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Damning Damming Modernity: The Destructive Role of Megadams

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Abstract

In Asia, the latter twentieth and early twenty-first centuries have witnessed an extraordinary expansion of mega-dam building. In many cases these dams cause more harm than good. These projects, which epitomize the instrumental mindset of modernity, need to be reconsidered, especially in light of climate change and their long term damage. Hoover dam in the U.S. constituted the first of these projects and its usefulness is coming to an end, suggesting that many dams in Asia may suffer a similar fate. Many of the megadam projects in Asia are being built on rivers fed by the Himalayan glacier system on the Tibetan plateau, yet climate change is altering the future availability of water due to glacial retreat, while changing rainfall patterns may cause flooding in one region and drought in another. Further, these dams have interrupted natural processes with resulting salinization of fields making them unproductive for agriculture. Many writers have spoken against these practices from Linda Hogan to Arundhati Roy to Ishimure Michiko. Their writings remind us that flowing water has an ecological integrity that dammed water has lost. Further, an ecological understanding warns us not to accept the discrete incident mentality that ignores the impact of climate change and treats every dam project as if it were unrelated to other projects and unrelated to long term environmental changes.

Keywords: modernity, dams, Asian dam projects, climate change, soil salinity

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For humanity water is required for everything from amniotic fluid to the hydration of the body, to the irrigation of crops, to the half a million gallons of water per minute that must flow to cool a nuclear power plant. Yet, of all of the water on the planet, only 2.5% of it is fresh water. Most of that is locked up in glaciers and the icecaps. Without desalination only 1% of the planet's water is available for human use. And that 1% is unevenly distributed around the planet, such that India has numerous major rivers, while Iran has none, and China has copious amounts of water in the Southwest but not in the Northwest or Northeast ("Human"). In responses to this extremely limited availability, with the rise of human civilizations came efforts to collect, trap, channel, and control the arrival of fresh water as rain and the flow of rivers. Throughout recorded history centralized governments have been tied to the control and distribution of water. Nowhere has that been truer than in Asia.

Human construction of dams dates back some 5,000 years for a large dam at Sadd-el-Kafara in Egypt and a dam for the town of Jara in Jordan, and earthen dams in Mesopotamia appeared at least 4,000 years ago (de Villiers 46; McCully 13; Yang, *et al.*). The existence of China has been bound up since its inception with water management in both the legendary and historical records ("Chinese Myths"). Despite this long history of human alterations of flowing water, dam building entered an entirely new phase in the nineteenth century and dramatically accelereated in the twentieth following the harnessing of water not only to provide reservoirs for water distribution or to generate power for mills *via* waterwheels but also for the generation of hydroelectric power (McCully 14). In 1900, for instance, Britain is estimated to have had nearly as many large dams as the rest of the world combined, including "almost 200 dams higher than 15 metres" (McCully 14). But at that time, no dam in the world exceeded 15 meters in height. In contrast, as De Villiers observes, "By 1950 there were 5,270, two of them in China. Thirty years later there were 36,562, of which no fewer than 18, 280 were in China" (121). And many more are to be found in the Indian subcontinent, with India, according to Arundhati Roy, having 3,600 that qualify as "Big Dams," with nearly 700 more under construction at the time of her writing in the first year of the new century (63).

In the United States, the construction of the Hoover Dam across the Colorado River near Las Vegas was hailed as an exemplum of industrial modernity. The first mega dam to be built in the world, it was constructed over a 5-year period at the height of the Great Depression and came to symbolize for industrialism humanity's power over nature through the use of technology, even being featured on the cover of *Life* magazine (Sigmund). The amount of concrete used equaled all of the concrete poured for dams in the United States up to that time

combined (McCully 16). Yet, even larger dams were under construction before it was even finished. Repeatedly the Hoover Dam is referred to as having "tamed" a mighty river, and was expected to last for centuries. In fact, at its dedication FDR claimed that the dam had made of the Colorado River "a great national possession" (French). Also, in 1941, the radical songwriter Woody Guthrie wrote and recorded "Roll On, Columbia," to celebrate the multiple damming of the Columbia River, another Depression era public works project. Yet today, Lake Mead, the giant reservoir behind Hoover Dam, is in serious trouble, and its ability to continue functioning as planned is increasingly in doubt (Hitzik; Plumer). Meanwhile, all around the Columbia River in the U.S. Pacific Northwest, dams are being removed to restore salmon runs as part of a larger scale ecological restoration and a growing movement is underway to remove those very dams on the Columbia that Guthrie idealized (O'Keefe). In the 1990s around the U.S. some 177 dams were removed and such decommissioning has picked up pace (McCully lxi).

In Asia, the latter twentieth and early twenty-first centuries have witnessed an extraordinary expansion of mega-dam building, changing the face of entire regions, inundating areas once heavily populated and permanently altering ecological systems (see Dharmadhikary; McCully; de Villiers; Nixon). Millions of people, particularly minority ethnic groups and poor rural peoples, have been dislocated due to dam construction. But what price is being paid for these dislocations through immediate and long-term ecological and social impacts for relatively short-term energy benefits?

As local resistance movements grow to mega-dam projects and awareness of their long-term alteration of the planet increases among the world's inhabitants, we have to analyze critically the role of dam building as part of modernity, as part of an instrumental reason that sees the world only in terms of raw materials, resources, and units of economically profitable energy, and as part of a contributing factor to the damage that anthropogenic climate change will inflict on specific populations. Literary and scientific texts can provide us with insights into the fundamental significance of flowing water for biotic diversity and health, and the ways in which the anthropogenic climate change induced by industrial modernity is altering the presence, availability, and impact of fresh water on human cultures and their environments.

Mega-dams do not merely hold back water and silt. They also displace and destroy ethnic cultures and communities who once lived in the valleys filled to create the reservoirs. Mega dams have two major purposes: one is flood control; the other is to produce electricity. But is restrained water necessarily superior and safer than flowing water? Is the strangled water that does flow to turn the turbines

and produce electricity serve the people from whom the land is taken for the building of dams? And is that water guaranteed to continue flowing in the ways that the planners, developers, and builders anticipate? No, no, and no.

In some parts of the world, conflicts are already focused around water rights and water access (Marat; Nixon 173-74; Richardson; "Water Wars"). The transition to a post-carbon world will only intensify the competition for available water resources ("Climate Change and the Global Water Crisis"; Lloyd's 360°; de Villiers). As I mentioned initially, millions of gallons of fresh water have to be available for each of the several hundred new nuclear power plants under construction worldwide to operate. Yet, shifting rainfall patterns due to climate change have already threatened the water levels necessary to maintain full plant operation in such areas as the American southeast and will threaten similar plants in parts of China, the Middle East, and Europe (Dell'Amore).

Hydroelectric power and flood control are both threatened by the effects of climate change for rivers dependent on glacial and snow melt because of accelerated melting, first speeding up the rates of flow and threatening to overwhelm dams and cause glacial lake outbreak floods (Dharmadhikary 32-38). After that rivers will decline as the primary sources of water recede and eventually disappear. As a result, water levels will fall too low for hydroelectric plants to function and for storage to be sufficient for irrigation release. Such is now the case with Hoover Dam and Lake Mead behind it (Monroe). Southwestern American drought has sunk that reservoir to new low levels. These levels threaten both the supply of fresh water to the cities of Las Vegas, Nevada, and Los Angeles, California, and the rate of flow necessary to maintain full turbine performance to produce electricity for these same cities (Plumer). Yet, as Patrick McCully observes, "Dam designers work on the assumption that historic hydrological variables such as average annual river flow, annual variability of flow, and seasonal distribution of flow are a reliable guide to the future. As global warming takes hold, however, there are likely to be significant changes in seasonal and annual rainfall patterns and other factors. . . . even small changes in climate can cause major changes in the size of floods" (145). McCully concludes that all of the data on which dam designers and power companies rely will "become increasingly unreliable" (145).

Centralized governments, multinational development agencies, and global construction consortiums have sold the idea that hydroelectricity can only be produced by massive projects that disrupt the ecology of entire regions. Yet, run-of-river hydro provides a clear alternative ("Run"). Both McCully and Marq de Villiers's books provide information about such alternatives, including smaller dams, in-stream turbines and the like. The history of nineteenth-century power

generation for mills provides another clear alternative. Of course, these smaller, less disruptive means of producing energy mainly benefit local communities. Megadam construction, in contrast, is based on the notion of taking the electricity and the water to urban, high consumption cities and large industrial projects, such as mining operations, at the expense of indigenous communities who historically migrated to the water. Such actions thus result in denying the water and the power to local peoples and forcing them to migrate again to the water, but now to urban areas where it and the power produced by it are salable commodities (see Nixon, "Unimagined Communities").

Those displaced and neighboring peoples whose ways of life are disrupted usually gain no benefits from this enormous destruction as the power generated is sold to multinational industries and exported to other countries for urban development and leads to little local employment (Dharmadikhary 31). For example, the Myitsone Dam now under construction in Myanmar by a Chinese corporation will be the first dam across the Iriwaddy River. Ninety percent of the electricity will be exported to China and thousands of Kachin people will be displaced ("Controversy"). Laos and Cambodia are in a similar position of building dams to export electricity (Grumbine 114). Often, for smaller nations it is a matter of needing an export commodity to provide foreign revenue for participation in the global economy and to meet the energy demands of larger neighbors, who might represent a threat to national sovereignty. Such is the case, for instance, with Nepal, Bhutan, and Laos.

I single out these three countries precisely to emphasize that mega dam construction is not just a phenomenon occurring in the larger nation states, such as India and China, which tend to receive the most attention, but also in many other smaller countries, such as the Sarawak area of Malaysia and Tajikistan (Soong; Galperin; Fradchuk). And often the pattern that is explored so extensively in Linda Hogan's novel *Solar Storms* is played out time and time again: native peoples are displaced, vast regions are ecologically destroyed to create an export commodity, the profits from which remain in the urban centers in the hands of elites. James Tarter has thoroughly discussed the effects and resistance of First Nations people to the James Bay HydroQueber Project depicted in this novel (137-42). And, unlike the situation in Canada, the real-world setting for Solar Storms, many states find such projects increasing rather than decreasing their national debt due to heavy loan repayment burdens (McCully 134-41); and actually intensifying malnutrition for complex reasons tied to ecosystem destruction and the global trade in food as a commodity. In fact, de Villiers concludes that "diversified agriculture has been found to produce more per hectare than irrigated agriculture" (125).

Resettlement projects, on the one hand, never live up to their promises. McCully's summary of the World Bank's pathetic defense of their own failures brings home this point: "The World Bank consistently claims in its on defence that while its resettlement record is poor, that of the projects in which it is not involved is even worse" (85; see also 66-68, 82-84; Nixon, ch.5). The corruption associated with resettlement from the Three Gorges dam led to significant unrest, especially as the number of people to be resettled kept being increased during construction (McCully lviii). And, on the other hand, what will happen to the remaining tribal peoples and rural poor who live downstream from aging megadams when they collapse? Will they suffer the same fate as the 230,000 Chinese who drowned in Henan in 1975 after dam collapse (McCully 115-17)?

Particularly because of the harm to local peoples, novelist Arundhati Roy has become an activist in the defense of the Narmada River (Shahin). And numerous other writers whose works have not yet been translated or brought to international critical attention are addressing this subject. Roy is the most internationally famous of these writers. She penned "The Greater Common Good" in April of 1999. It was published as the cover essay of the Indian journal Frontline in May of that year and has been reproduced and circulated widely *via* the internet. It is most easily accessed at the *Friends of River Narmada* website, the cause for which she wrote it. In it she reviews the history of dam building in post-independence India, noting that over time Nehru had come to regret his own speech, "Dams are the Temples of Modern India," yet India remains tacking to the course that he set. As Roy notes, "Big dams started well, but have ended badly," and they "haven't really lived up to their role as the monuments of Modern Civilisation." She focuses her critique first on the displacement of tribal peoples, which is estimated to have reached some 50 million, and that figure is from a decade ago, while dam building has proceeded throughout India since 1999. Then she turns to the fact that increased crop yields from irrigation have produced food for export while impoverished Indians continue to starve (Roy, "Greater Common Good").

Roy turns to the Narmada River as a case study of the more general problems with Indian dam construction. The overall Narmada Valley Development Project involves a comprehensive plan to erect 3,200 dams along the Narmada and its 41 tributaries, utterly changing the ecology of an entire watershed impacting the lives of the 25 million people who live there. Further, she argues that the short term benefits of irrigation from this project will be outweighed by the long term destruction of the fertility of the soil. Due to intense irrigation without investment in drainage, which the World Bank considers too costly to be implemented, this region will rapidly suffer from "salinity and water-logging." A

huge debt, she concludes, will be incurred by the nation to benefit the few at the expense of the many ("Greater Common Good").

She has continued her activism on behalf of the Narmada watershed and two years after her agitational essay, she published *Power Politics*. This book consists of three essays with the title essay most relevant to a discussion of the drawbacks of megadam and multiple dam projects. As with her earlier essay, she again focuses on the Narmada River, specifically the Sardar Sarovar Dam project (19). Her outrage here mainly focuses on the displacement of small villagers in the hundreds of thousands and she notes of these that "[a]lmost half of them are Dalit and Adivasi, the poorest of the poor" (20). Further, she debunks the official and widespread argument that megadam produced irrigation is vital to the overworked term "food security" by referencing the report of the World Commission on Dams, whose authors included key Indian government officials, which concluded that "the contribution of large dams to India's food grain production is less than ten percent" (66). For the world, the figure is less than a 16 percent contribution to food production (McCully xxx), and that is only a short-term boost. The byproducts of seasonal-flood-stopping dam-based irrigation render ever increasing hectares of land agriculturally unproductive due to salination (de Villiers 140-41).

For India, as for many other Asian countries, Tibet is literally the Water Tower of Asia (Grumbine 141). A majority of the major rivers that are the lifelines of Pakistan, India, Myanmar, Thailand, Laos, Cambodia, Vietnam, China, and the Central Asian States flow out of Asia's highest mountains. They are primarily glacier and secondarily snowmelt fed. Glacier recession and precipitation patterns are both highly sensitive to global warming, such that temperatures at the high elevations have been rising much more rapidly than lowland temperatures (daCosta). The intensification of dam building on all of these major waterways is not solving problems so much as intensifying existing ones and creating new conflicts.

The upriver central Asian countries harbor and release water based on the patterns that suit the generation of electricity for winter heating, which is the opposite of the catch and release pattern that the downstream countries need for agricultural production (Marat). Pakistan feels threatened by Indian dam building in Kashmir (Ahmad; Haseeb; Walton), while Laos, Cambodia, and Vietnam have expressed concern over Chinese dam building on the upper reaches of the river they call the Mekong (Fawthrop; Richardson). India is also worried about China's Tibetan mega dam projects (Ramachandran). Flowing water, like other ecological systems, cannot be the property of an individual nation state, and the downstream countries will eventually be forced to respond economically or

militarily to the cutting off of their basis for life if upstream countries divert too much water from any major river. And even when equitably distributed, flowing water cannot be regulated in an ecologically sustainable way without long-term attention to climate change.

Mega dam building is a continuation of modernity into the twenty-first century precisely because it represents the fundamental imposition of an enlightenment-based instrumental reason extended to multinational and global scales of destruction. Throughout the European Renaissance sharp debates arose about the morality of environmental destruction, particularly in regard to mining, as documented by Carolyn Merchant (29-41), but by the end of that period the organic framework had given way to a mechanistic one. While the Romantic reaction against the Enlightenment rejected the triumph of instrumental reason and raised questions, such as in German literature and art, about the moral effects of the despoliation of nature, not only in terms of the extraction of ores but also all of the collateral damage resulting from it as well (Ziolkowski, ch. 2), the philosophical idealism of the Romantics weakened their critique and did not provide a persuasive counterargument capable of rerouting public opinion and popular culture. Nineteenth-century materialist philosophy, which should have incorporated a systemic analysis into its dialectics in terms of recognition of nonantagonistic and irresolvable differences and distinctions, instead adopted a theory of the productive forces in the twentieth century, which was denounced by various so-called "anti-revisionist" organizations. Marxist philosophy, including these allegedly more revolutionary forms, however, failed to rethink the possibility that "man versus nature" is not a fundamental contradiction as Mao Zedong argued, but a noncontradictory, dialogical part-to-whole relationship (Mao). And the disastrous ecological consequences of some of Mao Zedong's conquering nature campaigns have been well documented in such works as Elizabeth Economy's *The River Runs Black: The Environmental Challenge to China's Future* and R. Edward Grumbine's *Where the Dragon Meets the Angry River*.

But perhaps more significant than fields of structured philosophical thought is mega dam building as a reflection of an anti-historical human exceptionalist practice of a mindset that I have labeled as DIM: Discrete Incident Mentality. Americans, and many others, suffer from this particular malady. With DIM, people treat every recurring event as a unique occurrence without precedence or prediction. As a result, people rebuild the same kind of home in the same place with the expectation that they won't get hit again by a flood, a dam break, a tornado, or a thunderstorm, relying on the myth about the singularity of lightning strikes as a general rule of non-recurrence. DIM is a device used repeatedly by climate change denialists to argue that every piece of evidence for anthropo-

genic global warming is anomalous, unconnected to anything else, or a fluke. DIM is employed to deny the cumulative effects of personal, cultural, and national behavior, a denial of history and ecology.

In the case of dams, it is particularly striking in that it ignores that every dam, no matter the design, has a limited life span, which has two different dimensions, such that a dam can cease to fulfill its function in one of two ways: failure or sedimentation. There is not a single dam in the world that can outlive the limitations of concrete inelasticity, while many of them are also at risk of geological instability, which is further affected by the weight of the enormous volumes of water built up behind them (de Villiers 127). As Jacques Leslie notes, "Around the world, five thousand large dams are at least fifty years old. . . . And the whiff of mortality has reached the dam industry, driving some multinationals out of the business" (346). There are nearly 80,000 dams of varying sizes in the United States and 85% of them are fifty years old or older. One-third of these are estimated to be at high risk of failure and little is being done to decommission them safely, except in those areas where their existence has been made an issue by environmental organizations (Cornish; Madrigal).

How prepared are other countries for the eventual failure of the global wave of mega dams built in the 1960s through 1990s with most just a decade or two from the beginning of their lapsing into the range of old age? The Aswan High Dam, for instance, which supplies Egypt with nearly half of its electricity, is already fifty years old. With its heavy international debt burden, can Egypt afford to rebuild or replace that dam? A 2007 study also suggested that mega dam building is a significant contributor to Pakistan's rising international debt level ("Rising"), while numerous other articles indicate a similar problem for many so-called developing countries.

Sedimentation is the other major factor in the useful life limit of dams (Dharmadhikary 9; McCully 108-10). Pakistan's most important dam, The Tarbela, was anticipated to silt up within fifty years of its initial construction in the early 1970s, given that the Indus River carries 430 million tons of suspended sediment per year. While some claim it may last an additional thirty years, others doubt that assessment. Each year the sediment builds up reducing the dam's effectiveness further. And the question of whether or not it has become fundamentally ineffective or actually harmful has been raised by the disastrous flooding of 2010 (Gall; Mackey). Meanwhile Nepal's Kulekhani dam had accumulated so much sediment in the first two decades of operation that its reserve lost nearly 25% of its storage capacity (Sangroula).

But, from an ecological standpoint, the issue of sedimentation is more important for what it does to downriver ecology than its eventual incapacitation of

the dams. On the one hand, that sediment is the new topsoil for the fertile delta regions, but, on the other hand, the sediment that flows in the rivers originating on the Tibetan plateau carries with it high levels of mineral salts, which are toxic to crops (de Villiers 142-43). As a result, for the sediment to increase fertility rather than decrease it, seasonal flooding is needed to wash the salt off the surface and out to sea. The dams prevent this natural process of fertilization and purgation. In central Asia that has produced a devastating destruction of the croplands devoted to cotton production, a very thirsty plant, and distorted Pakistani agriculture and aquaculture (Pearce 30). As Carlotta Gall has reported, "The damage done to the Indus delta by nearly 100 years of extensive irrigation upstream—perhaps the largest in the world—is well documented. It has made Pakistan a food and cotton exporter. . . . But so much water is used up that the Indus . . . runs virtually dry before reaching the delta. . . . The lack of river water has allowed sea water to inundate some two million acres of the delta." The same problem has plagued Bangladesh due to Indian dam building (Pearce 223). Sea level rise will only exacerbate the destruction of delta and estuary ecologies already underway by dam building (Gillis; Dasgupta).

Modernity was predicated upon an illusion of limitlessness, of a never ending supply of raw materials and an infinite production of energy. These illusions are crashing on the rocks of resource shortages and the destructive effects, particularly anthropogenic climate change, of energy generation. Mega dams epitomize the worst excesses of illusory modernity, while flowing water epitomizes the reality of ecological systems, which will not be denied their finality in charting the course of human potential. To follow the modernity of the mega dam is to produce an edifice of inevitable failure; to learn the way of water is to prepare for a future of changing channels.

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詛咒的築壩現代化：超級水壩的毀滅性角色

摘　要

在亞洲，二十世紀末及二十一世紀初見證了高度擴張的超級水壩建築。在許多案例裡這些水壩弊多於利。這些計畫是現代化工具主義心態的縮影，我們必須重加思考，尤其是從氣候變化及計畫的長期損害的觀點。美國的胡佛水壩是這些計畫中的第一樁，其效用正瀕臨終結，暗示著亞洲的許多水壩也可能遭受同樣命運。亞洲許多超級大壩建築所在的河流是由西藏高原的喜馬拉雅冰川系統供水，但是氣候變化造成冰川後退，改變未來水的可利用性，而改變中的降雨模式可能在一區造成洪水氾濫，卻在另一區造成乾旱。尤有甚者，這些水壩會因造成田地鹽化而阻斷大自然的程序，使田地不適於農業耕作。由琳達・荷根 (Linda Hogan) 到阿倫答提・羅伊 (Arundhati Roy) 到石牟禮道子 (Ishimure Michiko)，許多作家都起而反對這些做法。他們的書寫提醒我們壩中之水失掉了流動之水生態上的完整無損。生態的認知也警告我們不要接受個別事件的心態，而忽略了氣候變化的衝擊，將每一件水壩計畫認爲無關乎其他計畫，也無關乎長期的環境變化。

關鍵字：現代化，水壩，亞洲水壩計畫，氣候變化，土壤鹽化