Was the Large Dam a “Modern Temple”? Taking Stock of India’s Development Tryst with the Bhakra-Nangal

Is a large dam a technological artefact or a political object?¹ After many debates stretching over decades, the view that seems to have won the day, for now at least, is that the large dam is best grasped as a weave between technical arrangements and ideological motivations.² Put differently, holding flows within massive reservoirs and producing hydro-electricity while irrigating crops involves more than the ingenuity of the expert engineer. Rather, putting a river on tap necessarily acknowledges the work of political and economic imaginations.

De-centering the heroic world of the engineer in this way, however, does not de-materialize the large dam.³ If anything, the ecological and economic impacts, in terms of costs and benefits from damming rivers, continues to be the source for intense social and political contests and fuels many a protest. Disagreements over the actual benefits achieved and whether they contributed to grand ambitions such as progress, development, and economic growth became particularly loud during a frenzied period of dam construction between the 1950s to the 1990s, when, in an oft quoted estimate, close to 45,000 dams were built across rivers the world over.⁴ Amidst the construction boom and the enthusiasm, however, troubling questions repeatedly emerged over what could be listed as a benefit of a large dam and how to give measure to them while also discounting for

³ According to the World Commission on Dams, a large dam is defined as one that is 15 or more meters high, when measured from its foundation. A smaller dam, too, but with a reservoir volume of more than three million cubic meters can also be considered to be equivalent in terms of its impact to that of a large dam.
the costs. Could the costs from the forced displacement of communities, for example, be meaningfully compensated through rehabilitation efforts? Did existing methodologies to enumerate forest loss and damage to fisheries ably capture qualitative ecological loss? And, inevitably, could a cost-benefit ratio make a compelling case for constructing a dam?⁵

By the 1990s, intense popular critiques aimed at the official and expert claims about the quantitative and qualitative impacts of the large dam seemed headed for a decisive showdown. The need to effectively resolve what was clearly becoming an ever widening impasse — the benefits and costs conundrum — led to the organization of a workshop in April of 1997 in Switzerland by a slew of global organizations, comprising the International Union for the Conservation of Nature and Natural Resources (IUCN), the World Conservation Union (WCU), and the World Bank. The workshop not only included governments, funding bodies, and engineering companies but across the very same table were also invited several critical voices, who had, through the course of the 1990s, spearheaded some of the most dramatic resistance movements and stunning challenges to dam building projects. In effect, the meeting was aimed to set up a meaningful conversation between the two main protagonists of the large dam story: pro-dam lobbies and anti-dam campaigners. What followed from the vigorous debate between the various adherents of competing perspectives was the setting up of the World Commission on Dams (WCD). The newly instituted WCD, in the main, comprised 12 Commissioners whose role was to oversee and assess the evidence that was to be presented to them by representatives from civil society organizations, government, academia, and industry. These Commissioners, moreover, were to be assisted by a technical secretariat that was to be based in Cape Town (South Africa). While the exercise was chiefly expected to review the working of several large dams it also aimed to bake-in new standards and guidelines that could then re-set an altogether fresh direction for the beleaguered large dam industry. In November of 2000, the WCD finally released its much awaited findings as a report, blandly titled Dams and Development.

The Dams and Development report cut both ways and received bouquets and brickbats. While several called the entire exercise a sham for not being objective enough, there were many, on the other hand, who argued the opposite: that the WCD had made remarkable gains, specially by offering guidelines on risks and

rights and setting up protocols for participatory decision-making. It was also pointed out that given how the representation and diverse interests were stacked within the WCD process, it was but inevitable that the effort had to aim for a draw, by, at best, offering a credible summary of the arguments made by the pro and anti-dam groupings. Nonetheless, even though the WCD failed to generate a consensus on dam building, it did produce the possibility, intended or otherwise, for debating dams afresh with different criteria: notably, the good dam in contrast to the bad dam. While the good dam meaningfully addressed social and environmental costs, by advancing development goals, the bad dam caused the reverse: leaving people and places worse off after the completion of the project. The WCD exercise, in effect, offered fresh grounds for revisiting the large dam debate by calling attention to actual outcomes and urging for a closer scrutiny of the technical challenges, even as it failed to close the divide between the enthusiasts and the skeptics. Moreover, by collating, authenticating, and summing up the vast number of studies that were presented before the WCD, the large dam question was moved much beyond the previous singular emphasis on displacement and resettlement.

It is in keeping the backdrop of the WCD exercise in mind that this essay will rehearse and give context to two studies that were published in India. Both of these little heralded studies took up as their key theme a post-project review of one of the country’s most celebrated and iconic multi-purpose river valley development project — the famed Bhakra-Nangal Project (BNP). These studies, as I will suggest, appeared novel for not only focusing on the “afterlife” of the BNP — the post-project scrutiny of promise, performance, and outcomes — but, critically as well, the authors reconsidered the BNP project without necessarily sharing the earlier exuberance nor the unquestioning belief that dams brought about development. In several ways, the studies of Shripad Dharmadhikary and R. Rangachari, published in 2005 and 2006 respectively, argued for a perceptible shift within the large dam discourse in India. Unlike the previous focus on evaluating the dam within the anti-versus-pro viewpoints, the post-construction outcomes of the BNP was assessed instead within the WCD inspired good versus bad dam frameworks.

---

Re-situating the BNP

The construction of the BNP was completed in 1963, within the opening decades of India’s independence from British colonial rule in 1947. Planned and designed as a multi-purpose river valley project, the BNP comprised several dams, barrages, a vast canal network, and hydro-electric power houses. Added to this were equally complicated arrangements to carry out inter-basin water transfers. The centerpiece of the whole project, however, was undoubtedly the imposing 740 feet high Bhakra dam that was built across the Sutlej river, one amongst five of the huge watery arms of the sprawling Indus river system.

Though Prime Minister Nehru (1950–1964) visited the BNP on several occasions, two speeches given during ceremonies at the site proved to be particularly telling of how India’s post-colonial leadership sought to convey the significance of the large dam. Besides inserting dam construction within the grand quests for progress and development, Nehru also purposefully sought to evoke a kind of secular religiosity around the BNP. At the opening of the Nangal canal in 1954, he likened the project to being but the “biggest temple and mosque and gurdwara” that furthermore had turned “holier” after thousands of men had “shed their blood and sweat and laid down their lives as well.”⁷ At Bhakra, during the dedication ceremony in 1963, Nehru chose to, once again, evocatively reiterate that the dam was the “temple, mosque and gurudwara of modern India.”⁸ The large dam, thus, in postcolonial India was not only woven into themes about nation-making but was also assiduously overlain with political and spiritual capital. For the historian Daniel Klingensmith, however, in this early phase of India’s decolonization, rather than “dams granting legitimacy to the state, the state had to work to legitimize them.”⁹ That is, as a form of “spectacular development,” dams, Klingensmith argues, mostly appealed to the “professional, urban middle classes” and their views about nation making rather than to the vast underclass of “peasants, tribals and workers.”¹⁰ Clearly, the imagery surrounding the BNP was shaped as much by discourses about nation-making, generating legitimacy for the post-colonial Indian state and feeding into the

⁹ Klingensmith, ‘One Valley and a Thousand’, 255.
¹⁰ Klingensmith, ‘One Valley and a Thousand’, 271.
developmental expectations of the urban middle classes, than as being exclusively devoted to celebrating benefits such as hydro-electricity, irrigation, and flood control. The plot, in other words, was meant to be an elaborate one with the BNP aiming at weaving heroic engineering into the making of a post-colonial nationalism that in turn rested on claims for the acquisition of material and productive capacity.

The studies by Dharmadhikary and Rangachari, on the other hand, take stock of the BNP essentially only in terms of its performance as a technical artefact, perhaps driven by the belief that the only the technical could be coldly and objectively calculated. Nonetheless, the BNP as a political object haunts their analyses and assessments. Though again, it must be underlined that Dharmadhikary and Rangachari approach the question of politics and power with starkly dissimilar perspectives, linked not so much by their educational training as by the attitudinal chasm that usually runs between an activist and a technocrat.

Educated with a BE in civil engineering, Rangachari achieved considerable standing as a technocrat and remained widely engaged with the world of policy making. In the course of his long professional career, he served as a member of the Central Water Commission – the Indian government’s premier technical organization for harnessing water – and as additional secretary in the Ministry of Water Resources of the Government of India. Dharmadhikary, despite having trained as a mechanical engineer at the prestigious Indian Institute of Technology (Bombay), decided to pursue an unconventional path involving activism and community mobilisation. Over the years, Dharmadhikary has not only been part of a number of popular campaigns and movements but has also been actively contributing to various policy initiatives, including being associated with the WCD and becoming the founder coordinator of a research group called the Manthan Adhyayan Kendra, which takes up water and energy challenges in India. Clearly, different world views have shaped and informed the novel studies of Dharmadhikary and Rangachari, borne, in the main, by their contrasting professional commitments and ideological moorings.

Large Dams as Technical Artefacts

Rangachari in a somewhat plainly titled book Bhakra-Nangal Project: Socio-economic and Environmental Impacts sets out to evaluate the BNP by taking stock of the project’s “positive and negative social, economic and environmental conse-
quences.”¹¹ The effort is neatly lined up like a chartered accountant’s balance sheet. On the one hand, the costs: project displacement, waterlogging, salinity, and sedimentation of the reservoir. Juxtaposed to which in an even handed manner are the benefits: irrigation, agricultural productivity, flood mitigation, and hydro-power.¹² The strong, but not stated, assumption is that the BNP can be assessed by a simple tabulation of its measurable impacts. That is, there exists quantifiable “facts” that can convincingly help declare a result through an ex-post project Benefit-Cost (BC) ratio.

To give traction to such a claim, however, requires the equally strong claim that natural substances, though embedded in a plethora of ecological relationships, can nonetheless be meaningfully calculated as discrete units of economic value. That is, an entire world of ecological complexity made up of immense biological variability can be rendered into simple mathematically precise measures and legible economic values. Second, once these economic values are established as costs, they can then be contrasted, almost unequivocally, against another set of economic values such as benefits like irrigation. Thus, ecologies, people or cultures can be transformed into commensurable, substitutable, exchangeable, and equivalent economic values that are open to being repeatedly subtracted and added across time and space.

In other words, as pointed out by critiques of the BC format, nature and people must first suffer a comprehensive loss of quality in order to be then resurrected as plain numbers.¹³ It is only through such kinds of conceptual violence involving abstraction and quantification that, for example, forests in a reservoir’s submergence zone can be mathematically “compensated” and thereby presumed to have been equalized through an afforestation effort elsewhere. This submerged forest of numbers, therefore, is not treated as a collection of historically arrived biotic and faunal relationships but simply as a given sum of trees. The ledger book on forest cover, consequently, can be made to appear as a simple collation of numbers that can be neatly divided for comprehension —

¹² The Benefit-Cost ratio is a measure of return to investment for every unit of capital invested over the lifecycle of the project. The desired BC ratio in India requires that the value of the benefits over the project’s lifecycle should exceed the costs of its inputs.
¹³ For an excellent critique of the neo-classical problem with valuing “non-economic” goods such as environmental relationships and the limitations of the Benefit-Cost-exercise see John Foster, ed., Valuing Nature: Economics, Ethics and Environment (London: Routledge, 1997). In particular, see the essays by Robin Grove-White, John O’Neil, and John Foster in the volume.
as a subtraction (trees in the submergence zone) on one side of the balance sheet and as an addition (a plantation of trees) on the other.¹⁴

Such a BC maneuver also presumes that one can cleanly or credibly transform ecological time into exact units of economic time. That is, all the costs and benefits are accounted for only within the time frame of the dam's estimated lifecycle. Thus, any long term ecological consequences that could follow when the large dam’s services (irrigation, hydro-electricity or navigation) terminate will not be treated as part of the immediate calculation. In other words, to assess the performance of a large dam, economic quantification must trump ecological process. The exercise of the “quantifying spirit” that bends natural time to economic time, in fact, becomes crucial to determining how technical efficiency is measured.¹⁵

Interestingly, Rangachari attempts to sustain his untroubled embrace of the BC format, despite the latter’s proven inadequacies. Satyajit Singh, in one of the earliest analyses of large dams impacts in India, concluded that the BC ratio has inevitably proven to be a “tricky” operation and as a style for crunching numbers tended to be open to various kinds of manipulations, notably in the manner in which data and methods could often be generated to show reduced costs, while padding upwards the presumed benefits.¹⁶ The BC ratio’s inadequacies in capturing ecological complexity have also been described in a slew of monographs on large dam water projects in India, in particular in the works of Ranjit Dwivedi and Radha D’Souza. Dwivedi, in his exhaustive treatment of the contentious Sardar Sarovar Project (SSP) in India, records how varying outcomes were derived from different BC exercises.¹⁷ He points out, in particular, that the BC ratio

---

¹⁴ See the excellent discussion by Ravi Rajan on the emergence of what he describes as modern or continental forestry, which was a mix of Cameralist science and economic reasoning. Traceable as far back as the eighteenth century in Europe, Rajan shows how German and French forestry practices aimed at quantifying forests in order to meet the insatiable demands for timber by the State. Quantification helped makes forests legible to government officials who could set various quotas for extraction. See Ravi Rajan, Modernizing Nature: Forestry and Imperial Eco-Development 1800–1950 (New York: Oxford University Press, 2006). Also see James C. Scott, Seeing like a State: How Certain Schemes to Improve the Human Condition have Failed (New Haven: Yale University Press, 1998), 262–306.


¹⁶ Satyajit Singh, Taming the Waters: The Political Economy of Large Dams in India (New Delhi: Oxford University Press, 1997), 67–76.

¹⁷ The agencies that carried out the BC for the SSP were the Narmada Planning Group (1983); Tata Economic Consultancy Services (1983); World Bank (1985); SSP Narmada Nigam ltd (1989);
ended up being deployed principally to legitimize the project rather than as a method for objective appraisal. The intense social conflicts that subsequently dogged the SSP, according to Dwivedi, were largely brought on by the fact that the project’s BC ratio was constantly modified by political concessions, even as developing criterion for meaningfully estimating costs repeatedly eluded the project planners.¹⁸

Radha D’Souza’s study on the interstate disputes on the Krishna river goes a step further in pointing out how attempts to quantify hydraulic data by the Krishna Water Disputes Tribunal (KWDT) were compromised by the fact that there was a genuine absence of reliable time-series measurements on flows in the Krishna river. Critically as well, there were sharply differing spatio-temporal scales in the reading of the river’s hydrological behavior: between a geomorphological scale (river runoff and dependable flow), on the one hand, and a limited engineering scale (stream-flow), on the other. Inevitably the selection of the data sets by the KWDT, D’Souza argues, were made as choices borne from political pragmatism rather than from any pretension to scientific judgement.¹⁹ In several ways, these studies overwhelmingly establish that the BC ratio is a type of political arithmetic.²⁰

Added to the substantial criticisms discussed above, many of Rangachari’s other confidently stated arguments are similarly troubled as well. Most notably in the manner in which he paints the “pre-project scene” of the submergence and the command areas of the BNP, respectively. Undeterred by his own admission that baseline information was not collected at the time of the decision to build the BNP, Rangachari chooses to confidently describe what he perceives to be the “social, cultural, environmental and economic scene that existed both in the catchment and reservoir zone upstream as also the benefited region downstream.”²¹ The picture he paints is one typical of the standard development narrative that is based on notions about deficits. The downstream zone — comprising what is now South-West Punjab, parts of north-west Haryana, and a small portion of areas in Rajasthan — is sweepingly described as having been, in the none too recent past, landscapes of drought, famine, and peopled by vic-


¹⁸ Dwivedi, Conflict and Collective Action, 99 – 141.


²⁰ Porter, Trust in Numbers, 148 – 189.

²¹ Rangachari, Bhakra-Nangal Project, 38 – 55.
tims of recurring flood devastation. In other words, these areas, prior to the BNP, are declared as zones repeatedly wounded by forces of nature and inhabited by populations that were caught in various gradients of naturalized impoverishment.

What is inevitably conveyed in such a superficial and limited description is that the entire region can be defined as one that lacks the messiness of history. Thus, by an almost hop-jump-skip reading of a few nineteenth-century British District Gazetteers and one Famine Commission Report (1860–1861), much of the areas lying within and adjacent to the sprawling _doabs_ (flood plains) of the _Sutlej-Beas_, for Rangachari, appear as a mere development deficit, a claim that ignores the manner in which these _doabs_ had, across centuries, been harnessed by a range of pastoral groups, subsistence cultivation, cattle rearing, and by thick trading networks that supported many a powerful empire.

Furthermore, critically missing in Rangachari’s ahistorical view is the well recorded account of the dramatic transformations that had occurred in the regions through the course of the long nineteenth century: a period in which colonial policies led to the elimination of most cattle rearing “wandering tribes,” the relentless conversion of once forested tracts and grasslands into mono-cropped commercial wheat fields through perennial irrigation, the emergence of waterlogging, salinity and malaria, and the oppressive exploitation of settled agriculturalists by colonial revenue strategies. In fact, the transformation of the region’s ecology and social worlds was driven, in the main, by colonial attempts to “model the hydraulic environment,” through barrages, weirs, and canals. These British initiatives were relentlessly aimed at transforming the Punjab’s once variegated social and ecological flood plains into an administratively simplified settled agrarian tract.

Rangachari’s elision of the region’s colonial imprint, however, should not be treated as a simple omission of detail. Two discursive pretensions are in actuality

---

22 Recent histories have challenged the claim that the downstream zone was famine–prone and a near uninhabitable desert. See David Gilmartin, _Blood and Water: The Indus River Basin in Modern History_ (Oakland: University of California Press, 2015) and Daniel Haines, _Rivers Divided: Indus Basin Waters in the Making of India and Pakistan_ (New York: Oxford University Press, 2016).


involved in creating such a politics for forgetting. First is the attempt to present the BNP as a technological complex that is to be judged and assessed only by the disinterested expert. The “facts” and “data” are thus not to be distracted by the complications of politics, history, and the play of power. Once purged of such variables involving social power and historical contingency, the problems besetting the BNP can be reduced to being issues of oversight or technical misjudgement. Thus, for example, the multi-layered dilemmas brought on by displacement and rehabilitation are to be sanitised instead as challenges for reforming bad practice rather than as debates over what Pablo Kala describes as “erasure” — the processes whereby subsistence and traditional lifestyles are transformed (erased) and replaced by market-based life worlds.³⁵ For the sociologist Alf Nilsen, dam induced displacement in post-independent India, however, is conceptually more akin to being a form of “accumulation by dispossession,” a notion that he draws from the Marxist geographer David Harvey who aimed to explain how development projects often brought about the unequal distribution of costs and benefits. That is the dispossession of the vulnerable and marginal communities from their subsistence means development projects often resulted in the further concentration of resources amongst “regional, national and global property elites.”²⁶ In sum, displacement was not merely a technical or logistical challenge but spoke to messy issues of power and injustice.

Clearly, only by lopping off the deeper political and historical roots of the BNP could the latter be inserted into a narrative about national development. That is, only as a neutral “object of development” could the BNP be located within the singular quest for national productivity, efficiency, economic growth, and thereby inscribed into a spatio-temporal scale for nation-building. The impacts of the BNP are, therefore, tabulated as quantifiable deliverables: a) supply of electric power to the national grid; b) as a statistical increase in total canal irrigation; c) a means for augmenting national agricultural production; and d) a source for adding to the other innumerable intangibles that make up the national economy. In such a script, the impacts of the BNP becomes a truly displaced object without locality or environmental context and can be measured only within an overall balance sheet of nation-making.²⁷ The Sutlej river, in other words,

---

²⁷ See the celebratory account on dam building in India by Henry C. Hart, *New India Rivers* (Bombay: Orient Longman, 1956). In what was typical of the enthusiasm for large dams in
now truly belongs to the nation and not to a complex fluvial ecosystem nor to the histories of the communities that previously lived by it and alongside it. For nation-building, in other words, people and their ecologies suffer an encompassing loss of place, just as their realities are now increasingly expressed as abstract statistics and within averages. 28

Having set the study within such apolitical and ahistorical frames, Rangachari then concludes that the BNP has more than matched its expectations. On the question of canal irrigation, we are informed that from the opening of the Nangal works in 1954 till 1984/85, the irrigated zone touched around 3.506 million hectares (Sirhind canal included).29 The “progressive farmers” in the irrigated tracts, moreover, he surmises, proved to be prompt in managing to adjust their cropping patterns in “tune with profitability and market forces.” In the subsequent two chapters, Rangachari goes on to list what he considers to be the manifold gains from increased productivity in wheat and rice, that furthermore amplified the successes of the Green Revolution agricultural strategies in Punjab and Haryana. The inevitable conclusion being that not only did the BNP irrigation network dramatically raise food grain production in India but “yielded significant social and economic benefits without experiencing any unacceptable environmental costs.”30 Added to this story of agrarian success was also the less heralded contribution of hydroelectric power, generated by two power plants at the Bhakra dam. In this estimate, the BNP generated 211 billion kWh (Kilo-Watt Hour) between 1955/56 and 1999/2000 and continues to produce 7000 kWh each year, and lastly, the “incidental benefit” of managing floods,

that period, Hart writes his account of river valley development as being integral to the economic biography and political identity of “New India.”

28 The tensions between space and place have been vigorously debated by geographers. In his classic on the differences between space and place, the geographer Yi-Fu Tuan broadly suggests that a relationship space is more abstract than place, while the latter is saturated by experience. In such a rendering, it would be critical to understand how a sense of cultural loss might impact displaced communities. See Yi-Fu Tuan, Space and Place: The Perspective of Experience (Minneapolis: University of Minnesota Press, 1977). See also the notion of place in Doreen Massey, For Space (London: Sage Publications, 2005), 130–142.

29 The figure is quoted from a publication of the Bhakra Beas Management Board, History of the Bhakra Nangal Project, 1988. See Rangachari, Bhakra-Nangal Project, 89. It is interesting that he should refer to a 1988 BBMB report as the latest information in his book that is published in 2006.

30 Rangachari, Bhakra-Nangal Project, 121.
which the BNP reservoir was able to moderate and mitigate in the four decades of its operation.\textsuperscript{31}

While Rangachari asserts the above by mainly restating and collating statistically determined quantitative data, he, nonetheless, retains enough caution to alert us at the outset of the book itself that “there has been little systematic collection of relevant data about dam projects in the past” and therefore any “definite conclusions on their performance and impacts are difficult.”\textsuperscript{32} Hence, he ends with the reminder that there have been, thus far, no “credible” post-project evaluations by any independent professional agency of multi-purpose river valley development projects in India. In effect, data about dams, as Arundhati Roy eloquently observes, may hide more than they reveal, or worse such objective facts do not meaningfully exist.\textsuperscript{33}

Are Large Dams Just Politics by Other Means?

Shripad Dharmadhikary, in \textit{Unravelling Bhakra}, anchors his study of the BNP in a particular historical, ecological, and political setting rather than treating the project as a free floating signifier for development.\textsuperscript{34} This allows Dharmadhikary to disclose the BNP not merely as a technological complex but, more incisively, as a distinct economic and political moment in post-independent India. The impacts of the BNP are thus essentially treated as fallouts from the larger play of political economy: attempts to industrialize river control; the appropriation of water for assembling forms of social and political domination; and above all else the trying political efforts to transform fluvial flows into national resources.\textsuperscript{35} The version of “national development” that the BNP was meant to inaugurate, Dharmadhikary suggests, ended up producing project beneficiaries by creating project victims. Put differently, large dams can be understood as embodying a collection of several win-lose scenarios. And yet, despite arguing that the BNP is a political object, Dharmadhikary remains keen, nonetheless,

\begin{itemize}
  \item \textsuperscript{31} Flood control are not benefits that can be easily claimed. Floods in the Indian subcontinent, in fact, have often been welcomed and treated as being critical to sustaining river health. See Rohan D’Souza, “Event, Process and Pulse: Resituating Floods in Environmental Histories of South Asia,” in \textit{Environment and History} 26 (2020): 31–49.
  \item \textsuperscript{32} D’Souza, “Event, Process and Pulse,” 5.
  \item \textsuperscript{33} Arundhati Roy, \textit{The Cost of Living} (London: Flamingo, Harper Collins, 1999), 18–23.
  \item \textsuperscript{34} Shripad Dharmadhikary, \textit{Unravelling Bhakra: Assessing the Temple of Resurgent India} (Bawani: Manthan, 2005).
  \item \textsuperscript{35} This seems to be the tenor of the argument in Singh, \textit{Taming the Waters}.
\end{itemize}
to underline that large dams are more meaningfully analyzed as technical artefacts.

Dharmadhikary begins with the startling claim that the plans for the BNP arose not from the conventional desire to irrigate semi-arid or drought stricken lands. Instead several festering interstate water disputes between the provinces of Sind and the Punjab in British India actually provide the backdrop. In the post-1947 period these very same provincial skirmishes, in fact, went on to transmute into an international level discord, often referred to as the India-Pakistan conflict over the Indus system. That is, a regional fracas over hydraulic access and rights in the colonial period got transformed in the post-colonial years into a bitter complication over the need to establish the national ownership of the Indus river system. For the newly independent Indian government, commanding the Sutlej as an Indian river meant damming it in order to prevent its flows turning into “wastes” as soon as the waters crossed into Pakistan. At the heart of the project proposal was the aim to create a new Cultivable Command Area (CCA) within Indian territory that would irrigate 2.37 million hectares (mha). This addition, however, Dharmadhikary points out, could be made possible only by cutting off the existing irrigation supplies of 2.21 mha of the CCA of the Sutlej Valley Project that were until then still irrigating lands in Pakistan. In other words, the BNP was essentially about effecting a water transfer, whereby the irrigation benefits in India were going to be matched in almost equal measure by irrigation losses suffered within Pakistan.

As to whether the BNP was decisive in irrigating and powering (through hydroelectricity) the Green Revolution strategy in Punjab and Haryana, Unravelling Bhakra argues for severely qualifying such claims. After wading through the often conflicting numbers from government statistical abstracts and publications, there seems to be no “self-evident” case for suggesting that the canal irrigation boost that the BNP ostensibly supplied proved singular in turning Punjab and Haryana into the bread basket of India. Similarly, there are arguments for questioning the other equally enthusiastic claims about the BNP’s contribution to hydro-power. In order to lend perspective to the Central Electricity Board’s stated data that the BNP produced a total of 6500 MU (Million Units) of power

37 Dharmadhikary, Unravelling Bhakra, 24, 29.
a year, Dharmadhikary gives context to this electricity output by linking it to tubewell use in Punjab and Haryana. In 1990/1991, the number of tubewells in use stood at roughly 497,571 for Haryana and 800,000 for Punjab respectively; and upon comparing the electricity requirement for this grand total of 1,297,571 functioning tubewells, the BNP’s contribution would be able to meet barely 28% of the demand.\(^{28}\) In effect, 72% of all the tubewells in the grain belt would still have to be run either on diesel or with power generated from other sources.

Having thus argued that the BNP cannot be unequivocally celebrated, *Unravelling Bhakra* presents us a gripping account of the real costs or hidden debits. On the question of waterlogging and salinization, there is the challenge of making sense of huge uncertainties in the type of existing data, as statistics are compiled at the state level and not at the project level. However, despite the slippery nature of the existing numbers and the fact that the last report of any worth on the subject was compiled and published in 1991 (Government of India Working Group), only tentative figures could be advanced for soils affected by waterlogging, salinity, and alkalinity in the BNP’s command area: an approximate of 49.168 thousand hectares for Haryana and about 200 thousand hectares for Punjab. Given this yawning gap in credible data, Dharmadhikary takes up the next best option by making qualitative assessments with field visits to Badopal, Lambakhed, and Lohgarh villages (Haryana) and Malout Town (Punjab). Here the picture that is presented is one of wasted soils, crumbling houses, dead trees, stagnant pools of water, sinking roads, and rising salinity levels in what were previously fairly prosperous zones.

Such undocumented and unacknowledged post-project impacts, Dharmadhikary contends, have simply escaped the statistical record and do forcefully suggest that all may not be right in the way the benefits and costs have been tabulated. In a similar vein, the displacement and rehabilitation of the BNP’s project affected remains a story that is yet to be meaningfully told. Officially, the estimate is that 17.876 thousand hectares of land were submerged with approximately 36,000 persons being displaced from 371 villages. On the other hand, the full details of their suffering — forced dispossession, loss of livelihoods, and the sundering of their historical linkages with landscape and identity — Dharmadhikary opines have entirely escaped any systematic survey or careful study. To, consequently, even list the project affected of the BNP as mere costs might be inadequate, if not unjust, in taking stock of the complex and layered emotional and

\(^{28}\) Dharmadhikary, *Unravelling Bhakra*, 123.
economic sufferings that the project displaced might have undergone in the name of development.³⁹

On the question of the BNP’s contributions to agricultural growth through irrigation, Dharmadhikary provocatively argues that the impacts of the canals were far less spectacular than claimed.⁴⁰ Conventional wisdom holds that the BNP made significant contributions towards enabling India’s Green Revolution (GR). The GR package was aimed at boosting agricultural output by getting controlled irrigation to supplement a mix of chemical fertilizers, high-yielding seed varieties, mechanization, and the consolidation of land ownership. This GR format, furthermore, was soaked in ideologies of national self-reliance, national development, and nation-building.⁴¹ Whilst, undoubtedly, the output of wheat–paddy did witness a steep rise, for Dharmadhikary, this sudden spurt was not without huge shifts in cropping patterns and social changes. He draws our attention to the following:

In Punjab, in 1965–66, wheat occupied 39% of the cultivated area, gram 15%, maize 10%, and rice 7%. By 1990–91, wheat area was 44%, gram 1%, maize 2% and rice 27% [...]. In 2002, wheat–rice took up 78% of the total cropped area of Punjab.

In Haryana too, the case is similar, though less acute. In 1966–67, wheat occupied 18% of the total cropped area, gram 26%, bajra [*Pennisetum glaucum*, Pearl Millet] 22%, rice 5%. In 1990–91, this was 36% for wheat, 13% for gram, 12% for bajra, 13% for rice. In 1998–99, wheat and rice accounted for 57% of total cropped area.⁴²

The BNP, in Dharmadhikary’s analysis, thus, seems to have set in motion a broader agrarian dynamic within the flood plains of Punjab and Haryana that,

---


⁴⁰ In a recent attempt to revise the accepted understanding of India’s Green Revolution, a thesis submitted to the history department at King’s college by Kapil Subramanian suggests that the GR was actually brought about by a ground water revolution and not, as popularly claimed, by the introduction of new hybrid seeds. See Kapil Subramanian, “Revisiting the Green Revolution Irrigation and Food Production in Twentieth-Century India” (Ph.D. diss., King’s College London, 2015).


⁴² Dharmadhikary, *Unravelling Bhakra*, 160.
in essence, comprised the intensification of mono-cropping and the locking of soils into a limited wheat-rice regime. That is, acreage under wheat-rice cropping was made to steadily expand into lands that previously grew a range of mixed crops such as legumes (gram, *Cicer arietinum*) and cereals (bajra, *Pennisetum glaucum*, and maize, *Zea mays*). The dams and barrages as irrigation infrastructures, in effect, ended up ecologically simplifying an otherwise mixed cropping landscape.

Within the curve of the same reasoning, Dharmadhikary goes on to then contest the reigning belief that the BNP was singularly responsible for turning the states of Punjab and Haryana into India’s wheat and rice granaries. Or as he puts it, the unquestioning claim that “Punjab = Bhakra (and to a lesser extent Haryana = Bhakra).” His granular study of irrigation data in being specially attentive to aspects such as canal seepage helps him arrive at the conclusion that for the state of Punjab a full 71.8% of its agricultural production actually depends on the “ground water irrigated areas,” whilst for Haryana the estimate would be 47.58%. Further, by extrapolating from such calculations, the BNP’s canals system as a specific irrigation input, it appears, adds up to or contributes only to a mere 11% for Punjab and about 24% for Haryana of their total agricultural output. For Dharmadhikary, thus, a scrutiny of the available statistics, the official claims, and a considered look at the iconic and mythical status of the BNP strongly suggests that a mere tabulation of the costs and benefits would not meaningfully be able to capture the complexity of the ecological, social, political, and economic impacts.

**Dams as “Asset Class”**

In reviewing the studies of Rangachari and Dharmadhikary, this essay might appear to be merely fleshing out how a technocrat and an activist have respectively differed over the large dam question in India. While the technocrat concentrates on evaluating the technical performance of the project, the activist, in contrast, situates the project within the larger complications of political economy. It is not

---


46 Dharmadhikary, *Unravelling Bhakra*, 125.
hard to conclude that such distinct frameworks can easily result in a situation where the contending parties might be speaking across rather than to each other. What, however, makes these studies novel is their efforts at setting the conceptual grounds for a post project evaluation of the BNP within the overall context of the WCD exercise, which, as indicated earlier, sought to break the deadlock between the pro-dam and anti-dam groupings. Though Rangachari and Dharmadhikary do mostly stick to their respective scripts, as technocrat and activist respectively, they, nonetheless, also credibly make the case for scrutinizing large dams in terms of their already realized outcomes.

The clinching persuasion of the BNP, for Rangachari, lay in the project’s ability to deliver on a huge number of unstated indirect and incidental benefits such as the purported immunity from famines, poverty alleviation, and industrial development. Dharmadhikary, in contrast, flags several types of mismatches between the project’s stated claims and what has been delivered. In particular, arguing that it was ground water extraction rather than surface water through the canal network that actually enabled and spurred irrigation in the BNP’s command areas. Though the studies retain a sharp distinction between the technical artefact and the political object in their analyses, they both do imply, inadvertently or otherwise, that a meaningful dialogue over the BNP and large dams in general is possible if we can somehow meaningfully measure, count, and debate the benefits and costs. Put differently, Rangachari and Dharmadhikary are migrating the large dam debate in India from the previous anti-versus-pro dam framework to the WCD template that sought to distinguish between the good dam and the bad dam.

On the other hand, if a common conceptual ground does indeed exist between the activist and the technocrat, how should the political speak to the technical? In this regard, Sanjeev Khagram helpfully weighs in by exploring the links and implications between dams and democracy in India. In the initial years, according to him, the ruling dispensation in India energetically pursued and heroically constructed large dam projects as part of a “top-down, state-led, economic-growth focused and technocratic development vision.”\(^{47}\) Popular anti-dams struggles, however, soon broke out and by the 1980s “practically every big dam across India was facing some sort of organized resistance.”\(^{48}\) From the latter half of the 1990s, the muscular opposition to large dams, interestingly enough, steadily began waning and showed signs of what Khagram describes as arising

---


\(^{48}\) Khagram, *Dams and Development*, 34.
from three steadily consolidating trends: a) better organization and mobilization by pro-dam actors; b) the deepening of the neo-liberal economic policies of privatization and liberalization in the Indian water sector; and c) the mobilization of marginalized groups such as tribal, lower castes, and subsistence peasants by Hindu fundamentalist religious movements and growing political repression.⁴⁹

Popular agitations and resistance to large dams in India, in fact, continued to decline throughout the opening decades of the twenty first century, even as a number of inter-basin water transfers, irrigation and hydroelectric projects kept on being planned and even executed. According to the sociologist Amita Baviskar, this steady weakening in the otherwise robust popular challenge to large dams was largely a result of a sustained shift in tactics. Many of these erstwhile critics and campaigner, it is pointed out, tended to abandon calls for popular mobilization and agitations by opting instead to battle it out in courts, government committees and by getting involved in techno-managerial disputes. That is, for Baviskar, in India, there emerged a perceptible mood shift in which the technical domain seems to have trumped the field of mass politics and thereby turned the challenge against large dams into mostly becoming a scrimmage of sorts between experts.⁵⁰

Oddly enough, despite the evident weakening of popular movements, dam induced social conflict and political tension are hardwired into the infrastructure of the large dam.⁵¹ As aptly surmised by the historian Daniel Klingensmith, the sources for disquiet and potential resistance against large dams remains latent within how the engineered transfer of water from flowing rivers has been effected:

Both proponents and critics of dams would acknowledge that dams necessarily create changes in uses of, and access to, rivers. This inevitably means a transfer of power over rivers as resources: away from local control and customary law, and to bureaucracies and state regulation, away from small agricultural producers and from users of common lands and to large producers and to owners of privatized property.⁵²

Though the WCD report of 2000 made clear that building a “good dam” was incumbent on meaningfully addressing an exhaustive list of social and technical

⁴⁹ Khagram, Dams and Development, 63.
standards, this did little to dampen the spirits of governments and the dam building industry. If anything, close on the heels of the WCD report there followed the world over a renewed burst of interest in and funding for large dam construction. In part, a fresh quest for producing non-fossil fuel energy drove governments to address climate change mitigation through hydropower projects. Accordingly, in one considered estimate, by 2014, a total of 3,700 hydropower dams with a capacity of more than one megawatt (MW) had either been planned (83%) or were actually already under construction (17%), with a large chunk of these projects being located in China, India, and Brazil. The aim was to rapidly step up global hydropower electricity capacity from 980 Gigawatts (GW) in 2011 to about 1,700 GW within the next 10 to 20 years. While roughly 75% of these dams were listed under the category of small and medium (generating between 1 and 100 MW), the largest slice of producing up to 93% of hydroelectric power was to be generated by 847 mammoth-sized large dams, each of which could be expected to produce more than 100 MW. It should also be noted that of the 955 hydropower dams built after 2001, 81% of these projects were located in South America (427), closely followed by Asia (342). Most observers of the dam building industry, in fact, see a robust future for hydropower development in the emerging economies of Southeast Asia, South America, and Africa. In sum, despite all the caution and contrition of the WCD process, it appears that the twenty-first century will witness another fresh bout of damming.

In a landmark paper, social scientists Rhodante Ahlers, Margreet Zwartteveen, and Karen Bakker point to a significant conceptual departure within the large dam story by linking the recent enthusiasm for dam building to the emergence of a fresh set of calculations, forces, and measurements. The first burst of large dam construction that occurred in the twentieth century, they underline, was chiefly driven by nation states, who aimed to achieve national economic development and undertook to build dams as public projects. Dams in this phase, for the authors, could be metaphorically likened to a “Trojan

---

55 Peilei Fan et al., “Recently Constructed Hydropower Dams were Associated with Reduced Economic Production, Population, and Greenness in Nearby Areas,” *PNAS* 119, no. 8 (2022): 1–11.
horse” — “embodying far more than instruments for water storage.”\textsuperscript{57} That is, the
dams internalized the imperatives of the nation-state such as geo-politics, the
political reordering of landscapes, monumental engineering, and the efforts in
several cases for extending capitalist relations of production. In effect, the
large dam of the twentieth century proved to be the “tangible material embod-
iment of political economic relations.”\textsuperscript{58}

Dam construction in the twenty-first century, on the other hand, for Rhod-
dante et al., is marked by a defining role for private financial flows in infrastruc-
tural development, in which the latter is principally configured as an “asset
class.” The term asset class, as explained by Nicholas Hildyard, refers to the
process of turning infrastructure into a financial platform: whereby private equi-
ity firms, banks, various types of financiers, and investors acquire stakes in the
infrastructural project through loans, credits, and debt instruments.\textsuperscript{59} Conse-
quently, the complicated financial architecture of the project not only makes es-
tablishing the actual ownership of the dam obscure but, critically as well, it gets
even harder to pin down responsibility. Rhodante et al., in fact, throw into sharp
relief the example of the \textit{Nam Theun 2} dam in Laos to highlight how the latter as
an asset class created by a public-private consortium requires that the financial
agreements and documents relating to the project be kept confidential in accord-
ance with international and national law. Not only were critical details such as
the dam’s operating costs, debt liabilities, and water management priorities thus
not subject to public scrutiny but, astoundingly as well, the consortium involved
in building the dam was under absolutely no obligation whatsoever to share in-
formation with the public.\textsuperscript{60} In effect, for Rhodante et al. the twenty-first century
large dam as an asset class is best captured in the metaphor of the “Pandora’s
Box” — hidden complications and obscure internal arrangements.\textsuperscript{61}

\section*{Conclusion}

Clearly, frameworks to debate and discuss the modern large dam have been
evolving over the years. The studies of Rangachari and Dharmadhikary, as I sug-
gest in this essay, were striking efforts to reconsider how the impacts and contri-

\textsuperscript{57} Ahlers et al., “Large Dam Development,” 9.
\textsuperscript{58} Ahlers et al., “Large Dam Development,” 9.
\textsuperscript{59} Nicholas Hildyard, More than Bricks and Mortar: Infrastructure as an Asset Class: A Critical
Look at Private Equity Infrastructure Funds (Manchester: Corner House Publications, 2012).
\textsuperscript{60} Ahlers et al., “Large Dam Development,” 12.
\textsuperscript{61} Ahlers et al., “Large Dam Development,” 11–14.
butions of large dams could be meaningfully assessed. Though their differing
standpoints, as technocrat and activists respectively, focused on a post-project
evaluation of actual outcomes of India’s famed Bhakra-Nangal Project, their
studies, at heart, aimed at engaging with the World Commission on Dams pro-
cess. In short, instead of getting locked into the previous dead-end and increas-
ingly circular arguments between the pro-versus-anti dam reasoning, Rangachari
and Dharmadhikary sought to find conceptual grounds to evolve the notion of
the good dam.

What, nonetheless, remains central and defining to their analysis of the BNP
is what Rhodante et al. would metaphorically consider as a “Trojan Horse” — re-
ferring to the large dam of the twentieth century that embodied the political and
economic relations of the nation state. While challenges against these dams did
frequently erupt, especially following the brutal displacement of mostly subsis-
tence and marginal communities, the twentieth-century dam could nonetheless
be pried open for public scrutiny with its claims debated and often enough sub-
ject to democratic resistance. The internal arrangements of the Trojan Horse, in
other words, could be revealed and resisted precisely because it fell into the
realm of the nation making public project or the public good. On the other
hand, the subsequent twenty-first-century dam or what Rhodante et al. refer to
as being evocative of the Pandora’s Box, however, not only severely limits access
to public scrutiny but radically obscures aspects of ownership and responsibility.
Put differently, the large dam of the twenty-first century, by being principally as-
sembled as a financial platform, unlike a public good, can dodge and evade pub-
clic accountability.

Given that another frenetic round of dam building has begun, especially in
the continents of Asia and Africa, the twenty-first-century dam will not only fur-
ther intensify ongoing debates over what constitutes a good dam but, critically as
well, will increasingly foreground issues of financial transparency, public scruti-
nym, and democratic decision making.⁶ At the heart of the issue, however, will re-
main the big and central question: can large dams be built through market effi-
ciencies without meaningfully enabling public accountability?

---

⁶ For essays indicative of growing anxieties and dangers from large dam construction without
regulatory oversight, see Kelly D. Alley et al., “Visualising Hydropower Across the Himalayas:
Mapping in a Time of Regulatory Decline,” Himalaya, the Journal of the Association of Nepal
and Himalayan Studies 34, no. 2 (2014): 52–66. Also see Douglas P. Hill, “Transboundary
Water Resources and Uneven Development: Crises In and Beyond Contemporary India,” South