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PUNJAB FLOODS UNDER THE SHADOW OF TOWERING DAMS



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INTRODUCTION

The fool believes that the tallest mountain in the world will be equal to the tallest one he has observed,” writes Nassim Nicholas Taleb in *Antifragile*, invoking Lucretius. The aphorism starkly mirrors India’s misplaced confidence in its disaster preparedness amid escalating climate volatility.

The Punjab flood of 2025, the worst in five decades, has devastated nearly 1.8 million people, claimed over 230 lives, and inundated more than 350,000 hectares of farmland, crippling the state’s agrarian backbone. Torrential monsoon rains, aggravated by heavy siltation, rampant mining, encroachment, and flawed urban planning, transformed the “food bowl of India” into a vast inland sea.

Yet, beyond these chronic causes lies a more immediate failure — the mismanagement of Punjab’s three lifeline dams: Bhakra Nangal, Pong, and Ranjit Sagar.

Despite clear mandates under the National Dam Safety Act (2021) for pre- and post-monsoon inspections and real-time inflow forecasting, delayed water releases and ignored forecasts compounded the disaster. The flood is not merely a natural calamity, but a stark reminder of institutional complacency and the peril of repeating predictable mistakes.

"The fool believes that the tallest mountain in the world will be equal to the tallest one he has observed" writes Nassim Nicholas Taleb, the author of *Antifragile*, taking a leaf from Lucretius' work. This aphorism rings true of India's disaster predictability and preparedness in the wake of extreme weather events, enter the climate change.

Punjab flood, the worst in five decades, stands testimony to it. Rummaging through various government's minutiae, and ground report, it comes out that there is a general consensus on the causal roots of a catastrophe which has submerged the food bowl of India, unprecedented monsoon rain, heavy siltation in the river channels, mining, encroachment around the natural pathways of the rivers, haphazard and abysmal urban planning. All of which has substance of truth, howbeit, what is amiss here is the stocktaking of immediate causes which compounded these phenomena. The management of three key dams of Punjab sits at the heart of it, namely, the Bakhra Nangal dam on Sutlej river, the Pong dam on Beas river and the Ranjit sagar dam on Ravi river.

Laws, laws everywhere, not a law to keep?

The Sub-sections 31 (1), (2) and (3) (a-c) of the National dam safety act of 2021, mandates the owners of specified dams to undertake pre-monsoon and post-monsoon inspections annually so as to flag any sign of distress and rope in state dam safety organizations (SDFO) for timely redressal of the same, if any. Against this backdrop, Punjab witnessed its last flood in 2023, which should have, ideally -if not legally-

elicited a rigorous and farsighted insights into both the antediluvian and postdiluvian inspection of all major dams, but as vindicated by the recent floods, question arises as to whether the required inspection was conducted annually, and if answer is in the affirmative then how come the dam owners could not foresee the contingent flood under similar condition of excess rainfall.

Even more pertinent, the sub-sections 35 (1) and (2) of NDSA calls for the establishment of a trenchant hydro-meteorological network and an inflow forecasting system, and an emergency warning system for the downstream areas lest the dam breaches its water holding capacity. Sub-section (1)(e) even obliges the dam owners to "make available information on maximum anticipated inflows and outflows, flood warnings, adverse impacts (upstream/downstream) to district authorities and in public domain." From section 35 ensues the need for periodic revision of rule curves mapping the water inflow and outflow of water at different times of a year. The onus lies on Central water commission (CWC) to chart out and issue the flood cushion for the dams.

Given these explicit legal directives, the dam owners should have amped up not just monitoring but also measures to thwart any mishap the very day monsoon rocked the Punjab's sky on June 24, showering down more rain than forecasted, which would have required precision watch over the way of water in the reservoir in the coming days as the rainfall intensified, and ipso facto elicited response readiness in terms of water release from the concerned reservoir.

A clear case of cavaliness

Juxtaposing these safety mandates to what actually panned out, sources reveal that the spillway gates of Bhakra Nangal Dam were opened only on 19-20 August for the first time in two years, when the dam was already at 1,666 feet (80% full).

By September 2 morning, the level rose to 1,676.78 feet (88% full); by September 3 evening, it had reached 1,678.45 feet (93% full). Between August 1–20, inflow was 180% higher than outflow, yet outflow was kept limited, largely only for power generation.

A classic case of dam dilemma, where one priority trumped another, though on the face of it, it seems more like a Faustian bargain, than a Hobson's choice. A spate of questions glares into our face; why were advance releases not made when IMD forecasts had already predicted High rainfall in the upstream Himachal Pradesh districts (Shimla, Kullu, Mandi, Bilaspur) from late July onwards? Were dam rule curves adhered to? If yes, how was such storage allowed to accumulate in spite of forecasts?

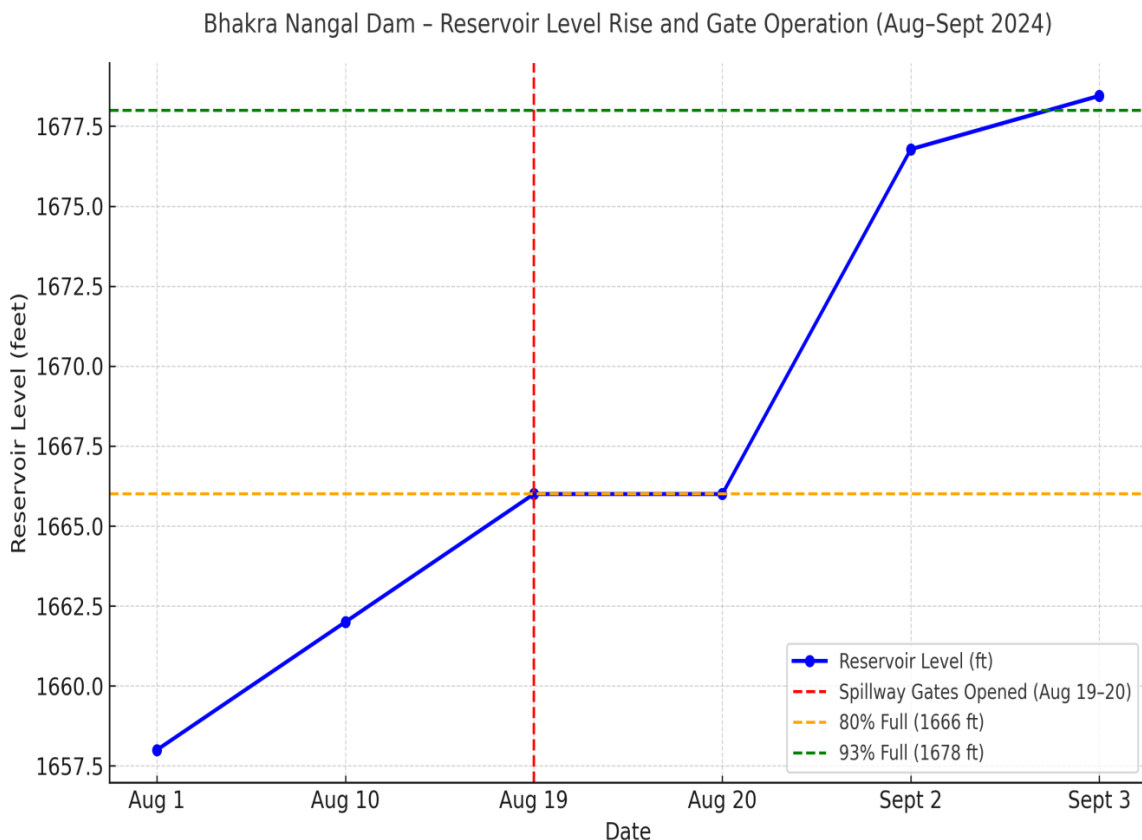


Figure 1: Bhakra Nangal dam Gate operation between August and September

THE RANJIT SAGAR DAM CASE

The Ranjit Sagar Dam (Ravi) met the same fate wherein the initial outflow was 9,000 cusecs (Aug 24), and was almost tripled to 24,000 cusecs (Aug 25), then increased to 77,000 cusecs (Aug 26), and eventually, the release suddenly jumped to 173,000 cusecs (Aug 27) after the reservoir crossed FRL (527.13 m). As it has become conspicuous by now, outflow exceeded inflow from Aug 27 onward for 5 days.

Surprise, this inflow-outflow asymmetry tantamount to dam generated flood in the rulebook of CWC itself. This sudden release led to damage of the Madhopur barrage and reportedly caused loss of life during repair work.

The same set of questions resurfaces as to why water release quantum was not gradually increased earlier, despite IMD forecasts and observed rainfall in upstream catchment districts (Chamba, Kathua, Pathankot)?

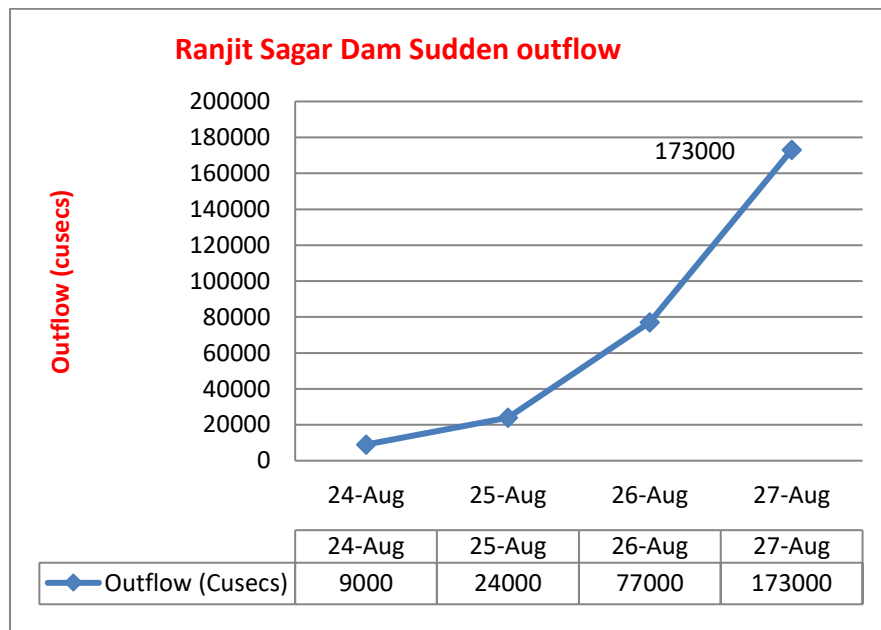


Figure 2: Ranjit Sagar Dam Sudden Outflow (Cusecs)

THE PONG DAM CASE

The Pong Dam (Beas) followed well-nigh the same trajectory. On August 18, the dam was 85% full (1,376.07 feet) but outflows were significantly increased only from August 26 onwards, when levels crossed 1,393 feet, above the Full Reservoir Level (FRL) of 1,390 feet. By August 29, outflow had to be increased beyond 100,000 cusecs, which coincides with floods in Punjab.

Notably, rainfall in the upper catchment area (Kullu, Mandi, Kangra) was very high on August 25–26, as forecast by IMD.

It leaves several questions;

- i) Why did dam authorities wait until after the dam crossed FRL to start large releases?
- ii) Were IMD's forecasts considered in operational decisions?
- iii) Did Bhakra Beas Management Board (BBMB), which owns the above two dams, and the Technical Committee follow the CWC's updated rule curves, 2024?

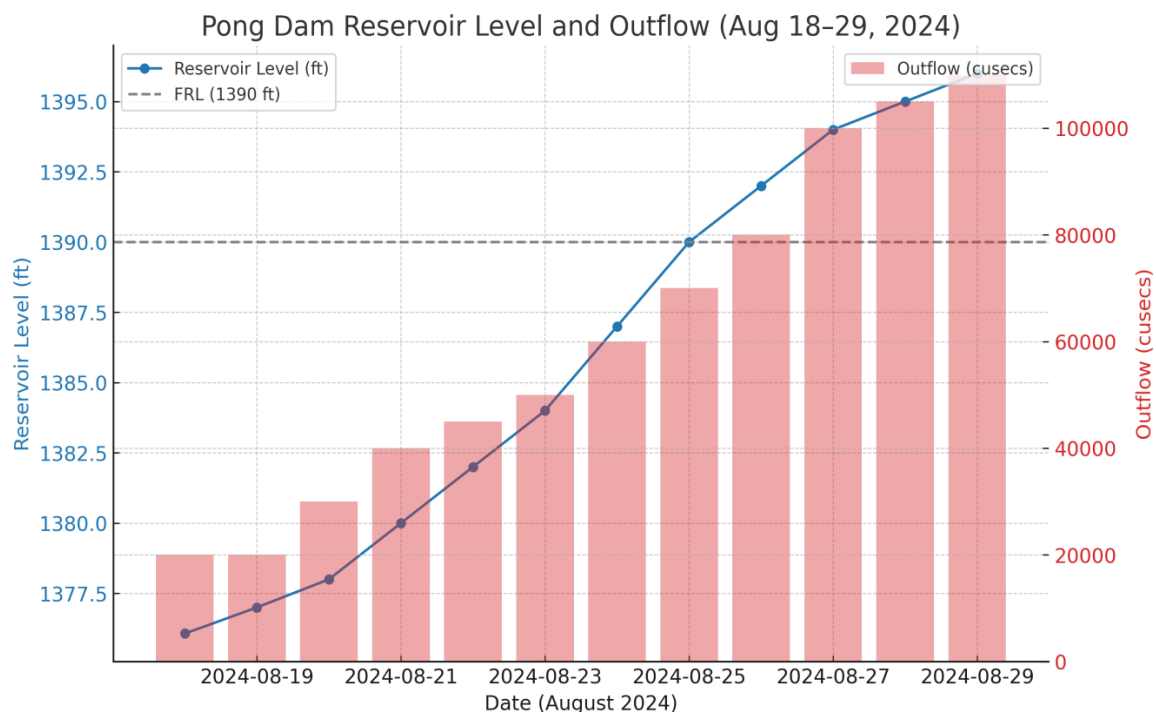


Figure 3 – Pong Dam Reservoir Level and Outflow

Operational necessity versus administrative responsibility

As elucidated in the National dam safety act, 2021, the onus lies on the dam owners to execute periodic investigation, maintain rule curves, monitor flood cushion in the reservoirs and prepare an emergency action plan. In tandem with these requirements, the BBMB which owns Bakhra and Pong Dam, and Punjab irrigation and power department which owns Ranjit sagar dam were supposed to proactively chart out plans to tackle any contingency stemming from heavy rainfall, however, juxtaposing these requirements to what actually panned out in the weeks of August, the modus operandi comes out as rather off handed.

Sitting on the helm of affairs with direct bearing on the lives and livelihood of citizenry, what was required of dam management boards was pre-emptive measures to deal with excess inflow tout court, with the decision pivoting around flood control instead of any other operational necessity, say electricity generation. Timely release of excess water might or might not have abated or reduced the extent and intensity of Punjab floods, given that several other factors like 25 % siltation in Bakhra dam, encroachment, and long drawn mis-planning were at play, what cannot be denied is that late release of water surely exacerbated and preponed the floods. The sheer fact that the water brought by the intense rainfall in the upstream had not hitherto wrecked such havoc in at least last five decades did not rule out that such events would not occur at all, and thus the Lucretian folly.

The question here is not so much of post facto accountability but real time responsibility, for laws are not meant to provide clauses for retrospective slugfest, but prospective amelioration and avoidance of adversity, a betrayal of this responsibility is a betrayal of public trust. What is required now is not merely an independent inquiry into the same, but also an official imprimatur on dam safety to ensure adherence to rule curves round the year.

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