

Icelandic Dam, Smelter Draw Interest of Alcoa

Alcoa Inc., the world's leading aluminum producer, is in talks with the Icelandic government on building a 320,000-ton smelter in East Iceland, the nation's Industry Minister said in April. The smelter would be powered by a dam that would destroy rare habitat and waterfalls in Eastern Iceland.

Alcoa came onto the scene when the Icelandic government began looking for new investors to help build the smelter when original partner Norsk Hydro, a Norwegian industrial conglomerate, postponed a decision whether to participate in the project.

The project's 190-meter-high dam would be one of Europe's largest, and would flood 4,000 hectares of lush highland vegetation. This is a significant proportion of the remaining highland vegetation of Iceland. It would block two of the three main rivers from the north of the Vatnajökull Glacier, Europe's largest glacier. The project would be a joint venture between an aluminum company and the Icelandic national utility, which would build the dam. The smelter and 580 MW dam are expected to cost between US\$2-3 billion.

Iceland's National Power Company, Landsvirkjun, provides 90% of the country's electricity and is looking for new ways of expanding its business. While the dam will not be built without a buyer for its power, it is expected that the aluminum smelter would buy the dam's entire output.

Threatened Wilderness

The area north of the Vatnajökull Glacier represents Europe's largest remaining wilderness area. Three glacial rivers surge over waterfalls and into narrow canyons, reindeer graze at the foot of Mount Snaefell and thousands of pink-footed geese settle to molt in mud-lined hollows. More than 80 waterfalls, including some of the most beautiful in the country, would be drowned by the dam. Environmentalists are also concerned that the reservoir will cause desertification in the sensitive highland vegetation.

On its web site, Alcoa calls the dam a "sustainable development project" that will bring jobs to communities suffering cutbacks in the fishing industry. But Icelandic environmentalists say the huge, energy-intensive smelter and dam will cause serious harm to

WHAT YOU CAN DO

The Iceland Nature Conservation Association is urging people to write letters to all parties involved in this project. See <http://www.inca.is/>

Alcoa also has a "feedback" area on their web site: <http://www.alcoa.com/site/community/ehs/iceland.asp>

both Iceland's fragile glacial highlands, and the areas where the alumina is mined. "This will be the one of the biggest environmental disasters in recent decades, something that generations to come will damn us for," said Arni Finnsson of the Iceland Nature Conservation Association.

Alcoa has agreed to conduct a feasibility study, and is expected make a decision on whether to join the project by mid-July. ■

For more information on dams and the aluminum industry, see the October 2001 issue of WRR, available for downloading from www.irn.org/pubs/wrr.

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Fighting India's Maan Dam with Fasts and Facts

by Malavika Vartak

As the monsoon draws closer, thousands of peasants and tribal people of the Narmada Valley in India are engaged in an increasingly intense struggle to save their lands and homes from the submergence by large dams.

One such bitterly fought struggle is against the Maan Dam, which is under construction on the Maan River (a tributary of the Narmada River). It is one of the 30 large dams planned on the Narmada. During this monsoon, which is about to begin, the dam will submerge 17 villages in the state of Madhya Pradesh and displace over 5,000 tribal people.

Beginning in mid-May, more than 150 people from villages affected by the dam have been engaged in a non-violent protest in Bhopal, against the unjust submergence. Activists Chitaroopa Palit, Vinod Patwa, Mangat Verma and Ram Kunwar went on a hunger strike for a month.

The protestors are demanding implementation of the state's rehabilitation policy, which entitles each dam-affected person to alternative land for the land they would lose to submergence. The government so far has offered only cash compensation – an approach that usually leads to further impoverishment, and has been recognized as inadequate by development agencies.

While the state government continues to ignore the protestors, local government has recently gotten aggressive with them. In anticipation of the monsoon and imminent submergence, local authorities have reportedly discontinued villages' electricity and water supply, cut down trees and demolished a school and health center. This has deprived people of basic amenities and created a health crisis: reports of increasing disease due to unavailability of clean drinking water have been coming in from the dam-affected villages. Protestors have demanded an immediate halt to such harassment.

In 1994 the Maan Project received environmental clearance from the Central Envi-

ronment Ministry on the condition that affected tribal families must be resettled on non-forest agricultural land.

Ignoring this condition and its own rehabilitation policy, the government of Madhya Pradesh offered only paltry amounts of cash in compensation. Consequently, the Appraisal Committee of the Central Environment Ministry chastised the Maan Project for violating conditions of the environmental clearance.

In 1997, residents of the 17 villages slated for submergence by the dam were issued eviction notices. Only after an intense two-year struggle did the Madhya Pradesh government begin to address the issue, by creating a committee for rehabilitation of the affected people. At that time the government also stated that any construction on the dam that violated the rights of affected persons would be stopped. Starting in October 2000, however, work began on the spillway section of the dam, thus creating a situation of imminent submergence for hundreds of tribal families yet to be rehabilitated. Facing an intensification of the dam's resettlement problems and subsequent protests, the Madhya Pradesh government responded, as usual, with harassment and arrests.

The Maan Dam has also been criticized by the Indian People's Tribunal, an independent civil society initiative. Taking note of government indifference and disregard for its own rehabilitation policies, the Tribunal has made several recommendations. These include stopping all spillway construction on the

NEWS FLASH

As we went to press, the Maan Dam hunger strike was called off after the Madhya Pradesh government agreed to look into the rehabilitation of project-affected people. The inquiry team will include advisors known to be sympathetic to peoples' movements and issues concerning tribal rights. Rehabilitation of oustees is to be completed by July 31, 2002.

dam until affected people are rehabilitated; using the cash compensation package to buy irrigated land for the oustees in accordance with the state rehabilitation policy; and monitoring of compliance with rehabilitation conditions by the Ministry of Environment and Forests and the Planning Commission of India. The Tribunal also recommended that the National Bank for Agriculture and Rural Development, which refinanced the Maan Dam, review its policies and take responsibility for rehabilitation of oustees.

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Affected people rally against dams in the Narmada Valley.

Photo: NBA



Spirit, Struggle and Solidarity

A rare opportunity arises for activists from Africa to see first-hand the dam-affected people's struggles in India's Narmada Valley.



When 2,000 people suddenly marched to protest unfulfilled promises of development from the Lesotho Highlands Water Project (LHWP), we knew we were part of something new. As community workers with the Lesotho nongovernmental organization Transformation Resource Centre, we were quite familiar with the quiet complaints of dam-affected people in Lesotho, but they had never before seemed willing to demonstrate their concerns in such a dramatic way.

We needed to build upon our existing advocacy skills and learn the unique strategies of community mobilization. Therefore, we decided to visit our NGO colleagues working in the Narmada Valley of India. The communities of the Narmada valley have a long history of resistance to dams. For 16 years they have advocated for their rights, and their protest strategies are unparalleled worldwide. This is the reason we went out of our way to go to India.

The dams along the Narmada were intended to provide hydroelectricity and water for irrigation. Unfortunately, what was not considered is that the Narmada valley, the most fertile in all of Asia, is a sacred one to people living there, and the Narmada is the most sacred of rivers. The Government of India cannot provide an adequate substitute to this, hence the 16-year resistance from local communities.

This belief in the sacredness of the Narmada was integral to the communities' struggle. Whenever there was a community meeting, there was an element of prayer. Prayer had become a powerful weapon that united the people around the common good. Our activist colleagues from the Narmada Bachao Andolan (NBA) did not tell us about these tactics; we observed them in action. The leaders' chants kept people focused on the goal during long meetings. Children were always present, because, as we were told, "They are here to fight also; the future is theirs; they have to be here." The activists live lives of austerity; some of them have fasted for many days in support of the affected people's cause.

We witnessed the power of these tactics first-hand during the trial of Arundhati Roy, who was accused of having "defamed" the government of India by writing "improper" things about the government's handling of dams and those affected by them. Heavily armed police tried to quash the protest march staged by the affected communities and NBA activists. But the communities huddled together, hand in hand, and refused to be moved anywhere. Ms. Roy was sentenced to one day in prison and fined 2000 rupees, and in a dramatic show of solidarity, the communities and activists went to prison with her. We had never seen anything like this before, serious commitment and dedication to a cause dear to them.

Even far out in the villages people repeatedly expressed their commitment. Many told us, "This land is mother to us, and we are willing to die for it. Just as mother gives birth, the land gives us everything. The government wants to give us cash. Cash is like ice; it quickly disappears. A government is also temporary. They govern for five years, but can destroy our lives for generations." It is the many years of solidarity with the NBA activists and other NGOs that allows the communities to have the strength to say these things.

The importance of a unified approach to advocacy was the trip's greatest lesson for us. In India, unity is strength, but in Lesotho it often feels like "every man is for himself." We have now been inspired to develop a habit of coming together to give solidarity to those in need. It may be a lofty goal, but we envision that a mass movement for peace, justice, and participatory development can also be built in our part of the world.

Jacob Lenka & Mothusi Seqhee

The TRC-India trip was made possible by the Global Greengrants Fund.

News Flash: Verdict in Lesotho Corruption Case

The Lesotho High Court sentenced Masupha Sole, the former chief executive of the parastatal building the multi-dam Lesotho Highlands Water Project, to 18 years in prison in June for accepting over \$1 million in bribes in exchange for favorable contract decisions, a ruling that could set the tone for the remainder of the corruption trial.

The court will now hear the case against the companies accused of paying bribes to Sole, a list that includes some of the biggest names in the dam industry. Acres International, a Canadian firm, currently sits in the dock.

The World Bank, which had said that it had no evidence to debar any of the accused companies, indicated that it would reconsider this decision if new evidence emerged during the criminal trials.

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New World Bank Report Reveals Major Flaws with Uganda Dam Project

Inspection Panel Report Vindicates Local NGOs' Concerns on Bujagali

by Lori Pottinger and Peter Bosshard

The Bujagali Dam in Uganda, proposed by the US-based AES Corporation, violates five of the World Bank's policies, according to a new report by the Inspection Panel, the World Bank's independent investigative body.

The confidential report, which was leaked to IRN, was submitted to the Bank's Executive Board at the end of May. At press time it had not yet been publicly released.

The project's policy violations include the economic evaluation of investment operations, involuntary resettlement, environmental assessment, natural habitats and disclosure of information, according to the Inspection Panel. The report was in response to a claim brought to the Panel by civil society groups in Uganda, who said the project violated several World Bank policies.

The World Bank approved \$225 million in loans and guarantees for the 200-megawatt dam at the end of 2001. At that time the Inspection Panel was still carrying out its investigation. Several international financial institutions had earlier declined to become involved in Bujagali. Then in early 2002, the export credit agencies of Sweden and Norway expressed reservations about the project's risks, and appeared ready to pull out. Since losing these funders could sink the project, the Bank decided to try to pull them back in with a guarantee of \$250 million, though its private sector insurance arm, the Multilateral Investment Guarantee Agency (MIGA). At press time, a vote to approve this funding had been indefinitely postponed, according to Bank sources.

Disturbing Findings

The Panel finds the project's economic analysis to be especially weak, and notes that the Bank does not address a number of risks that could turn Bujagali into a white elephant.

Specifically, the report reveals that a mild depreciation of Uganda's currency would drive power tariffs up to 20 cents per kilowatt hour, which the report calls "surely unaffordable" in a nation where the average income is around US\$300. It questions a number of optimistic macroeconomic assumptions that could affect the project's viability. The report states that the fundamental project contract, the Power Purchase Agreement, is unfavorable to Uganda, and not always up to international best practice.

It also reveals that the World Bank has neglected to assess potential alternatives, particularly geothermal energy, in the preparation of the project.

The Panel notes that, at a cost of \$2,910 per kilowatt (kW), Bujagali is an expensive project. Relying on a confidential study of over 20 leading independent power producers, the Panel report assumes the average cost of hydropower projects to be \$1,800/kW. The project documents, incidentally, estimate the cost of geothermal power plants to be \$2,000/kW.

The report also finds that important measures to analyze or mitigate the social and environmental impacts of the Bujagali dam were either missing or seriously deficient. These measures include an assessment of the cumulative environmental impacts of dams in Uganda, and a community development action plan for dam-affected people. The Panel notes that the project-affected people in the tourism industry are not being compensated for the loss of their livelihoods, in violation of Bank policy.

A promised deal with the Ugandan government to preserve another waterfall (Kalagala) downstream of Bujagali as mitigation for the project was found to be a sham, even though Bank management said the agreement was required to proceed with Bujagali. The Panel notes that the final agreement offers "no obligation to preserve the Kalagala Falls" and even "contains a direct expression of potential development of the Kalagala site." This is another violation of World Bank policy.

The report does find that most project-affected people received adequate compensation packages, that the Environmental Impact Assessment was generally of high quality, and that the project sponsor acted in good faith in attempting to mitigate the cultural consequences of losing the Bujagali Falls.

Way Forward

The Panel report suggests corrective action for rectifying the problems of Bujagali. The suggestions include various measures to properly assess the project's economic viability and risks, and changes to the unfavorable Power Purchase Agreement (PPA). The report says that a publication of the PPA would be "vital" for a public debate and understanding of the project's impacts.

Critics fear that World Bank management will argue that the problems described by the Inspection Panel can be easily addressed "after the fact," and will press to move the project forward. A June 11 Bloomberg article quotes Christian Wright, director of AES projects in Uganda, as being confident that the dam will go forward. Although Wright hasn't seen the report, he said, "The impression we have been given is that on the whole the Inspection Panel affirms the project is compliant with World Bank policies. Any deficiencies are to be discussed with the idea the project is a good one and should go forward."

But NGOs working on the project in Uganda feel that many of the problems raised are so fundamental that they must be resolved before the project moves forward. In a letter to the World Bank executive directors, IRN states: "Carrying out a realistic economic analysis and risk assessment is a necessary precondition for a prudent decision regarding the Bujagali project. Obviously, carrying out this necessary groundwork after the project has been approved would be futile."

AES announced in February that it would delay construction of Bujagali by some months because of the hesitation from the Nordic funders as well as its own financial troubles. The Virginia-based company, whose stock has plunged some 90% in the last year, said it will trim spending by 41% and sell as much as \$1.5 billion in assets. Yet the company said in February that it intends to push forward with Bujagali.

An IRN report on the Panel's report notes that the Bank should not rush to approve new funding for Bujagali: "AES does not seem to be able to come up with the full equity for the Bujagali project anyway. Its stock has lost more than 40% of its value only in the last ten days, and so the company needs to look for an investor partner in the project. This allows for time to carry out the measures suggested by the Panel report before a new Uganda power project is proposed for Board approval." ■

Two new IRN reports on this project are available at www.irn.org: "Pervasive Appraisal Optimism" and "A Review of the World Bank's Inspection Panel Report on the Bujagali Hydropower Project".

Intricate, Elegant, Delicate: The Inner Workings of Healthy Rivers

by Brian Moss

The highly complex web of natural systems that make up a healthy river can become unhinged by major engineering interventions. A biologist explains the intricacies of healthy rivers and catchments, and contemplates how we might regain balance in “managed” river systems.

River systems stitch together the landscape, providing a system that transports materials and living organisms and acts not unlike the circulatory system in the body. They are immensely detailed and the details matter. Sometimes they have been dammed by elegant structures whose designers are rightly proud, and whose curvature can be described by an equation of beauty in its simplicity. But the system that has been altered is of much greater intricacy. If it cannot be expressed in simple mathematics, it is because its complexity is so great, not because it is of no consequence. Elegance in engineering is a relative concept. Human engineering is, at best, very crude compared with what natural processes have produced.

Environmental flows are natural releases of water intended to supply the needs of the environment where the river has been engineered. It is, at least on paper, acknowledged that timing, volume and quality are all important to ensure that the key chemical, geomorphological and ecological processes necessary for healthy river systems can function. The crux lies in the perception of what is needed “for healthy river systems to function.”

Rivers are not just channels of water; they are much more extensive. Herein we will look at how two nearly intact river systems function. The first is the collection of rivers that drains the coastal ranges of British Columbia and Alaska, the second is a part of the Amazon basin. Both areas have been, or are likely in the future, to be densely dammed.

Pacific Rivers

Looking at one of the rivers flowing out of the mountains of the North American Pacific coast, you will be struck by the immense amounts of woody debris that litter the flow. Trunks and branches abound, twigs and



Healthy rivers depend on the workings of animals, both large and small. Bears are a key element to Pacific rivers.

leaves are held in tightly packed piles behind rocks and any other obstacle in the roaring white water. Like rivers elsewhere, this debris provides both habitat structure and food. It is a major source of carbon and energy for the animals of the river system, but its quality as food is initially poor. Several nutrients, particularly phosphorus and nitrogen, are scarce on a world scale, because of the particular biogeochemistry of these elements and of the original accident of planetary composition. Trees, before they shed their leaves, withdraw scarce elements, including these, back into their trunks for recycling into new, functioning young leaves.

The old leaves are thus mostly just cellulose, nutrient-deficient and full of indigestible, often toxic, compounds produced by the tree as a protection against insects. Wood, in general is also poor material as an animal food. However, once submerged in the river, the debris is colonized by specialist groups of fungi capable of digesting cellulose and absorbing phosphorus and nitrogen compounds from the tiny concentrations present in the water leached from soils of the catchment. The fungal enzymes replace part of this with fungal mycelium, which is

much more palatable to a range of invertebrates. The rocks on the river bed also bear a film of micro-organisms – algae that photosynthesize, again using nutrients absorbed from the water, and bacteria that thrive on organic matter dissolved in it and washed out from the catchment soils. A second group of scraping animals feeds on this film. All of these processes, the breakdown of the leaves and wood by fungi, the shredding of it by the invertebrates and the continuous production of feces as the animals eat, produce finer particles. These become recolonized by bacteria and further processed into richer food for another group of animals. A guild of collectors thus joins the shredders and scrapers, to be fed on then by predatory invertebrates and fish. Thus the catchment forest provides a significant energy and nutrient source to support the river community. However, matters are much more complicated than that.

Running up river in the water pouring down from the melt of the mountain snows, several species of salmon seek spawning sites in the upstream sections. There, gravel beds provide the conditions for their large eggs to

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be laid and covered with protective stones, yet supplied by a flow of oxygen-rich water. These fish have spent several years in the Pacific Ocean, feeding on other fish and accumulating a large supply of nutrients in their bodies. They detect the freshwater flows washing into the ocean as they move up the coast and indeed recognize the river system of their own birth from the subtleties of organic chemicals dissolved in the water and specific to that river. Their migration is stimulated by high flows which allow a sufficiency of these chemicals to be perceived even with immense dilution. The runs fail if the flow is severely curtailed.

As they move up river, the adult salmon must negotiate natural obstacles, like water falls, where they collect, awaiting suitable conditions for the jump they must make. Others, exhausted by the long swim, die and lie as carcasses. Bears patrol the river banks, awaiting a chance of a large meal. The carcasses, full of nutrients derived from the ocean, provide a significant source of nitrogen to the forest, which can be traced from the stable isotopes of nitrogen. The sea has a particular ratio or signature of nitrogen 13 to nitrogen 14. The salmon acquire this same ratio and it persists in the bears and ultimately in the forest trees within a few kilometres of the river as they absorb nitrogen compounds excreted by the bears. The trees contain as much as 25% of their nitrogen ultimately derived from marine sources through this route. But matters are even more complex and interconnected.

The salmon which survive to the spawning grounds are exhausted. They invest much of their energy in eggs or sperm and they have been unable to feed during the long last stage of their migration as they move up river. Big fish need big meals. The energy invested in catching lots of small prey gives little or no net return and rivers do not support large prey. After spawning, most die and their carcasses litter the spawning grounds. Meanwhile their eggs hatch into larvae; the larvae develop into young fish or parr. Parr need food; their invertebrate food depends on microorganisms and algae, in turn dependent on a nutrient supply in the water, a supply that is naturally low. This is because the forest systems are also short of such nutrients and have evolved mechanisms which reduce the risk of leaching losses to a minimum. But lying there, at just the right time, are the rotting carcasses of thousands of big, protein-rich fish, provided they can be held from being rapidly washed downstream in the river flow. They become tangled in the forest debris which has fallen into the water. If too

Environmental flows are natural releases of water intended to supply the needs of the environment where the river has been engineered.

tidy a forestry practice prevents this, the system breaks down and the young salmon recruitment fails.

Thus the ocean, the forest and the river are connected in an intricate system of nutrients, microorganisms, invertebrates, bears and fish. And the bears and the fish will have other connections with other forest and ocean species respectively which mesh together like the cogs of an infinite perpetual motion machine, ultimately powered by the sun to make the most efficient use of scarce resources.

The Amazon

The Pacific rivers are not unique in their intricacy. Every intact living system shows the same unexpected connectedness. It is a property of living systems that have developed sustainability over millions of years. The flooded forest of the Amazon merely provides a second example. Many tributaries of the Amazon rise in level over many meters as the snowmelts of the Andes bring water to the lowlands in spring. The Amazon basin is ancient and has had time to evolve an astonishing variety of species, many of them traditionally used by the peoples of the area. Like all unpolluted natural waters, the Amazon is scarce in nutrients. Its productivity and variety is supported by mechanisms that use the resources extremely efficiently.

In the dry season, the rivers are confined to their main channels and intensive fisheries take place where the fish, concentrated anyway by the restriction of the river, gather in favored habitats. But as the water rises and the river occupies the full width of its channel, the forests of the floodplain become inundated to several meters. Sometimes trees are covered more than half-way up their heights. Freshwater sponges may be seen in their uppermost boughs. There is not a lot of debris on the forest floors – organic matter rots quickly here – but the fish moving into the forest from the dry season channel find a rich source of food. The slightly higher nutrient load washed in from the

Andes supports floating plants anchored in the moving water by the forest branches and the fish catch fruits and seeds, and monkey feces falling into the water from the trees. They may even leap from the water to catch prey crawling along branches just above the water surface.

Still, dissolved nutrients are scarce, for they are rapidly taken up by the plants. But the submerged debris support microalgae on their surfaces which provide the initial food supply for newly hatched fish. As in the Pacific rivers, the rising water is the stimulus for spawning. These algae need a nutrient supply which is provided by the excretion of adult fish and their predators. Dolphins, turtles and caimans follow the fish into the forest. It is easier to catch prey in the stiller, clearer water than in the turbid, dry-season main channel. Again, the intricacies of these mechanisms was realized only when local extinction of the caimans, hunted for their skins, led to a collapse in fish.

The Value of Natural Rivers

These systems illustrate general features of all river systems. The catchment, the riparian part of it, close to the river in particular, the floodplain (the wet season channel) and the dry season channel are all necessary parts of the functioning system. So, too, are the quality, quantity, and seasonality of the water flows, the species, from micro-organisms to mammals, and usually, groups of traditional peoples. Both the Pacific and the Amazon systems have supported traditional societies which have developed systems of exploitation which unconsciously mesh with the natural gears to ensure sustainability of the resource.

These river systems have developed over very long periods. They have extensive links with other systems. If they have seasonal flows or natural irregularities of flow, we may be sure that these have been incorporated into the strategies evolved through natural selection in their living components, even in the habits of traditional peoples. The irregularities of flow, for example, may be important to ensure that submerged plants in floodplain systems produce crops of seeds, and these seeds ensure persistence even after droughts. Interference with any of a thousand subtleties can put the proverbial spanner in the works – tidy forestry and caiman hunting, for example.

Natural river systems provide fisheries, floodplain agriculture, natural services and products, aquifer replenishment, water quality improvement in polluted sites, and high biodiversity, all free. In 1987, Costanza and

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Watching the Rivers' Flows

Talking with an Expert on Rivers' Needs for Water

by Ryan Hoover

Jackie King has studied southern African rivers and wetlands for 26 years. A freshwater ecologist at the University of Cape Town, she is a specialist on the impacts of dams on rivers and an expert in the emerging field of environmental flow assessments – studies that determine the range of impacts to a river from reduced river flows. King's studies on South African rivers' environmental flow requirements influenced the writing of the South African Water Law, which requires the maintenance of an "ecological reserve" of water in all of the country's major aquatic ecosystems. King also led the recently completed study for rivers affected by the Lesotho Highlands Water Project (see box, this page). We interviewed King at the Environmental Flows for River Systems conference held at the University of Cape Town in March.

IRN: Environmental flow requirements (EFR) have major implications for how rivers are used and managed. Could you explain a bit how they relate to dams specifically?

JK: Over 200 EFR methodologies have been developed throughout the world, and dams have been the major driver behind many of them. There are two major kinds of these dam-related EFRs, and they are about equally common. Firstly, there are many countries that are still building dams and that will continue to do so throughout this century. This means that there are a whole lot of flow assessments that could be done before a dam

is built or even before it is designed. Then there is another kind of flow assessment that is done for existing dams which could be done to rehabilitate a river to the extent that the design of the dam allows that to happen. In Australia, they are looking at flow restoration methods, which would put water back that has been taken away by dams. In South Africa, however, the drive has mostly been to do flow assessments on rivers where we expect to build dams. Now that we have studied many of those rivers, we are starting to look at existing dams to see how we can change them for the benefit of communities and ecosystems downstream.

IRN: Are there other places where EFRs have actually changed the operation of a dam?

JK: I think that it is very common in the USA now, because the major era of dam construction in the US is over. The best sites have been taken, and the biggest rivers have been dammed. They're now looking into how to manage those dams in a more equitable way. The relicensing of hydroelectric power schemes in North America has presented an opportunity to have a complete re-look at how the dams have damaged the river. Some re-licensing processes have included vast changes in how dams are allowed to operate in the future because of the concerns and unhappiness of a whole load of stakeholders who weren't listened to originally.

IRN: What are the main challenges to implementing EFRs?

JK: Political will and collaboration between countries where there are shared rivers. These are problems because countries have different agendas and are suspicious of each other. It's for this reason that I would like to
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Good Studies Don't Save Rivers: The Lesotho Example

It remains to be seen if environmental flow assessment will significantly influence the management of large dams in the Lesotho Highlands Water Project (LHWP), Africa's biggest dam scheme. The expectation is that it probably will not.

The LHWP's environmental flow requirements report has been heralded by experts as being one of the most comprehensive ever undertaken. It offers predictions on the long-term impacts of reduced river flows caused by Katse, Mohale, and Matsoku dams. The report states that if Lesotho delivers as much water to South Africa as the original treaty requires, Lesotho's rivers could deteriorate to "something akin to waste-water drains." (See WRR, June 2000, at www.irn.org/pubs/wrr for a longer article

on this report's findings.) Although the two-year-old report is yet to be made public by project authorities, many observers had hoped that it would persuade the governments of Lesotho and South Africa to release more water downstream in order to preserve ecosystems and protect public health. But project insiders say they expect the governments to instead maximize water storage, meaning that only a fraction of the rivers' natural flows will be released from the dams.

"This is entirely because the economic value of the water in South Africa is so high," explains Andrew Macoun, the World Bank's LHWP task manager. He stresses, however, that "no decision will be made without a transparent process and broad

stakeholder consultation." A consultation process in downstream communities to elicit their views on the impacts of reduced flows began recently.

However, the degree of political resistance to increasing downstream releases suggests that the study's findings will be used primarily to determine the amount of compensation and mitigation required for downstream communities, and not necessarily to manage dam flows to maintain healthy rivers downstream of them.

A final decision on how much water to release from the LHWP dams is due before the impoundment of Mohale Dam in October. The decision will also prescribe an appropriate release schedule.

Ryan Hoover

coin another term to describe EFRs. We started with “instream flows” and then we moved on to “environmental flows” and I think it is time to move on to another term. I’m not sure what it would be yet, but it might be something like “managed river flows.” Many people are scared of the term “environmental flows.” The term “environmental” is a very peaceful term for me, but it’s not for a whole lot of other people who are going to be involved in decision-making in particular. They think it is just about fish, and I think we have something here that’s much more powerful than that. We have a tool which we can use to describe the whole range of options for how people could live in their catchments in the future. It’s a tool which allows us to say, “If you do this in this Country A, this will be the consequence in Country B for the river and for the people. However, if you do this there will be this consequence...” What this process is about is putting holistic options on the table about how to manage flows for everything and everyone.

IRN: *The Lesotho Instream Flow Requirement study has been described as a benchmark study in many ways because of its complexity and comprehensiveness. You and your team were very instrumental in that process. What are some of the lessons that have been learned from that experience?*

JK: The first lesson is that flow assessment should be done right at the very beginning of the planning stage. It shouldn’t be something you do after the design of the dam is finished, because it should be the flow

Defining the Term

“Environmental flows consist of water that is deliberately left in or released into a river system to manage some aspect of its health. The river-health objective is set by society and may be, for instance, to stabilize banks, maintain river resources used for subsistence, minimize health risks from aquatic diseases, or conserve biodiversity. Using environmental flows to combat river degradation and ensure sustainable use of water is a new practice, but more than 30 countries now use such flows and each year the list grows. The World Commission on Dams (WCD) listed the assessment and implementation of environmental flows as one of its Guidelines for Good Practice on dam projects, and recommended that current and future dam projects should be designed and operated to allow for an environmental flow.”

From a paper on environmental flows by Jackie King et al, presented to the WCD

assessment that allows you to see which options are possible. Another thing to do is to compare a number of different flow options and their results for the river and people. Then you add on to that the economic implications of each of those flow options. On top of that you add which ones would be acceptable to a wide range of stakeholders such as biodiversity treaties, people who run river rafting trips, departments of tourism and others. So lots of options must be put up front to let everybody understand what their choices are and what the implications are. You might come across a group of farmers who say, “Oh, we’d like the river to look like such and such with all the nice fish

in it.” So we say, “Okay, that means you’ll need to eradicate 50% of the irrigated land in this catchment.” This could change their opinions considerably. Stakeholders need to have all of that spelled out so they understand the full range of implications. Then you know what you’re going to build and how you’re going to design it. To do it the other way round doesn’t make any sense.

IRN: *When a community learns that there is to be an IFR process in their catchment, what should they know about the process, what should they be aware of? What are some things that environmental activists should be aware of?*

JK: I think there should be a public participation process that starts right at the very beginning as well. Communities should be voicing their concerns early on, so that the people who are doing the studies and creating the scenarios make sure that every scenario contains a bit of information about some-

thing that someone is worried about. If someone is worried about their river rafting business, or a Red List fish species, you say, “In option 1, this is what it means for the river rafting and this is what it means for the fish. In option 2, this is what it means...” So, right from the beginning we need to know everybody’s concerns in order that they be reflected in the options. Then they need to find representatives among themselves, which is incredibly difficult, but essential if their concerns are to be addressed. If stakeholders can effectively do these things, they stand a better chance of influencing decision-making and achieving their desired result for their catchment. ■

Healthy Rivers continued from page 5

others made an extensive economic analysis of the value of the goods and services still provided by naturally functioning systems. They listed services such as climate regulation, hazard protection, water regulation, erosion control, nutrient cycling, resource production, culture and recreation that naturally functioning systems provide. They valued them in terms of the cost of replacing them with human artifices. The results were astonishing. Natural systems provided goods and services worth three times as much

annually as all other economic activity. Wetlands, lakes and rivers, even more astonishingly, proved by far to be the most valuable of these systems by area (\$8,500-15,000 per hectare compared with a maximum of \$1,000 for land-based systems) and contributed about a fifth of the total global value of over \$33 trillion.

There is no doubt that many people perceive the schemes to engineer rivers as extremely intricate and clever. But let us compare them with naturally developed sys-

tems. Natural systems have been subjected to millions of annual testings through natural selection, under conditions that include considerable extremes. Every detail has been subjected to this process, which ensures the efficient use of scarce resources under any emergency.

In contrast, engineered schemes are effectively untested or tested by very simple models before they are put into operation. They are designed and tested for conditions that

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Replumbing the Plumbing: Decommissioning Dams

An Excerpt from a new book, "The Undamming of America"

by Elizabeth Grossman

On a warm October morning in 2000, in a small pool along Clear Creek, a few miles southwest of Redding, California, three chinook salmon flick their tails and wriggle. Water and scales glitter in the hot autumn sun. A sizable crowd peers over a ledge to see these fish. People wearing hard hats and orange safety vests, carrying clipboards, notebooks, tape recorders and cameras. Many of the safety vests bear the logo of the US Bureau of Reclamation, with the words "Dam Busters Tour" around the logo. The salmon are waiting to make their way up the 12 miles of Clear Creek that will soon be reopened to them once Saeltzer Dam is fully removed. Pieces of large earth-moving machinery are scattered around the site. Culverts have been laid in place to create a cofferdam through which the creek can temporarily flow as the dam is removed. Water is already rushing downstream, and the salmon swim below a small rush of rapids.

"Make no mistake about it," says Secretary of the Interior Bruce Babbitt to the group gathered to watch him and California Secretary of Resources Mary Nichols take a ceremonial swipe of the backhoe at the soon-to-be-demolished dam. "We are writing water management and conservation history today."

It's probably no exaggeration to say that more than in any other single state, the history of California has been decided by the manipulation of water. In determined ignorance of the natural inclination of their watersheds, California's rivers have been shunted across basins, piped into cavernous culverts and channeled into cement canals. Their groundwater has been pumped and floodplains and wetlands drained, bermed and diked. Almost every river in the state has been dammed, and approximately 90% of the state's waterway miles are diverted in one way or another. The resulting map of California's water projects is like a map of the New York City subway system. "California's very existence is premised on epic liberties taken with water," wrote Marc Reisner in *Cadillac Desert*, his classic history of water in the American West.

An excerpt from WATERSHED: The Undamming of America, published by Counterpoint Press, July 2002.

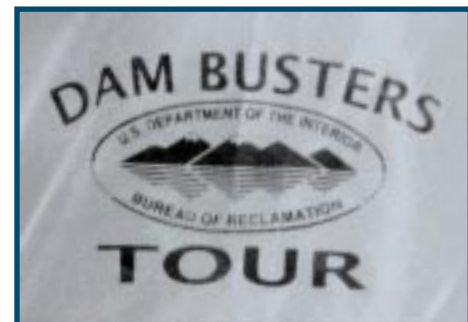
Altering the flow of California's rivers has taken a particularly heavy toll on native anadromous fish. Since the 1950s, about 85% of California's salmon and steelhead have disappeared. Roughly 95% of the spawning habitat for the state's spring-run salmon is gone. Some 90% of salmon and steelhead in the Central Valley are now blocked from reaching their historic habitat. Large populations of chinook salmon once thrived in California's Sacramento and San Joaquin Rivers. Most of these runs are now extinct, and others are listed under the Endangered Species Act. Similarly, most of California's chum, pink and sockeye salmon are gone. Coho, once found throughout northern California, are now extinct in much of that range, and their remaining runs are very small. Many inland runs of California's steelhead are now also gone, and many coastal runs are considered at risk of extinction or of special concern.

Rethinking Rivers

In an attempt to repair some of this damage, a number of dams in California are beginning to be rethought. In 1998, four small dams on Butte Creek, an eastern tributary of the Sacramento, were demolished to restore a threatened run of chinook salmon. Other dam removals are planned or are under way on Battle, Clear and Deer Creeks, all tributaries of the Sacramento. Yet because California's economy is so closely tied to the delivery of water, any dam removals in the state remain strongly tied to regional water politics. Even finding out which dams could go is proving difficult. A bill to fund an assessment of the state's dams recently failed to make it through the state legislature. Its supporters have said they will bring it back. It is painfully clear that California's growing consumption of water will increasingly compete with needs of native fish and river restoration.

Removing this dam, says Mary Nichols, "shows a lot of changes in the way we do business in California." Saeltzer Dam, Nichols tells me, is at "the beginning of a long list of outdated dams, of nonfunctioning dams we can remove without sacrificing water supply and flood control."

About 80% of the water used in California goes to agriculture, primarily in the Cen-



tral and San Joaquin Valleys, which is now the world's most productive farming region. Directing any of this water back into California's rivers is a radical idea, but the predicament of the state's anadromous fish is compelling this to happen. In 1994, the state of California and the federal government announced a jointly sponsored, multi-billion-dollar plan known as CalFed to restore the Sacramento-San Joaquin Delta. The plan aims to guarantee water to farmers and the cities of central and southern California, while at the same time restoring upstream habitat and the badly degraded river delta. Removal of some of California's estimated 1,400 dams is an important part of that restoration. "There are so many [dams] that it's a matter of setting priorities and getting the financial resources assembled," says Mary Nichols. "Each dam is unique and presents specific challenges to the communities affected." The Saeltzer Dam removal is a CalFed restoration project, as are the decommissioning of five diversion dams on Battle Creek and removal of the Butte Creek dams.

For over 90 years, the privately owned, 16-foot-high Saeltzer Dam diverted water to irrigate three ranches and about 400 acres of pastureland. The aging dam was beginning to crack. Instead of using Clear Creek, this property will now be irrigated by water from the Sacramento and the Central Valley Project – perhaps an ultimately imperfect solution, but one that will jump-start recovery of a local salmon run.

"It's an obvious choice," Secretary Babbitt tells me the morning of the Saeltzer dam busting, between "several hundred acres of irrigated pasture versus several thousand spawning salmon."

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Commissioning California Dams of America"

Saeltzer Dam blocked Clear Creek's chinook and steelhead populations, which have plummeted in recent years; all are proposed for listing under the Endangered Species Act. Clear Creek also provides habitat for a number of animals whose numbers have dwindled to a point unhealthy for their survival, among them the white-faced ibis, western burrowing owl, western spadefoot toad, green sturgeon, California red-legged frog, and northwestern pond turtle. Although their numbers are low, Clear Creek probably still has some of all the wildlife species it used to, so prospects for restoration are encouraging.

Since the 1940s, it's been known that Saeltzer Dam blocked upstream spawning habitat for salmon and steelhead. Despite the California law requiring dams to have functioning fish ladders, Saeltzer Dam had none. Removing the dam opens 10-12 miles of salmon and steelhead habitat, but migrating fish will still be blocked further upstream by Whiskeytown Dam, which also has no fish passage. Removing Saeltzer Dam will also enable more water to be released from Whiskeytown Reservoir into Clear Creek. Increasing the cold-water flows into Clear Creek out of Whiskeytown is a crucial part of this restoration.

"As long as we take away the obstacles that have damaged it rather than simply trying to mitigate, nature has a way of repairing itself," says Steve Evans, conservation director of the California nonprofit group Friends of the River, with cautious optimism about the project.

Buford Holt, an environmental specialist with the Bureau of Reclamation in Redding, has a different perspective but comes to a similar conclusion. "A hundred years ago," says Holt, "we drained swamps and wetlands. We flooded deserts. We kept on doing it past when society wanted it. Now we have a turnaround and it's time to stop flooding deserts and draining marshlands. The same can-do mentality that accomplished those projects makes [the Bureau of] Reclamation the vehicle for getting restoration done more than any other agency."

"It took a long time to plan the removal of Saeltzer Dam, but deconstruction moved quickly once it started," says Mary Nichols. To plan and implement the removal, federal



Photo: Mark Capelli

Southern California's Matilija Dam, targeted for removal, is killing steelhead salmon.

and state agencies worked with the Centerville Community Services Project, the Townsend Water Ditch Company and the McConnell Foundation, a local organization that owns 85% of the property served by the dam's water diversion. One of the things that facilitated removal was the fact that the McConnell Foundation, which was a willing participant in the process, was the sole owner of the dam, associated property and water rights. That the Secretary of the Interior would turn out to herald the removal of a small, privately owned dam that provided no drinking water or hydropower and irrigated only a small acreage, points to the complexity of such projects.

Before the diversion of the tributary creeks of the Sacramento for irrigation, before over-fishing in the late 19th and 20th centuries and erosion from stream-bank development, the Sacramento is estimated to have produced some 700,000 spawning salmon each year. Canning reached its peak here in 1882, when about 20 canneries packed some ten million one-pound cans of salmon. But less than 40 years later, the last Sacramento River cannery closed. The numbers of fish then plummeted so severely that Sacramento River winter chinook were the first salmon to be listed under the Endangered Species Act.

Now a concerted effort is being made to return salmon to these same waters. As part of this restoration, four diversion dams on Butte Creek have been removed, where in 1987, only 14 spawning spring-run chinook

salmon were found. If these fish had been listed under the Endangered Species Act, it would have meant curtailing downstream water withdrawals. The threat of listing provided an incentive to replace the dams – and a dozen other water diversions that trapped fish – with pumps and pipes that would allow irrigation without blocking fish migration. So far the dam removal project has been a success, with 20,000 adult chinook returning in the spring of 1999. But further upstream the Centerville Head Dam continues to block salmon from the full range of their habitat, and Friends of the River and other conservation groups are pushing to have that dam reconsidered as well. "We've only done the bottom half of the watershed," says William Kier, a fisheries consultant.

Yet in November 1999, the Pacific Gas and Electric Company and the CalFed restoration program agreed to remove five diversion dams from Battle Creek, another northern tributary of the Sacramento, enabling imperiled chinook salmon and steelhead to reach the headwaters of their spawning habitat for the first time in a century. Kier describes Battle Creek as a salmon refuge, one of the only places left for California's most vulnerable fish species to find habitat reliably sheltered from drought. Here, even in midsummer, cool water comes off of Mount Lassen and Mt. Shasta, creating ideal conditions for salmon. Many such streams from the southern Cascade Mountains were

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Selling Out Canada's Rivers

Manitoba Hydro Seeks to Dam Northern Rivers for US Market

by Will Braun

Dazzled by the prospect of damming huge northern rivers and selling hydroelectricity to the United States, the premier of the Canadian province of Manitoba declared in 1966: "We can have our cake, we can eat it and we can make a bigger cake and sell part of that." In that spirit of limitless and consequence-free development, Manitoba Hydro – the government-run utility – began building dams that still supply power to Manitoba and the US. This electricity is sold at rates that are among the lowest in the world.

The company says the power is "clean" and "environmentally friendly." But a panel of national and international religious leaders recently described the northern mega-project as "an ongoing ecological, social and moral catastrophe." For indigenous people living near the dams, there is no doubt as to who is telling the truth.

Hydroelectric development in Canada is a high stakes matter both environmentally and economically. Canada is the world's largest producer of hydroelectricity, with 662 large dams – most of those on indigenous peoples' lands.

Boasting that northern rivers are only half exploited, Manitoba Hydro now wants to spend US\$5 billion on new dams and transmission lines that would carry 2,000 MW of power to market, mostly to the U.S. President Bush's push for increased conventional energy production is welcomed by Manitoba Hydro, which is eager to cash in on northern rivers. Lured by export dollars, Manitoba Hydro and the government are much more intent on expanding an environmentally destructive system of dams than restoring the health of the watersheds they have already dammed and diverted.

In addition to hydroelectric projects in Manitoba, utilities elsewhere in Canada are either constructing or considering projects worth US\$20 billion, primarily for export purposes. This includes Hydro Quebec's plans to spend \$5 billion on four projects that would produce 2100 MW of power, primarily for the US market. That company also signed a deal with the Inuit paving the way for some \$18 billion worth of potential hydro development. And the Quebec government has announced a plan to grant at



Photo: Jackson Osborne

Pimicikamak Elder Charlie Osborne surveys exposed, muddy lake bottom near the Jenpeg Dam.

least 36 dam sites on 24 rivers to private companies (see WRR, February 2002).

As in so many cases around the world, Manitoba's indigenous people are the ones standing up to the "have-our-cake-and-eat-it-too" developers. The Nelson River system – the source of Manitoba Hydro's fortunes – is at the heart of the Pimicikamak Cree Nation homeland, some 650 km north of the Canada-US border. Pimicikamak Chief John Miswagon says, "utility profits and consumer rates are subsidized by the suffering of our lands and people." Consumer costs are low, but environmental and social costs borne by Pimicikamak people and lands are debilitating.

Manitoba's largest lake and two largest watersheds have been drastically re-engineered; a "concrete conversion" that has turned rivers into power corridors and lakes into holding tanks. The system of dams, diversions and reservoirs was built against the wishes of the affected Cree people, and with an equally cavalier attitude toward the environment. In 1973 a utility spokesperson proclaimed: "Manitoba Hydro does not have time to wait until studies are completed. Our job is to produce electricity." Nearly 20 years later the Auditor General of Canada found

"no evidence that a comprehensive environmental impact assessment had ever been performed."

Reflecting the pain of seeing a homeland destroyed in this manner, one Pimicikamak spokesperson compares expansion of the project to feeding off the wounds of Mother Earth.

Environmental Roulette

Impacts of the northern project are many. About 85% of the flow of the huge Churchill River is diverted more than 300 km southward into the Nelson River. The seasonal water regime in the entire Nelson River is reversed so that water flows match variations in power demand. Erratic and unnatural fluctuations have severely disturbed fragile riparian ecosystems which the company admits play a "vital role" in "overall environmental health." Riparian zones are critical for fish spawning, moose feeding, waterfowl nesting, and as habitat for aquatic fur bearers, berries and medicinal plants.

Cross Lake is a primary Pimicikamak lake located immediately downstream of the Jenpeg Dam in the flow of the Nelson River system. At times when water is held back for

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storage behind the dam, up to half the area of the lake bed has been dried up.

At another major Pimicikamak lake, 5 to 10 square kilometers of shore lands collapse into the lake each year due to raised water levels from dams. Entire islands erode right off the map. Pimicikamak citizens have come across the remains of their ancestors protruding from the mud where erosion has eaten away at sacred grave sites. This has been going on for 30 years.

Erosion of that magnitude results in a high volume of wood debris in the water. Half-submerged logs are like land mines for those traveling by boat. Manitoba Hydro has been found liable for the deaths of Pimicikamak citizens killed in project-related boating accidents. Commenting on one such case, Manitoba Hydro President Bob Brennan told a Canadian Broadcasting Corporation reporter; "Well, we'll sit down and work this out, but it's just the cost of doing business."

"If the cost of doing business is the lives of our people," responds Chief Miswagon, "that price is far too high."

The traditional Cree economy has been severely affected by the project, contributing to high unemployment, poverty, cultural decay and social breakdown. "Our people are grieving," says traditional healer Bob Brightnose, "they are grieving for land, the water and a way of life that was brought to an abrupt halt. I remember going along the shoreline to pick medicine with my late grandmother only to find it flooded. My grandmother stood there crying because that was her life. Her life was the land."

The environment that was once the source of physical and spiritual sustenance is now a daily reminder of a sacred homeland looted for the benefit of markets far to the south.

"It is time to stop playing environmental roulette with Aboriginal communities' lives and cultures," says Lorraine Land of Toronto-based Citizens for Public Justice. "The burden of carrying the environmental and social costs for [the northern Manitoba project] has fallen disproportionately on Aboriginal communities."

Manitoba Hydro, their fellow hydro utilities, and the Canadian government, say the Kyoto Accord should be structured to grant Canada significant credits for its "clean" hydro exports (as well as exports of natural gas). But the Pimicikamak Cree, along with NGOs, national churches and the European Union, say hydro exports are not clean and Canada should not be allowed to water down Kyoto in this way. Research is showing that hydro reservoirs have their own emissions – in some cases, quite significant ones.

There is more to the story. Canadian hydro developers would destroy boreal forest that acts as a critical carbon sink. Boreal forests, which make up a third of the world's forests and a majority of intact forests, are increasingly recognized as the "northern lung of the planet," as they "inhale" carbon dioxide and "exhale" oxygen. Thirty percent of the world's boreal forest is in Canada.

A 1996 government study says that in Canada's boreal shield, 85% of the rivers have been altered by hydro development and 77% of drainage areas have major dams. Manitoba Hydro's existing northern system is one of the largest in the boreal.

In addition to dams, Manitoba Hydro is proposing an 800 km transmission corridor that would bisect one of the largest sections of intact boreal forest in Canada. As the company eats away at this critical carbon sink, they cynically herald the global warming benefits of hydro dams.

Enough is enough

In response to ongoing damage and the push to expand the project, the 5,800 Pimicikamak Cree citizens say they have had enough. In 1997, they rejected a US\$70 million deal that would have essentially bought their compliance with the power company. Based on a spiritual mandate to protect the earth, the Pimicikamak are boldly speaking out to inform consumers in Manitoba and the US about the human rights violations and environmental devastation caused by the mega-project, and of their plans for environmental and social recovery.

The Pimicikamak message is that the earth is sacred and the market economy is not. Collectively, we must stop trying to have our cake and eat it too, and start healing the earth.

Over the past three years Pimicikamak spokespersons have made countless presentations to church groups, students, environmentalists and human rights groups. Of particular importance have been presentations to groups in Minnesota, where Xcel Energy – Manitoba Hydro's single largest customer – is based.

As more Americans learn about the true impacts of the electricity lighting their living rooms, they are calling on their elected officials to ensure that checks and balances (legislative and regulatory) are in place to ensure that they are not importing environmental and human rights violations along with their electricity.

Resolutions put forward by supportive Xcel Energy shareholders have put the Pimicikamak Cree in a position to deal directly with the fourth largest utility in the US.

They are also working with tribal groups that oppose new transmission corridors which would affect their territory and carry power from Manitoba.

The goals of the campaign are to: 1) compel Manitoba Hydro to clean up its mess; 2) prevent further unacceptable harm; 3) contribute to more equitable and sustainable energy options; and 4) bring recovery to the Pimicikamak people. Talks with Manitoba Hydro and government regarding specific ways to address the harms are ongoing. Coordinated campaigns carried out with allies in Canada and the US provide incentive for the utility and government to get down to business. It is becoming harder and harder for Manitoba Hydro to label its product as "green."

The Pimicikamak are demanding the environmental clean-up and community development promised by the utility and government in the 1970s. As one part of this they are proposing to clean up wood debris along thousands of kilometers of shorelines and use the wood in biomass cogeneration units that would produce electricity, as well as heat for buildings and a variety of other possible uses. This would improve the environment, make navigation safer, provide employment, and provide a cleaner alternative to uncontrolled burning of the debris (Manitoba Hydro's preferred option).

The Pimicikamak approach is rooted in recovery and renewal, not further development and destruction. It involves no compliance, concessions or compromise by Pimicikamak with respect to existing or future resource development. Cree interests do not become aligned with corporate interests.

With the Canadian boreal suffering and under threat of more hydro development, the Pimicikamak Cree lead the struggle to ensure protection, and achieve recovery of their homeland and their part of the terrestrial home we all share. They are squarely facing up to the fact that we all will need to face sooner or later: when corporations, governments and societies try to have their cake and eat it too, the sacred balance at the heart of all life is violated. ■

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Brazilian Government Pushes Ahead with Plans for Huge Dam in Amazon

by Glenn Switkes

The world's largest "run of river" dam is plodding forward with help of electioneering politicians in Brazil. The environmental impact studies for the Belo Monte Dam on the Xingu River in the Brazilian Amazon have been suspended by court order, and yet the Brazilian government says it is determined to offer the concession for the 11,182 MW installed capacity project this year, before the country's presidential elections take place.

Belo Monte would be offered as a public-private partnership, with the state electricity company Eletronorte taking responsibility for sailing the dam plans through environmental licensing authorities, and private companies taking on most of the financial exposure (although up to half of the "private" investments may be shouldered by the country's National Economic and Social Development Bank). According to Eletronorte, Brazil would retain 30% of the ownership of Belo Monte, with a consortium of private companies sharing the remaining 70%. In order to put the project in the hands of private companies as soon as possible, the government plans to separately auction the project's transmission lines, which would run as much as 3,200 kilometers through the rainforest to population centers in southern Brazil, costing \$3-\$5 billion, more than the dam itself.

With the president's ticket of candidates lagging behind in the polls for the country's October presidential elections, Belo Monte is seen as an important campaign tool for the ruling party. Eletronorte's president, José Antônio Muniz Lopes, is doing his best to bring a sense of urgency to the decision-making process, saying that the country would run the risk of a collapse of its electrical energy system by 2008 if the dam is not approved. The final decision on whether or not to offer the project for concession will come from the National Electrical Energy Agency, ANEEL. The government has said this authorization could come as early as mid-June, with the concession put up for competitive bidding in August.

The project's environmental studies have been stalled since last November, when a federal judge suspended them due to a lack of public bidding on the contract. The research agency that had been given the study, the Foundation for Support of

Research Development (FADESP), had previously been implicated of fraud in distorting the findings of various scientists on the studies for the Araguaia-Tocantins industrial waterway project. Furthermore, the terms of reference for the study had been determined by Pará state authorities, and not by Brazil's environmental protection service as mandated for rivers that pass through several states. Another problem cited by the judge in suspending the studies is that Belo Monte affects indigenous reserves, and thus would require a special act of Congress to authorize the studies in the first place.

In May, Brazil's attorney general told the Supreme Court that the studies should not be suspended because they are required to permit a careful assessment of any subsequent request for a construction license. He classified Belo Monte as "an essential public service."

In any case, the project itself remains highly controversial. Eletronorte has boasted that its new engineering design for Belo Monte will conduct water directly down a 90-meter slope to the dam's powerhouse via two artificial channels, bypassing the "big bend" of the Xingu river, and avoiding the flooding of the Juruna Indians' reserve. The 120-kilometer-long "Big Bend" is an important area to indigenous and other river-dwelling people.

Following a visit by IRN campaigners to the Belo Monte dam site in May, it is clear that there are serious reasons to believe that Belo Monte will not function as its proponents say – at least not without constructing the four other dams upstream that were part of the government's original plan for the Xingu Hydroelectric Complex in the 1980s. The Xingu River has an extremely low streamflow during summer months, and it is unlikely that the Belo Monte reservoir, which according to Eletronorte will flood 400 square kilometers, would be able to hold enough water to both drive the plant's turbines and provide an adequate "ecological flow" into the big bend of the Xingu River. Eletronorte says it will guarantee a minimum flow of 250 m³/sec to the big bend, which is far below the historic low flow of 441 m³/sec.

The consequences of this poor hydrological planning could be both zero power generation for up to five months of the year and/or a dry stream bed for the 120-km stretch of the river during the dry months.

This could affect indigenous communities on the mainstem of the Xingu, as well as tributaries such as the Bacajá River. In a letter to Brazil's president, indigenous organizations of the Amazon and support groups noted that, besides the Juruna, the Xikrin-Kaiapo, Xikrin, Arara, Xipaia, and others would be directly affected by the drying out of the big bend.

Another issue is the cost of the dam. Official estimates are that the dam will cost \$3 billion, plus \$3 billion for its transmission lines. Recently, the company has admitted that hooking up the dam to the national grid might involve a \$5 billion investment in power lines. Specialists at the University of São Paulo's electricity institute have found the cost of energy generated by the project may easily be 3-4 times higher than the \$12/megawatt-hour indicated by Eletronorte. Critics have indicated the need for an independent review of the economic and engineering feasibility of the project, since billions of dollars of public money will be required.

Eletronorte has also expressed little concern for the fate of at least 16,000 people whose homes will be inundated by the dam, and has gone so far as to present the flooding of some neighborhoods in the city of Altamira as a kind of urban slum renewal, implying that the families would be better off somewhere else. Organizations writing to Eletronorte to request project studies receive a CD-ROM with computer-generated images of the project, and reports on how the development of the region will be promoted by the projected \$36 million in royalties that will be paid to municipalities in the project's area of influence.

In any case, Eletronorte officials have already indicated they plan to begin studies on a second Xingu River dam in 2003. This second project, just upstream from Belo Monte, was originally called "Babaquara," but has been renamed "Altamira." The original project would flood over 6,000 km² of the Amazon rainforest, including indigenous reserves. Additional dams upstream would flood the Xingu indigenous park, considered a showcase for the Brazilian government's indigenous protection policies.

In March 1989, opposition to the Xingu Hydro Complex culminated in an international gathering in Altamira, organized by

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Meso-American Groups Organize Around Huge Regional Development Scheme

by Monti Aguirre

In March of this year, 300 dam-affected people and activists from Mexico and Central America met in Guatemala to share experiences on the impacts of dams in their communities. This is one of many civil society meetings organized in response to the Plan Puebla Panama (PPP), a massive regional development plan that has serious implications for ecosystems, communities and local economies, and could lead to numerous large dams.

The US\$10 billion PPP includes a number of electricity-sector projects, water schemes, transportation, factories and other projects. Funding for the PPP comes from a mix of private investments, government resources, the World Bank, the Inter-American Development Bank (IDB), the European Union, the Japanese Bank for International Cooperation, the Andean Development Corporation, the Central American Integration Bank, USAID, and the Economic Commission for Latin America.

Energy to fuel the PPP's development plans is expected to come from dams, geothermal, natural gas and biomass power plants in the region. According to the IDB, only 8% of Central America's hydroelectric potential, which amounts to 35,991 MW, is now being utilized. Many Central American rivers still flow freely, and many hydro dams are being proposed to feed the machinery of regional economic development plans.

An example is the 560 MW Boca del Cerro Hydroelectric Project, a joint project between Mexico and Guatemala on the Usumacinta River. This dam is one of six planned for this river. The definitive plan has not yet been finalized or shared with the public, but communities on the Usumacinta fear the dam project could flood as much as one-third of the El Petén area, harm areas of high biodiversity and flood archaeological sites.

Communities are almost always compromised by the lack of information they receive about such projects, and those represented at the Forum said they have been systematically excluded from the decision-making process. Cristóbal Gonzáles, a Lenca indigenous representative from the Civic Council of Popular and Indigenous Organizations of Honduras, criticized the secrecy surrounding the planning process for the El Tigre Dam (700 MW), a binational project of Honduras and El Salvador. "We found out that this project would impact more than 40,000 people who would have to abandon their lands and their ancestors' graves," he said. "This project would not benefit the Lenca communities – on the contrary, it would kill us because for the Lenca people life without land is no life at all. Our community includes the forest, land, animals and humans. If one of those elements is gone, the harmony is broken."

Seeking Restitution

Some dam-affected communities represented at the Forum are still seeking compensation and restitution for the harm they suffered. Perhaps the best-known case is that of the Rio Negro community affected by the Chixoy Dam in Guatemala in the early 1980s built with loans from the IDB and the World Bank. Carlos Chen, who lost his family to the dam massacres, spoke at the Forum of his experiences. "It is very important for me to let you know what happened to us. They said that this project represented development, but it was not development for us poor people, but for the developers. And when we spoke of our rights, we were massacred. We want to know why the World Bank and the IDB financed a project during a military regime that caused us so much harm, and we are still seeking compensation."

Unfortunately, violence associated with dams is not a thing of the past. Jacobo Martínez who lives San Miguel, El Salvador, told the Forum participants of the assassination attempt he suffered earlier this year, stemming from his leadership against construction of the El Chaparral Dam on the Torola River. "We are totally against this project because it threatens us with forced resettlement, cultural destruction, environmental impacts, and loss of our sources of income. Our struggle is peaceful and respectful of the peace agreements signed on January of 1992 which ended 12 years of civil war," he said.

Forum delegates agreed on organizing locally and regionally to demand and share information about upcoming projects and to address project funders on the social, economic and environmental impacts their loans have on local communities. The groups will especially target the IDB.

Those participating in the Forum agree that large-scale development schemes are part of the problem, not part of the solution – especially for rural communities. Although the PPP promises, among other things, electricity grid interconnections, increased trade and "sustainable growth," local communities believe that they will not be the beneficiaries of its projects and indeed that they will lose natural resources upon which they depend. They are saying, through forums such as this one, that they are prepared to fight the PPP's grand schemes, and push for a more people-centered, decentralized form of development instead.

"There are already too many widows, too many orphans, too many loved ones killed during the war. So, we need to think about how are we going to fight these projects that threaten our survival," said Juan Rojas from El Salvador "We don't want more bloodshed." ■

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the Kayapó and other indigenous groups. With international television cameras rolling, Kayapó women warriors ran the blades of their machetes against the face of Eletronorte engineers to symbolize their opposition. Shortly afterward, the project was shelved. This time around, local opposition continues to run high.

At a rally in a community in the big bend of the Xingu in May, organized by the Movement for the Development of the Transamazon and Xingu (MDTX), banners hung by Eletronorte welcomed activists with slogans like "Gringos out of Amazonia" and "You already killed your Indians." Youth who were paid \$4 and given sugarcane whiskey and a Belo Monte t-shirt dutifully booed and

heckled the speakers, who nearly all denounced Eletronorte and the project. The majority of those in attendance cheered enthusiastically.

As for the indigenous people of the Xingu, they say they are preparing to gather once again in Altamira later this year to stop the Belo Monte Dam – to save the Xingu and their homelands. ■

Maan Dam continued from page 1

On June 1, a delegation of protestors met the Governor of Madhya Pradesh, Bhai Mahavir. Two officials present at the meeting, the Deputy Chief Minister Subhash Yadav and the Chief Secretary A.V. Singh, refused to abide by the state's rehabilitation policy and accept the demand of land-for-land. The reason given was that if land were provided to the Maan oustees the same would have to be provided to all other dam-affected people in the state.

Flawed as this reasoning is, clearly it has influenced Madhya Pradesh's attitude toward

rehabilitating oustees from all dam projects in the state. Of the 30 large dams planned on the Narmada, 29 are located in Madhya Pradesh. While dam-building activity in the state is progressing at great speed, authorities have done little to acquire land for resettlement. Recently, in the case of the controversial Sardar Sarovar Project, 6,000 families in Madhya Pradesh were issued eviction notices with little or no provision for land-based resettlement as required by law.

Activists are trying to hold the government of Madhya Pradesh accountable for

continuously flouting laws and policies concerning rehabilitation of dam-affected families. Confident of pursuing dam building while abdicating its responsibility toward affected people, the government has paid little heed to the Maan Dam protestors even as the hunger strike enters its fourth week. As Bondri Bai of the Maan-affected village of Khanpura said: "How long will the massacre of tribals go on in this manner? If the government is not prepared to give us land for resettlement with respect, it might as well poison and kill us." ■

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can only include those that have pertained in recorded historic time, which is very short. They ignore most details of the system, and they are valued through flawed cost-benefit analyses, which measure only the simplest components, not necessarily the most important. Often these are just the actual purchase and construction costs balanced against the commercial value of the water retained. There are no guarantees of efficient use. The approach, compared with that which produced natural systems, is crude and unsophisticated.

The consequences of such schemes are often manifestly obvious and widely documented. Not for nothing has there been and still is world-wide protest about the impacts of large dams and channelized rivers. The damage that has been done by insensitive economics and the engineering it engenders is considerable.

Environmental Flows

The concept of environmental flows originated from a realization of these problems and was an attempt to mitigate the damage caused by major engineering projects. They should be regarded as a good use of the water in maintaining natural systems that offer great benefits to society in general. The language of documents concerned with the concept, however, is not encouraging. The hidden agenda appears to be that such flows pander to idealists, and are a waste of water that could be used for profitable agriculture or power generation.

Environmental flows are typically begrudged at a few percent of the natural flow, often as low as 5-10%. Where even very conservative estimates have been made of ecological needs – for example in the rivers flowing into the Kruger National Park in South Africa – these have been of the order of 25% of the mean flow and have considered only dry season in-channel needs

and not those of the floodplain. The real needs must be much greater than this.

Water is a currency. It is used and recycled, sometimes taken out of circulation then returned through the water cycle to the land and its freshwater systems. It represents a capital asset, on which profits, conventional and latent, are realized. Businesses running on conventional currency might expect to realise 5-10% in the long term on their capital if they are to survive. The expectation that river systems should be expected to realize 90-95% on theirs then begins to look wildly unrealistic, even if the numbers are imprecise. A business behaving in this way will not survive, nor can river systems managed in this way.

Aldo Leopold

Perhaps there is a better way to learn from the lessons of rivers and those who have studied their intricate systems. Aldo Leopold (1887-1948), a US forester and reknowned ecologist, held that land had to be used by humans but that it had a right to be used wisely. The word sustainability had not been coined in the 1930s, but Leopold knew about it and understood it. Leopold was a pragmatist, but his balance of pragmatism gave as much emphasis to direct economic values as to latent economic values and those values that are not measurable by a crude cash economy.

Leopold understood the impacts of engineering schemes on rivers:

"Mechanized man, having rebuilt the landscape, is now rebuilding the waters. The sober citizen who would never submit his watch or his motor to amateur tamperings freely submits his lakes to drainings, fillings, dredgings, pollutions, stabilizations, mosquito control, algae control, swimmer's itch control, and the planting of any fish able to swim. So also with rivers. We constrict them with levees and dams, and then flush them with dredgings, channelizations, and the floods and silt of bad farming ... Thus men too

wise to tolerate hasty tinkering with our political constitution accept without a qualm the most radical amendments to our biotic constitution."

But he was a professional who understood the thinking of other professions:

"The engineer has respect for mechanical wisdom because he created it. He has disrespect for ecological wisdom, not because he is contemptuous of it, but because he is unaware of it. We have, in short, two professions whose responsibilities for land use overlap much, but whose respective zones of awareness overlap only a little."

To Leopold perhaps we can look for guidance. Leopold's advice to those who might wish to modify river systems would be to be conservative; to prove that the scheme will have no net negative effects, to respect all the users. He would caution that a feature – the full flow itself, an irregular flow pattern, a floodplain – should always be retained unless its loss can be proved to be immaterial or ultimately beneficial (unlikely in most cases). He would include all the costs of a scheme and weigh them against the benefits both of modification and also of retaining the undisturbed system. He would explain that sustainability means you can continue to indefinitely reap a benefit only if it is without deterioration of the resource. This is sustainable management.

Leopold would be in favor of restoration of many features of natural systems that have been lost – reconnection of floodplains, re-meandering, removal of weirs and dams. Many of the modifications and structures serve only sectional interests. We cannot afford to allow sectional interests to benefit at the expense of everyone else. And above all, Leopold would not be taking sides, except the side of wise use. ■

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blocked by the 600-foot-high Shasta Dam and by dams built for mining a century ago. Kier calls the Battle Creek restoration "the crown jewel of the CalFed program."

Heading South

Anadromous fish have fared even less well in southern California. When Ed Henke was growing up in Ventura in the 1930s, steelhead were still plentiful in the Ventura River. Each year, large runs of steelhead migrated up the river into Matilija Creek. But in the late 1940s, these steelhead were blocked from reaching vital spawning grounds when the Matilija Dam was built across the creek near the cities of Ojai and Ventura. Because of dams and other development which degraded and eliminated their habitat, steelhead have declined over 90% throughout California since the 1950s. In southern California, their numbers are down 99% since the early 1900s.

Henke has spent years documenting the effect of the Matilija Dam on the river's steelhead. He describes himself as a "long-time advocate for our self-perpetuating native indigenous cold-water aquatic resources." Henke's goal is to return steelhead to the river by removing the dam. In 1998 Henke released an analysis of the dam's impact on the river's ecosystem that helped lay the groundwork for what has become a nationally supported endeavor. Matilija Dam is now high on the list of dams that groups like California Trout, Friends of the River and American Rivers would like to see removed.

The Matilija Dam was built by Ventura County to control downstream flooding and provide water. Designed to retain over 7,000 acre-feet of water, the dam is now so silted that it holds less than 500 acre-feet of water, Henke explains. It traps sand that should flow downstream to naturally replenish the coastal beaches. It is estimated that the dam now impounds enough sand to extend all of Ventura County's beaches by 30 feet. The 198-foot-high dam was completed in 1948 without effective fish passage, and it has blocked access to upstream spawning grounds ever since.

When the dam was proposed in the late 1930s, some in the community expressed concern about the wisdom, safety and cost of such a project. Despite these questions, a bond issue was passed in 1945 to fund construction of the Matilija and Casitas Dams, part of the Ventura River Water Development Project. There has been concern about the stability of the dam's construction "since the day it was built," says Henke, as well as about what would happen to the narrow

canyon and to surrounding communities in case of an accident or flood.

Further complicating conditions for the Ventura River and its tributaries is the Robles Diversion Dam, completed in 1958 just 1.5 miles downstream from Matilija Creek. Its purpose is to divert water from the Ventura River – including water from the Matilija Dam impoundment – into a canal and the Casitas Reservoir. In so doing, it greatly reduces the amount of instream water, which steelhead need to migrate and spawn.

In 1997, southern California steelhead were listed under the Endangered Species Act. This focused attention on obstacles to their recovery like Matilija and Robles Diversion Dams, says Nick DiCroce, board member and chair of California Trout's conservation committee. He believes that a California Trout lawsuit – charging that unscreened diversions and low flows constituted a "take" of the ESA-listed steelhead – pushed the federal government to act. The water district responded to the suit by putting a fish passage plan into effect and initiating plans to remove silt impounded by the dam. Now the district is seriously reassessing the Matilija Dam.

Removing the dam from the narrow canyon will be an enormous undertaking, but local political officials and federal agencies agree that it should go. "It is important to keep the benefits of removing Matilija Dam in the forefront and not let the size of the project discourage us," Ventura County supervisor Kathy Long said in 1999. Estimates on the cost of removing the dam vary from \$20 million to almost 10 times that.

DiCroce is surprised at how quickly federal agencies responded to the notion of removing the dam. "I'm amazed at how quickly they've responded to Babbitt making this a priority," he says. Money for the first phase of assessing dam removal has been readily available, he says, and all agencies involved have been "wonderfully cooperative up to this point." But where the money will come from for the next phase of feasibility studies, let alone to actually remove the dam and restore the river, has yet to be determined. "We'd like to see it removed in our lifetimes," says DiCroce, alluding to the length of time these projects can take.

Head Dam-Buster

Because he has been so influential in setting at least part of the national agenda for river restoration and dam removal, I wanted to speak with Secretary Babbitt*. I catch up with him one morning on the "Dam Busters Tour," and ask him what first sparked his interest in dam removal.

"What got me thinking about it," says Babbitt, "was a long time ago, close to 20 years ago, on a dory boat trip through the Grand Canyon. The river started to disappear as we got to Tanner Rapid. So we spent a day at Tanner Creek waiting for the Colorado to be reinstated by the operators at Glen Canyon. I realized then that the river was being manipulated like a giant toilet bowl.

"After that I really started noticing things: the dead riparian vegetation along the high-water mark. I thought about the decline of the native fish and the change in the beaches," he recalls.

I ask him how tied to politics and policies are current river restoration and dam removal efforts. We have spent so much of our history in this country fragmenting our watersheds, how hard does he think it would be to begin to shift our focus and understanding to thinking about rivers on their own time frame?

"This movement is on its way," Babbitt assures me. "It's no longer dependent on the policies of federal agencies. It's rooted in communities all over the country."

As I learned more about California's engineered rivers, with their cross-basin diversions shunting mountain stream water into deserts and churning salmon streams through turbines to power countless computer-filled offices and homes and to provide drinking water for the growing millions of Californians, I began to think of the system as a hydrologic push-me-pull-you. Or, as William Kier said, summing up the state's dam removal efforts, "We'd like to rearrange the plumbing and show you how it will work better when we're done."

A number of non-federally owned hydropower dams in California will come up for license renewal within the next decade. That some of California's salmon streams are beginning to be freed of unnecessary dams is an enormously hopeful sign. Still, California must have the courage to look at the entirety of its fragmented watersheds and make difficult decisions about truly putting some of those pieces back together again. Solutions should be sought that will not repair one basin or ecological function at the expense of another, and it seems more important than ever to begin addressing issues of carrying capacity and the limits to growth. Thinking critically about what we have done to California's rivers with dams is part of that process. ■

**Bruce Babbitt left government when the Bush administration came on board. The new administration has made clear it does not support major dam decommissioning.*