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Shifting Rain Patterns: Implications for Pakistan

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Since the earth's natural inception, its climate has been continuously evolving. The increase in global temperature and spatiotemporal variations in precipitation patterns are the primary indicators of Climate Change. Climate Change is having a catastrophic impact on the world's water resources as ice sheets are melting, sea levels are rising, heat waves are occurring more frequently, and rainfall patterns are changing due to global warming.¹ Unpredictable trends in rainfall patterns along Pakistan's coastal areas and arid plains have also been observed. In the past, the whole of Sindh, most of Balochistan, major parts of Punjab and central parts of Northern Areas used to receive less than 250 mm of rainfall in a year, but now in 2022, the situation is the opposite. Sindh and Balochistan have been declared victims of hefty rains in recent floods. Balochistan has experienced such heavy rains first time due to shifting monsoon patterns, and the same is the case with Sindh, where rains and standing water have indeed damaged the infrastructure. Surprisingly Punjab, AJK and parts of KP are least affected, resulting from a spatial shift in rain patterns.²

The entire monsoon pattern in Pakistan has moved 100 kilometres to the west due to climate change.³ The country's climate zones have demonstrated a generally changing rainfall pattern, particularly those in the north, northwest, west and coastal regions.

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Pakistan has monsoon rains in the summer, while the western depression brings precipitation in the winter.⁴ According to National Disaster Management Authority (NDMA), about 1 million people have been affected by floods since mid-June 2022. According to determined and established norms, Sindh typically receives 109.5 mm of rain during the monsoon. It is, therefore, 522 pc greater



than average. Like Balochistan, which typically receives 50mm of rain per monsoon, this year's total is 284 mm, or 469 pc more. Overall, this monsoon has resulted in 207 times more rainfall nationwide. This year, the scenario also appeared to be similar in other regions. According to Met Office data, Gilgit-Baltistan has received 50.3 mm of rain in just two months, 99 per cent over average, and Punjab has received 349 mm, which is precisely 90 per cent more rain than its typical monsoon rainfall.

This monsoon, Khyber Pakhtunkhwa saw rainfall at a rate of 31% over average; there have been 257.4 mm of rain so far. Azad Jammu and Kashmir is the country's only area with below-average rainfall this monsoon. The valley has recorded 279.6 mm of rain, which is minus 7 pc lesser than its usual monsoon downpour; therefore, the situation indicates shifting rain patterns which is quite alarming.⁵

Analysis

- Pakistan's Met department and administration could not comprehend the phenomenon of change in rain patterns, therefore, did not prepare accordingly.
- A shift in rain pattern has adversely affected the catchment area of Mangla Dam, thereby creating a water shortage in our eastern rivers, Jhelum, Chenab, Ravi and Sutlej.

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- c) Damage in KP is caused by excessive rain due to changes in the monsoon pattern. However, it is felt that destruction is more due to violation of laws related to the construction of buildings along riverbanks and the destruction of Munda Dam in Swat.
- d) Swat and Kabul Rivers, when joined at Attock, increased water in the Indus River, which enhanced flooding in the Sindh Province. This water, combined with the adverse flood situation in Sindh due to excessive rains and poor Manchar Lake drainage System management, created devastating effects.
- e) Damage in Balochistan province could have been avoided if the money allocated to construct small dams could have been spent religiously on the given projects.
- f) Similarly, in Sindh, the devastation could have been reduced if drainage systems like LBOD could have been made functional before the onset of monsoon season.

Recommendations

- a) More water reservoirs are now essential to be constructed on Indus, Kabul and Swat Rivers (KalaBagh Dam) so that the same water can be shifted to Jhelum, Chenab, Ravi and Sutlej Rivers more effectively through link canals.
- b) Changes in rainfall patterns significantly impact Pakistan's dependency on freshwater resources, yet the nation is to blame for its ineffective water management. Pakistan's overall dam capacity is 27.81 km, significantly less than the country's requirements, and the current economic climate has delayed the development of large dam projects. Smaller dams are becoming increasingly

popular worldwide, and since they can be built anywhere at a manageable cost and with a more compact structure and reservoir, they can be a practical answer to Pakistan's flood or stormwater management problems.

- c) Additionally, it is essential to mainstream the development of the public and government officials' capacity to anticipate, adjust to, and reduce the hazards associated with changes in monsoon patterns.
- d) Enhance the infrastructure to collect rainwater, isolate it from sewage systems, recycle it, and reuse it. It can lessen the harm brought on by changing rainfall patterns and the subsequent flooding or lack of water.
- e) The Sponge City Project in Wuhan, China, illustrates how rainfall can be retained for the city's benefit rather than being channelled away. Pakistan must establish research facilities to advance our understanding of climate change-induced changing rain patterns.

Adequate weather forecasting methods, pre- and post-monsoon preparations, and the execution of the Climate Change Act 2017 are necessary to lessen the harm caused by the monsoon season in Pakistan. Due to changing trends in rainfall patterns and the need to strengthen the six-step cycle of community resilience (preparation, response, recovery, assessment, planning, and prevention), Pakistan must develop contemporary strategies for monsoon risk mitigation and a new method of managing climate-induced disasters. In addition, assuming responsibility is essential for a successful future.

References

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 - ³ Pakistan Meteorological Department. Climate Data Processing Centre. Accessed <http://www.pmd.gov.pk/cdpc/home.htm>.
 - ⁴ "Rainfall Trends in Different Climate Zones of Pakistan, *Journal of Meteorology*, Vol. 9, Issue 17, July 2012. Accessed "https://www.researchgate.net/publication/278329911_Rainfall_Trends_in_Different_Climate_Zones_of_Pakistan_Pakistan_Journal_of_Meteorology_Vol_9_Issue_17_Jul_2012.
 - ⁵ F. Safdar, M. F. Khokhar, M. Arshad and I. H. Adil. "Climate Change Indicators and Spatiotemporal Shift in Monsoon Patterns in Pakistan." *Adv. Meteorol.* 2019.