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Hydrological, environmental and geological effects of climate change on Indian river basins

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In the past few decades, scientists have assembled considerable amount of database which speak in favor of the causes and projected impacts of the growing concern of climate change. The changes in the hydrological response of a river basin will depend on the sources of runoff, climatic conditions & physical characteristics of the basin and the magnitude of projected climatic scenarios. All the 20 river basins in India are different from each other in terms of spatial and temporal water resources availability; topography; geomorphological characteristics; meteorological behaviors, etc. Climate change can bring significant changes in these basins along with adverse socio-economic consequences. The quantity of surface run-off due to climate change would vary across the river basins as well as sub-basins in India. However, there is general reduction in the quantity of the available run-off. There is rising trend in temperature in the basin, however minimum temperature has shown falling trend. The Ganga basin is richest basin in terms of availability of utilizable surface water resources and replenishable ground water resources. There is a rising trend in temperature in the basin except minimum temperature in monsoon period which is showing falling trend. Similar types of findings were also recorded for Indus basin. The trends of changes in temperature suggest that majority of the basins have experienced an increasing trend in mean annual temperature over the last century (7 river basins: Ganga, Indus-lower, Mahanadi, Mahi, Narmada, Brahamani & Subaranrekha, and Tapi), while 2 basins (Sabarmati and Luni & other small rivers) have experienced cooling trends. Narmada basin experienced maximum warming as compared to other basins, while Sabarmati river basin has shown the largest cooling trend. Majority of river basins have shown increasing trend both in annual rainfall and relative humidity. The magnitude of increased rainfall for considered river basins varied from 2 to 19% of mean per 100 years. Maximum increase in rainfall is observed in the Indus (lower) followed by the Tapi river basin. Most of the river basins have experienced decreasing trend in annual rainy days with maximum decrease in the Mahanadi basin. The identification and prioritization of actions should be taken to enhance the resilience of Indian riverine ecosystems to mitigate biodiversity loss or severe flooding.

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Lead bioremediation using bacteria isolated from industrial effluent

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Microorganisms have an important role in bioremediation which is evolving method for the removal and degradation of many environmental pollutants. Heavy metals and hydrocarbons are hazardous chemical for nature; many waste effluents contain heavy metals like lead, arsenic, chromium, copper, etc. These heavy metals need to be removed before discharging to natural water bodies. The property of some bacterial species to adsorb or absorb these metals, have been utilized to purify industrial waste. $PbNO_3$ is an industrial hazard produced from dye, petrochemicals and electronics industry. It comes out with factory effluent and spread to environment. Excess exposure of $PbNO_3$ is harmful to skin, kidney and respiratory system. Lead causes several types of cancer. We have isolated a bacterial strain from industrial sewage that can accumulate a fair amount of Pb from these effluents. These types of bacteria produce exopolysaccharide (EPS) which is confirmed by Scanning Electron Microscopy study of bacterial samples. This bacteria have been grown in LB media (0.5% yeast extract, 1.0% beef extract and 1.0% NaCl) containing 1mM $PbNO^3$ solution. EPS have been separated from media by isopropanol extraction method and subjected to lyophilization. The Energy-Dispersive X-ray spectroscopy (EDX) result shows presence of Pb molecule in EPS sample. EPS is further characterized by FTIR to know the functional groups presence in the sample. These results show that this bacterial strain may use potentially to remove Pb contamination from industrial effluents.

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