Chapter 19
Environment, Climate Change and Biodiversity

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19.1 Introduction

Climate is a long term, usual prevailing weather condition in a specific area of earth. Climatic conditions in different areas determined by rainfall intervals, amount of precipitation, wind velocity, wind pressure, humidity percentage, sunshine, cloud formation and others meteorological events such as thunderstorms, windstorms and snowstorms. These all events collectively responsible for determining the climatic condition. Climatology basically related with the geographical position of area on earth. Geographic location include distance from ocean, sea or coast, altitude, latitude, and also mountain ranges which are also responsible for changes in wind direction. Variety of flora growth, development, morphology and reproduction are visible sign for specific climatic conditions. Climatic conditions also responsible for adaptations. Animals lived in different areas behave differently and adapt different ways for living, feeding, and reproducing. Climatic conditions strongly affects the human lives and also determine the different cultures and traditions in areas. So we can say that climate affect each aspect of plants, animals and human lives. Basically six major climate discussed on earth.

- Tropical areas
- Temperate areas
- Polar regions
- Arid zones
- Cold tundra
- Mild Mediterranean

These six are major climatic systems and each have different environmental conditions. So the Biodiversity in these systems adapted in a different way. Climate is

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usually long term environmental condition in definite area but now in modern age many human activities are responsible for changes in natural climatic conditions like industrialization, greenhouse gases, deforestation, land cutting, changes in slops and natural flow of water for commercial purposes.

19.1.1 Six Different Climatic Systems

19.1.1.1 Tropical Regions

These regions are exist in middle of equator and have suitable climatic condition but temperature usually remain high throughout the year. Africa, Asia, North America, South America and Australia, Amazon basin, Congo basin, rainforest of Malaysia and Indonesia are included. Soil in these regions are more fertile for growth of different plants. Mountain in these areas remain cover with snow all year but in summer large amount of water fill sea and ocean. Summer in some areas is too much hot like Asia, Africa and North America. Soils in tropical regions are favorable for growth of major crops like wheat, rice, corn etc. These areas have luxurious vegetation's. Different kinds of animal species inhabitants in tropical regions.

19.1.1.1.1 Tropical Environment

Usually rainfall 1000 mm yearly and 60 mm averagely noticed per month (Wambeke 1992). Fortunately four seasons available in these regions. Summer is too hot in these regions and duration of summer is long than winter especially tropical deserts. Dew drops are only source of water for shrubby vegetation's. In these areas temperature rarely fall below 65 Fahrenheit. Seasons are either dry or rainy. Mostly temperature remain constant throughout the year.

19.1.1.1.2 Tropical Rain Forest

There is large pasture areas available for grazing animals. Annual rainfall is above 1000 mm yearly makes vegetation more flourished and also proper temperature available to plants growth and development. All tropical forest are not rainforest, some areas receive low amount of rainfall yearly especially in summer. Winter produce heavy rainfall which flourishes vegetation's. Epiphytes, orchids, palm trees, rubber trees, giant water lilies, and jaguar is special living creatures in these regions (Reiners et al. 1994).

19.1.1.1.3 Tropical Grassland

Africa is a famous for grasslands. Large grasslands are also exist Australia, South America, Colombia, and Indian plateau. Areas with variety of plants trees, grasses, flourishes vegetation's. Three major grasslands in world savanna grasslands, prairie

grasslands, steppe grasslands. These regions receive 500–900 mm rain yearly. Temperature range between −20 and 30 degree (Dlamini et al. 2014).

19.1.1.1.4 Tropical Deserts Properties and Specialties

The deserts in these areas have very harsh climate and very hot summer throughout the year. The plants in these regions are cacti, saguaro cactus, weathered trees, tumbleweed, wildflowers are very common existing species (Sánchez and Cochrane 1980) (Fig. 19.1).

19.1.1.1.5 Tropical Regions Common Diseases

Tropical regions have many cases of epidemic which destroyed large community in history such as malarial disease sign are also found in ancient Egyptians mummies. Dengue, yellow fever, filariasis, common in Africa and Southern America. There are others many disease are present in these rural areas but neglected by world like African sleeping sickness disease, rabies, leprosy, guinea worm disease, cholera, lymphatic filiariasis. Many developing countries in these regions have no availability of proper vaccine, medicines and treatments. There are large number of population affected by these aliments and epidemics and finally death (Hotez et al. 2007). Most countries of Africa and Asia are considered as developing countries so low quality food and food products and no proper provision of drinking water to communities are major reason of aliments in these regions. Different agencies and societies work in these areas in field of health and food security but major program needed for development of these regions.

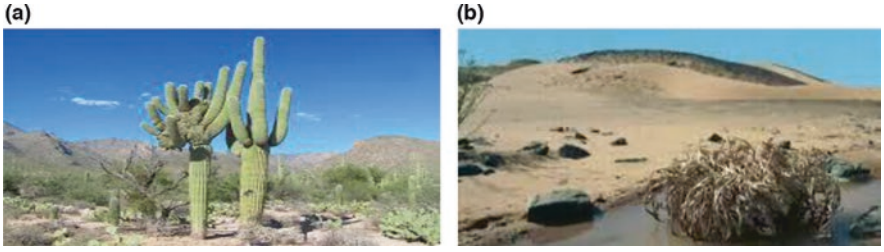


Fig. 19.1 The respresentatiove plants of tropical deserts. (**a**) Saguaro plant. (**b**) Tumbleweed plant

19.1.1.1.6 Tropical Areas Human Adaptations

I. Rainforest are basically the home of native tribal people. They depend on their surrounding for survival and to full fill basic needs of routine life. But due to cutting of more and more trees is the main reason of forest destruction, but their government have no hold on these people.
II. People live in tropical deserts face more difficulty than any others. They live in small huts face shortage of water whole year. They totally depend on herds of animals and camels for food and transport. In Pakistan Cholistan desert, Rohi desert, and Thar and Thal and Rajistan in India are popular for their harsh environment.
III. People live in cold tropical areas face less difficulties than any other because in summer luxurious fruits and vegetation's and crops variable. No shortage of food and water. Crops growth is highs in these areas.
IV. Rain forest in tropical are very thick, flourished and evergreen vegetation's grow here. Only tribal people live mostly in these areas. No shortage of water and scarcity of food here (Table 19.1).

19.1.1.2 Temperate Regions

Temperate regions lie between tropical and polar regions and cover approximately 7% of world. Climatic conditions are normally moderate no severe burning not freezing. Mostly these areas have four seasons summer, autumn, winter and spring. Temperate regions include Europe, Canada, Sothern Australia, Central Asia and Southern South America. Unpredictable rainfall, fog, snow, and storms are common characteristics of these areas. Soils are fertile and good for plants growth but remained cold for long period of the year. Winter months are too much cold for ripening of crops but summer is hot enough for ripening of wheat, rice, sorghum. Weather conditions are not remained stable in these regions (Whitehead 1970).

19.1.1.2.1 Temperate Environment

Temperature in temperate areas is not at extreme caused no burning and not too much cold. So environment in these areas is more flourished and favorable for life. Four seasons in a year autumn, spring, summer and winter makes them more luxurious. Precipitation fall in form of rain or snow. Amount of precipitation fluctuates in Washington and Seattle. In rainforest precipitation rate is above 137.79 inches annually. In some areas rainfall is above 78.74 inches (Delpla et al. 2011) (Fig. 19.2).

19.1.1.2.2 Temperate Rain Forest

Temperate rain forest start from Alaska to northern California in North America. Temperate rain forest located near the costal line of United States, Norway, Japan, New Zealand and South Australia. Difference between tropical and temperate rain

Table 19.1 Tropical region animals, plants, and their adaptations

Tropical regions	Species name	Picture	Adaptations
Tropical desert	Chile llama		Found in Atacama desert. High concentration of hemoglobin in blood help to survive at high altitude.
Tropical evergreen forest	Jaguar in rain forest		Jaguar is a good swimmer and fur camouflage helpful in predation.
Tropical plants	Palm tree		Palm tree leaves is an adaptation, protect from drought, heat and cold.

(continued)

Table 19.1 (continued)

Tropical regions	Species name	Picture	Adaptations
Tropical plants	Durian fruit		Jackfruit effectively grow in these areas because of large water supply and mineral content.
	Giant lilies		Thick cuticle protect from desiccation, and enhance photosynthesis, and also protect fishes in water.

Fig. 19.2 Temperate forest in South America

forest is that tropical rain forest are warm and humid and have high moisture content but in case of temperate rain forest are moist, humid but cool (Kitching et al. 1993). Only woodlands in temperate rain forest receive heavy rainfall large numbers of trees grow in these forest compared with tropical rain forest. Only small portion of tropical forest are rain forest (Kikkawa 1966).

19.1.1.2.3 Temperate Grasslands and Woodlands

Basically 4 major grassland in temperate regions. Temperate grasslands have cold winter and hot summer. Major grasslands includes veldts of Africa, pampas of South America (Argentina), steppes of Eurasia and plains of North America. These regions have heavy rainfall and have many types of trees (Prober and Thiele 2005). In grasslands trees are dominated over grasses (Poaceae). Summer is hot in these regions some time high as more than 100 Fahrenheit but this is not caused burning so vegetation's remained flourished approximately whole year. In summer rainfall also occurred but average is low than winter. In winter heavy rainfall makes soil more porous and enhance nutrient content. Temperature vary from low to −40 Fahrenheit (Martin-Neto et al. 1998).

19.1.1.2.4 Temperate Regions Common Diseases and Humans Adaptations

Temperate regions usually have cold climate. Some diseases are common hepatitis B, influenza A, measles, asthma, pertussis, tuberculosis, rotavirus, tetanus, syphilis are common diseases which prevail in these countries. Respiratory diseases are common in these regions. Death rate due to epidemic is low in these areas as compared with tropical regions. Most areas have temperature 0 degree to 28 degree which is not sever in most cases. But seasonal fluctuations are common in these regions fogy storm some time destroy whole cities and seasonal rains some time change in to storm and are reason of sever destruction for crops and infrastructure (Van Dijk et al. 2010) (Table 19.2).

Table 19.2 Major plants of temperate climate

Northern America deciduous forest	Species	Adaptations
Quercus rober (Oak plant)		There are many variety of oks are found in temperate areas, evergreen leaves, fruit ripe after 2 years, female flower covered with scales and protect food. Male stamens born on same plant. Many species are highly poisonous.
Fagus grandfolia (American beech)		Use for timber and ornamental purposes, leaves of American beech are blue green, 13 cm long, trees are 30 m long, deciduous tree, also grow for ornamental purposes in lawns and gardens.

North temperate zone (Japan)		
Acer saccharinum (Silver maple)		More than 200 species, basically grown for ornamental purposes due to different shaper of fruit. Important for maple syrup. Berries use in medicines. Winged seeds lobed leaves.
North America, Greenland, Iceland's, Europe		
Carya avata Shagbark hickory		Grows in North American deciduous forest. Use for ornamental purposes, large and evergreen leaves, wood used for furniture. Long trees above 100 m.

(continued)

Table 19.2 (continued)

Northern America deciduous forest	Species	Adaptations
Liriodendron tulipifera (Tulip tree)		Important North American timber tree, height is 60 meter, also known by white popular and yellow popular. Grow for its beauty long straight stem with oblong crown.
Nyssa sylvatica (Black gum)		It found in moist area of US, Maine south, gulf coast and Oklahoma, wood is light in weight and strong enough,

Taxodium distichium (Black cypruss)		Valuable wood because of water resistance, very beautiful foliage. About 100 ft. long trees, but due to wholes in wood fungus can easily destroy wood..
Eucalyptus globulus Eucalyptus trees		Largely plantation in Australia. Basically grows shading, as a forest tree. Major plants in temperate forests.

19.1.1.2.5 Temperate Regions Biodiversity and Relationship with Their Environment

I. Temperate regions are famous for its cold climate. People in these areas are adapted according to their environment. Adaptations vary according to their climatic conditions such as in north America people face strong cold and wear thick dresses as compared with native tribes in temperate rain forest where even winter is not too much cold (Galicia et al. 2015).
II. People lived in hilly areas faced severe winter, everything change in to ice .life tough in these areas.
III. Due to different climatic conditions cultures, traditions are different among people.
IV. Environmental conditions are favorable for agriculture.
V. People in these areas have close relationship with their environment (Swarts et al. 2017).

19.1.1.3 Polar Regions

Arctic, Antarctic, Siberia, Northern Canada located at high latitude. Land in these areas cover with snow and darkness throughout the year. Temperature fall as low as −80 in Antarctic and −50 in Artic which is severally low for life. Average rainfall is low annually 250 mm yearly which makes them dry as deserts hot areas. Soils in these areas are too much cold for plants growth and remain covered with snow whole year. Only those plants can grow in these regions which have high content of anti-freezing proteins bearberry (fruiting plant), pasque flower (flowering plant), Artic willow (dwarf shrub) but mostly algae, lichens, mosses grow here. Only those animals can survive here which hibernate 6 month of winter like polar bear, or those live which live in water like seals and other fishes survived in these cold water because of presence of unsaturated lipid bilayer which protect them from freezing (Chilali et al. 1999).

19.1.1.3.1 Polar Regions Characteristics

Polar climate are characterized by lack of summer, no warm month in whole year. Summer is cool in these regions sun is on horizontal position so heat intensity is very low but the winters are dark and bitterly cold. Each month have temperature below 10 degree. Soil is cover with thick are thin layer of ice during whole year. So glaciers, tundra treeless regions are included in it. Cool to cold environment exist here. Very complex plants and animals in these regions. Slops, slides, elevation above sea level (Gow and Tucker 1990) (Fig. 19.3).

19.1.1.3.2 Artic Regions Characteristics

These regions located in northern most region of earth. Exist in latitude 65.5 north direction of equator. Arctic regions are overall covered with water which is in frozen state. Summer is cool but winter is bitterly cold in these regions. Soil remain frozen all

Fig. 19.3 Arctic climate and environmental conditions

the year and germination of normal flora is impossible due to very low temperature of soil. This makes conditions of arctic tundra. Arctic regions not only the hose of unique species like polar bear but also large frozen white area on earth reflect the sun rays and help in balancing the earth temperature (Zoltai and Vitt 1995). Other than this these areas are the house of unique animals like polar bear, dog fish, snow fox etc.

19.1.1.3.3 Importance of Arctic Regions

Arctic regions play an essential role to control global warming and maintaining earth temperature. Large white ice frozen area reflect the sun rays from earth surface and protect to penetrate in earth surface but humans activities are major reason for destruction of habitat lead towards the global warming. Soil temperature continuously elevate and this increase is a major reason of melting ice in polar region and glaciers (Walsh 2008) (Table 19.3).

19.1.1.3.4 Antarctic Regions Characteristics

Antarctica is the highest, coldest, driest region on the earth. Highest peaks 4000 m are located. Mt. vision is a part of Ellsworth Mountains located in western continent in Antarctic Peninsula. Antarctic region have highest mountain due to these this regions is consider highest continent in the world, it is because of thick layer of ice. East area have thicker ice sheet and low underlying row of rocks than west side have more rocks bed and thin ice sheet. It is the world coldest and driest part of earth with very low precipitation (Fernandoy et al. 2012). Due to low precipitation it is consider as polar desert. Only 0.32% area is glaciers free but these island exist between large mountains of ice. These coldest areas are very precious for our earth because they balance our earth temperature against sun rays (Aristarain et al. 1990) (Table 19.4).

19.1.1.4 Arid Zones

These areas faces sever dryness and water shortage. World biggest desert Sahara, Gobi desert, Arabian Desert and large area of Iraq, Northern China, and Cholistan at boarder of India and Pakistan also included in arid zones. Rainfall is below

Table 19.3 Plants in polar climate

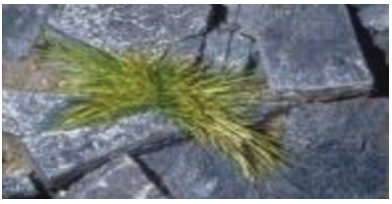
Artic region plants names	Species	Adaptations
Salix arctica Arctic willow		Dwarf shrub, food foe caribou, musk oxen, and native people called this plant tongue.
Pulsatilla vulgaris Pasque flower		Found in northwestern united states and northern Alaska. Body covered with fine silky hairs which protect against ice hazardous.
Arctostaphylos uua-ursi Bearberry		Leathery evergreen leaves, body is covered silky smooth hairs, these berries are called bearberries because bears like to eat.
Saxifraga oppositifolia Purple saxifrage		Grows in low light and tight hard soil areas, small star shaped flowers appear from melting snow.
Papaver radicatum Arctic poppy		Plant height is 10–15 cm, one flower on each stem, flowers turn their direction towards sun.

(continued)

Table 19.3 (continued)

Artic region plants names	Species	Adaptations
Eriophorum angustifolium Cotton grass		Name for its fluffy flowers, cotton grass are important food ingredient for migrating snow geese's.

Table 19.4 Antarctic regions plants

Antarctic regions plants names	Species	Adaptations
Deschampsia antarctica Antarctic hair grass		Grow in tough and hard rocks and absorb nutrients. Source of food for Antarctic animals.
Antarctic lichens		Lichens are association between algae and fungi, cn grow in hard environment because can perform photosynthesis.
Red algae		Look like plant, is a major source of food for aquatic animals.

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150 mm annually and when rain do fall caused flash floods. So very strong winds and dirt storms. Temperature reached at 0 C at nights and above 50 C during daytime (Rapport and Whitford 1999). Southeastern Arizona disturbance of vegetation due to no rainfall occurred till centuries (Bahre and Shelton 1993). Most vegetation's are dwarf shrubs and plants with deep stomata, tough cuticle layer protect them from transpiration, mostly plants adapted themselves and reduce leaves to spines, all those strategies are adapted by plants which protect them from desiccation. Grasslands are consist of shrubs (Whitford et al. 1995). Animals lived very tough life and faced scarcity of food and shortage of water whole year, Sahara elephants, wilder beat etc. they travel long distances for water and food sources. Shrubby vegetation's and dwarf trees are only source of food.

19.1.1.4.1 Desert

Deserts is a part of earth which receive very low amount of rain fall, less than 250 mm annually. Approximately 1/3 part of earth is included in deserts. There are 25 deserts in different continents of world. There are 4 major kind of deserts (1) cold winter deserts (2) cool coastal deserts (3) subtropical deserts (4) polar deserts (Tables 19.5 and 19.6).

Table 19.5 Major five deserts in world

Deserts name	Characteristics
Antarctic desert	Antarctic desert is world largest polar desert. It cover approximately 5.5 million square miles. This region receive very low or no precipitation. Very large slop and mountain exist in this desert these are formed due to thick ice sheet small rock bed.
Arctic desert	Arctic desert is the second largest desert of world. It covered approximately 5.4 million square miles. There are many countries include in this desert Canada, Norway, Russia, Iceland, Greenland, Sweden, Finland.
Sahara desert	This is the third largest desert of earth. This is a subtropical desert in Northern Africa. Area extended more than 3.5 million square miles. Hard and tough climate. No rainfall do even many years. Only dwarf shrubs and arid regions plants. Dew drops is only source of water for plants.
Arabian desert	Located in Arabian peninsula is a subtropical desert. It covered one million square miles area. Also have very harsh climate. Very low rainfall if rainfall do it is only flushes. Only shrubby vegetation's are found grow here. During night temperature fall and sometime reached at 0 degree but days are too hot.
Gobi desert	Gobi desert is a cold desert covered area of 500,000 million square miles. In winter temperature reached at −40 degree and in summer 45 degree. Temperature in this region at great extremes.

Table 19.6 Major deserts plants

Plants names	Species	Adaptations
Saguaro cactus		Found in Sonoran desert of Arizona. Mysterious plant, without leaves, bloom in summer and its flower are national flower of Arizona
Baseball plant Euphorbia obesa		Found in Karoo desert of south Africa have similarity with baseball so names baseball plant. This has become extinct in nature because of more collection.
Silver torch desert		This plant is also known as wooly plant and have 2 inch long spine, grow at −10 degree, very beautiful in structure.
Barrel cactus		Native to southwestern America, grow till 10 m in height, have shallow root system. Yellow color flower appear on head. This plant can survive 150 years in harsh environment.

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Table 19.6 (continued)

Plants names	Species	Adaptations
Desert ironwood		This plant only food in Sonoran desert on north America. This plant also have ability to drop temperature around environment, shad their leaves when temperature too much increase.

19.1.1.4.2 Arid Zones in Pakistan

Cholistan is a major desert cover the area of Bahawalpur, Bhawalnagar, Rahimyar khan (Akhter and Arshad 2006). Indus valley desert located in northern area of Pakistan. Kharan desert area found in northeast Baluchistan. Thal desert located in Mianwali area between Indus and Jhelum River. Thar desert located in province Sindh (Enright et al. 2005).

19.1.1.5 Cold Tundra

Tundra mean treeless regions. Two types of areas consider in tundra Alpine tundra and Arctic tundra. In these areas soils are called gleisoil's low nutrient soils are frozen enough for germination of seeds. These regions are located at high latitude. Frozen soil only support growth of lichens, mosses, dwarf shrubs, and wildflowers. In tundra animals popular one is muskox, arctic wolf, snowy owl, and arctic squirrel (Rocha et al. 2012).

19.1.1.5.1 Cold Tundra Plants

There are basically three tundra regions (1) Arctic tundra (2) Antarctic tundra (3) Alpine tundra.

19.1.1.5.2 Arctic Tundra

Region occur in northern hemisphere in taiga belt. There are treeless plains. Major area of Russia and Canada include in it (The tundra biomes 2006). Several people live in these areas Nenets and Nganasan tribes. Winter seasons are cold and dark

temperature in winter −28 and as low as −50 degree. In summer temperature 12 degree. Flora mostly consist of mosses lichens, and algae (Higuera et al. 2011).

19.1.1.5.3 Antarctic Tundra

Antarctic tundra basically consist of Antarctic regions. South Georgia, Sandwich Island and Kerguelen Island. Only support driest vegetation's like mosses algae and lichens (The terrestrial plants 2006). These regions are home of many animals major like polar bear, seals and penguins (Antipodes Subantarctic Tundra Island 2009)

19.1.1.5.4 Alpine Tundra

These regions are also located at high altitude and similar to polar climate because if no trees growth at high altitude. These regions are cold due to low air pressure. Alpine tundra differ from polar tundra because soils are better drain. Vegetation's like mosses, lichens, sedges, perennial grasses (Körner 2003).

19.1.1.6 Mild Mediterranean

Part of the earth around Mediterranean Sea is known as Mediterranean regions. 22 countries surrounded the Mediterranean Sea. Mediterranean countries includes north shore linked with Italy, japan, France, Spain, Bosnia, southern shore includes Morocco, Algeria, Egypt, Tunisia, Libya (Brun et al. 1998). Summer is hot and dry in these regions and mild and rainy winter. Soil is mix type but have high nutrient content, annual plants dried out during summer due to sever dryness but winter makes soil porous (Yaalon 1997). Rate of precipitation is 20 inches yearly. Summer is severely dry but winter is rainy. Crops growth is good in these regions but dry areas have shrubby vegetation's thyme, rosemary.

19.1.1.6.1 Mediterranean Regions and Climatic Conditions

Mediterranean climate is between dry hot summer but mild and wet winter. Climatic conditions is not sever in these regions. Mediterranean ocean directly affect their climate. Diurnal temperature variations. Days are hot and dry but dusk time rapidly cooling start. Precipitation rate is higher during winter but no rainfall during summer for 3–6 month. Rate of evapotranspiration is higher in day time. Rainfall is not evenly distributed in these regions like Barcelona and Los Angeles experience very hot and dry summer but now frost and snowfall in winter but in Tashkent winter have annual snowfall and frost. But in Athens have very high temperature even 48 degree in summer. Los Angeles have mild climatic conditions like 21 degree normal temperature even in summer ("España a Través de los Mapas". *www.ign.es*.).

Table 19.7 Major vegetation's in mild Mediterranean regions

Herbs	Penstemon, dietes, achillea
Grasses	Bunchgrasses, sedges, rushes
Shrubs	Rosemary, banksia, chamise
Trees evergreen trees	Cypress, pine, bay laurel,
Deciduous forest	Sycamore, oak, buckeyes

19.1.1.6.2 Vegetation's in Mediterranean Regions

Basically seven types of vegetation's are found in these regions and their growth is supported by environment (Dallman 1998) (Table 19.7).

19.2 Climatic Changes and Biodiversity Destruction

This earth is precious for humans because this is the only planet where all environmental conditions is suitable for human life along with animals and plant life. Environmental conditions on others planet do not support our biodiversity. But this beautiful home destroy by humans only. Changes in climate refer to anthropogenic climate change (Bodansky 1993). Term climate change related with anthropogenic climate change. Major disturbance is caused by global warming. Earth temperature is continuously increase due to human activities. There are some major factors involve in climate changes.

19.2.1 Global Warming

In modern world human activities severely damage the earth natural processes. In anthropogenic activities green house is really important to discuss. In green house sunrays are absorb but do not reflect back. So this is the major reason to elevate the earth temperature. These four gases concentration elevate constantly (1) methane (2) carbon dioxide (3) nitrous oxide (4) fluorinated gases. Oil, coal and gas like methane burring, elevate carbon dioxide content in atmosphere. Excessive use of nitrogenous fertilizers elevate nitrous oxide content in atmosphere. These gases enhance environmental temperature. In last two decades earth temperature elevate 2 degree. This is critically dangerous for all life forms on earth (Meinshausen et al. 2009; Fahad and Bano 2012; Fahad et al. 2013, 2014a, b, 2015a, b, 2016a, b, c, d, 2017, 2018, 2019a, b).

19.2.1.1 Greenhouse Effect

Greenhouse effect by definition is less transparency of our atmosphere and different types of toxic gases covered our atmosphere around earth, so sunrays are not reflect back and absorb on earth surface and propagate heat around all direction. These gases includes chlorofluorocarbons, methane, nitrous oxide and specially carbon dioxide (Broecker 1975).

19.2.2 Changes in Natural Path of Water for Infrastructure Development

Changes in natural flow of water by cutting land for infrastructure development but these changes are major reason of land degradation, flooding and also decrease soil fertility. Floods destroy large population in different countries because humans tried to change natural water routes, resources, and natural flow of rivers and streams according to their own designs (Weitzman 2009). It is time to need sustainable infrastructure. Its mean that infrastructure development don't affect ecologically, socially and economically (Oztas et al. 2013).

19.2.3 Changes in Pattern of Rainfall and Threat for Agriculture

Climatic changes are mainly related with anthropogenic activities of humans like deforestation, release of fluorinated gases, nitrous gases, methane, carbon dioxide, industrialization are factors which majorly contributed in temperature elevation, variations in rainfall patterns, storms and drought (Mendelsohn 2014). These problems are sever especially in developing countries because government have not enough capacity to mitigate these issues (Kurukulasuriya et al. 2006). Changes in pattern of rainfall and as a result in drought on large fertile land in Asia and Africa. Shortage of water for agriculture researcher predicted that wheat yield in south Asia will decrease 50% by 2050 which is 7% of global wheat production (Arnell et al. 2004). Sub-Sarah Africa and south Asia are sever hungry areas of world (Vermeulen et al. 2012). In south Asia variations in rainfall pattern either caused drought situation or in other case floods in many areas destroy and washed away whole fields. Farmers in developing countries face more trouble because government provide no fun and support for rehabilitation (Droogers and Aerts 2005).

19.2.4 Heavy Industrialization

Sunrays are come from sun some reflect back and some absorb on earth surface but the problem is raised due to excessive release chlorofluorocarbons, carbon dioxide and methane gases (Lockwood 2009). These gases absorb sunrays and propagate heat in all direction but recent researches show that these gases excessively released from heavy industries due to burning of coal, oil and methane gases**.** Industrialization in recent decades has become a major and critical problem and a reason of climatic changes but also fill soil with heavy metals and toxic chemicals which prohibited the growth of many plants and animals species leads many areas towards desertification (Lean 2010).

19.2.5 Deforestation

Deforestation not only leads towards lessens of trees but also the stores carbon dioxide released from dead plant body to environment. Carbon dioxide is a major greenhouse gas and its higher concentration is a serious threat for earth environmental stability. Elevation in concentration of carbon dioxide because trees use this gas in photosynthesis but lessens number of trees and large amount of carbon dioxide is a serious threat. There are some major reason of deforestation

I. Woods used in paper industry
II. Cutting of trees for furniture and for home decoration.
III. Wood is also used for wood oil like pine trees.

For restoration of environment basically efforts needs diminish the excessive quantity of carbon dioxide and to buildup wildlife habitat (Bradford 2018).

19.2.6 Disappearance of Water Bodies

Disappearance of water bodies (lakes and rivers) dried up in many areas of world. Climatic disturbance change rainfall pattern and due to less rainfall and due to high temperature evaporation rate increase and this leads to sever desiccation. Chad Lake, rivers in Africa, Asia and Middle East, Aral Sea in border of Kazakhstan and Uzbekistan and list is not end up here. Waste area in Pakistan also damage. Dams and water extraction from rivers through canals are also a major reason for water sources disappearance (UNEP GM 2002).

19.2.7 Oceanic Acidification

Oceanic acidification is a burning issue in these days. Many anthropogenic activities are only responsible for this problem. In recent decades industrialization and agricultural reforms buildup human life style and decrease the scarcity of food for humans along with animals but humans are also responsible for destruction of natural ecosystem. Burning of coal, gases and oil elevate carbon dioxide concentration in air and when oceanic surface touches atmosphere and also acidic rains these carbon dioxide mix in oceanic water. Then a chain of chemical reactions occurs and carbonic acid. High concentration of hydrogen ion decrease level of carbonates. These carbonates are important in calcification and shell formation in sea shells, oyster, corals and calms. Due to disturbance of optimum ph. and increase acidification dissolves calcium shells and in some cases inhibit the formation of shells in corals. In some fishes it damage fish normal development (Shafeeque et al. 2017).

19.3 Climatic Changes and Threats to Biodiversity

19.3.1 Temperature Elevation

Constant increase in temperature is an alarming situation for survival of biodiversity. Decline in rate of reproduction of many species of animals and plants because environment cannot full fill the requirement of optimum temperature. Green ringtail possum in Queensland cannot maintain its body temperature if environmental temperature increase from 30 degree. But now this is an endemic species (Laurance 1990).

19.3.2 Bleaching of Coral Reefs

Bleaching of coral reefs, is due to high temperature corals expel zooxanthellae outside their body so corals loss their color. Zooxanthellae and corals makes mutualistic relationship. Algae provides nutrients and proteins to corals and zooxanthellae provides oxygen to corals to remove waste. Due to removal of algae loss of pigmentation, nutrients. Those corals which loss zooxanthallae is not able to perform photosynthesis, no photosynthesis no food preparation. So death of coral (Hoegh-Guldberg 1999).

19.3.3 Changes in Rainfall Patterns

Changes in pattern of rainfall severely affect aquatic life of earth. For example Australia is is dry continent but have variety of fauna and flora. Changes in rainfall pattern alter water quality and quantity but also leads towards extinction of many species like Australian kangaroo's. Macquarie marshes are home of many species like water birds, turtles, and whales which are at high risk (Memmott et al. 2013).

19.3.4 Higher Concentration of CO_2 in Water and Plants Growth

Higher concentration of carbon dioxide is harmful in water bodies harmful for aquatic life. Higher quantity of carbon dioxide caused eutrophication and microalga growth lower the oxygen content. Rainwater flow fertilizers from field, phosphate and nitrates to water bodies is a major reason of eutrophication (Riebesell 2004). Higher concentration of carbon dioxide produce algal bloom over entire surface of water bodies and depleted the nutrient concentrations for other organisms and also inhibit sunrays to reach to flora in water depth (Rixen et al. 2012).

19.3.5 Rise in Sea Level

Global warming is a burning issue now a days. It has become a severe problem for ice caps and glaciers in last decades. Researchers estimate that glaciers will completely melt in 2035. The rate of ice caps melting is quicker than snowfall deposition. The rising in sea level is the result of melting of glaciers and ice caps. Ices caps are critically important for balancing earth temperature because there ice structures reflect sun rays from earth surface along with diminish the heat waves effect in all directions (Church et al. 2013). Oceanic heating in different parts of earth contributing in sea level elevation like Antarctic regions store 70% of world fresh water (Winkelmann et al. 2012). World highest contribution in increase of sea level is found in East Antarctica (Fretwell et al. 2012). West Antarctica, sea ice and glaciers are at hiher risk of melting as a results of global warming.

19.3.6 Adaptations of Organisms Against Changing Environmental Conditions

19.3.6.1 Adaptations of Plants

I. Elevation in temperature due to global warming many plants species short their life cycle because high temperature makes pollens unable to fertilize ovule so plants start early reproduce and complete their life cycle in spring before summer heat start.

II. In Arctic regions plants start to migrate towards higher latitude and altitude because their native environment is not support their life cycle (Aldrich et al. 1998).
III. Hybrid plant species survive more effectively in changing environment than parent variety.
IV. Many plants species have more thick cuticle layer than before to protection against desiccation (Jump and Penuelas 2005).
V. Many plants species starts to reduce their expansion because of difference in continental and oceanic environment temperature in northern regions (Crawford and Jeffree 2005).

19.3.6.2 Adaptations in Animals

I. Elevation in temperature and scarcity of food, animals starts to move towards higher altitude and latitude (Cho 2015).
II. At Australian coast sea turtles gender transformation has become a serious issue. In case of lower temperature eggs embryo develop in female but in case of higher temperature of environment eggs develop in to females, researchers observed 99% female turtles, this is a serious dander for species survival (Besnier et al. 2014).
III. Oceanic corals starts bleaching and loss their color because they expel algae which make mutualistic relationship with corals due to low nutrient supply and higher temperatures. These corals are home of variety of aquatic life (Perry et al. 2018).
IV. Epigenetic changes in guinea pig like their ancestor produce phenotypic changes according to environment needs but due to change in environmental sequences the changes as such transfer to next generation without change. So next generation's loss ability to transform themselves according to environment requirements (Weyrich et al. 2016).

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