

River Discharge and Water Level Changes in the Mekong River: Droughts in an Era of Mega-Dams

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Abstract

While 1992 marked the first major dam – Manwan – on the main stem of the Mekong River, the post-2010 era has seen the construction and operationalisation of mega dams such as Xiaowan (started operations in 2010) and Nuozhadu (started operations in 2014) that were much larger than any dams built before. The scale of these projects implies that their operations will likely have significant ecological and hydrological impacts from the Upper Mekong Basin to the Vietnamese Delta and beyond. Historical water level and water discharge data from 1960 to 2020 were analysed to examine the changes to streamflow conditions across three time periods: 1960-1991 (pre-dam), 1992-2009 (growth) and 2010-2020 (mega-dam). At Chiang Saen, the nearest station to the China border, monthly water discharge in the mega-dam period has increased by up to 98% during the dry season and decreased up as much as -35% during the wet season when compared to pre-dam records. Similarly, monthly water levels also rose by up to +1.16m during the dry season and dropped by up to -1.55m during the wet season. This pattern of hydrological alterations is observed further downstream to at least Stung Treng (Cambodia) in our study, showing that Mekong streamflow characteristics have shifted substantially in the post-2010 era. In light of such changes, the 2019-2020 drought – the most severe one in the recent history in the Lower Mekong Basin – was a consequent of constructed dams reducing the amount of water during the wet season. This reduction of water was exacerbated by the decreased monsoon precipitation in 2019. Concurrently, the untimely operationalisation of the newly opened Xayaburi dam in Laos coincided with the peak of the 2019-2020 drought and could have aggravated the dry conditions downstream. Thus, the mega-dam era (post-2010) may signal the start of a new normal of wet-season droughts.

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