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## NCERT Class 11 Part 1 Geography Chapter 12: World Climate & Climate Change YouTube Lecture Handouts

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[NCERT Class 11 Part 1 Geography Chapter 12: World Climate & Climate Change \[https://www.youtube.com/watch?v=AoX8WtIGU2c\]](https://www.youtube.com/watch?v=AoX8WtIGU2c)

### Classification

- Empirical
- Genetic
- Applied
- Empirical based on temperature and precipitation
- Genetic classification based on causes
- Applied classification based on specific purpose

### Koeppen's Classification

- Relation b/w vegetation and climate (values of temperature and precipitation selected)
- Empirical based on mean annual and monthly temperature and precipitation (capital and small letters)
- Developed in 1918
- 5 groups – 4 on temperature and 1 on precipitation (B as dry while A, C, D and E as humid)
- Small letters as seasonality of precipitation and temperature

<i>Group</i>	<i>Characteristics</i>
A - Tropical	Average temperature of the coldest month is 18° C or higher
B - Dry Climates	Potential evaporation exceeds precipitation
C - Warm Temperate	The average temperature of the coldest month of the (Mid-latitude) climates years is higher than minus 3°C but below 18°C
D - Cold Snow Forest Climates	The average temperature of the coldest month is minus 3° C or below
E - Cold Climates	Average temperature for all months is below 10° C
H - High Land	Cold due to elevation

- Seasons of dryness by f, m, w and s
- f – no dry season
- m – monsoon
- w- winter dry
- s – summer dry
- Temperature severity by a, b, c and d (small letters)
- B (dry) has S for Steppe and W for desert

## Group a- Tropical Humid

- b/w tropic of cancer and Capricorn; hot and humid ITCZ
- Af – Tropical wet
- Am – Tropical Monsoon
- Aw – Tropical wet and dry
- Af – Tropical wet – Amazon basin, equatorial Africa and east Indies, rainfall throughout year with afternoon thunderstorms; high temperature and negligible range, dense canopy and large biodiversity
- Am – Tropical Monsoon – India, NE of South America and North Australia, heavy rain in summer and dry winter
- Aw – Tropical wet and dry – North and South of Af; border dry climate of west of Cf/Cw; in north and south of Amazon; less rain than Af and Am; short wet and long dry season; high temperature throughout year with deciduous forests

## Group B – Dry Climate

- Low rain – from 15 to 60 N & S of equator
- In subtropical high where no rain due to temperature inversion
- On western margins of the continents
- BS – Semi-Arid
  - BSh – Subtropical steppe
  - BSk – mid-latitude steppe
- BW - Arid
  - BWh – Subtropical desert
  - BWk- mid-latitude desert
- BSh more rainfall than BWh
- Variable rain affects life in steppes
- Rain with short intense thundershower in desert
- Fog in coastal desert near cold currents
- Annual and diurnal temperature ranges are high

## Group C – Warm Temperate Mid Latitude

- 30° to 50° on east & west margins of continents
- Warm summer with mild winters
- Cwa – humid subtropical (dry in winter and hot in summer)
- Cs – Mediterranean
- Cfa – Humid subtropical – no dry and mild winter
- Cfb – marine west coast
- Cwa – poleward of tropic of cancer and Capricorn in north Indian plain and south china plains. Similar to Aw except temperature in winter is warm
- Cs – west coast near Mediterranean sea – central Chile, central California, SW and SE Australia – influence of subtropical high in summer and westerly wind in winter. Hot dry summer and mild rainy winter. Rain 35 - 90 mm
- Cfa – lies on eastern part of continents in subtropical latitudes, unstable airmass and rain throughout – USA, east China, South Japan, NE Argentina, South Africa and east Australia. Rain from 75 to 150 cm. Summer thunderstorm and frontal rain in winter
- Cfb – poleward from Mediterranean climate on west coast of continents – NW Europe, West of N America, N California, S Chile, SE Australia and New Zealand. Moderate temperature with warm winters as compared to others in that latitude. Rain throughout the year

## Group D – Cold Snow Forest

- 40° to 70° N in Europe, Asia and North America
- Df – cold climate with humid winter
- Dw – cold climate with dry winter
- Df – poleward of marine west coast and mid latitude steppe; cold and snowy winter; frost free season is short, large range of temperature, short weather changes and severe poleward winters
- Dw – NE Asia, winter anticyclone, weakening in summer sets in monsoons with wind reversals; low summer and extreme low winter temperatures; rain in summers about 12 - 15 cm

## Group E – Polar Climate

- Beyond 70°
- ET – Tundra
- EF – Ice Cap
- ET – low growing mosses, lichens and flowering plants, permafrost with subsoil frozen, short growing season, water logging support only low growing crops. In summers have long duration of day light
- EF – Interior Greenland and Antarctica, summers below freezing point, less rainfall, ice accumulated and deformation of ice sheets occur, move as icebergs over waters

## Group H - Highland Climate

- Governed by topography
- High mountain – large changes in mean temperature occur over short distance
- Precipitation type and intensity vary
- Vertical zonation of climate with elevation

## Climate Change

- Geological records show alternations in glacial and interglacial period
- In high altitude – retreat and advancement of glaciers
- Sediments in glacial lakes denote warm and cold period
- Rings of tree explain wet and dry period
- Rajasthan desert was wet and cold around 8000 BC. High rain from 1700 to 3000 BC. From 2000 to 1700 BC Harappa civilization and then dry climate
- Earth warm in Cambrian, Ordovician and Silurian period,
- Glacial and interglacial period during Pleistocene with last major peak glacial period around 18,000 years. Present interglacial period started 10,000 years ago.

## Climate in Recent Past

- Variability occurs
- 1990's – warmest with worst floods
- 1967 - 77 – worst drought in Sahel
- 1930's- drought in SW Great Plains of USA – dust bowl
- 10<sup>th</sup> -11<sup>th</sup> century – Vikings settled in Greenland (warm and dry conditions)
- 1550 - 1850 – Europe witnessed Little Ice age

## Causes of Climate Change

- Astronomical – solar output and sunspots (dark cooler patch that increase and decrease in cyclical manner)
- Sunspots increase – cold wetter climate and more storms
- Milankovitch oscillations – variation in orbital characteristics around sun, wobbling and change in axial tilt. Alter insolation from sun
- Volcanism – throw aerosols in atmosphere and reduce sun radiations reaching earth (e. g. , Pinatoba and El Cion)
- Anthropogenic effect – higher concentration of CO<sub>2</sub> leading to global warming

## Global Warming

- Greenhouse Gases – CO<sub>2</sub>, CFC, CH<sub>4</sub>, N<sub>2</sub>O, O<sub>3</sub>
- NO and CO react with GHG and affect their concentration
- Due to greenhouse gases, earth behaves as greenhouse – transmit incoming shortwave solar radiation but absorb longwave radiations going out (allow temperature inside to rise)
- CFC are highly effective. It destroys ozone in stratosphere leading to ozone hole.
- Ozone absorbs UV rays
- More time GHG molecule remain in atmosphere, longer it will take to recover from changes that are brought about
- Forest are largest carbon sink, photosynthesis, 20 - 50 years taken to adjust to the changes in source to sink. Rises about 0.5% annually. Concentration doubles over pre-industrial levels. Fossil fuels, combustion lead to CO<sub>2</sub>
- Kyoto protocol proclaimed in 1997 and ratified in 2005 by 141 nations bounds 35 industrialized nations to reduce emissions by 2012 to 5% less than 1990 levels.
- Melting of glaciers, ice caps, rise of sea levels, submergence of islands
- Temperature data is available for Europe with reference period of 1961 - 1990 with annual average sea surface temperature of 14 degree Celsius
- Maximum warming during 1901 - 44 and 1977 - 99. Globally average temperature at end of 20<sup>th</sup> century was 0.6 degree Celsius higher than 19<sup>th</sup> century

- 7 warmest years in 1856 - 200 were during last decade (with 1998 was the warmest year)

