Creating the Nation's first BioPark

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Letter From the Desk of David Challinor
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When man-made constructions change the ecology of a region, there are often unforeseen consequences which have to be dealt with later. This letter will address the unexpected and often deleterious effects of the building of giant dams, both in the United States and abroad.

Just before and after World War II, the United States embarked on several major dam projects. In the northwest, the flow of the Columbia River and its tributaries was dammed for the generation of hydroelectric power and the storage of irrigation water. In the arid southwest the Colorado River and its tributaries were dammed so that virtually no fresh water flowed from its mouth into the Gulf of Lower California. In fact the water that reached the U.S.-Mexican boundary was and is so full of dissolved salts from irrigation water draining from fields back into the river that the U.S. has had to build huge desalinization plants to freshen the water sufficiently for Mexican farmers to use it for irrigation, as required under our treaty obligation with Mexico.

Such a loss of fresh water by overextended irrigation is an example of the unexpected delayed cost of dam construction. The Colorado River problem has been replicated many times, particularly as dam-dependent irrigation projects become older. The idea of using dams to store water and generate electricity makes economic sense. Although expensive to build, dam construction furnishes many jobs and requires unbelievable amounts of cement. The benefits from power generation and subsidized irrigation water, especially in the southwest and in California's central valley, are promptly realized, and until 40 years ago the environmental costs were unknown and not even considered by the engineers and economic planners.

By the 1970's, however, unexpected costs began to be noticed and finally became a factor in calculating the feasibility of constructing a large dam. In the late 1960's, for example, the U.S. Bureau of Reclamation and the Corps of Engineers occupied a three-story office building in downtown Bangkok. The hundreds of people there were working on the design and construction of the Pa Mong dam to harness the Mekong, the largest river in southeast Asia. The dam was to be built in northern Thailand, where the Mekong forms the boundary between Thailand and Laos. The site chosen was 35 km upstream from Vientiane, the Laotian capital, where the river had cut through a mountain chain.

In 1968 I was active in the Southeast Asia Development Advisory Group (SEADAG). This organization, composed primarily of academics, was concerned with the approaches to development being taken by U.S. agencies in this part of the world. My colleagues and I were particularly worried about the serious environmental consequences, both above and below the dam, that could arise were it ever built. The result of our attention was a modest contract with USAID in which I, as principle investigator, and three other SEADAG scientists received funding to examine potential environmental consequences of the proposed dam.

We went to Thailand in 1969 and 1970 to see the area that would be flooded and to determine what crops were being grown there and how many people would have to be relocated. Our report was eventually published as "Some Environmental Considerations for the Mekong Basin Project" in 1973. Among the obvious benefits to the U.S. would be the use of large numbers of U.S.-made earth moving equipment, and the employment of hundreds of U.S. advisors to plan the construction. Local economic benefit would be the generation of relatively cheap electricity for Vientiane, the nearest city, and the storage of water for irrigation downstream during the dry season; all worthy goals. The environmental and social costs we calculated, however, were just as great or greater than the project's benefits, but harder to quantify.

Among the costs would be the flooding of the most fertile cotton growing area of Thailand and the displacement of 100,000 families. The planners scheduled their resettlement to the northeast part of Thailand where there was still (in 1969) some undeveloped land. When I later visited the proposed resettlement district, it was clear that the reason it was still undeveloped was because the soil, a tight, light grey clay was too poor to grow much except native trees. Even the teak plantations, that elsewhere in Thailand grow vigorously, were in this area stunted and unproductive.

Below the dam in Cambodia we predicted there would be a profound effect on fishing in the Tonle Sap, the country's largest lake. Tonle Sap is connected to the Mekong by a tributary of 100 km. During flood season the tributary flows northwest from the main channel and fills the almost empty lake. The fish that have survived the dry season then follow the rising water and grow and multiply rapidly as they eat earthworms and other organisms that had heretofore been unavailable on land. During the dry season the lake drains back into the Mekong and farmers plant crops in the wet soil as the shoreline recedes. This annual flooding has sustained a large human population for millennia, but controlling the river flow with a dam would eliminate the natural flooding cycle and thus alter traditional fishing and farming practices. Other related costs were highlighted in the report, such as the spread of schistosomiasis, a tropical disease second only to

malaria in the number of people globally infected. The disease's alternate host is a snail which spreads widely when water is available through year-round irrigation, a planned result of the dam.

The Pa Mong dam has yet to be built, not so much because of the environmental questions raised in our report, but rather because of the lack of confidence by the big international lending agencies in the political stability of the area. Local boosters attempted to revive the project in 1977 and again in 1991. Although demand for electric power has undoubtedly increased since the late 1960's when planning for the dam first began, the cost of resettling an even greater number of people would now probably more than offset the benefits. Resettlement costs are not only financial, but social and political as well, and are thus almost impossible to calculate.

Doubt has spread about the value of building new dams. The World Bank recently withdrew funding for the giant Sardar Sarovar project which proposed to dam India's Nermada River. The impounded water would have flooded 37,000 ha (about 145 square miles) and displaced about 100,000 people. Construction, nearly half finished, has almost stopped as the Indian government considers whether it can afford to complete the dam without outside financing.

Two other current large dam projects are also in trouble. One is the recently completed British-financed Victoria dam in Sri Lanka. There the rainfall in the dam cachement basin turned out to be lower than predicted, and when the water level eventually rose enough to produce electricity, the dam began to leak badly. A second British-financed dam project, begun in Malaya in 1991, has been plagued with problems. At that site rock conditions turned out to be much poorer than expected and the dam required costly modifications.

The era of big dam construction may have ended. As the world's population has increased, too many people are dependent on farm production from fertile river valleys. When these valleys are flooded, the fish crop gained seldom offsets the value of the lost terrestrial production. The seeming benefits from cheap hydroelectric power are often overshadowed by the loss of productive farmland and the high cost of resettlement.

With the end of the petroleum age as we have known it likely to come in the next century, we can expect rapid development of alternative energy sources such as wind, solar, fusion, etc. Ideally, we will have learned to estimate some of the hidden costs in our exploitation of new energy sources, but based on past human experience, such calculations are unlikely.

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