Framing India's Hydraulic Crises
The Politics of the Modern Large Dam

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For several decades following 1947, the modern large dam in India presented itself as a political conundrum, often voiced in strange, contradictory tones. In an oft-quoted speech in July 1954 Jawaharlal Nehru, India's first prime minister (1947–64), likened the large dam to a "modern temple." Later, in a less remembered speech before a gathering of engineers and technocrats in 1958, Nehru, as if in contrition, bemoaned the quest for big dams as a "disease of gigantism."[1]

Nehru's contradictory views were, perhaps, understandable for the times. The post-Second World War denouement was unprecedented in several ways. It was a period that left unquestioned the idea of progress, insisted upon the supreme belief in development, inculcated faith in modern technology, and advocated an unwavering confidence in positivist science. How else could one explain the unexpected surprise that greeted civil engineer Dr. K. L. Rao (later minister of irrigation and power, 1963–73) when scouting around for a dam site for the Nagarjunasagar project in the early 1950s in Andhra Pradesh (in south India)? He was troubled by the fact that a police escort was required since the survey zone was then experiencing a communist-led guerilla insurgency, primarily against landlordism. However, as events unfolded, Dr. Rao noted in his autobiography:

> Later, I got a letter from the leader of the Communist Party who was underground, that there was no necessity for me to have a police escort and that they would not have harmed me and the other engineers unless we were engaged in building roads to their hide-outs. Engineers dealing with dams and irrigation projects were most welcome. This was similar to what the Communists told Dr. Savage when he went to the river *Yangtze* in China to see a storage dam site. The Communists sent word to him that he could freely move about without escort as they would not harm engineers engaged in the development of rivers.[2]

Clearly, the large dam appeared class neutral, if not beyond politics. Such was its apolitical allure that Henry C. Hart, a U.S. academic and

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commentator on India, declared with much gusto in a book published in the late 1950s that the large dam with its multipurpose reservoir had "correctly come to symbolize the engineering of the era of nation-building."[3] Put differently, the "development of rivers" seemed to have charged decolonizing nations with a new technological mission: the giant quest to transform fluvial powers into national assets—hydroelectricity, navigation, irrigation, and flood control.

Turning dammed rivers into synonyms for nation building, however, did not spring unadulterated from the breasts of technology enthusiasts. Rather, the enthusiasm for the modern large dam had been derived from many of the troubled forces that had overwhelmed capitalism in the early decades of the twentieth century—the Great Depression in the United States, the crisis of capitalist overproduction, and the brutal failings of the free market. It was in the vortex of near desperate interventions to save capitalism through the New Deal, Keynesian-style economic pump priming, and the crafting of capitalist planning that the comprehensive control of the Tennessee River through a series of multipurpose large dams was assembled. Under the aegis of the Tennessee Valley Authority (TVA), dams placed across the Tennessee River were expected to transform the region into an economically dynamic and modern productive landscape.[4] The TVA model was soon to mark a profound hydraulic departure by kick-starting the post-Second World War global obsession for large dams.[5]

With a formidable collection of technocrats, water bureaucrats, engineers, sundry social experts, and several charismatic chairmen, the TVA enthusiasts not only set about attempting total river control but also simultaneously obscured the large dam's political roots. In other words, the large dam under the rubric of multipurpose river valley development was declared a technology exorcised of politics: a pure expert-driven, techno-economic artifact intended to dominate nature for the freedom of man, to pursue national triumph by disciplining rivers, and to create abundance through controlled flows.[6]

In many ways, India's colonial legacy reinforced the pursuit of hydraulic capitalism through the large dam. Historically, technologies for hydraulic manipulation in the Indian subcontinent have moved through three distinct, though overlapping, phases. From the earliest times, tanks, inundation canals, temporary structures to trap drainage, wells, and waterwheels made up the ensemble of water harvesting structures. These techniques were essentially directed toward either impounding precipitation, tapping river inundations, or retrieving groundwater re-

charge.[7] At the risk of oversimplification, one could perhaps conclude that the underlying hydraulic principle was to adapt the water harvesting structure and design to microclimates, topography, and fluvial process.

In the early nineteenth century, however, British colonialism initiated a radical break in both technique and hydraulic principle by introducing perennial canal irrigation in several parts of the South Asian subcontinent. For the first time, permanent headworks in the form of barrages and weirs were thrown across riverbeds, and their waters were diverted through intricate and extensive canal systems. These barrages and weirs were equipped with a series of shutters to regulate flows by impounding water during lean seasons and diverting it into canals; and, on the reverse, the shutters could be flipped open to release waters during the river's peak discharge. In effect, by flattening the river's variable flow regime at certain points along its course, irrigation was transformed from a seasonal to a perennial possibility. This phase, often referred to as the advent of the era of modern irrigation, witnessed the construction of several large canal irrigation schemes with permanent headworks such as the Ganges Canal (1854), the Godavery system (1852), and the Krishna system (1855). These big-engineering efforts, in several ways, had profound transformative impacts. The civil engineer and the bureaucratic control of water, in particular, soon caused the expropriation of the skills of the local irrigator and unsettled the "fluvial wisdom" of the community.[8]

Changes in irrigation technologies were also followed by dramatic alterations to entire hydraulic environments. The case in point being that of the eastern deltas (contemporary Bengal, Bihar, and Orissa), which were transformed from being flood dependent agrarian regimes into flood vulnerable landscapes.[9] In the quest for comprehensive flood control, the colonial dispensation undertook the systematic construction of flood control embankments to hem in rivers within their main channels. Though driven chiefly by the need to secure private property in land, these flood control measures soon disrupted natural flow regimes and ended up aggravating flood lines and thereby opening up the deltas to enhanced flood vulnerability. In addition, they also constructed a network of roads, railway lines, and bridges, which by running in the east-west direction ended up interrupting natural drainage lines that mostly dropped from north to south. These structures, in time, not unexpectedly, began to unsettle a complex and fragile arrangement for drainage. By the beginning of the twentieth century, natural drainage arrangements survived only in pockets, as vast parts of eastern India

were transformed into a "succession of water logged morasses" in which "dismal swamps breeding malaria" debilitated the population and the fertility of the soil.

Colonial hydraulic interventions, as it is now widely recognized, oversaw the dismantling and destruction of several unique water traditions in India. This, of course, is not to argue that all "traditional" water practices were ideal, enduring, and environmentally sound. Rather, the emphasis here is to point out that the contemporary model for harnessing water in India amplifies its colonial legacy by continuing to expropriate or eliminate traditional water management skills and technologies. And having thereby relentlessly extinguished other ways, techniques, arrangements, traditions, and cultures for managing and conserving water in India, the large dam is always pursued as the TINA (there is no alternative) option.

Today, globally, according to a recent count, over 45,000 large dams currently sit astride innumerable river valleys, gorges, and "gun-shot" sites.[10] Formerly wild cascading flows are now put to work—running turbines, marching as orderly cusecs in irrigation canals, providing the measured electric hum for industrial machines, and winding their way diligently through drinking water pipes or simply contained as silent volumes in immense reservoirs. The river has been put on tap.

Yet, a dammed river—as I will argue below—profoundly plays out the irreconcilable tensions and intense contradictions between capitalism and nature. Modern large dams, given the experiences in the last sixty years in particular, have been deeply implicated in various processes integral to capitalism such as enclosure, the transferring of hydraulic endowments to powerful constituencies, the intensification of industrial agriculture, the shifting of ecological costs onto marginal communities, and the expropriation and elimination of indigenous water management traditions.

The New Enclosures: When Dams Ate People

In India, disquiet regarding large dams was first expressed over the issue of displacement.[11] The multipurpose reservoir, requiring the creation of an artificial lake, drowns vast swathes of existing forests and habitations. Thus, entire villages and settled communities, which fell within the bed of the dam's reservoir, were forcibly evacuated from their lands and homes. By the 1980s, the number of *oustees* or dam-displaced persons had reached such alarming proportions that the much celebrated *Second Citizens' Report* (1985) on the growing environ-

mental crises was dedicated "to the dam-displaced people of India."[12]

Dam-displacement victims were, in fact, doubly dispossessed. On the one hand, all their possible means of livelihood were comprehensively destroyed through submergence, while, on the other, they were systematically denied any meaningful resettlement or rehabilitation. Initially, under the pretence of compensation, the oustees were simply paid paltry cash settlements. In 1984, however, partly following the intense resistance that was building up against the infamous Sardar Sarovar Project over the Narmada River, the official policy on resettlement and rehabilitation was finally compelled to concede the right for a land compensatory package.

Despite this seemingly radical gain, the resettlement and rehabilitation strategy in India continues to act as a new type of enclosure. Armed by the archaic colonial Land Acquisition Act of 1894, the government exercises eminent domain over all land, which can then be seized for anything that is deemed as a "public purpose" requirement. Through such a legal framing, moreover, the dispossessed are also denied any right to either challenge or dispute the government's definition of what constitutes a public purpose. With their livelihoods thus lost, the oustees are then further compromised.

The implementation of resettlement and rehabilitation programs have invariably tended to address compensation claims by breaking whole communities that previously existed as culturally dense intertwined arrangements into now oversimplified family units. In effect, the deep associations that sustained and secured the viability of various kinds of social groupings (especially that of tribal or *adivasis* communities) are disoriented and rendered instead, by design, into collections of atomized individuals. In other words, the bureaucratic and formal categories deployed to facilitate the economic calculations for resettlement and rehabilitation have led to the forced snapping of deep historical ties, bonds, and cultural linkages that were critical to survival strategies and livelihood means.

Finally, by concentrating all its efforts on estimating economic equivalences to land loss, the resettlement and rehabilitation strategy has ended up ignoring and devaluing an entire range of other subsistence institutions and means such as commonly shared forests, grasslands, streams, tanks, fishing rights, and village commons—a web of natural endowments upon which the landless, the marginal, and the impoverished were heavily reliant.

Clearly, dam-displacement in terms of both the legality of its direct seizure of means of livelihood and in the details of enforced atomization and increasing individual vulnerability amounts to a contemporary version of enclosure. One conservative estimate of the number of people displaced by large dams in India since 1947 is placed at 40 million; with possibly a mere tiny fraction of this huge number of oustees having managed anywhere near meaningful resettlement. Nevertheless, the astounding number of oustees has not in any way deterred large dam enthusiasts from pursuing the Polavaram project in south India, which is expected, by a very conservative count, to displace up to 230,000 people. Not surprisingly, the vast majority of the displaced, once again, will be predominantly tribal or *adivasis* populations.[13]

Benefits and Costs as Political Arithmetic

The large dam is always announced as a techno-economic decision. Typically, therefore, quantification is pursued; which, in the main, boils down to the search for an acceptable cost-benefit ratio for the project. Ideally, the benefits are expected to outnumber the costs. However, the cost-benefit ratio is rarely, if ever, arrived at neatly. In great measure, much of the confusion springs from the contested and political nature of how values and prices are determined.

For India, Satyajit Singh helpfully summed up some of the earliest questioning of the cost-benefit format. In an insightful review of several dam projects, he pointed out that the cost-benefit ratio was invariably a manipulated figure, in which the costs were made to move downwards while the benefits always tended to be overstated.[14] The cost-benefit ratio, not unsurprisingly, has served as the spark igniting many a resistance campaign against large dams in India. In the case of the controversial Sardar Sarovar Project, for example, Ranjit Dwivedi's study records how different cost-benefit outcomes were politically arrived at rather than being based on objective criteria.[15]

The cost-benefit format, however, was flawed in other ways as well. An excellent study by Radha D'Souza points out that the quantitative data were often conceptually suspect. In her study of the Krishna Water Disputes Tribunal, D'Souza shows how the attempts to "scientifically" quantify hydraulic data were troubled not only by the fact that there was an absence of reliable time-series measurements on flows in the Krishna River but, interestingly enough, there existed sharply differing spatio-temporal scales in the reading of the river's hydrological cycle: 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 Krishna Water Dispute Tribunal, D'Souza argues, was determined on the basis of political pragmatism and opportunism rather than any pretension to scientific judgement.[16] These studies convincingly suggest that the cost-benefit ratio has been made to operate as a type of "political arithmetic" in which the project was positioned as a neutral technological artifact while all along being directed toward realizing specific political outcomes.

With the subjection of the cost-benefit format to critical scrutiny, therefore, a new definition of the large dam is called for. The large dam is seen as the technical means to realize political outcomes. The dam enables the transfer of a region's hydraulic endowments to already empowered beneficiaries with the costs disproportionately borne by dispossessed oustees and marginal communities.

The hydraulic transfer is affected by the comprehensive transformation of the river's ecology. That is, the river is put to work by being altered into irrigation cusecs, kilowatts for hydroelectricity, and dead storage for flood control. The consequences of this dramatic overhaul in the river's character has been brilliantly discussed in a recent study by Shripad Dharmadhikary.[17] In *Unravelling Bhakra*, Dharmadhikary provides one of the most original discussions on both the cost-benefit approach and the politics of the hydraulic transfer in India, through a reassessment of the much celebrated Bhakra-Nangal Project. This project, made operational in 1963, comprises several dams, reservoirs, interbasin transfer linkages, powerhouses, and a massive canal network intended to harness the waters of the Sutlej and Beas Rivers (tributaries to the grand Indus River system).

For Dharmadhikary, the impacts of the Bhakra-Nangal Project cannot be evaluated by a standard cost-benefit examination. The project points to win-lose rather than, as widely claimed, win-win outcomes. For instance, from the very beginning, the water availability for the Bhakra-Nangal Project to irrigate 2.37 million hectares was made possible by cutting off a near equivalent amount of supplies for 2.21 million hectares in the Sutlej Valley Project lying in Pakistan.[18] Perennial canal irrigation, furthermore, was intended to initiate India's embrace of the Green Revolution agricultural strategy. The Green Revolution package was essentially aimed at providing a steroid effect in agriculture. Controlled and abundant irrigation became the means for stimulating a constellation of techniques and technologies that were intended to boost crop yields. This profoundly reworked ownership and land tenure patterns

(through consolidation), introduced new input packages (chemical fertilizers, high yielding varieties, and mechanization), and encouraged crop monocultures.

However, the gains from the increased yields, mostly in cereal production, have been clouded by environmental costs. Dharmadhikary notes that waterlogging, salinization, and the deleterious effects on the soil from intensive monocropping have plagued many parts of the canal irrigated tracts. Furthermore, the scissor effect of mounting input costs and the tapering off in yields has squeezed the profits of many farmers. Clearly, a simple cost-benefit approach is unable to capture long-term ecological and economic trends.

And as for the hydraulic transfer effected by the Bakra-Nangal dams, Dharmadhikary argues that the project actually ended up amplifying earlier British colonial land and water management initiatives in the region. Beginning in the nineteenth century, colonial policies led to the eradication of most cattle-rearing "wandering tribes"; the conversion of once forested tracts and grasslands into monocropped commercial wheat fields; the elimination of subsistence cultivator communities who depended on inundation irrigation; and the oppressive exploitation of settled agriculturalists through colonial revenue demands. That is, colonialism attempted to transform the once variegated social and ecological flood plains watered by the Indus system into an administratively simplified, settled agrarian tract.[19]

Historically, for the Indus region, it has been calculated that before the great siphoning projects, associated with perennial canal irrigation initiated in the latter half of the nineteenth century, up to 150 million acre-feet of fresh water probably flowed into the delta along with the deposition of close to 400 million tons of nutrient rich fertilizing silt. The Indus Delta was then a sprawling interstitial zone between land and sea and made up of mangroves, inlets, creeks, and an inestimable number of ecological relationships between flora and fauna.[20] But subsequent to the damming and diversion of the Indus and its tributaries for agriculture, power, and nation building, the amount of fresh water flowing into the Indus delta has been reduced to a lean 10 million acre-feet (less than 10 percent of historical flows).

The full effects of this massive siphoning off of fresh water from the delta has only now begun to be acknowledged. Besides debilitating livelihood possibilities for approximately 1.2 million people, who live in the delta and along the coasts, the fluvial impoverishment of the delta has resulted in tangible negative impacts on fish breeding, damage to

marine food webs, destruction of unique salt water ecological habitats, and an inestimable loss in biodiversity.[21]

Hydraulic transfers enabled by multipurpose reservoirs have, however, undergone a further twist in recent years in India. Increasingly, large dams or multipurpose river valley development projects are now redirecting river water for urban and industrial consumption. The brewing conflict over the apportionment of the waters of the *Narmada* River is one such clear instance. Originally intended to "benefit" 29 million people across 8,215 villages and 135 towns in the drought-prone areas of Saurashtra, Kutch, north Gujarat, and Panchmahal, the Gujarat Water Infrastructure Limited has piped the much-awaited flows, instead, to the city of Gandhinagar and oversupplied it to industries in Kutch.[22] In the state of Orissa (in eastern India), in November 2007, some 30,000 farmers gathered at the reservoir of the Hirakud Dam (Sambalpur district). Upon surrounding the reservoir they demanded that the government ensure that the waters be committed for irrigation rather than being directed toward industry. Despite the subsequent police action of arrests and beatings the farmers remained firm in their resolve. In fact, ten days after the protest, they reassembled to erect a sixteen-foot-long wall above an underground pipe that had been laid by Vedanta Aluminum to move water from the reservoir to its smelter. The wall has been named the Chasi Rekha (farmers' demarcator) and has become a major rallying symbol for the farmers to assert their claims over the reservoir.[23]

The level of strife and conflict caused by the hydraulic transfer has, in fact, reached alarming political proportions on the Indian subcontinent.[24] At the heart of this is the large dam, which is increasingly viewed as the most extreme physical manifestation of the pursuit of supply-side hydrology. In short, since 1947, governments in India, building on a destructive colonial legacy and twentieth-century modernist ideology, have aggressively sought to ascertain and meet water demands through either big-engineering projects or intensive extraction technologies rather than concentrating on localized conservation efforts or on strengthening indigenous water knowledge traditions. Supply-side hydrology has meant that initiatives to ameliorate perceived shortages have been met either by the construction of dams and diversions or by encouraging groundwater mining through electric and diesel pumps.[25] Thus, water management in India is now dominantly controlled by centralized water bureaucracies, contractors, private engineering firms, institutions of global financial capital (such as the

World Bank and Asian Development Bank), and powerful political lobbies. Put differently, these expert-led institutions and organizations, possessing immense financial and political powers, have systematically moved to either expropriate indigenous water techniques or caused the destruction of water management traditions.

Conclusion

The large dam in India is today less of a political conundrum. It is now widely accepted that it is part of a contested political, economic, and ecological terrain. As the above discussion indicates, large dams, though announced as neutral technological artifacts, have been deeply implicated in several processes integral to capitalist expansion, and in the manner in which it casts its imprint upon the natural world. Hence, dogging the very assembling and functioning of the multipurpose reservoir from the beginning have been the political effects of enclosure, hydraulic transfer, the expropriation and elimination of other water management skills and traditions, and inevitably the externalization of the costs onto the most marginal and impoverished communities.

The modern large dam must also be understood as crucial to sustaining supply-side hydrology. In recent years, however, the pursuit of supply-side hydrology, the world over, has begun to flounder especially over the question of its environmental impacts. The triptych of strategies involving groundwater mining, perennial canal irrigation, and large dams, in other words, have proved to be unsustainable as a water management model. There is a growing realization that civil-engineering and bureaucratic framings of river systems, as merely moving masses of water crying out to be regulated and dammed, is flawed.

In sharp contrast to such highly simplified views, ecologists have convincingly demonstrated that fluvial regimes are complex geomorphologic, chemical, and biological processes in motion. Rivers are made up of habitat mosaics that support a wide variety of aquatic and riparian species. And the beating heart that keeps alive the river's ecological health and viability is its *natural-flow regime*, which organizes and defines the river ecosystem itself. It is now understood that natural variable flows create and maintain particular dynamics between the channel, floodplain, wetland, and the estuary. While wetlands provide important nursery grounds for fish and export organic matter and organisms into the main channels, the scouring of floodplain soils by floods rejuvenates habitat for plant species within the basin. A large body of evidence now reveals that the natural-flow regime is inherently variable,

and that this is critical to ecosystem function and native biodiversity. Not surprisingly, therefore, by alienating the river from its natural-flow regime and pushing for extreme water extraction, supply-side hydrology has fatally collided with nature itself.

In India, despite the paucity of credible documentation, enough cause for alarm has already been sounded. In one recent study, for example, it has been determined that overexploitation of groundwater has led to the rapid depletion of water tables, saltwater encroachment, drying of aquifers, and groundwater pollution. It has been reported that in many parts of the country, water tables are declining at the rate of 1–2 meters a year.[26]

Conversely, in intensive canal irrigated tracts waterlogging problems have emerged. Water tables here are rising up to 1 meter a year, which leads to soil salinization. By the late 1980s, in fact, India's share of salinized soils was close to 7 million hectares, which added up to roughly 17 percent of the total land that was then under canal irrigation.[27] At the same time, the impacts of large dams in India has singularly suffered from the lack of any credible official examination. If anything, the purported successes or failures of the large dam in India continue to remain a state secret, despite several independent studies and reports indicating that all is not well in their functioning.[28]

More than ever, the large dam and supply-side hydrology in India urgently awaits a political resolution. On one side are the contractors, private engineering firms, and centralized water bureaucracies, who, in recent years, as a last gasp effort, have been advocating for the interlinking rivers project. This is essentially a business-as-usual model, in which thirty-seven rivers in India are sought to be connected through thirty diversions or links and thirty-six major dams.[29] On the other side of the fence are innumerable popular movements, potential victims of displacement, and a rising crescendo of voices that are now loudly arguing for the abandonment of the existing water paradigm.[30] Much depends on which way the tide turns in this round.

Notes

1. For the full quote see endnote 4 in Arundhati Roy, *The Cost of Living* (London: Flamingo [imprint HarperCollins], 1999), 104. Gigantism as the condition of the modern positivist technocratic mind is well summed up by Paul Virilio's stark quip that these "enthusiasts for Progress" are but a "dangerous gang of dwarves smitten with gigantism," who in entertaining a naïve conception of the world have the "satisfaction of a stubbornly repeated infantile refusal." Put differently, they are plagued by the refusal to grow up. See Paul Virilo, *Ground Zero* (London: Verso, 2002), 2.
2. K. L. Rao, *Cusecs Candidate* (New Delhi: Metropolitan, Kanpur Printing Press, 1978), 37.

3. Henry Hart, *New India's Rivers* (Bombay: Orient Longman, 1956), 256.
4. Rohan D'Souza, "Damming the Mahanadi River," *Indian Economic and Social History Review* 40, no. 1 (2003): 82–105.
5. On the global influence of the TVA and India in particular see Daniel Klingensmith, "*One Valley and a Thousand*" (New Delhi: Oxford University Press, 2007). Also see David A. Biggs, "Reclamation Nations," *Comparative Technology Transfer and Society* 4, no. 3 (2006): 225–46; Heather J. Hoag, "Transplanting the TVA? International Contributions to Postwar River Development in Tanzania," *Comparative Technology Transfer and Society* 4, no. 3 (2006): 247–68.
6. See James C. Scott, "High Modernist Social Engineering," in Lloyd I. Rudolph and John Kurt Jacobsen, *Experiencing the State* (New Delhi: Oxford University Press, 2006), 3–52.
7. For a comprehensive discussion of the various types of water harvesting structures termed "traditional" see Anil Agrawal and Sunita Narain (ed.), *Dying Wisdom* (New Delhi: Centre for Science and Environment, 1997).
8. Rohan D'Souza, "Water in British India," *History Compass* 4, no.4, (2006): 621–28.
9. See Rohan D'Souza, *Drowned and Dammed* (New Delhi: Oxford University Press, 2006).
10. Here a large dam is defined following the International Commission on Large Dams, as one with a height of more than fifteen meters from its deepest foundation; also see the report by the World Commission on Dams that was released on November 16, 2000, http://www.dams.org.
11. The literature on dam displacement in India is vast but an excellent introduction to the subject is Jean Dreze, Meera Samson, and Satyajit Singh (ed.), *The Dam and the Nation* (New Delhi: Oxford University Press, 1997).
12. *The Second Citizens' Report* (New Delhi: State of India's Environment, Centre for Science and Environment, 1996 [reprint, 1985]). According to a recent estimate, there are 4,528 large dams in India, which could have submerged at least 4.426 million hectares or 44,262 square kilometers. This is equal to 10 million acres. See the newsletter *Dams, Rivers & People* 5, no. 4–5 (May–June 2007), 8–9.
13. Uma Maheswari, "Preparing to Repeat a Dammed History," *India Together*, February 2–9, 2006, http://www.indiatogether.org/2006/sep/hrt-polavaram.htm.
14. Satyajit Singh, *Taming the Waters* (New Delhi: Oxford University Press, 1997), 67–76.
15. The agencies that carried out the cost-benefit analysis for the Sardar Sarovar Project were the Narmada Planning Group (1983), Tata Economic Consultancy Services (1983), the World Bank (1985), SSP Narmada Nigam Ltd. (1989), and the World Bank again (1990). See Ranjit Dwivedi, *Conflict and Collective Action* (London: Routledge, 2006), 102. On the agitation against the Sardar Sarovar Project see Sanjay Sangvai, *The River and Life: People's Struggle in the Narmada Valley* (Mumbai: Earthcare Books, 2000) and Amita Baviskar, *In the Belly of the River: Tribal Conflicts over Development in the Narmada Valley* (New Delhi: Oxford University Press, 1995).
16. Radha D'Souza, *Interstates Disputes over Krishna Waters* (Hyderbad: Orient Longman, 2006), 215–35, 433–62.
17. Shripad Dharmadhikary, *Unravelling Bhakra* (Badwani: Manthan, 2005).
18. Dharmadhikary, *Unravelling Bhakra*, 24, 29.
19. Dharmadhikary, *Unravelling Bhakra*, 151–206.
20. Dharmadhikary, *Unravelling Bhakra*, 198–99.
21. IUCN, "Indus Delta, Pakistan," *Case Studies in Wetland Valuation* no. 5 (May 2003). Also see Altaf A. Memon, "Devastation of the Indus River Delta," Proceedings, World Water & Environmental Resources Congress 2005, American Society of Civil Engineers,

Environmental and Water Resources Institute, Anchorage, Alaska, May 14–19, 2005, 1–14.

22. See D. P. Chattacharya, Ahmedabad, *The Indian Express*, April 1, 2007, http://cities.expressindia.com/fullstory.php?newsid+229515.
23. Richard Mahapatra and Ranjan K. Panda, "Ground Swell," *Down To Earth* (December 31, 2007) 22–30, http://www.downtoearth.org.in.
24. For an excellent review of water conflicts in contemporary India see the compilation by Biskam Gujja, K. J. Joy, Suhas Paranjape, Vinod Goud, and Shruti Vispute, "Water Conflicts in India," *Economic and Political Weekly* 41, no.7 (February, 2006): 570–612.
25. Rohan D'Souza, "Supply-Side Hydrology in India: The Last Gasp," *Economic and Political Weekly* 38, no. 36 (September 2003): 3785–90.
26. Dhirendra Kumar Singh and Anil Kumar Singh, "Groundwater Situation in India," *Water Resources Development* 18, no. 4 (2002): 563–80.
27. Sandra Postel, *Pillars of Sand?* (New York: W. W. Norton, 1999), 93.
28. A fairly substantial number of criticisms against large dams in India have emerged from the "non-expert." One of the first authoritative non-official overviews of the negative impacts by large dams in India was *The Second Citizens' Report*, cited above. See also Anil Agarwal, Sunita Narain, and Srabani Sen (ed.), *The Citizen's Fifth Report* (New Dellhi: Center for Sceince and Enviornment, 1999), http://www.cseindia.org/html/pub_soie.htm#sie2.htm 131–66. Two excellent recent collections on large dams in North East India are, "Large Dams Northeast India; Rivers, Forests, People and Power," *The Ecologist (Asia)* 11, no. 1 (January–March 2003), and Manju Menon and Kanchi Kohli (compilation), *Large Dams for Hydropower in Northeast India* (Pune and New Delhi: Kalpavriksh, South Asia Network on Dams, Rivers and People, 2005). For regular updates on resistance to large dams in India see the newsletter *Dams, Rivers & People* brought out by the South Asia Network on Dams, Rivers and People, http://www.sandrp.in.
29. For criticism of the inter-linking rivers project see Medha Patkar (ed.), *River Linking* (Mumbai: National Alliance of People's Movement, 2004) and Arun Kumar Singh, *Inter-Linking of Rivers in India* (New Delhi: The Other Media, 2003).
30. Some of the most significant critical and alternative ideas on the subject of water in India have been expressed in the writings of Medha Patkar, Himanshu Thakkar, Shripad Dharmadhikary, Dinesh Mishra, Jayanta Bandyopadhyay, and Ramaswamy R. Iyer.

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For those interested in looking at Bill Livant's work, three of his short articles ("I'll Make You an Offer You Can't Refuse," "The Dialectics of Walking on Two Legs," and "Livant's Cure for Baldness," previously published in *Science & Society*) appear in a new book edited by Bertell Ollman and Tony Smith, *Dialectics for the New Century* (Palgrave Macmillan, 2008). (Other contributors to the book, besides Bill and the book's editors, include: Richard Levins, John Bellamy Foster, Lucien Sève, David Harvey, Frederick Jameson, István Mészáros, Michael Löwy, Thomas T. Sekine, Christopher J. Arthur, Nancy Hartsock, Joel Kovel, and Ira Gollobin.)