vegetables are also grown according to seasonal changes. Livestock farming is an important activity on the farmlands in the outskirts of the city. Due to all these activities, job opportunities are increasing and improving the economic importance of the city.

Urbanisation and industrialization have increased the distance of the people to reach their



*Minar-e-Pakistan*



*Badshahi Masjid*

destinations. The government has improved the road transport system by building underpasses overhead bridges and ring roads to reduce the distances. It has also introduced Bus Rapid Transport System (BRT), Lahore Metro Bus (MBS) and Orange-line Transport System to provide efficient, comfortable and cheap urban transportation system. Allama Iqbal International airport is the second largest airport of the country to link the city with the domestic and international services.

## Peshawar

Peshawar is the capital and largest city of Khyber Pakhtunkhwa. It is the major educational, political, and business center, holding great historical importance. It lies at the eastern end of the famous Khyber Pass, 16 km north of Peshawar city near the Afghanistan-Pakistan border. It is the sixth most populous city in Pakistan.

Its economy is both agro-based and mineral-based. Sugarcane, maize, tobacco, pulses, and oil

seeds are the main crops. Subsistence livestock farming is practiced. Khyber Pakhtunkhwa is blessed with a variety of metallic and non-metallic minerals, making mining an important occupation. Industries such as leather shoes, garments, ghee, sugar, matchboxes, and marble products are significant.

Mohabat Khan Masjid is a historical building located in Peshawar. Islamia College Peshawar is also an important landmark in the history of Pakistan.



*Khyber Pass*



*Islamia College*

### Quetta

Quetta, the capital city of Baluchistan, has a unique blend of natural beauty and cultural diversity. It is the only major city of the country at a high altitude of 1680 metres above sea-level, surrounded by rugged mountains. The mountains have many passes and the Bolan Pass is an important trade route which connects the central areas of the country with the Baluchistan province. Quetta is well-linked with road, rail and air transport links. The Khojak Pass connects Sibi, Quetta, and Kandahar with Chaman.

Quetta is a commercial centre which is known for its fruits and vibrant bazars. The fruits include wide variety of fresh and dried fruits in the region. It is also famous for its handicrafts for example mirror work, embroidery, Pushtun rugs, Baluchi carpets made by the Nomadic tribes, fur coats, jackets and other traditional handicrafts of common use.

Quetta is an important summer resort attracting tourism. Hanna lake, with its small dam facility provides entertainment through boating and fishing. Quaid-e-Azam Residency, Ziarat is an important historical building. It has wooden floors and balconies overlooking the world's rich Juniper forest valley. Quetta geological museum has a collection of rocks found in the Baluchistan province.



*Bolan Pass*



*Ziarat Residency*



The government has endeavored to set up many schools and colleges to improve literacy rate of the area. Bolan University of Medical Sciences and Quetta Institute of Medical and Health Science have been established to increase health facilities. Hospitals and health centers are set up by the public and private sectors to improve the social services of the city. The headquarters of the Geological Survey of Pakistan and a center for seismic studies are set up in Quetta due to its sensitive location for earthquakes.

### Karachi

Karachi is the capital city of Sindh province and the most populous metropolitan city in the country. It is situated on the Arabian Sea coast and serves the country with two sea ports, Karachi and Bin Qasim. The city is well connected by rail and road to other parts of the country. Karachi International Airport, with its Jinnah Terminal, provides national and international air services. Mazar-e-Quaid Karachi holds the biggest commercial and industrial status in the country. Important industries include iron and steel, textiles, and many chemical and mechanical industries. Multiple auto parts industries and automobile plants have been set up. The city is also known as the "City of Lights" due to its vibrant nightlife. It is a commercial hub and home to the biggest malls in the country. It is also known for its parks and picnic resorts; beaches along the coast are sites of great attraction for both domestic and foreign tourists.



*Mazar-e-Quaid*



*Clifton Beach*

### Gilgit-Baltistan

Formerly known as the 'Northern Areas', Gilgit-Baltistan is the northernmost political entity administered by the government of Pakistan. It borders Azad Kashmir to the south, the province of Khyber Pakhtunkhwa to the west, and the Xinjiang region of China to the east and northeast. Gilgit, the capital city, is situated in a broad valley near the confluence of the Gilgit and Hunza rivers. The area is home to five of the



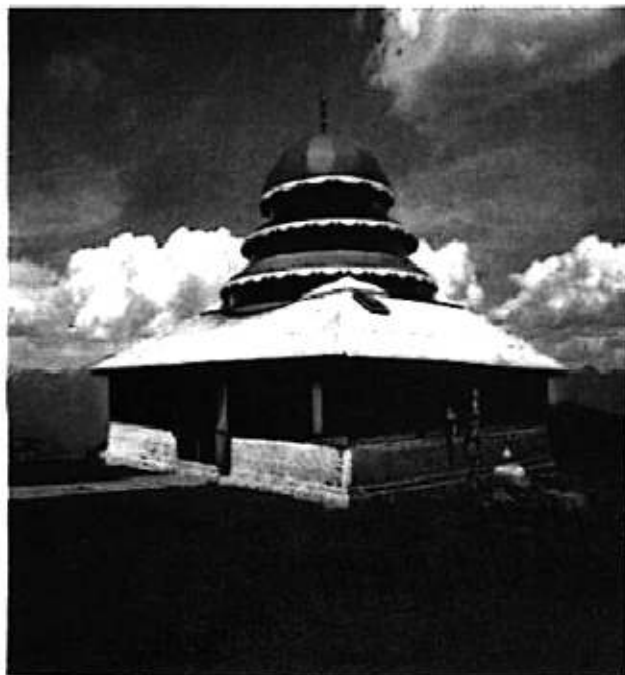
world's highest peaks, including K2, which are more than 8,000 meters tall. Additionally, about fifty peaks exceed 7,000 meters. Gilgit and Skardu are important centers for mountaineering expeditions to these mountains. The area is renowned for its scenic beauty and is a major attraction for both national and international tourists. The visitor season lasts from May to mid-October, with polo and skiing being popular activities. The region is sparsely populated due to its mountainous terrain and cold climate. Many of the world's largest glaciers, including the Siachen, Baltoro, and Batura, are found in these mountains.

### Muzaffarabad

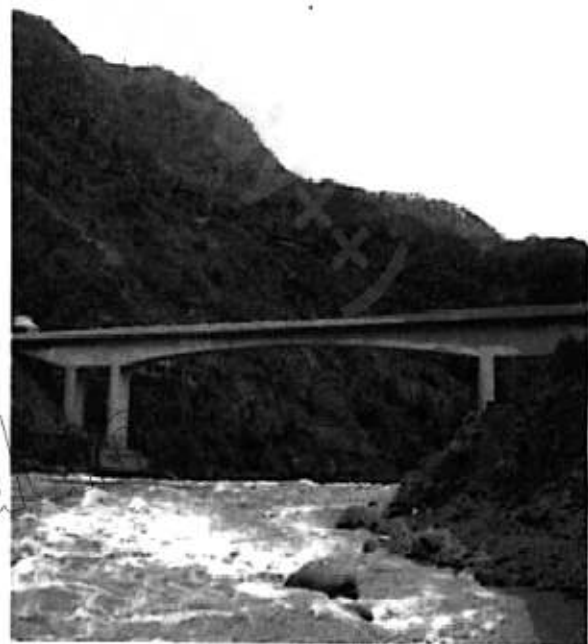
Muzaffarabad is the capital city of Azad Jammu and Kashmir, administered by the government of Pakistan, and is the largest city in the region. The geography consists of hill torrents, sub-montane, streams and intermontane narrow valleys, with many peaks rising above 5,000 meters. The city is 138 km from Rawalpindi and Islamabad and is accessible via the Kohala Bridge and Hazara Motorway. It is located at the confluence of the Jhelum and Neelum rivers. Pir Chinasi is a notable area that offers panoramic views of Muzaffarabad. The literacy rate is quite high; the University of Azad Jammu and Kashmir provides quality education, with many colleges affiliated with it, including Kashmir Law College, Scholars College of Science and Information Technology, and Fatima Jinnah Government Post Graduate College.

The main sources of income are employment in the public and private sectors, and agriculture, practiced along the river floodplains, focuses on maize, wheat, and pulses.

Handicrafts such as walnut wood carving, Kashmiri shawls, carpet weaving, rugs and mats, and stone crafting are popular and well-regarded in national and international markets. The Development Authority of Muzaffarabad has played a crucial role in regulating construction and controlling the city's development patterns and guidelines. Hill View Park and Kashmir Abshar are popular recreational areas.



*Pir Chinasi*



*Kohala Bridge*

## (B) Environmental Hazards

### Global Warming

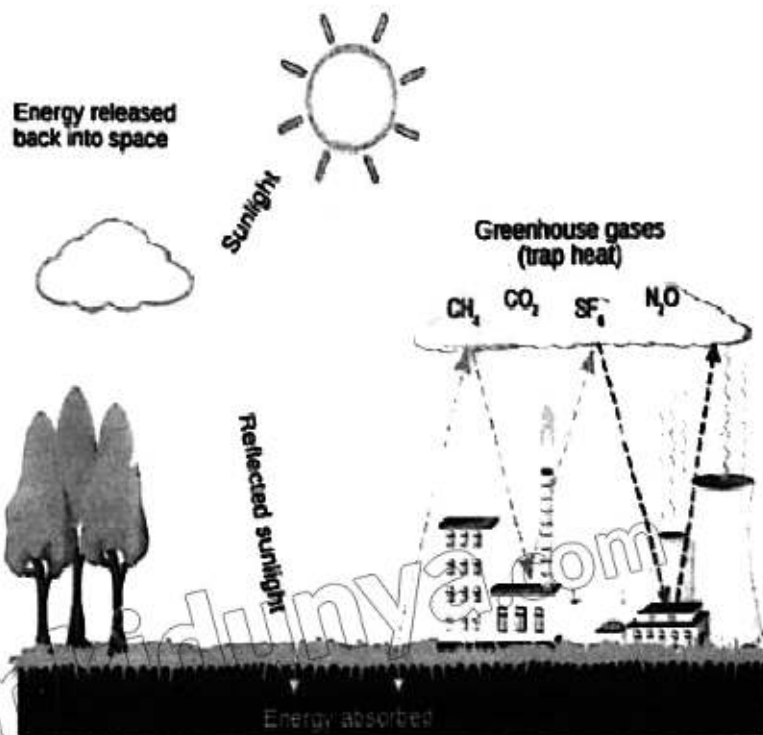
Global warming is the phenomenon of gradual increase in average temperature of the Earth. It is caused by the release of greenhouse gases like carbon dioxide, methane, chlorofluorocarbons (CFCs) into the atmosphere.

For the past two centuries, there has been a gradual increase in temperature on the Earth, due to both natural and human factors.

Ozone layer, protects the earth surface from the harmful ultraviolet rays thereby increasing the temperature of the earth. In 2013, the intergovernmental panel of climate change, (IPCC) held in Warsaw, Poland, reported that the average temperature in 2013 was 14.6 degree Celsius which is 0.6 degree Celsius warmer than the mid 20th century baseline. the average global temperature has risen about 0.8 degree Celsius since 1880, according to new analysis, Carbon dioxide emissions are the main cause of future global warming. Past emissions have brought us to today's climate, but every ton of Carbon dioxide that we emit in to the atmosphere from now on will warm the climate further. Various human activities have added temperature to global warming, such as, burning of fossil fuels, which increases heat trapping, and greenhouse gas levels in the Earth's atmosphere. Over the past fifty years or more, the amount of carbon dioxide and particulates in the air have risen, primarily due to the combustion of fossil fuels such as coal, oil, and natural gas.

The greenhouse effect is a natural process that keeps the Earth warm by trapping heat from the sun in the atmosphere. It's caused by greenhouse gases, such as carbon dioxide, methane, nitrous oxide, ozone and some artificial chemicals, absorbing and re-emitting infrared radiation from the Sun. The Earth's average temperature would be around - 20 degree Celsius if there was no greenhouse effect. The Fig below explains the impact of Greenhouse effect on the earth.

### Greenhouse effect







The movement of tectonic plates is usually slow but the areas near plate boundaries are more susceptible to earthquakes, Tsunamis and volcanoes. On 31 May, 1935, a terrible earthquake occurred in Quetta with a magnitude of 7.7 at Richter scale, 70,000 people died. Quetta city was completely destroyed. On 8 October, 2005, another severe earthquake hit the northern areas of Pakistan, known as Kashmir earthquake. The quake had a magnitude of 7.6 on Richter scale. Over 100,000 people died, 130,000 people were injured and 3.5 million were rendered homeless. The severity of damage caused by the earthquake is attributed to the severe upthrust of the plates. It is considered the deadliest, after the Quetta earthquake in 1935. On 24 September 2013, an earthquake with a magnitude of 7.7, hit Awaran, Ketch region Baluchistan. Another quake with a magnitude of 6.1, on 31st 2018, hit various parts of Pakistan including, Quetta, Karachi, Lahore, Islamabad, Peshawar, Murree, Sargodha, Shangla, Haripur and Gujranwala. These are a few examples of the strongest earthquakes, but otherwise, the country experiences frequent tremors with low intensity.



#### Forest Fires:

Global warming causes higher temperatures, which in turn, reduces the water content in trees. Trees catch fire and large areas of forests are burnt. In spite of the immediate efforts of the concerned governments the forests are damaged. May 2023 Canadian wildfire, triggered by lightning, ripped through the western side of Canada. All thirteen provinces of Canada were affected. Over 155,856 people were evacuated. 18.496million hectares of land was damaged



Forest fire in Canada

## Environmental Hazards

Environmental hazards include human created hazards such as air and water pollution, burning of fossil fuels, toxic waste, pesticides and chemicals which all adversely affect the ecosystem.

#### Human Factors

##### Agriculture

Use of chemicals for insecticides or fertilizers produce carbon dioxide and methane, add to the greenhouse effects in the atmosphere and increase the air temperature, Pesticides, used for the protection of crops, have harmful effects on human health. They cause allergies and stomach diseases. When it rains the chemicals seep through ground and drain into the water and cause water pollution,



which is harmful for fishing.

Overgrazing in large areas of the country has increased deforestation and soil erosion. Irrigation system has caused water logging and salinity which has damaged many farmlands, reducing crop production.

Industrial development has significantly contributed to the adverse effects on the environment. The thick smoke emitting from the factories pollutes the air and increases the air temperature. Lahore faces a great smog (a combination of fog and smoke) problem during winter for many years. This smog affects the visibility for transport, and the Motorway has to be frequently closed for traffic. The smog is also a serious health hazard, people suffer from different types of allergies, asthma, and chest diseases.



## Impact of the use of Fossil Fuels on the Environment

When fossil fuels (coal, oil, natural gas) are burned, they produce smoke fumes, soot and other combustion by products, wind blown dust and sea salt pollen spores. They release a large amount of carbon dioxide, a greenhouse gas, into the air. Greenhouse gases trap heat in our atmosphere, causing global warming.

In the last 50 years or more, carbon dioxide and particulates in the air have increased due to use of fossil fuels as a source of power for transport, industries etc. The use of chemicals as raw materials has added more adverse effects on the environment.

Pakistan is also under the great effects of Global warming. Its climate change is quite evident by untimely rains in their amounts and strength. Flash floods and thunderstorms are becoming frequent in different areas. Some areas are affected by severe drought, which is forcing the people to migrate. This erratic weather behavior is changing agriculture, reducing fresh water supply and causing loss of biodiversity.

Air and water pollution is contributing to an increase in Respiratory infections and diseases including asthma, stroke etc. In 2004 WHO ranked the Pakistani cities of Karachi, Peshawar, Lahore and Rawalpindi amongst the most atmospherically polluted cities in the world.

Overpopulation adds to carbon dioxide in the air. The lifestyle of the people, high rise buildings, use of vehicles emitting smoke, thermal power plants using coal, oil and natural gas for fuel are a few examples of global warming.

According to Macrotrends, 50 years ago in 1974 the world population was 3.996 billion, by 2024 it has increased to approximately 8 billion.

(<https://www.macrotrends.net>>WCD). Due





to increase in World population the demand and needs have increased in all the fields of primary, secondary, tertiary and quaternary. The mass production of goods has resulted in the generation of industrial waste and its associated pollution.

Human activities have disrupted the earth's energy balance by increasing the amount of carbon dioxide in the atmosphere and ocean, which has led to rising temperatures. Some consequences of the greenhouse effect include: Flooding of coastal cities, desertification of fertile areas, melting of glacial masses and proliferation of hurricanes. All modes of transportation -air, sea, road and rail are contributing to global warming across all levels of atmosphere.

## Effects of Global Warming

The increase in global temperatures is a key driver of global warming, leading to various climatic hazards of varying intensity across different regions. These changes pose significant risks to human life, with many areas experiencing higher temperatures and more frequent heatwaves. According to NASA analysis, global shutdowns related to ongoing coronavirus (COVID-19) pandemic reduced particulate air pollution in many areas, allowing more sunlight to reach the surface and producing small but potentially significant warming effects. Year 2020 was one of the hottest years on the earth. High temperatures increased heat related illnesses. It was more difficult to work outdoors. Wildfires and severe storms affected many areas.

Drought causes destructive sand and dust storms, increasing desertification and reducing land for growing crops. This environmental degradation has a direct impact on the livelihood, of the people for their health, agriculture, economies, energy and the environment.

In 2004, Tsunami in Indian Ocean, killed more than two million people and infrastructure and houses were destroyed effecting fourteen countries including Indonesia, Srilanka, India, Maldives and Thailand.

Murree, a hill station in Pakistan, on 7 January 2022, was hit by a snow storm. Murree is a popular hill resort at an altitude of 7517 feet in Pir panjal range. It is an hour drive to the north of Islamabad. Snowfall continued for 5 days which was four feet deep. The alert warning was given to avoid visiting that area. Many people, who had already reached there, were trapped in snowfall. People could not get reasonable accommodation. There was a great traffic jam, The tourists had to stay in their cars. The temperature dropped to -8 degree Celsius. 22 domestic tourists were killed. This event highlights the increasing unpredictability and severity of weather events driven by global warming, affecting both human safety and local economies.



Murree Snow Storm (2022)

## Factors affecting Global Warming and Climate Change

### Floods:

**Causes:** Pakistan has one of the highest mountains in the world with snow-capped peaks and many large glaciers. The country has a unique climate. It receives rainfall by the Monsoons in summer and by the western Depressions in winter. The country has a tail end effect of both climates. The number of rainy days and amount of rainfall is unpredictable. In spite of the fact the climatic predictions have advanced to inform us about the weather forecast predictions but sometimes sudden weather change is unpredictable.

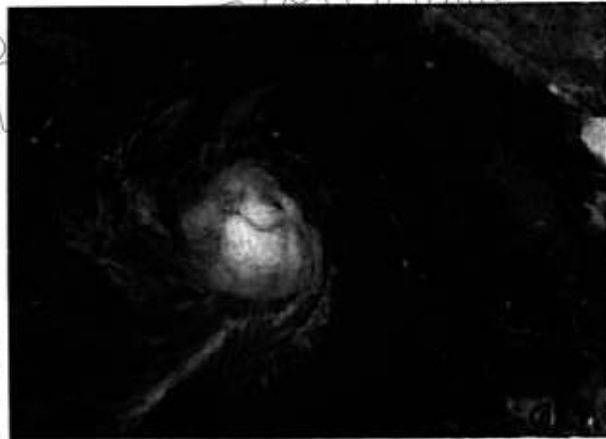
Pakistan is located north of Tropic of Cancer (23.5degree North), 22 June is the longest day. The monsoon winds are highly influenced by increasing temperature in July and August and cause heavy rain in many parts of the country during summer. Due to the high temperature in summer, the glaciers in the north start melting and more water and silt (eroded rocks) are added to the rivers. The northern areas become a high-risk area for snow avalanches and landslides. Deforestation for fuel is also a strong factor for soil erosion and fast flowing of water down the stream adding ton of silt and tremendous amounts of water to these rivers beyond their capacity. The banks of the rivers are washed and water spreads almost in all the low-lying areas of Punjab and Sindh. Baluchistan earlier was not much affected by floods during summer but now because of climate change Baluchistan is also hit by flash floods along with other areas of Punjab and Sindh. On 22 July 2010 there were flash floods in Khyber Pakhtunkhwa, Punjab and Baluchistan. Inundating large areas sweeping roads and bridges. 1000 people were killed and 100,000 people were displaced.

### Measures to check floods:

The Water Management and Flood protection Department works with the Ministry of Water Resources to control flooding. Their efforts include structural measures, including flood forecasting and warning system, with weather radars, a high communication system and effective river inflow/out flow data reception and dissemination, increased coordination between different provinces and federal departments. Flood protection walls, or flood embankments. Form of flood mitigation, is being followed to plant trees along river banks, particularly eucalyptus, building of Levees, and flood control walls, removing people and their belongings through evacuation routes. Well-developed perennial canal system is linked to inundation canals to distribute quick supply of water to remote and drier areas to control the water flow within its banks.

Large and Small storage dams like, Rawal dam, (Korang river) Khanpur dam, (Haro river) Kurum-Garhi dam (kurum river) Bhakar Dam across Sutlej to store water during the rainy season are built. These reservoirs can also be used for fishing and domestic use. More inundation canals should be extended further to provide water to dry areas to reduce the pressure of water in the rivers during rainy season. Dredging of canals on a self-help basis during winter at the low water flow is usually practiced by the farmers to increase the smooth flow of water during summer. River Indus is the only reliable water source for all the provinces. A water accord was signed in 1991 for the fair distribution of river water between the provinces. Strict measures are required to implement the accord by the Indus River System Authority to monitor the water flow particularly during flood time to protect the areas from flooding.

Tropical Cyclones are defined as a non-frontal, symptomatic scale cyclone. These cyclones develop in tropical and subtropical seas having a definitely organised circulation. They cause torrential coastal flooding, damaging winds, and cyclones mostly hit Sindh coast than Balochistan coast. Cyclones form in Arabian sea, and reach Pakistan by the support of on shore monsoon winds during summer. They are not of severe intensity. Usually they enter the sea but often result in strong winds and heavy rainfall, in Pakistan. In 2023 fearsome cyclone Shaheen moved away from the Sindh coast curved towards Oman losing its intensity near Baluchistan. Pakistan has only one warning centre in Karachi.



### **Drought**

Drought is a prolonged dry period in the natural climate cycle that can occur anywhere in the world. It is caused by low rainfall and high temperature. Lack of rainfall causes a serious water shortage. Drought can last for days, months, or years. Atmospheric conditions, such as climate change, increase in ocean temperatures, changes in the jet stream and changes in the local landscape are the factors that contribute to drought. The jet stream is a fast, narrow current of air, flowing from west to east that encircles the globe. Jet stream flows overhead about 7 miles above the surface. It has a dominant influence on the changes in the weather near the surface of the earth.

Pakistan is highly vulnerable to climate change. It has a semi-arid climate, which is influenced by the monsoons in summer and western depressions in winter. Due to the tail end influence of the rainfall system, the country has unpredictable rainfall in its amount and time. It also has continental climate with extreme temperatures in winter and summers. Some areas of the country have very low rainfall less than 250mm, for example Thal and Cholistan in Punjab, Kharan in Baluchistan and Thar and Nara in Sindh.

### **Role of Government Departments for the Awareness of Weather Change**

#### **Weather Forecast**

“Weather” refers to the specific condition of the atmosphere at a particular place and time. It is measured in term of variables including, wind speed, and directions, air temperature, humidity, atmospheric pressure, cloudiness and precipitation. Weather can change from hour to hour and day to day and season.

Pakistan Meteorological Department (PMD) is the government department that provides weather and climate information. The weather forecast refers to the prediction of future weather conditions based on global and regional scale, numerical models and data assimilation. It is used to plan field measurement schedules and identify preferred weather scenarios.

#### **Role of National Disaster Management Authority**

The department conducts hazard vulnerability and risk assessments (HVRAs) and improve risk



anticipation through weather monitoring posts and early warning systems.

IT refers to the design and application of policies to reduce existing risks, prevent new and emerging risks, and manage residual risks with the long term and presumably durable aim of strengthening, resilience against disaster risks.

### The Disaster Management Cycle

Key preferences to manage in disaster management cycle:



### The Disaster Management Cycle

NDMA, coordinates emergency response of federal government in the event of a national level disaster through the National Emergency Operation centre (NEOC). Require any government department or agency to make available such men and resources as are available for the purpose of emergency, Response, rescue and relief.

The purpose is to facilitate the development, assessment and implementation of multi -sectoral disaster risk, reduction frameworks, plans and promotes education, training and public awareness among role-players and communities to ensure disaster avoidance and built community resilience.

NDMA formulates and enforces national disaster policies at federal and provincial levels to provide technical assistance to the provincial governments and provincial authorities, for preparing their disaster management plans, in accordance with the guidelines laid down by the national commission. They are to coordinate and respond in the event of any threatening disaster situation that develop. The department aims at sustainable operational capacity and professional competence to undertake its humanitarian operations at its full capacity. Disaster networks can be classified as mitigation networks and disaster relief networks.

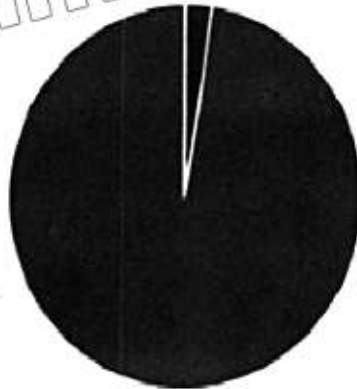
## Fresh Water and Ocean Water Pollution

### The distribution of Fresh and Sea water on Earth

Water on Earth is divided into fresh water (2.5%) and salt water i.e ocean water (97.5%). Of this fresh water, nearly 69% is in glaciers and icecaps, with less than 1% accessible for human use. Conservation efforts are essential to ensure continued clear water for future needs.

## The distribution of Fresh and Sea water on The Earth

Water Distribution on Earth



■ Fresh Water ■ Salt Water

### Reason for water pollution:

Water pollution is a major global environmental problem because it can result in degradation of all aquatic ecosystems - fresh, coastal and oceans. Water pollution occurs when harmful substances often chemicals or microorganisms contaminate a stream, river, lake, ocean, aquifer or other bodies of water, degrading water quality and rendering its toxic effect on humans or environment. The widespread problem of water pollution is damaging our health. Fresh water is polluted through many sources, including municipal, industrial and agricultural waste. Waste water and nutrient run-off from power generation, heavy industry without any treatment plant, automobiles and others.

Around the world, some two-billion tons of human waste are discharged in the water bodies. The dumping of the liter like plastic and glass and other solid waste are also polluting the water bodies.

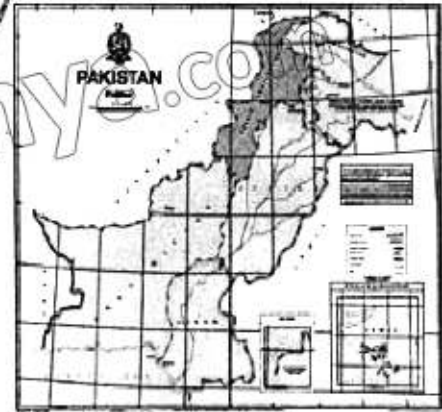
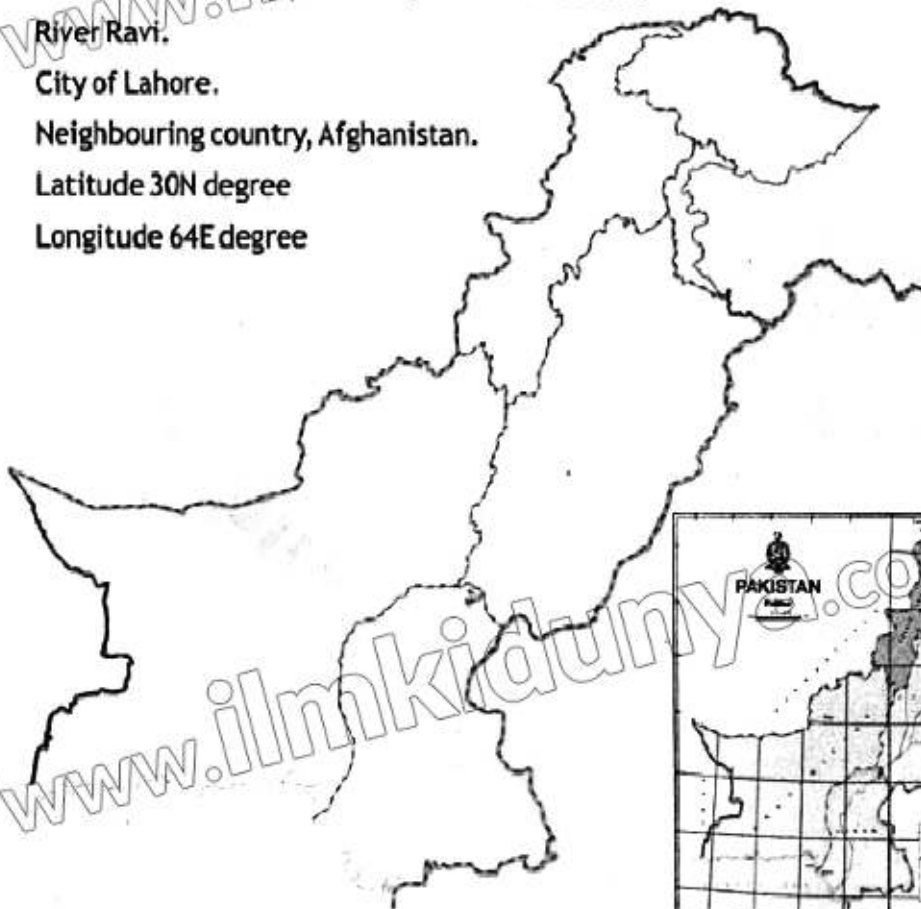
### Solutions:

Awareness to maintain quality of water is the dire need of the time. It is not only the task of the government administration or the non-government agencies but it is the duty of every individual to maintain the quality of water in any form. Sewage must not be discharged directly into the rivers. It is recommended to use biodegradable detergents and limited use of fertilizer and pesticides. Plastic materials should not be thrown in the water instead these should be recycled and reused. The domestic wastes should not be thrown down the drains. The chemical cleaners and non-biodegradable items should be properly disposed of. In outdoor spaces, such as beaches and parks, people should dispose of trash in proper trash cans.

Answer the following questions by choosing the best answer A, B, C or D.

1. On the outline map provided, mark and locate:

- River Ravi.
- City of Lahore.
- Neighbouring country, Afghanistan.
- Latitude 30N degree
- Longitude 64E degree



Choose the correct option.

- 1) Which country is towards the North east of Pakistan?
  - a. Afghanistan
  - b. China
  - c. Iran
  - d. India
- 2) What is the length of the boundary line between India and Pakistan?
  - a. 1000 km
  - b. 1516 km
  - c. 29021 km
  - d. 2192 km
- 3) Pakistan- China Belt and road initiative is of the:
  - a. SAARC
  - b. OIC
  - c. ECO
  - d. CPEC
- 4) Durand line is the international boundary line between:
  - a. Pakistan- India
  - b. Pakistan- Afghanistan
  - c. Pakistan- China
  - d. Pakistan- Iran



- 5) Global warming is due to increase in:
- |                |             |
|----------------|-------------|
| a) Temperature | b) rainfall |
| c) Dust        | d) snowfall |
- 6) Quetta Earth quake hit Baluchistan in:
- |         |         |
|---------|---------|
| a) 1935 | b) 1960 |
| c) 1950 | d) 1945 |
- 7) Desertification is caused by:
- |                   |               |
|-------------------|---------------|
| a) Heavy rainfall | b) low rain   |
| c) snow storm     | d) wind storm |
- 8) Tsunami is a:
- |               |                  |
|---------------|------------------|
| a) Dust storm | (b) Snow storm   |
| c) Sea storm  | d) Thunder storm |
- 9) Summer monsoons cause:
- |             |            |
|-------------|------------|
| a) rainfall | b) Drought |
| c) Tornado  | d) tsunami |
- 10) Murree incident happened in year:
- |         |         |
|---------|---------|
| a) 2020 | b) 2021 |
| c) 2022 | d) 2024 |

Answer the following questions briefly

1. Assess the geopolitical importance of Pakistan?
2. Describe the importance of Gilgit-Baltistan for tourism.
3. Why is CPEC an important project for Pakistan?
4. Identify the causes of earthquakes in Pakistan.
5. With the help of a labelled diagram, explain what is Greenhouse Effect.
6. State the main causes of floods in Pakistan.

Answer the following questions in detail

1. analyse the strategic importance of Pakistan for its neighbouring countries.
2. Evaluate the importance of Gwadar port with reference to the economic progress of Baluchistan.
3. Relate the importance of tourist potential of Pakistan to its unique geographical location.
4. Examine the importance of the National Disaster Management Authority (NDMA) in managing the disaster in Pakistan.
5. Explain with reference to examples. The effects of floods on the environment and human life.
6. What factors effect the climate change in Pakistan Elaborate with examples.

## Learning Activities

1. Use Google maps and to observe the location of Pakistan in the world and write at least 5 important points about the location of the country from their own observations.
2. On the outline map of Pakistan, the students may be helped, how to label the map  
Classes may be divided in groups and allocate them to either important cities or Provinces, to evaluate their importance to the country including some of the personal evidences as case studies to make it more interesting and a direct concern of the students for the country.  
Outline map of Pakistan should be provided for further 10 to 20 copies photo copied for frequent practice of labelling and location of important cities, Rivers and Neighbouring countries.
3. Raise awareness by practically demonstrating how to deal with environmental hazards. (Earthquake and floods)
4. Provide weblinks of weather channels, videos, useful websites and reading material to the students to run a campaign, 'Save Pakistan'.

## Glossary

- **Earthquake:** These shifting of the earth's plates, which result in a sudden shaking of the ground that can last for a few seconds to a few minutes.
- **Geopolitics** is the study of earth's geography on politics and international relations.
- **Global Warming:** is the long-term heating of earth's surface since the pre-industrial period (between 1850 to 1900) due to human activities primarily, fossil fuel burning, which increases heat-trapping green house gas levels in earth's atmosphere.
- **Green house effect:** The process through which heat is trapped near the earth surface by the substance of green house gasses.
- **Hierarchy** a system in which members of an organization or society are ranked according to the relative status or authority.
- **Latitude:** Latitude line starts (0 degree) at Equator and runs east and west parallel to equator.
- **Longitudes:** Longitude is the measurement east and west of prime Meridian (0 degree). These are imaginary lines that run vertically around the equator to meet a north and south pole.
- **Tsunami** is a series of waves caused by earth quakes or volcanic eruption under the sea.

List more words and write their meaning that you find difficult in this unit.
