In Depth – Western Disturbance

An intense thunderstorm on 16th April, 2018 claimed over 64 lives in India. Rajasthan bore the brunt of the storm, as about 25 people lost their lives. Deaths were also reported from the regions of Madhya Pradesh, Gujarat, and Bihar. The thunderstorm also caused immense damage to the property and crops in Punjab, Haryana, Gujarat and Rajasthan. **This weather condition was caused by an intense western disturbance.**

Storms

- Storms are a **natural phenomenon,** caused by violent atmospheric disturbances over land and water. They get **formed when a centre of low pressure develops with a system of high pressure surrounding it**.
- They are classified by how strong the winds are or by how heavy the rainfall, lightning or snow are.
- **Storms that form north of equator spin counter clockwise whereas storms, south of the equator spin clockwise. This difference is because of the earth's rotation on its axis.**
- They have the potential to harm lives and property through a tidal surge, heavy rain or a snow- causing flooding, lightning and vertical wind.

Tropical Storms

- These are **revolving storms that develop in the tropical regions** i.e. approximately between 5 degree and 30 degree latitudes (south of the tropic of cancer in northern hemisphere).
- **When the speed of winds rotating in the storm reaches 74 miles per hour (mph) , the storm is officially a tropical cyclone.**
- **The weakest tropical cyclones are called tropical depressions.** If a depression intensifies such that its maximum sustained **winds reach 39 mph,** the **tropical depression becomes a tropical storm**.
- **Cyclones are called 'Hurricanes' in the North Atlantic and Eastern Pacific, 'Typhoons' in South-East Asia and China and 'Tropical Cyclones' in the South West Pacific and Indian Ocean Region.**
- **Formation**
    - Tropical Cyclones use warm, moist air as fuel. That is why they form only over warm ocean waters near the equator.
    - The warm and moist air over the ocean rises upward from near the surface. Because this **air moves up and away from the surface, there is less air left near the surface, thus creating an area of low pressure**.
    - **Air from surrounding areas with higher air pressure pushes in** to the low pressure area. Then that "new" air becomes warm and moist and rises, too.
    - As the warm air continues to rise, the surrounding air swirls in to take its place. **As the warm and moist air rises and cools off, the water in the air forms clouds. The whole system of clouds and wind,** fed by the ocean's heat and water evaporating from the surface, **continues to spin and grow. This system is what a tropical cyclone is**.
    - As the storm system rotates faster and faster, **an 'eye'** forms in the center. It is very calm and clear in the eye, with very **low air pressure**. Higher pressure air from above flows down into the eye.
- Hurricanes are the most violent storms on earth. In the Atlantic, Hurricane season officially **runs**

from 1st June to 30th November. 97% tropical activity occurs during this time period. However, hurricanes can and do occur outside of this six month period.

Western Disturbances

- Western Disturbances **develop in the mid latitude region (north of the Tropic of Cancer),** not in the tropical region, therefore they are called as mid latitude storms or extra-tropical storms.
    - Extra-Tropical Cyclones are also called as **winter storms and blizzards**.
- Western Disturbances are low pressure systems, embedded in western winds (westerlies) that flow from west to the east.
- It is a term coined by an Indian Meteorologist for the weather phenomenon which is propagated from the West.
- The phrase Western Disturbance was first used in a published literature in 1947. However, its precursor Winter Disturbance was coined earlier in 1931.
- **Arrival in India**
    - Western Disturbances begin is a low pressure system that originates in the Mid- latitude region near the Atlantic ocean and Europe.
    - **The low pressure typically forms over the Mediterranean Sea and travels over Iran, Iraq, Afghanistan and Pakistan before entering India loaded with moisture.**
    - These moisture laden western disturbances eventually come up against the himalayas and get blocked, as a consequence, the moisture gets trapped and precipitation is shared in the form of snow and rain over Northwest India and sometimes, other parts of North India.
    - An average of 4-5 western disturbances form during the winter season and the rainfall distribution and amount varies with every western disturbance.
    - **The word 'Western' refers to the direction from which they originate with regard to India.**
    - **The word 'disturbance' is used because the air within the low pressure systems tends to be unstable or disturbed.**
    - Sometimes, when western disturbances become more intense in the Indian Region, they can extend even upto 15 degree north, resulting into rainfall upto north Maharashtra, Gujarat and the entire Madhya Pradesh to the south.
- **Impact**
    - Western Disturbances are the cause of the most winter and pre-monsoon season rainfall across North-West India. This phenomenon is usually associated with cloudy sky, higher night temperatures and unusual rain. It is estimated that **India gets close to 5-10% of its total annual rainfall from western disturbances**.
    - In winter, western winds bring moderate to heavy rain in low lying areas and heavy snow to mountainous areas of the Indian subcontinent.
    - India is a rain dependent country and while the south west monsoon covers most of India, parts of **North India** don't get much rain from it. These regions **depend upon snow and rain from western disturbance during winter season from November to March**.
    - Precipitation during the winter season has **great importance in agriculture particularly for rabi crops including wheat,** which is one of the most important Indian crops.
    - They start declining after winter. During the summer months of April and May, they move across North India and at times **help in the activation of monsoon in certain parts of northwest India**.
    - During the monsoon season, western disturbances may occasionally cause dense clouding and heavy precipitation.
    - **Weak western disturbances are associated with crop failure and water problems across north India.**
    - Strong western disturbances can help residents, farmers and governments avoid many of the problems associated with water scarcity.
- **Casualties**
    - Since western disturbances are not high intensity weather systems, they are not usually associated with disasters but in the recent past, it is observed that this beneficial weather phenomenon is increasingly becoming disastrous during the summer and monsoon seasons.
    - **The 2010 cloudburst in Leh,** in which 71 towns and villages were damaged and 225 people died was caused due to the western disturbances.

    - **In September 2014, the Kashmir region** suffered disastrous floods across many of its districts killing over 200 people. This was also caused by the Western Disturbances.
    - Expert opinion on western disturbances is divided regarding the 2013 floods in Uttarakhand in which over 5000 people were killed, after three days of incessant rainfall. While many believe that Uttarakhand floods may have occurred due to interactions between western disturbances and the summer monsoon, many others believe that western disturbances and monsoon occur in completely different time frames.
- Western disturbances need to be studied in much more detail. Like tropical cyclones or monsoon, **there needs to be an end to end tracking of western disturbances**.