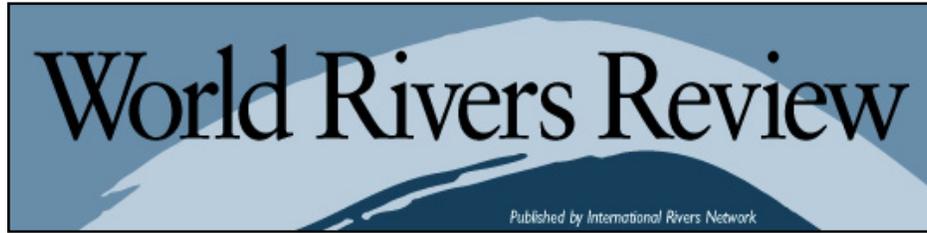


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International Rivers Network

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Focus on Africa

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Tropical Reservoirs Boost Global Warming

The reservoirs behind hydroelectric dams in tropical forest regions can contribute far more to global warming than fossil fuel-burning power plants, recent scientific research has revealed. The findings refute dam industry claims that hydropower does not emit greenhouse gases.

The research, by Dr. Philip Fearnside of the Brazilian National Institute for Research in Amazonia, shows that in 1990, reservoirs in Brazil's Amazonia emitted about 0.26 million tons of methane and 37 million tons of carbon dioxide - the two most important nonsynthetic greenhouse gases.

The worst offender was the Balbina dam. Emissions of carbon dioxide and methane from its reservoir had 26 times more impact on global warming than the emissions from a coal-fired power station generating the same amount of electricity. Greenhouse gases from dams come primarily from rotting vegetation in the reservoir, although the still water of reservoirs also give off methane. Although gas releases from Balbina will slowly decline over the years as the flooded trees decay, Fearnside calculates that they will always be higher than those from equivalent fossil fuel generation.

The Balbina dam, which began operation in 1989, flooded 3,100 square kilometers of uncleared rainforest. Millions of tons of rotting vegetation have turned the reservoir into a polluted, putrid pool that for years has been unfit for drinking and harmful to life. The regional power company that built the dam, Eletronorte, ignored the recommendation of scientists, environmentalists and even Brazilian law to clear the vegetation before flooding the reservoir.

Greenhouse emissions from the reservoir behind the Tucuruí Dam, also in the Brazilian Amazon, had only 60 percent as much impact on global warming in 1990 as an equivalent coal-fired plant - but 50 percent more impact than a gas-fired power station. The 4,000 megawatt Tucuruí Dam is the world's tenth most powerful hydrodam. It has less impact on global warming than Balbina as it floods far less land per unit of electricity generated.

Fearnside notes that while only four large reservoirs have so far been created in Brazilian Amazonia, another 75 are planned. These would increase the area of reservoirs in the region 20-fold and make a significant contribution to worldwide greenhouse gas emissions.

Fearnside's paper, published in the spring issue of the academic journal *Environmental Conservation*, joins similar research published in 1993 showing that reservoirs in northern Canada emit substantial amounts of carbon dioxide and methane.

Scientists are now increasingly concluding that greenhouse gas emissions are connected to rising world temperatures. At press time, the Intergovernmental Panel on Climate Change, a leading scientific authority on global warming, had just released a draft report concluding that temperature increases of 0.3-0.6 degrees Celsius in the past century are "unlikely to be entirely due to natural causes."

This marks the panel's first official acknowledgment of the effect of human activities on the world's climatic changes.

--Patrick McCully & Lori Pottinger

The paper referred to in this article, "Hydroelectric Dams in the Brazilian Amazon as Sources of 'Greenhouse' Gases," appears in *Environmental Conservation*, Vol. 22, No. 1, Spring 1995.

From "Clean"House to Greenhouse

"Hydropower plants produce no carbon dioxide . . . no air emissions at all." *US Department of Energy promotional brochure prepared with the technical assistance of the National Hydropower Association and others, 1994.*

". . . hydro does not burn, emit, dump or leave behind pollutants of any kind . . ." *Linda Church Ciocci, Executive Director, US National Hydropower Association, in letter to The Journal of Commerce, March 15, 1995.*

"Enviros . . . seem uninterested in the upside of [third world hydropower] projects - mainly huge amounts of zero-emission . . . energy . . ." *Gregg Easterbrook, New York Times Magazine, September 11, 1994*

Commentary: Draining Laos' Future

According to international aid agencies, the economic future of the tiny Southeast Asian country of Laos lies in damming its rivers and selling the electricity to neighboring Thailand. Consultants from dam building corporations have been paid by the aid agencies to assess the feasibility of building the dams and, no surprise, have concluded that the dams are economically and technically viable. The Lao government believes the aid bureaucrats and the consultants and is eager to start pouring concrete and see the dollars from Thai power users flow.

Boosters of hydropower in Laos claim the country will become "the Kuwait of Indochina"- a small nation made rich by its energy exports. Kuwait, however, does not sell hydropower, but hydrocarbons - a very different product. Extracting oil does not depend on the vagaries of rainfall, its production costs are well known, and it can be sold on the world market to the highest bidder. A more valid comparison for Laos would be Paraguay, the world's largest exporter of hydroelectricity. Like Laos, Paraguay is a small land-locked nation with large and powerful neighbors. And like Laos, Paraguay has huge hydro resources but little demand for electricity.

Paraguay set out on the hydro-export road in the early 1970s when together with its huge neighbor Brazil it began to build Itaipú, the world's most powerful hydrodam. Itaipú was originally predicted to take 14 years to build at a cost of US\$2 billion dollars. In reality, it took 16 years and cost \$20 billion. Although Laos has no plans to build a single dam on the scale of Itaipú, it is considering 60 different hydropower projects which would together cost more than \$16 billion, according to very preliminary

official estimates. The GNP of Laos, by comparison, is currently around \$1 billion.

Nam Theun 2 is the most advanced of the larger dams planned for Laos. The World Bank currently projects the dam would cost \$1.2 billion. One wonders if the World Bank has informed the Lao government that a Bank study - buried in the reams of reports it produces each year - shows large dams on average cost 30 percent more than projected.

Paraguay gets half the electricity from Itaipú, and then sells almost all of its share to Brazil. Unfortunately for Paraguay, mighty Brazil is a monopoly buyer of Itaipú's electricity, and pays Paraguay only a fraction of the world market price. Brazilian electricity users are also several billions of dollars behind in their payments.

Thailand, the economic powerhouse of Indochina, will be a monopoly buyer of Laotian electricity. The two countries have agreed upon a price for power from Nam Theun 2, but Thailand already wants the cost lowered. Further clouding the prospects for Lao power sales is the recent announcement by the Thai electricity utility that it has over-estimated its demand forecasts for the year 2000 by 8,000 megawatts.

Even if Thailand does need all the power Laos wants to sell, there is some question as to how much power the dam will actually produce. Itaipú was predicted to generate up to 80,000 gigawatt-hours per year of electricity. After several years of operation with all turbines installed it has still not generated more than 69,000 GWh per year. Consultants on Nam Theun 2 say the dam would generate an annual average of 4,864 GWh, but such a level of output would require the dam operating with an almost record-breaking efficiency. A more realistic - but still high - efficiency level would reduce the projected output from Nam Theun 2 by a quarter.

To be a high-performing dam, Nam Theun 2 will need a reliable supply of water for its turbines. But hydrologic data on the Theun River is sparse. It is unlikely that the consultants have briefed the Lao authorities on the inherent uncertainties of hydrological forecasting, their lack of reliable streamflow data, or the hydrological wild card of changing rainfall patterns due to global warming.

The billions of dollars which flowed into Paraguay to pay for Itaipú sparked off an orgy of corruption, benefiting an élite of soldier-politicians and entrepreneurs. It stoked an inflationary economic boom which turned to recessionary bust once the bulk of dam construction was done, greatly widening the already yawning gap between rich and poor. Many of those enriched by the dam put their money into land, dispossessing small farmers and converting huge swathes of rainforest into fast-eroding soybean prairies.

The dam building consultants are taking the Laotians for a ride. Damming its rivers will not turn Laos into a nation of wealthy hydro sheikhs, but instead lead it down the road of indebtedness, environmental destruction, and increased social tensions.

--Patrick McCully

World Bank Takes U-Turn on Supporting Critical Nature Area

The Nakai Plateau in Laos, one of the world's richest remaining wildlife habitats, was to be the centerpiece of a conservation project coordinated by the the Global Environment Facility (GEF), the "green fund" managed by the World Bank. No longer. The area has quietly been dropped from the GEF project - and the Bank is now considering funding a dam which would flood more than a quarter of the plateau.

The 681-megawatt Nam Theun 2 Dam would inundate 350 square kilometers and directly displace more than 4,300 people. The Nam Theun River below the dam would be almost totally deprived of water for eight months of the year, while flooding would be worsened on another river into which most of the Nam Theun flow will be diverted. All the electricity generated by the dam is intended to be exported to Thailand, where public opposition has made it extremely difficult to build new dams.

The Nakai Plateau is a rich and irreplaceable mosaic of wetlands, savannah grasslands, and tropical pine and deciduous forests. The Nam Theun 2 reservoir would inundate and fragment valuable habitat for several designated "globally threatened species," including the Clouded Leopard, Asian Golden Cat, Asiatic Black Bear, Sun Bear, and White-winged Duck, of which only a few hundred individual birds survive. Other species affected include the Elephant, Tiger, three types of otters, various primates, the Lesser Fish Eagle, Blyth's Kingfisher, and the Large-antlered Muntjac or Barking Deer. The Large-antlered Muntjac was only discovered by scientists in 1993, indicating that there may be many smaller undiscovered species which could be affected by the dam.

In 1993, following a recommendation from the International Union for the Conservation of Nature, the Lao government declared the plateau - excluding the dam submergence zone - a National Biodiversity Conservation Area. The World Bank is helping Laos' newly established network of Conservation Areas with a US\$14 million aid package coordinated by the GEF. Despite being regarded by many as the most valuable wildlife conservation area in Laos, the Nakai Plateau was recently dropped from the GEF project. An article in the Bangkok daily *The Nation* remarked that "undoubtedly it is no coincidence that the Bank's pullout came at a time when [it was] reviewing the draft of the hastily conducted environmental assessment of the Nam Theun 2 project." The Bank presumably considered it too embarrassing to be giving money both to conserve and destroy the Nakai Plateau.

The cost of Nam Theun 2 is currently put at \$1.2 billion, three times the size of the Laotian government's annual budget and more than twice the price estimated in the 1991 feasibility study sponsored by the World Bank and UN Development Programme. Both the main division of the World Bank (the International Bank for Reconstruction and Development) and its private sector arm (the International Finance Corporation) are presently considering subsidizing the project with loans and commercial guarantees. Three leading commercial banks - Barclays (UK), Société Générale (France) and Deutsche Bank (Germany) - are lined up to lend to the project consortium, but only if the World Bank guarantees their investments.

The commercial banks have good reason to be cautious: large dams are notoriously risky investments, usually involving substantial time- and cost-overruns and often producing far less than their projected

power output. Nam Theun 2 project documents assume it will generate power at an efficiency level (or "plant factor") of 81 percent, far higher than the level actually achieved by most dams.

Another major risk facing private investors is whether sufficient water will be available to turn the dam's turbines. The draft Environmental Assessment for Nam Theun 2 notes that the hydrological figures on which the project's generating capacity is calculated are "based on limited data, both in terms of quantity and quality." Several decades of streamflow data are normally desirable when designing a large dam - yet only seven years of rainfall statistics are available for most of the Nam Theun 2 catchment.

--Patrick McCully

What Can You Do?

Write the following people to express concern that the Nakai Plateau has been dropped from the GEF conservation project, and may instead be partly destroyed by a World Bank subsidized dam.

Rebecca B. Hall
East Asia and Pacific Region

World Bank
1818 H. Street, NW
Washington, DC 20433
FAX: (202) 477-6391

David Martinusen
Asia Department
International Finance Corporation
1850 I Street, NW
Washington, DC 20433
FAX: (202) 676-0820

Mohamed T. El-Ashry
Chief Executive Officer
Global Environment Facility
1818 H. Street, NW
Washington, DC 20433
FAX: (202) 522-3240

Decade of River Development Leads to Health Disaster in Senegal

Dams and irrigation schemes in the Senegal River Basin have precipitated a health crisis among riverine people, according to *The Senegal River Basin Health Master Plan Study*. The report, prepared by the Water and Sanitation Health Project (WASH) with the support of the U.S. Agency for International

Development (USAID), reveals that increases in numerous deadly diseases and malnutrition can be directly linked to water development projects in the region.

In the early 1970s, the governments of Mali, Mauritania and Senegal formed an international authority (known as OMVS) to develop the water resources of the Senegal River. The subsequent change in the river's ecology brought on by river-development projects has led to an epidemic of bilharzia (or schistosomiasis), a large increase in the number of malaria cases, outbreaks of rift valley fever, and other health problems.

Bilharzia results from infection by the parasite *Schistosoma*. Different species of the parasite can cause either intestinal or urinary problems. Before 1989, intestinal bilharzia was unknown in the Senegal River Basin and in all of Mauritania. WASH reports that "the regulation of the river and expansion of irrigation has spread bilharzia throughout the river basin."

After the completion of the Diama Dam in the Senegal estuary in 1986, intestinal bilharzia reached Richard-Toll - the site of intensive sugar cane irrigation - for the first time, and by 1993 nearly 100 percent of the residents of nearby Ndombo Village were found to be infected. Cases were reported for the first time on the Mauritanian side of the river. The report concludes that the "Diama and Manantali dams have transformed the Senegal River Basin into an ecosystem that is exacerbating the proliferation of urinary and intestinal bilharzia." Untreated intestinal bilharzia infections can lead to irreversible organ damage and death. Because of the severity of the outbreak of this deadly disease, the WASH report recommends a high-priority emergency program to treat infected people.

Malaria cases are harder to track because research and confirmed data aren't available from the health services in the region. However, the report states that the Diama and Manantali dams have likely had "an effect on the ecology of the malaria mosquito and therefore also on the period and intensity of malaria transmission." The large irrigation schemes made possible by the dams create more breeding sites for malaria mosquitoes and extend their breeding season. Such projects also increase relative humidity, which lengthens the adult mosquitos' life-span. *Malaria tropica*, which constitutes virtually all reported infections in the region, can cause recurring sickness and, in severe cases, death.

Rift valley fever, which is transmitted to humans and animals by insects, is also believed to be linked to the filling of reservoirs. The first epidemic in West Africa was in 1987 in Rosso, Mauritania, near the site of the newly filled reservoir behind the Diama Dam. The epidemic caused nearly 300 deaths.

WASH also reports on the "paradox of malnutrition" in the basin. Severe malnutrition has persisted among farming families participating in irrigated agriculture despite planners' assertions that increased yields would alleviate existing malnutrition. Prior to the control of the river, farming families based their nutritional intake on the fruits of flood-recession crops - a diverse diet that included sorghum, corn, and niebébeans. Now that dams allow for irrigated agriculture, many farmers have switched to irrigated rice production and are now in debt due to "limited profitability, poor yields and problems with marketing the rice," the report notes. The change in diet, which is now based almost completely on rice, has exacerbated malnutrition in the area.

Several other health-related issues were reported by WASH. A lack of fresh water supply and adequate sanitation facilities has caused increased risk of cholera and other diarrheal diseases in areas of increased industrial agriculture activities. Agricultural chemicals dumped in the river have also contaminated public water supplies.

The WASH report criticizes the lack of communication between water planners and health workers, stating that "disease problems were predictable and planners should have designed the projects to avoid them." The authors note that similar health crises occurred in the wake of earlier dam projects in Africa, listing the Aswan dams in Egypt, the Sennar and Roseires dams in Sudan, and the Akosombo and Kpong dams in Ghana.

The report concludes that "if current development policies continue unchanged, the deterioration of health among populations in the river basin will seriously reduce the expected benefits of OMVS programs."

--Aleta Brown

"The Senegal River Basin Health Master Plan Study" is available from the Environmental Health Project, 1611 N. Kent St., Suite 300, Arlington, VA 22209 USA phone (703) 247-8730

Shutting the Gates on Lesotho: Dam Moves Forward, Problems Remain

The sluice gates of the Katse Dam were closed on October 20 in a televised ceremony that marked the official beginning of water transfers from the tiny land-locked nation of Lesotho to South Africa. The closing of the gates came only two weeks after Moea Ramokoatsi, a representative of the Lesotho-based Highlands Church Action Group (HCAG), met with World Bank officials in Washington, D.C. to request that the gates remain open until the project's critical unresolved problems are addressed.

The US\$8 billion Lesotho Highlands Water Project will divert water from the Orange River to the industrial Transvaal region in South Africa through a series of dams, tunnels, and pumping stations. With the closing of the sluice gates, water is expected to reach South Africa within two years. Now only half complete, Katse Dam will be Africa's largest dam when finished.

Accompanied by staff from International Rivers Network, Environmental Defense Fund and the Mennonite Central Committee, Ramokoatsi met with officials from the World Bank, the U.S. Treasury Department and other agencies involved in the project to register a list of complaints from people living near the dam site. The World Bank is currently disbursing a loan of US\$110 million for Phase 1A. Ramokoatsi requested that plans for the second phase (1B) of the project not move forward until critical issues stemming from the nearly complete first phase (1A) - affecting 20,000 people - are resolved.

Bank officials said they recognize the need for Phase 1A to be "cleaned up," and that the Bank has no intention of moving forward with Phase 1B until existing problems are resolved. Despite this verbal assurance, however, Bank consultants are already doing preliminary work on Phase 1B. Advance

infrastructure is already being put into place in Lesotho.

Problems stemming from the first phase include deteriorating health conditions and inadequate compensation for project-affected people. Health problems include increases in typhoid, AIDS (resulting from prostitution), malnutrition and alcoholism. Food compensation for lost land - once-yearly shipments of cornmeal - is grossly inadequate. Plans to protect the livelihoods of those evicted by the project have not been implemented. Furthermore, Phase 1A's environmental impact assessment, including critical erosion and sedimentation studies that could call into question the project's viability, has not been completed.

Despite these glaring problems, South African Water Affairs Minister Kader Asmal declared at the impoundment ceremony that the resettlement process for Phase 1A had been given "a clean bill of health." He stated that the scheme would help provide potable water to "newly enfranchised citizens" and would "support industrial development crucial to job creation." Asmal also attacked the non-governmental organizations (NGOs) opposing the project, calling them "green terrorists" and saying that they had accentuated negative aspects of the project while disregarding the positive elements.

Ramokoatsi, who lives very near the dam site and has collected a long list of grievances from local people, has a different perspective on the project's effect on the Basotho people. "People have been told by project officials that their livelihoods would be re-established. [There were] promises to train people how to maintain their lives. But to the surprise of the people, nothing has been done," he said. "People do not believe anything good will come from this project; they see it as a monster which will swallow them up. Not a single person can be found who is happy with what they got from the project. This is the relationship of the people to the project."

--Christa Coleman

Letter From Lesotho: A View From the Katse Dam

The lunch line stretched 150 feet outside the Katse Dam construction workers' cafeteria one cold day in July. The men in line had spent the morning pouring concrete into the nearby dam wall, which is planned to reach 185 meters. One of the young Basotho workers invited me to join him inside for lunch. The unsanitary conditions of the cafeteria were staggering. The men were being fed like cattle. Each received a plastic tray with a few scraps of lamb and a *bolus* of cornmeal - no drinks, no eating utensils, just slop.

Less than a mile away is the opulent Katse Lounge, resting stop of helicopter-borne project authorities and diplomats. The Lounge and its surrounding suburban community were built for resident engineers obviously at a high cost. Although water is a scarce and highly valued commodity in the region, the Lounge's entryway features an ornate fountain, and the entire complex has its own modern water infrastructure.

The water comes from a creek which had previously supplied drinking water to the nearby village of Ha Mensle. Project engineers diverted the stream into a tank and encircled it with barbed wire. Complaints from Ha Mensle finally forced them to attach a nozzle for villagers to collect buckets of water from the

tank.

A substantial portion of Ha Mensle's meager water supply now goes to livestock tied up next to houses in the village. In addition to losing free access to water, villagers have also lost the use of the majority of local grazing lands, which now lie within the boundaries of the watershed and have been deemed off limits by project authorities.

Back in the cafeteria, I asked my host if I could return with him to his worksite at the dam. While he went in search of a hard-hat for me, I reflected on my visit to Lesotho. All that I had seen and heard in the past few weeks reinforced what I had gleaned from World Bank documents critical of the project, as well as reports from independent consultants and letters from the Lesotho-based Highlands Church Action Group. It seemed that the environmental degradation, short-term economic planning, and blatant disregard for civil rights that has plagued the project for ten years show no signs of abating.

--*Elliot Mainzer*

What Is IRN Doing?

IRN is working with a network of organizations in Southern Africa, Europe and North America to apply pressure on funding agencies to address unresolved problems caused by the Lesotho Highlands Water Project. IRN is also preparing a campaign packet with updated materials on the project.

Drought Dims Ghana's Hydroelectric Power

Ghana, like many other African countries, draws its power from a huge, internationally financed hydroelectric scheme whose construction displaced thousands of people. But now the "miracle" dam is failing to deliver the power the country needs. Yao Graham reports.

For the second time in ten years, drought forced Ghana last year to reduce the generation of hydroelectricity, provoking a national debate about power supply.

The 1994 cutback followed two years of abnormally low rainfall in the catchment area of the Volta Lake on which the Akosombo and Kpong dams are situated. It resulted in power rationing and a reduction in supplies to neighboring Togo and Benin for three months.

The Akosombo and Kpong generating stations, commissioned in 1965 and 1982 respectively, provide the overwhelming bulk of Ghana's electricity. The two stations account for 1,072 megawatts (MW) out of a total national power-generating capacity of 1,160 MW, with Akosombo alone providing 833 MW.

Until recently, most of that minority of Ghanaians who use electricity tended to see the Volta

hydroelectric dams as sources of uninterrupted power. The unprecedented drought of 1982-83, which compelled the rationing of electricity until 1986, shattered that illusion. And if that drought's power cuts jolted the nation's complacency about hydroelectricity, the 1994 incident concentrated minds forcefully on the impermanence of power from Akosombo and Kpong and the need for alternative sources.

According to the Volta River Authority (VRA), the statutory power generating body, the "cumulative inflow" into Volta Lake by the middle of August 1994 was "the worst . . . in the 50-year record of Volta river flows - worse than the same period in 1983." At its lowest, in early August, the level of Volta Lake was 239.48 feet. This was well below the 248 feet the VRA claims is the minimum level for generating power without risk of damaging the turbines.

Some critics have blamed the power cuts on the VRA's poor management of the reservoir, accusing it of indulging in guesswork rather than science in its predictions about water levels and of wasteful spillage of water. Water in the lake builds up between July and November and the level at the end of the inflow period determines how much power can be generated the following year. The VRA periodically spills water, primarily to control the level of the lake. Critics point out that as recently as 1992 the lake attained its highest level (275 feet, three feet below the maximum operating level) since the 1982 drought.

In addition, the VRA's predictions about the maximum lake level for the current period has proved to be way off the mark. In June last year it predicted satisfactory rainfall. By early September it was warning that by the beginning of November the lake level would be just about 242 feet. Two weeks after the announcement, the lake had topped this level, thanks to heavy rains in Northern Ghana. By late November the level was over 256 feet.

This was not the first time the VRA's predictions had been wrong. However, the incident reflects the unpredictability of natural flood and drought cycles rather than mismanagement. Behind the charge of "mismanagement" lurks the widespread perception of the Volta River Project as "one of the engineering feats of the world" which has tamed the Volta River forever to produce electricity for the "common good."

The charge of wasteful spillage, for example, reflects ignorance of or indifference to the potential ameliorative effects that such spillage can have on riverine communities downstream. The damming of the Volta has had a devastating ecological and socio-economic effect on the communities below the dams. It is widely acknowledged that the resettlement of 80,000 people in the 740 communities displaced by the lake was poorly conceived and executed. Many people quickly abandoned the resettlement villages and returned to the area.

Destruction of Livelihood

Before the construction of the Akosombo Dam the cycle of farming was structured around the rise and fall of the river. Fertile flood plains provided a significant part of agricultural output, cattle grazed on these plains, people fished in the river and collected clams from its bed.

No more. The damming has put an end to a cycle which deposited silt on the flood plains, resulting in a drastic curtailment of agricultural output and herding. Communities have appealed unsuccessfully to VRA to time its spillage to coincide with the traditional flooding season to facilitate economic activity. Creeks have dried up, and salinization due to the penetration of sea water has destroyed the clam beds and lowered the quality of the drinking water.

As a result of slower flow and elimination of annual floods to flush the river, the incidence of stomach and intestinal diseases have increased. The stagnant waters of the reservoir also dramatically increased breeding conditions for vectors of three waterborne diseases: schistosomiasis (transmitted by snails) and malaria (by mosquitoes). Before the filling of the reservoir, schistosomiasis afflicted 1-5% of the population. By 1979 it had become the most prevalent disease in the area, and average infection rates in lakeside villages grew to 75%.

The destruction of livelihoods has resulted in increased male emigration and a rise in the number of female-headed single-parent households, increasing women's traditional workload. Some of the displaced returnees have been accused of undermining the efficiency of power generation by "illegal farming" along the reservoir's shore, which can contribute to siltation. Government officials have called for the prevention of illegal settlements and the control of "farming and other human activities" along the lake.

The Volta Lake - which inundated 4% of Ghana's land area and resulted in one of the largest man-made lakes in the world (3,275 square miles) - swallowed some of Ghana's best agricultural lands. Yet among the world's biggest dams, Akosombo yields one of the poorest ratios of area of land inundated to installed capacity of electricity. In a recent survey of the top 40 big dams in the Third World, Akosombo - producing 0.9 kw per hectare of land - ranked 37th.

Growing Demand

Beyond periodic drought and diminishing efficiency due to siltation, Ghana's domestic demand for power is growing at a pace which makes additional generating capacity urgent unless there is a dramatic change in power allocation from the two stations. Demand has been growing at 10% per year and, as of 1992, only a third of Ghanaians had access to electricity. In 1987 the government announced a 30-year plan for the electrification of the whole country.

US-owned Valco Aluminum, operating a smelting plant in the industrial city of Tema, is the single biggest consumer of Ghana's hydroelectricity. In 1993 it took 45% of output. Another 48% went into domestic consumption with the remaining 7% exported to Togo, Benin and Côte d'Ivoire. Sales to Valco and the neighboring countries earned Ghana \$118 million in 1990, making electricity the fourth biggest source of export revenue. A significant part of this income, however, goes to service the loans contracted for the building of the dams. As of 1990 the electricity sector accounted for more than 10% of Ghana's external debts.

A reduction in power exports is unlikely and the discussions about new energy sources have been marked by strong conservatism. The country's thermal energy output is, however, being increased with

immediate effect. The first phase of a \$400 million 350-MW thermal station is due to be completed in 1997. A 130-MW thermal plant, to be powered by natural gas from the Tano gas fields offshore in southwestern Ghana, is also planned. There has also been talk about exploiting some of the country's untapped hydro potential. At least 17 sites with a potential total generating capacity of 1,200 MW have been identified.

But all the reports of discussions about new hydro-dams suggest they have been marked by a singular lack of concern for environmental implications and the impact on riverine communities. This point is particularly important in light of a recent admission by the World Bank that the resettlement of people affected by the construction of the Kpong Dam repeated a number of the Akosombo project's mistakes.

The concern to expand power generation has been matched by an extremely casual official policy toward promoting conservation and efficiency in electricity use. There is no comprehensive and sustained policy to raise awareness about conservation as the cheapest way to increase the amount of available energy. At the height of last year's power cuts the VRA and the Ministry of Information carried out a flaccid two-week "Save the Akosombo Dam" campaign. Its most consistent feature was daily publication of the current lake level in the state-owned newspapers - read by only a tiny percentage of Ghana's 16 million people.

The absence of public discussion on environmental costs and conservation reflects the weakness of Ghana's small but growing environmental movement. For the minority of Ghanaians who enjoy electricity, its increasing cost is likely to stir a greater interest in resource-conscious energy policy. At the beginning of last year's power cuts, a 300% increase in electricity tariffs was announced. But despite concerns this aroused, in Ghana as elsewhere the accidental determination of the market is no substitute for conscious mobilization toward sustainable development.

Yao Graham is managing editor of African Agenda. This article first appeared in African Agenda, Vol. 1, No. 1, and is reprinted with permission. For more information, write African Agenda at P.O. Box 94154, Yeoville 2198, Johannesburg, South Africa; Tel: (+011) 487-1596/7, Fax: (+011) 648-0907; e-mail: afagend@iaccess.za

DAM DATA: AKOSOMBO

River System:The Volta River Basin is fed by the Black and White Volta rivers, the Oti and the Afram.

Rated Capacity: 912 MW

Constructed By: Impreglio (Italy)

Dam Size:134 meters high, 671 meters long

Area Flooded:Approximately 8,500 square kilometers

People Relocated:80,000, from 740 villages

How Aluminum Ruined a River

The Akosombo Dam is a world leader in terms of the harm caused by a large dam. It is also one of the

most clear-cut cases of the aluminum industry driving the damming of a river.

The Ghanaian state gained little economically from the project, which was spearheaded by foreign interests. Rather than bolster the nation's economy by levying electric tariffs that would turn a profit or by reaping significant tax revenues from Volta Aluminum Co., Ltd. (Valco), the government gave Valco extremely cheap electric rates and numerous tax breaks. In 1983, Valco's electricity rates were a fraction of those charged to other customers by VRA (6-18% of VRA's other industrial rates).

Valco is 100% owned by multinational foreign interests: 78% by the giant Maxxam Group, 10% by Reynolds and 12% by private interests.

Aluminum's Power Needs

The electricity required to produce aluminum from bauxite ore is prodigious: a six-pack of (empty) aluminum cans consumes as much electricity as it takes to run a 21-inch color TV for more than 11 hours. The hydroelectricity used each year to produce aluminum is nearly equal to all electricity consumed by Australia, or enough for 35 million US residents. Electricity is the second largest cost component of aluminum production, typically accounting for 20-30% of total cost. Because energy costs play such a central role in production, aluminum companies have aggressively sought the most "inexpensive" sources of electricity. Since hydro is often regarded as the cheapest way of generating electricity (primarily because most of its indirect costs are not taken into account), aluminum smelters have frequently been established in conjunction with new dams.

The relationship is symbiotic: utilities in sparsely populated areas need energy-intensive customers to provide blocks of steady, longterm demand to generate the revenues needed to amortize a large dam. The Valco project is the perfect example of this symbiotic relationship: at full capacity, the smelter uses 40% of the dam's electric output.

Source: IRN's Working Paper #2, "The Relationship Between Primary Aluminum Production and the Damming of the World's Rivers," Aug. 1993, by Jennifer Gitlitz. The report is available for \$20 from IRN.

India's Dams Fail Environmental Appraisal

Nearly 90 percent of medium and large dams being built in India are in violation of environmental and social stipulations required of such projects by the Ministry of Environment and Forests (MEF), according to an MEF environmental appraisal committee. The findings reveal that the ministry is unable or unwilling to follow through on its own environmental policy and regulations.

The River Valley Projects Environmental Appraisal Committee (EAC) evaluated all projects with budgets greater than 500 million rupees (US\$15 million). What the committee found was a long list of transgressions affecting nearly every irrigation, hydropower or multipurpose water project approved in the past 15 years.

MEF approval for larger projects is contingent upon adherence to a variety of conditions, including compensatory afforestation (when forests are submerged), resettlement and rehabilitation of affected people, soil erosion controls intended to reduce the rate of reservoir sedimentation, mitigation of waterlogging and salinization of irrigated land, and actions to save or compensate for the loss of wildlife.

Regional offices of the MEF monitor each project, and regularly report back to the main office regarding fulfillment of conditions. If stated conditions are not fulfilled by project authorities, conditional clearance can be invalidated and any further construction disallowed. If the violations are deemed serious enough, the MEF has the powers to stop construction, and even to prosecute project officials.

The EAC took on the special nationwide investigation because of the poor compliance record of dams such as [Sardar Sarovar](#) (on the Narmada River) and Tehri (on the Bhagirathi). Of the 319 projects cleared by the MEF since 1980, 212 were completed or ongoing as of 1995. According to regional office reports, 90% of these projects had not complied with stated environmental conditions. In some cases violations were minor, but in many they were extremely serious.

The conditions most often violated included compensatory afforestation, catchment treatment and rehabilitation of displaced people. As a result, forests are being submerged, wildlife destroyed, and people displaced without compensation. In addition, there are negative implications for the projects themselves: reservoirs are prematurely filling with sediment and irrigated soils are becoming waterlogged.

Among those projects which the EAC has recommended immediate action (including a halt to construction) are Chamera (Himachal Pradesh), Sipu (Gujarat), Koyna (Maharashtra), Man, Jobat, and Hasdeo Bango (Madhya Pradesh), North Koel (Bihar), Upper Indravati (Orissa), Singur and Telegu Ganga (Andhra Pradesh), and Sharawati Tail-race (Karnataka).

Beyond warning some project authorities, the MEF has taken no action to challenge projects that have failed to meet its own conditions.

According to the EAC, there are serious deficiencies in the entire process of evaluating, screening, and clearing projects. The MEF's impact assessment unit is hopelessly ill-equipped to handle the task, the EAC says. The EAC has suggested a drastic overhaul of this procedure, including strengthening of the MEF's regional monitoring centers and assessment division. These recommendations have met with agreement within the MEF bureaucracy, but overhauling the structure is expected to be time-consuming, and the ministry has yet to take the first steps.

Stringent action against erring project authorities, including stoppage of construction and prosecution of officials, could be the first crucial step. EAC members have told the ministry that it is not willing to consider any new projects for clearance until defaulting state governments act to bring existing projects into environmental compliance. Several of the defaulting projects are funded by international agencies, including the World Bank.

Mr. Kamal Nath, then Minister of Environment, was apprised of the situation in late May, and a detailed

discussion was held with the Secretary of the MEF in July. The meetings led to the establishment of a separate monitoring cell within the MEF. But at press time, MEF appeared reluctant to take any drastic action against state governments. A number of NGOs are now gearing up to take the matter to other forums, including the courts, if the ministry continues to procrastinate. --*Ashish Kothari*

Ashish Kothari is with the environmental action group Kalpavriksh, and is a member of the Environmental Appraisal Committee on River Valley Projects of the MEF.

US Confirms Opposition to China's Three Gorges Dam

The US Export-Import Bank may not provide financial assistance to US companies for contracts associated with the Three Gorges Dam, thanks to a recommendation from the US National Security Council and pressure from the Clinton administration.

"We think it would be unwise for the US Government to align itself with a project that raises environmental and human rights concerns on the scale of the Three Gorges," states a September 22 memo from the White House to the Ex-Im Bank. Other reasons listed include the project's financial viability and the threat of legal problems if environmental and human rights groups decided to sue over US assistance for the dam.

The startling scale of Three Gorges' social and environmental consequences makes it one of the world's most controversial dams. If completed, it would stretch nearly a mile across and tower 575 feet above the world's third longest river. Flooding its 350-mile-long reservoir would force the displacement of 1.2 million people. Construction began in 1994 and is expected to take 20 years. The most recent official estimates put the final cost at US\$26.5 billion - a daunting amount of money to raise for such a contentious project. Early this year the Chinese government announced that it would delay selling bonds on the international market, largely because of growing concerns from the investment community over the viability of the project.

This marks the third major setback for the project in recent years: two years ago the US Bureau of Reclamation canceled its contract with the Chinese government to provide technical assistance on the dam's design, and the World Bank continues to maintain that it will not support the project.

Massive Relocation Plans

In other Three Gorges news, *World Rivers Review* received the following first-hand report from Simon Winchester, who recently returned from the region near the dam:

"China is apparently becoming increasingly anxious about its so far less-than-successful attempts to rehouse some of the 1.2 million people who will be displaced by the flooding of the reservoir above the Three Gorges dam. Last June Jiang Zemin, China's President, made an unprecedented and unpublicized visit to the city of Jiujiang, some 600 miles downstream from the dam. According to a *People's*

Daily reporter who now owns a hotel in that city, President Jiang's mission was to persuade the Jiujiang mayor to accommodate at least 250,000 of the people who will be displaced. The reporter said that the mayor, under the kind of intense persuasion that only a Chinese president can bring to bear, offered the use of a stretch of river front to the east of the city, though he demanded central government financial assistance for house construction.

"The news that so many people from Szechuan and western Hubei provinces may now have no choice but to move to the alien surroundings of Jianxi province is as nothing, however, compared to published reports that others will be forcibly removed to the high plateau of Xinjiang, a thousand miles to the northwest, and persuaded to farm cotton. Already there have been indications that the people due to be moved are becoming restless. That so many will have to move so far from their homelands is bound to increase tensions even more."

Winchester's upcoming book on the Yangtze, tentatively titled *The River at the Center of the World*, is scheduled for publication next fall by Holt (New York), and Viking-Penguin (London).

Insurance Canceled for US Mining Operation; OPIC Cites Damage to Rivers As Prime Reason

The Overseas Private Investment Corporation (OPIC) has canceled \$100 million in "political risk" insurance for a huge US-operated gold and copper mining operation in Indonesia. The federal insurance agency canceled Freeport McMoran Copper and Gold, Inc.'s insurance for its Grasberg Mine on November 2, citing the mine's environmental impacts on local rivers as a primary reason for the cancellation.

The Grasberg Mine is the world's largest gold reserve. Freeport has been operating in Irian since 1967, and has been receiving OPIC insurance for five years. The federal insurance is intended to encourage US investment in developing countries, by covering companies against the risk of losing assets to terrorism, nationalization or war.

Freeport had recently increased its ore production in Irian to nearly double that stated on its insurance policy, which greatly increased mine waste disposal problems. The production increase has resulted in the "massive deposition of tailings in the Ajkwa river and the sheet flow tailings that has degraded a large area of lowland rainforest between the Ajkwa and Minajeri rivers," states a letter from OPIC attorney Robert C. Sullivan.

Freeport has been under increasing criticism from Indonesian and international nongovernmental organizations (NGOs) both for its environmental record and for its close relationship to the Indonesian military, which is responsible for a series of human rights violations in and near Freeport's concession area around the mine.

WALHI, an environmental NGO based in Jakarta, recently sued the Indonesian Department of Mines and Energy over the department's approval of Freeport's environmental management and tailings (mine

waste) plan. WALHI maintains that Freeport's management plan does not offer alternatives to dumping tailings into the local river systems, and fails to adequately address other key environmental issues such as extensive destruction of forests.

This marks the second time in recent weeks in which the US government signaled its opposition to subsidizing corporations involved in controversial development projects overseas (see "[US Confirms Opposition to China's Three Gorges Dam](#)").

What Is IRN Doing?

IRN has been following Freeport's activities in Irian Jaya for the past year. IRN is calling on Freeport to do the following:

- Allow independent environmental monitoring of its operations;
- Drastically reduce the Indonesian military presence in and around its operation in Irian Jaya, and
- Set up an independent mechanism to allow local Irianese people to air their grievances against the company.

A Kinder, Gentler Hidrovia?

On November 1, Carlos Eduardo D'Almeida stepped down as Principal Technical Advisor for the studies of the proposed South American shipping channel known as the Hidrovia. D'Almeida's São Paulo-based engineering firm Internave created the original design for the Hidrovia - a design that would straighten, blast and excavate the Paraguay and Paraná Rivers.

Some observers feel that D'Almeida's abrupt exit from the project signals an attempt by the governments promoting the Hidrovia to distance themselves from the Internave plan's reliance on engineering works that would have a heavy environmental impact.

The Hidrovia is an ambitious scheme to convert 3,400 kilometers of the Paraguay and Paraná River system into a shipping canal stretching from Cáceres, Brazil to the Atlantic Ocean. The resulting change in the river system's water regime is expected to have major environmental impacts on Brazil's Pantanal, the world's largest intact wetland (see story below). Other problems from the massive project include the possibility of increased downstream flooding and the project's impacts on indigenous peoples and riverbank dwellers.

Government officials continue to try to sell the project around the world. In September, Brazilian Marcelo Jardim, acting president of the Inter-governmental Committee on the Hidrovia (CIH), told an audience of environmentalists in Washington, D.C., "We are not dredging in sensitive areas, not straightening bends nor blowing up rocks. We'll leave the Pantanal practically untouched." Jardim's term as CIH president ends in December; expected to replace him is Jorge Sanguinetti of Uruguay, a

spokesman for port and shipping interests who has been heralding the Hidrovia as the backbone of South American integration for more than a decade.

Groups from the region affected by the project remain skeptical of claims that the project has dramatically changed. Maurício Galinkin of Brasília's CEBRAC Foundation cautioned that D'Almeida's departure "does not signal any alteration in the basic concept of the project." Alcides Faria, Secretary of the Rios Vivos Coalition, added, "We have no assurance that the Pantanal will not be subjected to enormous risks. Extensive dredging may still be carried out, as well as other still-to-be-determined engineering works which can be extremely damaging. Our doubts have not been calmed - we'll continue to remain alert."

The form which the Hidrovia project will eventually take is still on the drawing board. Louis Berger International, the Washington, D.C. engineering firm which has responsibility for defining the Hidrovia's engineering works, says that a preliminary list of short-term, lesser-impact navigation improvements required downstream from the Pantanal will be presented to the governments "possibly in November." Representatives from the firm say they have received no information that their design should exclude engineering works in the Pantanal.

The governments of the region have called a December meeting to implement a plan for public participation on the Hidrovia. Taking part will be officials of the UN Development Programme and the Inter-American Development Bank, and NGOs from the region. The Rios Vivos Coalition Paraguay-Paraná-La Plata, which brings together 150 organizations from the region as well as support groups from the US and Europe, has emphasized the urgent need to make all project information public, and to convene a process of consultation which will give affected populations a voice in the Hidrovia discussions.

--*Glenn Switkes*

New Publications Keep Mekong in the Spotlight

Powerful forces are gearing up to develop the rich resources of the Mekong River - especially its massive hydroelectric potential. This "river rush," which on paper already includes plans for 60 dams, could move from paper to the rivers themselves now that the region is no longer a theater of war.

The world's eleventh longest river is also receiving increasing attention from groups that advocate a "big picture" approach to managing the river's resources. Two new publications help put Mekong development plans in perspective.

"Lessons Unlearned: Damming the Mekong River," a new report by Steve Rothert and published by International Rivers Network, details for the first time the cumulative consequences of all dam projects being proposed by the Mekong River Commission and other official bodies.

"The 50 million residents and countless river biota of the basin depend on the Mekong's annual flood-

drought cycle and all the natural functions driven by this process,"the report states. "Planned water resource developments threaten the integrity of this system on a grand scale: the hydrologic cycle could be permanently altered; thousands of square kilometers of critical wetland and agricultural area could be inundated; the river's exceptionally important fishery could suffer great damage; habitat of endangered wildlife species could be destroyed; the region's farmland could be deprived of fertile silt; and nearly 100,000 people could be forced to relocate."

Another new resource that will provide a regional perspective on Mekong Basin issues is a magazine entitled *Watershed: People's Forum on Ecology*. The magazine, which covers other Southeast Asian watershed areas besides the Mekong, is produced by Towards Ecological Recovery and Regional Alliance (TERRA) in Bangkok. The first issue (June 1995) includes an article on watershed development that outlines a community-based approach rather than a resource-based one, a two-author debate on the need for dams, a profile of the Asian Development Bank and its role in the region's rapid development, and a background story on the Mekong River Commission - the driving force behind the move to dam the Mekong.

"The movement of money, people, natural resources and environmental degradation across borders is accelerating with the demands of the global market economy,"the editors write in the first issue. "In this region, where the pace of environmental destruction and investment in development is staggering, development as currently defined by government-industry alliances should be questioned."

--Lori Pottinger

Watershed is available from TERRA, 409 Soi Rohitsuk, Pracharatbampen Road, Huay-Khwang, Bangkok 10310, Thailand; phone: (+662) 691-0718-20; e-mail: terraper@ksc.net.th

Lessons Unlearned: Damming the Mekong River is available for \$15 from IRN

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