Flood & Drought - Curious Case of India

What is the issue?

Kerala and parts of Karnataka are facing a searing drought while both regions were battered severely by floods in August of this year.

Why this occurrence is strange?

- The sequence of flood followed by a drought is definitely strange.
- While alternating intense wet and dry phases are normally taken as two sides of the same global warming coin.
- But in the case of Kerala and pars of Karnataka, the time interval is too short — August to September.
- Drought conditions after floods have made the earth beneath so parched.
- This is affecting the aquifer; the underground layer of permeable, clay soil where water normally flows.
- Major rivers such as Periyar, Bharathapuzha, Pampa and Kabani, which were in spate during the floods, are now quite depleted.
- Floods have also altered the topography of the land in many places.
- Long cracks are visible along the mountainous landscape of Idukki and Wayanad, which witnessed massive landslides.
- Old streams and rivulets have disappeared, and new ones are seen to be flowing through fields.

What role does the topography factor played in the present situation?

- The topography of Kerala varies from the coastal plains to the high hills and mountains of the Western Ghats.
- The floods impact the topography and particularly, they contribute to the possibility of riverbed scouring.
- The scouring occurs when the **shear stress induced by the flowing water is more than the shear resistance of the channel bed material**.
- The recent floods in Kerala resulted in high flows in all the rivers.
- Such high flows led to excessive riverbed scouring.
- The typical riverbed material has low permeability and can hold the water.
- However, the high flows remove these low permeability materials.
- In addition, the opening of a number of dams caused high flow in the downstream channels that are also vulnerable to scouring.

- The scouring and deepening of riverbeds will lead to lowering of the groundwater table along a river, which can cause a drop in the level of water in wells and dry out vegetation on floodplains.
- The lowering of water in the wells and signs of dried up vegetation immediately after the flood do not indicate an impending drought.
- However, a future drought can be more damaging as the groundwater levels have been already lowered.

What does the report on the deluge by CWRDM says?

- Centre for Water Resources Development and Management (CWRDM), a Kerala government research institute located at Kozhikode submitted a report to the government regardin the deluge in the state.
- Open wells in almost 60 per cent of the geographical areas witnessed a sudden drop in water levels, which was rather unusual.
- At places, the fall in groundwater levels was as high as 1.5 metres as compared to the levels a year ago.
- The decline in groundwater table and depletion in river flows, subsequent to the floods, could be attributed to

    1. flood-induced topographical and
    2. hydrological alterations,
    3. unique topographical and
    4. hydrological characteristics of the State and
    5. Impact of recent land use changes on hydrology.

- It was exacerbated by other atmospheric and geological conditions.
- They include an unusually long dry spell ,the deepening of riverbed due to heavy erosion caused by high flood velocity, and high groundwater discharge to the river systems due to high hydraulic gradient.
- It is a fact that Kerala has been witnessing major land-use changes in the last few decades.
- Apart from deforestation in its high ranges, wetlands and paddy fields in the plains have been encroached upon due to population pressure.
- The role played by paddy fields in natural recharge of groundwater table is well established.
- But when these fields, which remained flooded for months during monsoon season, are diverted for non-farm activities, we are depriving the soil a means to replenish groundwater.
- The loss of topsoil would have also prevented rainwater from percolating down and thus hampered the process of groundwater recharge

Can this situation be explained from the hydrology view point?

- In the Western Ghats, when the groundwater levels are above a certain threshold, water is released through numerous naturally-formed micro/macro **'soil pipes'** present in the near surface.
- Saturated soil water gets drained safely through the hill slopes towards the stream banks through these soil pipes.
- 'soil piping' (a form of internal erosion of the soil that leads to subsidence) might be a reason for the caving in of the earth.
- The heavy spell of rains in August put more pressure on these soil pipes and initiated soil erosion.
- The erosion lead to increased size and water carrying capacity of the pipes, which drained out more water at much faster rates than normal.
- In the normal course, the increased size provides safer passage to the excess waters.
- But when massive land subsidence, such as that reported from Idukki, Wayanad, Thrissur and Kannur, happened, an excessive soil pipe erosion may have occurred.
- These landslides resulted in sudden release of stored soil waters, leading to immediate drawdown of groundwater levels in these regions.
- Scientists may take a while to understand why such sudden drop in groundwater levels has happened.

What were the reasons for the rapid decline in water table in Karnataka?

- Kodagu district was battered and Cauvery had crossed the danger mark at various locations in August,2018.
- But new that water has disappeared as though the floods hadn't occurred at all.
- In Dakshina Kannada district, the water level in the river Payaswini was around 12 feet all these years.
- Now it is only 3-4 ft this year.

- Even silt accumulation does not explain such a drop.
- The decline in water level is mainly because of a chain of interconnected links.
- **Monsoon Break**

1. One of the reasons is the high-intensity rainfall leading to floods in many areas during August.
2. Followed by a long break of nearly 35 days this year, compared with a break of four-five days in the previous years.

- **Role of weedicides**

    1. Grass does an effective job in recharging water table in the earth.

2. Grass immediately deposits rain – in the range of 1 mm to 10 mm – into the earth.
3. But there has been decline in the grass cover due to the use of weedicides in the plantations over the last two-three years.
4. People use weedicides as an easy way out for their farm operations, as it reduces dependence on farm labor.
5. As the green cover vanishes, there is no possibility of rain water draining into the earth.

- **Tourism and commercial activities**

1. Tourism and commercial activities in Kodagu have led to either vanishing of water bodies or the water sources being covered by concrete floors.
2. As a result, all-season sources of water are losing their capacity to feed rivers.
3. Even small streams and rivulets are drying up quickly.

- **Too many bore wells**

1. Indiscriminate drilling of bore wells in most parts of Dakshina Kannada is also a reason for the decline in water level, both in rivers and open wells.
2. Bore wells that did not yield water can lead to decline in water table, if they are not sealed scientifically.
3. Villagers who took initiatives to drill bore wells in their lands did not show the same enthusiasm to recharge them during the monsoon.

What is the solution?

- The natural calamity in the form of floods and landslides has severly ioacted the socio-economic fabric of Keralites.
- It suggests the unscientific urban and rural planning by the policy-makers.
- Scientific literacy among the community is the only way to tackle the situation.
- Unscientific urbanisation has changed the geo-morphological (land forms) and natural flood plains of Kerala across the landmass.
- There are benefits of flooding despite its immediate ill effects.
- The development of flood plains with alluvial deposits (sand, silt and clay) is ideal for agricultural purposes.
- But such benefits can be experienced only through scientific planning and agricultural activities.

Source: Business Line