Atmospheric Rivers

written by iasexam.com | 08/02/2024

Context- Atmospheric Rivers are the reason for massive rainfall in California (U.S.)

Key Highlights

- They are large, narrow sections of the Earth's ecosystem that convey moisture from the Earth's tropics close to the equator to the poles.
- When they reach land, atmospheric rivers release this moisture, generating heavy snow and rain.
- A well-known example of a strong atmospheric river is the **"Pineapple Express"** that is a common function for the west coast of the US and Canada.
- Atmospheric rivers are typically located inside the extratropical North Pacific/Atlantic, the southeastern Pacific, and the South Atlantic oceans, frequently making landfall alongside the western coasts of North and South America.

Formation of Atmospheric Rivers

- The atmospheric rivers begin with the evaporation of ocean water because of improved temperatures.
- Robust winds facilitate the transport of water vapor through the atmosphere. Upon attaining land, atmospheric rivers set off further upward thrust of water vapor into the atmosphere, wherein it undergoes cooling and condensation into water droplets, in the long run resulting in precipitation.

Characteristics of Atmospheric Rivers

- Atmospheric rivers are usually formed within the tropics or subtropics wherein heat ocean surfaces evaporate water into the air.
- They frequently broaden inside the low-degree jet stream, a fast-flowing, narrow air current.

- The shape of an AR is sort of a slim ribbon or corridor of moisture, often extending from the equator to higher latitudes.
- These rivers within the sky can transport widespread quantities of water vapor, equivalent to the drift of the Amazon River, the arena's largest river, however in the form of water vapor.

Impact of ARs

- ARs play a critical role within the water cycle and make contributions to water resources in the regions they affect.
- Consecutive atmospheric rivers, referred to as AR families, can cause significant flooding.
- When atmospheric rivers make landfall, they release the saved moisture within the form of precipitation, which can lead to heavy rainfall, snowfall, or a combination of each.
- The heavy precipitation associated with ARs can make a contribution to flooding, landslides, and snowstorms, relying on the geographic location and season.
- In a few regions, ARs are vital for retaining water supply as they contribute a significant part of annual precipitation.
- In some regions, ARs contribute extensively to snowpack, affecting water availability during drier seasons. Conversely, their absence can make a contribution to drought situations.
- Monitoring and forecasting ARs are important for predicting and preparing for extreme weather events, supporting mitigate capacity damages.
- The variability in precipitation introduced by ARs can impact hydropower generation in areas that depend on rivers for energy production.

Mechanism of ARs

- Not all ARs motive damage; maximum are susceptible structures that frequently offer useful rain or snow that is critical to the water supply.
- ARs are a key characteristic in the worldwide water cycle and are intently tied to both water supply and flood dangers, in particular within the western United States.
- ARs occur all around the global, most commonly inside the mid-latitudes.
- They shape while large-scale weather patterns align to create narrow channels, or filaments, of intense moisture shipping.
- These begin over warm water, generally tropical oceans, and are guided closer to the coast through low-stage jet streams beforehand of cold fronts of extratropical cyclones.

Concerns

- Strong atmospheric river activities can cause extreme flooding and landslides. They can cause billions of dollars of damage.
- Excessive rain promotes a growth of grasses and bushes that becomes gas for destiny fires.

Source: The Hindu