

Demanding Respect for Rivers and Rights on the Day of Action

by Jeff Vreeland

Two decades ago, Brazil launched the “Brazilian Day of Struggle Against Dams.” That commitment to rivers lives on through the International Day of Action Against Dams, and for Rivers, Water, and Life held on March 14 every year. This year, the day was celebrated with nearly 100 events in more than 34 countries. A few highlights:

As usual, Brazil made a strong statement, hosting actions that spanned four days, and brought together more than 1,300 dam-affected people to participate in panel discussions, ceremonies and marches. The majority of Brazil's actions were hosted by Movimento dos Antigos por Barragens (Dam-Affected Peoples’ Movement, or MAB).

The Fourth Annual World Water Forum in Mexico City brought together thousands of people from all over the world, and prompted local and visiting activists to launch a massive march on March 16 to raise awareness about major water-related issues, including large dams, water privatization and inequities in water services. The march included a large contingent of people

who would be affected by the La Parota Dam near Acapulco.

Spain was another powerful force in this year’s Day of Action, with actions taking place throughout the country, including Huesca, Madrid, and Saragosse. Currently, at least six large dams are either proposed or under construction in Spain.

Safe Water Africa convened a Million Man March Against River Pollution in Abuja and at the Nigerian House of Assembly. Participants wore vests with the message “Safe Rivers for ALL” to raise awareness about the region's alarming rate of river pollution.

A large march in Lesotho raised awareness about future phases of the Lesotho



Protesters gather at the confluence of Chile's Nef and Baker rivers, site of a proposed dam. The demonstration was organized by the Coalition of Citizens for the Aysén Reserve of Life and the Group of Defenders of the Spirit of Patagonia.

Highlands Water Project. As many as 5,000 people participated, including many from dam-affected communities. ■

For more information, see <http://www.irn.org/dayofaction/>

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Bearing Witness to the Epic Struggle for India's Narmada River

by Ann Kathrin Schneider

“We think the Sardar Sarovar Projects as they stand are flawed, that resettlement and rehabilitation of all those displaced by the Projects is not possible under prevailing circumstances ...”

Independent Review of the SSP by the World Bank sponsored Morse Commission (1992)

The protest site of the Narmada Bachao Andolan (NBA) in central Delhi felt like a stage. Cameras and microphones were everywhere.

Television crews and stylish journalists were lingering outside the site, waiting for Something to Happen. An ordinary street fence and a couple of thin ropes created a dividing line between the media and the protesters. Every day, Indian VIPs – including author Arundhati Roy, Bollywood stars, and United Nations Human Rights experts – crossed the line and declared their solidarity with the struggle.

The NBA was protesting a proposed increase in the height of the Sardar Sarovar Dam. In March this year, the Narmada Control Authority had given the go-ahead for construction of the biggest dam in the Narmada valley to resume. The planned raising of the dam height from 110 to 122 meters will submerge the land of another 35,000 families in the Narmada valley, adding to the tens of thousands who have already suffered from this huge project. This decision violates an Indian Supreme Court decision



NBA activists sing protest songs at the protest site in Delhi.

from the year 2000, stipulating that any further increase in the height of the Sardar Sarovar Dam must be preceded by the implementation of resettlement and rehabilitation measures.

For more than two weeks in April 2006, the NBA protest was front-page news in India. For those two weeks, it appeared that the plight of 35,000 families who would be displaced could not be ignored by the political elite and the public at large. It appeared as if the government would no longer be in a position to sacrifice a “couple of families” for the “greater common good.”

The protesters, protected against the strong Delhi sun by a rainbow of colorful swaths of fabric strung overhead, seemed exhausted and alert at the same time. They were not a homogenous group, but one could feel the strong connection between them. Some were affected people who arrived at the protest site in groups, dressed

in cheap, colourful saris and carrying small bags containing all their travel gear for the multiple-day journey from distant villages to Delhi. Other protesters looked like left-wing, middle-class urbanites, dressed in a modern blend of Western and Indian clothes, always on their mobile phones and constantly in motion. Absent was Medha Patkar, the long-time leader of the NBA. A big sign in the middle of the protest site reminded everyone of the number of days she had been on fast already. On an indefinite hunger strike for more than two weeks, she had been forcibly taken to hospital by the police a couple of days before. The Indian government cannot afford a martyr in this struggle over development.

Even at the current dam height, adequate rehabilitation of the affected people exists on paper only. The resettlement process has been characterized by corrup-

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Lessons Not Learned

There is an underlying theme that links many of the articles in this issue: the problems they describe could be avoided by taking into account the lessons of the World Commission on Dams (WCD).

Take, for example, the efforts to limit public participation at a recent African hydropower meeting (page 3). The discussion on developing Africa's hydropower potential should be subject to the kind of transparent, inclusive planning path called for by the WCD. The WCD report states: "To improve development outcomes in the future, we need to look at proposed water and energy development projects in a setting that reflects full knowledge and understanding of the benefits and impacts of large dam projects and alternative options. It means that we have to bring new voices, perspectives and criteria into decision-making, and we need to develop a new approach that will build consensus around the decisions reached." Ignoring this fundamental concept could lead to a rocky energy-development path in a part of the world that cannot afford to stumble. Fortunately, the African Rivers Network is stepping into the breach and working to increase civil society's understanding of the issues surrounding large dams, and to press for proper participation in decision-making processes.

India's Narmada valley saga predates the WCD, but the latest concerns there as described in our cover story – a plan to raise the dam's height would drown the lands and hopes of an additional 35,000 people, before past resettlement problems are resolved – offered an opportunity to take a new direction. Instead, the incident reveals a stubborn adherence to staying the course even after the course has been shown to be unjust and inhumane. Those behind the Sardar Sarovar Project continue to ignore the WCD's call for a "recognition of rights and assessment of risks" to ensure that people who lose the most to development projects are the first to gain from its benefits. The WCD report states: "Large dams have increasingly been characterized by bitter conflict and deep feelings of resentment and injustice ... Trust and confidence in the capacity and commitment to meet obligations must be restored if new projects are to create more positive development outcomes and avoid the level of conflict that has occurred in the past." The Narmada Valley is home to one of the longest-running dam conflicts in the world, and yet the Indian authorities seem unable or unwilling to address its root causes, and determined to reject proposals laid out by the WCD that could improve the situation.

The troubling proposal for dozens of new dams in the Amazon (page 8) represents the antithesis to the WCD's strategic priority on "sustaining rivers and livelihoods." This strategy calls for "a basin-wide understanding of the ecosystem's functions, values and requirements, and how community livelihoods depend on and influence them before decisions on development options are made." In addition to a thorough evaluation of environmental costs, the WCD also calls for public processes for determining energy and water needs. Brazil's unsustainable growth in energy-intensive metals-processing industries that is now fueling plans for dams in Amazonia has not been analyzed for its impacts on the basin's ecosystems and cultures. And such developments are proceeding without "an open and decentralized planning process [that] provides opportunities for public scrutiny ... to assess the validity of the needs assessment." Brazil's dam critics have their work cut out for them to stop this onslaught of new projects.

Like Brazil and India, China is a major dam-building nation that has refused to pursue the democratic principals and open planning processes put forth by the WCD. Our article on damming the Min River (page 10) reveals a nation intent on its pursuit of electricity at almost any cost. China's rivers and the many ecosystem values they bring to human culture are being sacrificed for hydropower to fuel the world's fastest-growing economy – which also happens to be one of the world's most energy-intensive economies. The WCD emphasizes the need to prioritize improving the efficiency of existing systems before building new energy supply. China's inefficient use of energy makes it a perfect candidate for widespread "demand-side management" measures and development of its impressive renewable energy potential. Such a path could preserve at least some of China's rivers from over-exploitation to the point of death.

In all of these cases, civil society is working to provide a much-needed reality check on the most excessive dam plans, and to bring transparency and democratic principals to the planning process. Dinosaur dam-building governments that think they can stop this wave with closed doors and suppression of dissent are sadly mistaken.

Lori Pottinger

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Africa Hosts Hydropower Love-In

by Terri Hathaway

“**V**iva Inga! Viva Inga!” The words resounded through the hall filled with African energy and water ministers, and the crowd cheered with excitement. It was perhaps a predictable ending to Africa’s first major hydropower conference – an event sponsored and heavily influenced by the dam-lobby group, the International Hydropower Association. The conference’s main premise was that large-scale hydro – epitomized by the grandiose Grand Inga project (whose capacity is said to be as much as 40,000 MW) – is the answer to Africa’s woes. Many delegates seemed eager to swallow this candy-coated message.

For three days in March, dam builders and financiers schmoozed with a few hundred government representatives at the invitation-only African Ministerial Conference on Hydropower and Sustainable Development. Some UN agencies and river basin organizations were also mixed into the crowd. A handful of approved NGOs were tucked into the margins of the event.

There might have been no more than a token civil society presence if it were not for the sustained pressure from the African Rivers Network (ARN), a network of NGOs from more than 20 African countries working on water and energy issues. ARN’s lobbying resulted in more than 20 last-minute invitations for those from dam-affected communities and NGOs.



Photo: Terri Hathaway

African Rivers Network members at the ministerial meeting on hydropower.

Shutting out Civil Society

The desire to keep the conference free of civil society voices that may be critical of large dams was most clear from behind the scenes. Only a tiny handful of carefully pre-selected NGOs were originally invited. Significant foot-dragging from the primary host, South Africa’s Department of Minerals and Energy (DME) – emphatically supported by the Inter-

national Hydropower Association – resulted in a massive delay in allowing broader NGO and affected community participation.

For months, ARN sought an opportunity to participate in the meeting. They wrote letters and met with government bodies in an attempt to secure invitations. At first, a stingy offer of 10 invitations – five NGOs

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Viva Wind Power! Viva Solar!

Africa already has a high proportion of countries that are heavily dependent on hydropower for most of their electricity – an economically risky approach. Large hydro also does not address the sticky problem of distribution in grid-poor Africa. Below is a sampling of renewable energy technologies which could help Africa diversify its energy portfolio in coming years. Most renewable technologies can service industry and large-scale grid systems as well as provide decentralized power for off-grid communities (a particular advantage in Africa, where only a small fraction of society is linked to national grids).

Geothermal: The Rift Valley in east Africa has an estimated geothermal energy potential of 9,000MW.

Wind: Some 15 countries have “excellent windpower resources” according to a 2004 study prepared for the African Development Bank. Ghana has an estimated 2,000MW of wind potential, while South Africa has about 3,000MW, to name just two.

Solar PV: Total solar potential across southern Africa amounts to some 360 GW, according to South Africa’s energy ministry.

Solar Thermal: A 2005 Greenpeace report on this high-output solar technology reports that Africa has about 4,000 MW of potential in concentrated-solar thermal power.

Bagasse: Co-generation of sugarcane waste (bagasse) is a process that involves the use of sugarcane waste to cogenerate heat and electricity at high efficiency in sugar mills. All sugarcane-producing nations are candidates. East and Southern Africa have more than 25,000 gigawatt-hours of potential from this type of energy, which could account for about 12% of the region’s electricity generation, according to AFRPREN, an energy think-tank based in Nairobi. Sudan could generate 40% of its electricity needs from bagasse.

Ocean Power: Using the natural force of tides to turn underwater turbines, this “wave of the future” has enormous potential, and pilot projects are taking off around the globe, including Cape Town (700 MW potential). One estimate shows South Africa’s coastline alone has 56,000MW of ocean-power potential.

A Brief History of River Protection in Europe

by Ulrich Eichelmann

Europe is a densely populated continent. At 10.5 million square kilometers (6.5 million square miles), it is just a bit bigger than the US, but has almost three times as many people. So human pressure on rivers and other ecosystems is generally pretty high on the “old continent.”

The biggest problem facing most European rivers is not water quality, but destructive changes to their physical structure. Most rivers have been regulated, dammed and diverted to within an inch of their lives. Nine out of ten of Europe’s rivers are fragmented by large dams.

A representative example is Austria. Austria has about 100,000 kilometers of rivers. An official government report states that 80% of Austrian rivers have high water quality, but 80% are in a pretty bad condition from structural changes caused by dams and other forms of regulation. WWF Austria found out that since 1950, about 30,000 kilometers of rivers have been regulated or dammed and 400,000 hectares of natural floodplains have been cut off from their rivers. The Danube has lost about 92% of its former floodplain and has been turned into a chain of dams. In its first 1,000 kilometers – from the source in the German Black forest to the Austrian-Slovakian border – there are 58 dams and only three free-flowing stretches.

The result was more space for agriculture, infrastructure, housing, etc., but the price is high: Austria has seen about 1,000 river-related species become endangered or extinct, the groundwater table is declining, and the flood risk is increasing tremendously. The nation was plagued by so-called 100 Year Floods in 1999, 2002, 2005 and 2006.

The situation is similar in other parts of Europe: the Rhine, Elbe, Tiza have seen more than 80% of their floodplains destroyed, and flood risk is increasing. Severe floods like those most recently on the Danube are an almost annual occurrence in Europe. From 1998-2002 Europe suffered about 100 damaging floods, causing damage to some 700 facilities, the displacement of half a million people and at least US\$30 billion of insured economic losses.

European jewels

Of course, there are still some very beautiful, healthy rivers left in Europe. There is the Drava in Croatia and Hungary with its gravel islands and steep banks, which provide breeding sites for more than 14,000 sand martins. Or the “Queen of the Alps,” the Tagliamento in Italy. This wild river is up to 2.5 km wide with vast gravel banks, clear water and beautiful surroundings. Or the Polish Vistula, where NGOs quite recently stopped plans for a new dam. Although water quality is still quite bad, the structure

of the riverbed is excellent. But my personal favorite in Europe is the Allier/Loire system in France. In the middle of Europe, it still has its intact dynamics and most of the original biodiversity, including Atlantic salmon, thousands of breeding terns, storks, ospreys, beaver, otter...

And last but not least is the Danube, Europe’s second longest river (the Volga is number one). Besides the upper part of this stream, where only short “oases” of its former grandeur remain, the middle and the lower parts are in extraordinary condition. For example, the inland delta of “kopacki rit” in Croatia, where the Drava flows into the Danube, or the nearly unregulated border stretch between Romania and Bulgaria with hundreds of islands, where scientists recently found the spawning grounds of large sturgeons – for the first time ever! The most prominent is the Delta, one of the world’s most important wetlands. The biodiversity is astonishing: more than 100 fish species live here as well as some 300 bird species. About 70% of the world’s population of white pelicans lives in this delta, together with more than half of the world’s population of pygmy cormorants.

Needless to say, nearly all these beautiful rivers or river stretches face new threats, dam projects, dredging, regulation and so on. The Danube, for example, could be deepened in order to improve inland navigation. More than 1,000 kilometers are qualified by the European Union as “bottlenecks,” or stretches that are too shallow for large barges and vessels. Unfortunately, those are exactly the stretches that hold the highest ecological value. The WWF and other partner NGOs are fighting these plans in the Danube countries and in Brussels, the capital of the European Union. And, of course, hydropower projects are still an almost-everywhere threat. While most of western Europe is pretty full of dams, the new market for the dam lobby is farther east, especially the Balkan rivers (with their rich mix of endemic species) and Turkey (with its cultural-heritage treasures).

Environmentalists Target Rivers

The development of the European environmental movement was strongly connected to river conflicts in the past. It started in December 1984 in the little Austrian village of Hainburg, 45 kilometers downstream of

continued opposite



Photo: Toni Vorauer/WWF Austria

Austria’s Lech River remains undammed, but activists have had to fight to prevent 13 dams from being built on the mainstem and its tributaries.

Vienna. The Austrian government wanted to build another large dam in the region, but thousands of demonstrators occupied the construction site and stopped work on the project. After some battles with the police, public opinion turned against this project and the government had to cancel its plans. Twelve years later, this area became a National Park. Other dam conflicts came up in that era, including Nagymaros on the Danube in Hungary (1989), Serre de la Fare on the Loire in France (1989-1994), and quite recently the “Plan des Aguas” in Spain (2002-04), where the government wanted to construct more than 100 dams and divert water from the Ebro to irrigate farmland and golf courses in the dry south. All of these dam projects failed mostly because of the strong professional and emotional work of people and NGOs not afraid to get into a conflict.

The result of these conflicts was more than just the direct environmental effects: there was also an enormous change in public awareness about river ecosystems and an increased sensitivity against dams. More and more people began working on environmental issues. NGOs and Green parties were founded or grew bigger, and “green jobs” were created. And legislation was introduced to protect rivers and nature.

Legal Protection for Europe’s Rivers

One effect of the various environmental conflicts in the past 20 years was the modification of European legislation. In the European Union we have quite strong laws to protect nature. First of all there is a Union-wide network of protected sites, called Natura 2000. Countries must establish Natura 2000 sites. In these areas ecosystem deterioration is forbidden and sustainable management is mandated.

Another very important law is the Water Framework Directive (WFD). According to this law, environmental deterioration is for-

bidden and by 2027 (at the latest) all rivers must be in a good chemical and ecological state. And people have the right to participate in these processes.

One of the effects of Natura 2000 and the WFD is a new restoration movement. Since 1992 about 800 project sites are being restored, at a total cost of \$1.66 billion. Levees and dykes are being removed, dams are getting new fish passes, etc. Although this seems very promising, projects are often small and cost-intensive and far more rivers are still being destroyed than restored. That is against the spirit of modern water laws, but it is the reality.

Public participation

Another harsh reality is the somewhat false promise of participation. Public participation by law is, of course, a great success and it seemed at one time that it could mark the end of the most environmentally damaging projects being built in Europe. But the reality is different. Governments and project managers interpret “participation” to be more like “involvement,” and that is a big difference. While real participation does have the possibility to influence decisions about projects, including the no-project-option, “involvement” means you will be informed, but you don’t necessarily have any real influence. This weakens the position of NGOs. If they spend all of their time in workshops, they cannot spend their energy in opposing



White pelican colony in the Danube delta.

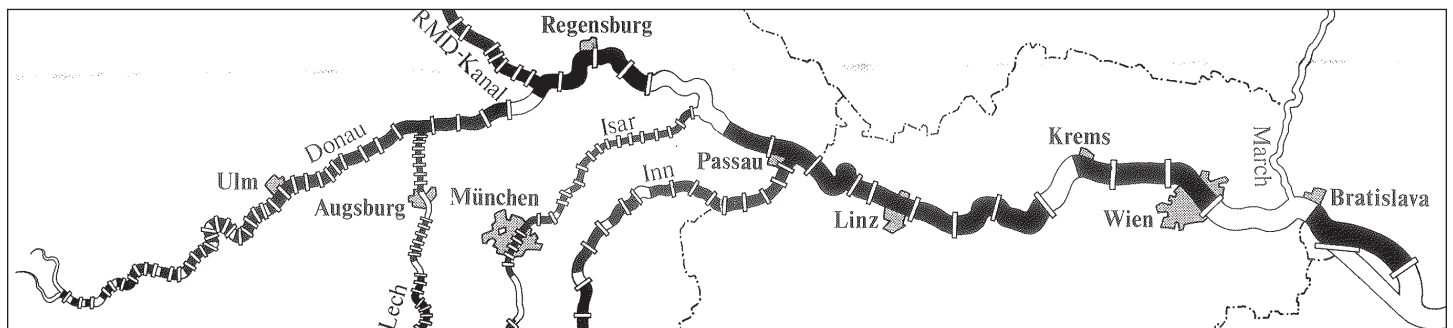
Photo: Tomi Vorauer/WWF Austria

bad projects. The “participation trap” is a very common term in Europe’s NGO scene.

In the last 20 years a lot has been achieved in terms of river protection, mostly through major conflicts and the constant work of committed people and NGOs. Some major dam projects were stopped, the legal situation has been improved, and some very popular and beautiful river stretches are now protected by law. Nevertheless, pressure on remaining rivers in Europe is still very high. Dam companies, governments and other lobby groups still want to build dams and regulate these lifelines. NGOs somehow have to find the right way to oppose these projects. From my point of view there will be more conflicts if we are to stop any further degradation. Conflicts have proven to be a very important catalyst for river protection and for European civil society in general. They are like little revolutions in an otherwise slow evolutionary process. ■

The author is with WWF Austria, where he has worked on river issues for the past 16 years.

The Danube: 58 Dams and just 3 Free-Flowing Stretches in 1,000 km



Hetch Hetchy: “A Dam Dilemma”

Weighing the Complexities of the Biggest Dam Removal Campaign of them All

The O’Shaughnessy Dam in Yosemite’s Hetch Hetchy Valley should have never been built. John Muir, famed wilderness-tramping founder of the Sierra Club, was reportedly so distraught when the huge dam was approved for the Tuolumne River in Yosemite National Park that he died of a broken heart within the year. Today, his words provide a rallying cry for environmental activists who wish to restore this “second Yosemite Valley” to its Muir-era splendor by removing the 131-meter-high structure.

The 1906 San Francisco earthquake and fire helped turn the tide against Muir and his band of Sierra Club activists. San Francisco’s unstable water supply was one factor in the spread of devastating fires that followed the earthquake, and city officials were able to successfully lobby for passage of the controversial 1913 Raker Act, which authorized San Francisco to build the dam. Just three years later, Congress amended the National Park Act to allow hydroelectric projects within national parks.

Completed in 1923, the dam flooded Hetch Hetchy Valley, a smaller version of Yosemite Valley – California’s famed glacier-carved, waterfall-strewn granite wilderness that draws hordes of tourists each year. The dam supplies water to 2.4 million people in the San Francisco area, and hydropower to San Francisco, but also drowned the lovely valley under 300 feet of water.

**“Dam Hetch Hetchy! As well
dam for water-tanks the
people’s cathedrals and
churches, for no holier temple
has ever been consecrated by
the heart of man.”**

John Muir

Today, a number of groups are lobbying to decommission the dam and restore the valley. The effort first gained prominence in 1987, when then-President Ronald Reagan’s Secretary of the Interior, Donald Hodel, made a serious proposal to remove the reservoir (Hodel remains outspoken on the issue to this day).

Then in 2003, a study by a graduate student revealed that the dam could be removed with virtually no loss of water for the San Francisco area. The study inspired Tom Philp, an editor at the *Sacramento Bee*, to advocate for restoration of Hetch Hetchy in a series of editorials that later won a Pulitzer Prize. More recently, Governor Arnold Schwarzenegger ordered the state’s Resources Agency to review the issue, at a time when the state is considering spending \$4 billion to overhaul the dam’s antiquated water-delivery system.

Proponents of the dam removal have commissioned a rough plan showing costs of replacing Hetch Hetchy’s water and energy, and are calling for more detailed cost estimates as part of a wider feasibility study for the project.

Why Hetch Hetchy?

The prime rationale for the restoration is to regain for public enjoyment a unique wilderness, which John Muir called “one of nature’s rarest and most precious mountain temples.”

“The public value of the restored valley would be much greater than using it as a water tank,” said the *Bee*’s Tom Philp at a public debate on Hetch Hetchy, held in San Francisco last November.

But others have noted that transferring some of Yosemite Valley’s masses of tourists to Hetch Hetchy could defeat the purpose. “Every year more than 3 million people squeeze themselves into [Yosemite Valley’s] 7 square miles,” notes San Francisco Chronicle travel editor John Flinn. “Hetch Hetchy, by contrast, is filled only with water. And silence.”

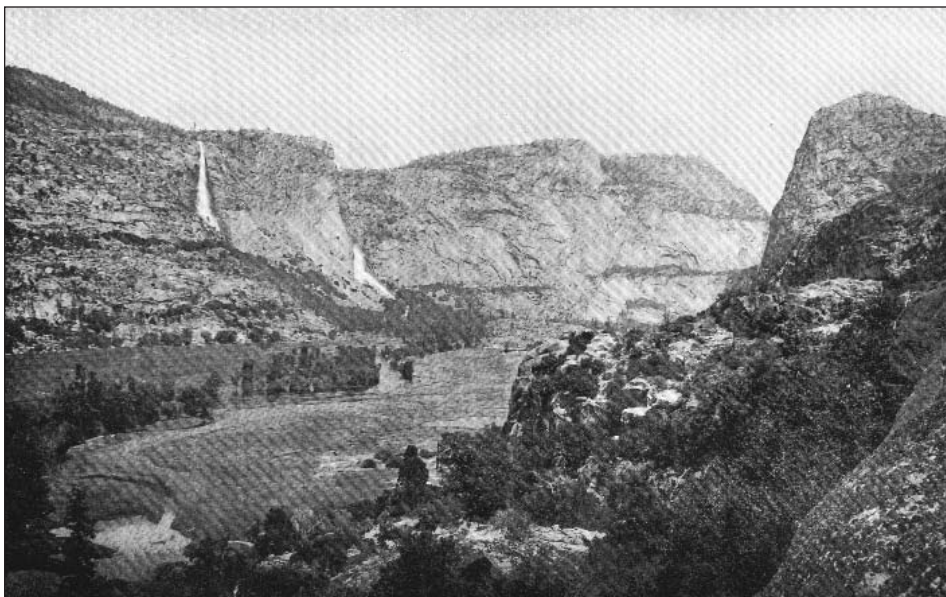
The broader environmental values that would be regained with this dam removal are also fairly localized, because downstream dams would remain (and in some cases, reservoirs could even be enlarged to accommodate Hetch Hetchy’s lost water storage). Fisheries and downstream wetlands would generally not be improved by this effort.

But the biggest objections to the proposal are the cost of the restoration, and loss of services to those who use the dam’s water and power.

Environmental Defense says they estimate it would cost \$1-2 billion to restore the valley and services to San Francisco, but they acknowledge that many factors are missing from this calculation, including the cost of dismantling the dam. The San Francisco Public Utility Commission’s estimate is around \$9 billion.

Environmental Defense says there is enough room in eight downstream reservoirs to accommodate the city’s water needs. City officials are doubtful. At the November public debate, an official of a Central Valley irrigation district said that San Francisco does not have the needed water rights to use downstream dams for its water storage. Dam-removal proponents say another downstream reservoir could be enlarged. Susan Leal, general manager of the San Francisco

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Hetch Hetchy Valley from Surprise Point, 1908.

Photo: Isaiah West Taber/Sierra Club

Remove or Repair?

Dam Safety Concerns Provide Window of Opportunity for River Restoration

by Elizabeth Brink

In the aftermath of catastrophic flooding in New Orleans from Hurricane Katrina and extreme storm events in the Northeastern United States that brought several dams to the breaking point, renewed attention has been focused on the growing crisis of dam safety in the US. River-protection groups would like to turn this crisis into an opportunity for river restoration through the removal of obsolete and unsafe dams.

These events brought attention to the need for stronger state and federal dam safety policies and programs, and the poor state of repair of many of the nation's dams and levees. State dam safety officials have identified more than 3,500 unsafe or deficient dams nationwide, and many dam owners lack the funds required to bring the structures into compliance with state regulations.

This year's extreme weather had impacts on dams and levees in a number of US states. In New Jersey, one low-hazard dam failed and a significant-hazard dam was overtopped but did not fail. Downstream residents were evacuated. Several coastal dams along the Jersey shore reached record levels, which resulted in extensive flooding in upstream communities. Similarly in New Hampshire, flooding from the storm overtopped and damaged several dams.

Then on March 14 a dam break in Kauai released nearly 500 million gallons of water, claiming seven lives and raising fears about the safety of dozens of similar privately owned dams across Hawaii. The century-old earthen dam collapsed after days of heavy rain swelled the Kaloko Reservoir behind it. The water swept away houses on two multi-million-dollar properties in the rugged hills of the island, cutting a three-mile path of destruction to the sea. Nearly all of Hawaii's dams were built early in the past century before federal or state standards existed.

In October 2005, the American Society of Civil Engineers had identified at least 22 dams in the Hawaiian Islands with deficiencies that raised safety concerns. The society has been monitoring 130 dams in Hawaii. The dam on the Kaloko Reservoir was not on the list of dams rated "high-hazard" structures that could cause deaths and significant damage if they failed.

Restoration Opportunity

In mid-March, representatives from New York, Utah and Hawaii introduced legislation



Photo: NOAA

The West Henniker Dam in New Hampshire was a public safety hazard until it was removed in 2004. The dam removal restored 15 miles of the Contoocook River to free-flowing conditions.

to reauthorize the National Dam Safety Program. The Dam Safety Act of 2006 would provide up to \$12.7 million a year for four years to assist states in improving their dam safety programs. Hawaiian senators also introduced the Dam Rehabilitation and Repair Act of 2006, which would provide up to \$350 million over four years to repair and upgrade unsafe dams in the United States.

While the lawmakers and engineering groups are pressing for renewed attention to improving the condition of potentially dangerous dams throughout the US, conservationists and river managers are concerned that proposed legislation will force repair and rehabilitation of dams that should be removed.

Incorporating dam removal into effective dam safety programs is well-established in states like Wisconsin and Pennsylvania, and is gaining ground elsewhere, such as Ohio and Minnesota. However, states without migrating fish species tend to face greater obstacles to acceptance and funding for dam removal.

An examination of small dams removed through consensus process in Wisconsin showed that dam removal typically cost two to five times less than the estimated safety repair costs. By reducing costs at obsolete dams, funds under this bill could be stretched to address safety threats at even more dams.

Across the country, hundreds of thousands of aging, small dams that once served

to provide power for grist mills, sawmills and iron ore operations still interrupt the flow of streams. Some continue to provide recreational and commercial uses, but many pose a safety threat, make the water overly warm for aquatic life, impede fish attempting to migrate upstream, and can be a nuisance for canoeists.

A large obstacle to their removal is cost, with some owners being quoted seven-figure price tags for demolition of small dams. This is where private/public efforts enter the picture. Groups such as Trout Unlimited and American Rivers are providing engineering expertise to significantly lower removal costs, while agencies such as the Pennsylvania Fish and Boat Commission and US EPA offer similar help and sometimes have grant money available.

Though responsible dam decommissioning can have a large price tag, it can add up to long-term savings through the removal of insurance liability and maintenance and repair costs, enhanced ecological and property values, and even in reduced flood damage from the restoration of wetlands and floodplains.

Today, the nation has an excellent opportunity to evaluate aging, unsafe dams as candidates for decommissioning and river restoration. We must not let this window of opportunity for healthier rivers and ecosystems close. ■

Grand Dam Plans for the Amazon

Schemes for Dozens of Dams on Tributaries Would Choke River, Stifle Opposition

by Oswaldo Sevá

The Amazon River, whose tributaries are formed in the Peruvian Andes, flows over a sedimentary flood plain hundreds of miles wide, with thousands of lagoons and seasonally flooded lakes – it is a river that is impossible to dam. However, the principal tributaries of the Amazon in its southern basin – the Madeira, Tapajós, Xingu, and to the east the Araguaia and Tocantins – descend steeply from crystalline rocks into the Amazon basin. From these heights rush enormous volumes of water, reaching volumes greater than 30,000 cubic meters of water per second. These numbers arouse the megalomaniac dreams of international dam builders and their Brazilian partners.

The Lula government, which took office in January 2003, has unfortunately also become stricken with this delirium, and damming the rivers of Amazonia has become a banner that will be waved widely by political candidates in this year's election campaign. Harping on the increasing threat of energy blackouts by the year 2010 if large dams in the Amazon are delayed, the level of debate about Brazil's energy policy has fallen to a new low. The Lula government now appears more interested in hitting citizens in their guts with scare tactics about energy shortages, rather than in capturing their hearts and minds to advance the country toward a sustainable energy future.

As a response to this looming threat, 84 large dams with a total generating capacity of more than 30,000 MW are planned for construction – including 23 in the Amazon basin. Half of this energy generation would be provided by two huge dam complexes in the Amazon. Dozens of other dams being planned for the rainforest appear in the government's new energy plan for the year 2030, which will be released in coming months. **[Editor's Note: This rash of dams would dangerously increase Brazil's excessive dependence on hydropower, which already accounts for 85.4% of the nation's electricity. Drought crippled the nation's electricity grids in 2001.]**

Steamrolling the Opposition

A dangerous symptom of this dam fever is a rash of bold proposals to preemptively steamroll any opposition that could arise. Mines and Energy Minister Silas Rondeau, a Lula appointee, is introducing a bill in congress which would establish "energy reserves" – a new form of protected area – in the Amazon. These reserves would take precedence over any proposals to create conservation units or indigenous reserves, in the interest of avoiding conflicts that could restrict the dam-ability of Amazonian rapids. A Brazilian Congressman from the Xingu region has introduced a bill that would abolish constitutional guarantees of indigenous people to the exclusive use of natural resources in their territories, including their rivers. This constitutional right is viewed as an obstacle to the expansion of Brazil's hydroelectric network in the Amazon. Under Ribeiro's measure, indigenous peoples would receive a royalty when their territories are flooded by dams.

The hydroelectric potential of a dozen major Amazonian rivers is now being re-evaluated by the government, which insists dam projects will proceed with environmental safeguards. But environmentalists say that these "integrated analyses of river basins" are only a green veneer masking a plan to destroy the cultural and biodiversity of the Amazon.

First and foremost in the sights of the dam industry have been the twin rivers Araguaia and Tocantins, which flow from Brazil's central plateau, descending 1,000 meters to the delta of the Amazon. The Araguaia still flows freely, and two proposals to dam it have been rejected by the Brazilian environmental protection agency, Ibama. It is generally recognized that dams on the Araguaia, which has a wide floodplain, would have serious environmental consequences. However, plans for damming the Araguaia are in the new energy plan.

Dammed and Damned Again

The Tocantins has already been dammed at five sites – the first in its lower reaches was Tucuruí, built at the Itaboca rapids. Tucuruí



Activists take to the Madeira, the Amazon's largest tributary, in a

began operating in 1984, but its capacity is only now being expanded to reach its original design level of 8,000 MW. Some 2,860 sq. km. of the rainforest was flooded by Tucuruí, affecting more than 40,000 people.

Upstream are Lajeado (850 MW) and Peixe Angical (450 MW), whose reservoir is now being filled, as well as Serra da Mesa (1,275 MW), which began operating in 1998. One of the most controversial projects was Cana Brava (450 MW), which was financed by the Inter-American Development Bank, and is operated by Tractebel (a subsidiary of the French company Suez).

The riverbank lands of the Tocantins are the site of some of the longest-lasting land conflicts in Brazil, and conflicts over dams being planned have accentuated these conflicts. São Salvador Dam is currently under construction, Estreito Dam is awaiting a construction license, and in all 80 dams are planned for the basin, including 33 large hydro projects, and 47 smaller dams.

As in many countries, Brazil's dam industry defies human rights laws and democratic principles, destroys fertile farm lands, and inundates river rapids and waterfalls which are truly natural monuments which should be conserved. To further compound the controversy over new dams in Brazil is the growing harassment of leaders of Brazil's Movement of Dam-Affected People (MAB). MAB leaders have been beaten by the police and arrested as a measure to pre-empt protests against dams. By building strong ties with local political leaders and conservative inter-



protest against planned dams. Photo: Glenn Switkes

Controversy Mounts on Plans to Dam Largest Amazon Tributary

by Glenn Switkes

Despite assertions by Brazilian energy planners that damming the largest tributary of the Amazon is essential to avert blackouts, the controversial Santo Antonio and Jirau hydroelectric dams on the Madeira River are attracting criticism from environmentalists, those who would be affected by the project, and even energy investors. Project proponents Furnas, a state electric company, and Odebrecht, a Brazilian private construction company, have portrayed the two-dam project as nearly without environmental impacts, and say each would have a much smaller reservoir than other dams with a similar generating capacity.

But opponents of the dams charge that this sugar-coating of the project masks significant impacts around which many questions remain. At a recent meeting in Porto

Velho in May to discuss the Madeira projects, Jorge Molina Carpio, the former director of Bolivia's National Hydrological Institute, criticized official studies for the projects, and warned that flooding would extend into Bolivia. According to Molina, "The effects of the Jirau reservoir will extend far greater than the official studies indicate, and the area flooded by the dam will include the bi-national stretch upstream. This flooding should affect forests and populations in the Bolivia's Pando province." If verified, this means the Madeira dams would require the negotiation of international treaties between the two nations.

According to Molina, the muddy Madeira, if dammed, would deposit enormous quantities of sediments in the reservoir. The Madeira River is the principal source of sediments in

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ests in the countryside, dam builders create a parallel power structure based on promoting dams and violating the rights of dam-affected populations, helping limit the pace of Brazil's political recovery from 25 years of military dictatorship, which ended in 1985.

Following the dismantling of many of Brazil's state electric companies during the administration of Fernando Henrique Cardoso, the Lula government has emphasized a return to centralized state energy planning, and has halted the privatization process. Still, the building of large hydroelectric dams continues to be practically the only plan for strengthening Brazil's electrical energy security.

It appears that Amazonia's rivers face a tragic destiny. As electro-intensive mining and metals processing industries proliferate throughout the Amazon, the *barrageiros* (dam-building interests) are advancing on the world's last great rainforest, with a greedy plan to get their hands on huge amounts of electricity. It is a devil's bargain that could accelerate the destruction of Amazonia, and for which the planet will pay dearly. ■

Oswaldo Sevá is professor and researcher in Energy at the Mechanical Engineering Faculty at São Paulo State University, Unicamp. He coordinated the study "Tenotã Mõ: Alerts on the Consequences of Hydroelectric Dams on the Xingu River," published by IRN in 2005 (see <http://www.irn.org/programs/xingu/index.php?id=archive/TenotaMo.html>). This article was translated by Glenn Switkes.

Kayapó Say No to Xingu Dams

In a significant event which could further set back attempts to dam the Xingu River in the Brazilian Amazon, Kayapó leaders meeting in Piraçu, Mato Grosso, declared they would oppose the damming of the river. The meeting marked the first time in more than a decade that the Kayapó met regarding the dams planned for the Xingu. According to Terry Turner, an anthropologist who has worked with the Kayapó for many years, "The participants in the meeting were unanimously opposed to the construction of these dams, saying that they would have catastrophic effects on the ecosystem, and would flood large areas of indigenous territory."

Kayapó leader Megaron Txukarramãe, who organized the meeting, said: "We are aware that the problems which threaten the lives of our communities in the Xingu Valley also threaten other peoples, both indigenous and Brazilian, who also live in the valley. We call on all the inhabitants of the Xingu Valley to join with us in a great demonstration in Altamira against the Belo Monte dam and the other dams that Eletronorte wants to build throughout our valley, and for the protection and development of our own productive powers, our cultures and communities."

Belo Monte is considered a priority project in Brazil's 2015 Energy Plan, and the Brazilian government plans to conclude new studies of other potential hydroelectric sites on the Xingu by November. Although the Mines and Energy Ministry insists these studies will incorporate environmental and cultural concerns, it is considered likely that the government will attempt to build dams upstream of Belo Monte to regulate the stream flow of the Xingu, and thereby maximize energy generation.

Glenn Switkes



Kayapó dancers at the meeting.

Scenes from a River

by Kyle Meng

It was late afternoon and the sun, hidden somewhere behind these thick Sichuan clouds, was sure to be setting. Our dusty SUV pulled up alongside an overlook at the end of a gravel road for some much needed stretching.

Gray dominated everything within sight. From a short distance, the only visible color was that of a red helmet worn by a construction worker pushing a cement-filled cart. In this dull landscape, even a structure as large as a 156-meter-high (512 feet) concrete dam requires a bit of squinting.

In a country home to some of the world's largest dams, Zipingpu is notable even by Chinese standards. On both sides flow the Min River, the lifeline of western Sichuan and a major tributary to the Yangtze River. Turbulent and powerful during its descent from western Sichuan's highlands, the Min River comes to a silent stop at Zipingpu, accumulating slowly behind the nearly completed dam.

The surrounding mountains reveal few traces of the valley as it looked only five years earlier. Chiseled, excavated, and plastered with concrete, the once-jagged mountainside is now blanketed with undulating sheets of artificial stone.

This is China's final frontier. Out here in western Sichuan and other parts of China's mostly undeveloped west, the Chinese central government is implementing a large-scale development campaign to assist the region in catching up to its more prodigious eastern counterpart. To the Chinese government, large-scale engineering structures like Zipingpu Dam are critical components of this campaign, as they generate growth in the local economy and help meet the region's increasing demand for electricity and water. In light of those benefits, potential consequences such as pollution and environmental destruction are usually seen as secondary concerns by the Chinese government, if not by local populations directly impacted by such projects.

I arrived in Sichuan as part of a research team that was conducting an environmental impact statement for a proposed irrigation project not far from Chengdu, Sichuan's provincial capital and urban center. The project, which plans to irrigate a large swath of the Sichuan Plain, will draw water from one of several offshoots of the Min River. The question my research team was charged with answering was whether or not this irrigation project would leave enough water in the Min

for downstream residents, a critical issue for an already overused waterway.

Unknown to me at the beginning of that trip, I would spend the following two weeks at different stretches of the Min River, from its downstream offshoots in the Sichuan Basin to its headwaters in the mountains of northern Sichuan.

It was along the long bank of the Min River that a larger narrative became apparent to me, one that spoke about the different ways in which the Chinese perceive and relate to their waterways. It is a narrative that probes into some of the underlying issues beneath China's ever-mounting environmental challenges and unveils deeply rooted traditions that, together with the more conventional economic explanations, suggest why there is such widespread manipulation, abuse and neglect of China's environment. Out here in western Sichuan, nature and man, past and present, all crash into the waters of the Min River.

River as Sewer

Originating from the snow-capped mountains of the Min Mountains in northwestern Sichuan, the Min River flows some 650 kilometers (403 miles) before it funnels into the Yangtze River. With a watershed of over 135,000 square kilometers, the Min River provides and collects the water used by Chengdu and its surrounding metropolis.

My first encounter with the waters of the Min River came at a highway overpass in Xinjin, one of many burgeoning industrial towns located on the periphery of Chengdu. The bridge stretched across the Jinma River, a tributary of the Min River that veered southeast from Chengdu.

Though nearly 200 meters wide at this crossing, the water level at the Jinma was never more than waist deep. The low water level, I soon found out, was due to increasing demands placed on the river by Chengdu's exploding urban population. The Sichuan Basin, historically one of China's most fertile regions, is now experiencing



Huanglong National Park, where the Min River begins.

water shortage problems that rival those of China's dryer regions.

The water here had an inky color. Across the road, a cement factory dumped its cooling water into the river. Off in the distance, a large pipe expelled wastewater collected from surrounding villages. Littered along the bank were plastic wrappers, cigarette butts, old rags, and various food wastes. At the bottom of the bank, a man, dressed in a white-collared shirt and pressed pants rolled up to his knees, washed a bucket of clothes in the ankle-deep water.

"The Chinese have used the rivers to wash away their trash for thousands of years," said Yang, a professor of environmental science whom I was accompanying. "That is why you see wastewater deposited into the Jinma and trash tossed along its banks. The farmers here believe that the river's water will flush everything out. The only difference is that now with China's large population and rapid industrialization this method of trash disposal has gotten out of hand."

When asked about viable solutions to the problem, Yang answered, "You need to improve the quality of life here and teach China's poor farmers to change their old habits."

Ingenious Ancient Waterworks

The most revered section of the Min River is at Dujiangyan. Located some 60 kilometers northwest of Chengdu, Dujiangyan is home to one of China's prized World Heritage Sites: the Dujiangyan irrigation system.

Some 2,200 years ago, Chengdu was regularly threatened by the tempestuous floods of

continued opposite

the Min River, disasters that held back the development of the city and its neighboring towns. In 256 BC, Li Bing, governor of Shu prefecture, historic Sichuan, began to draw up plans that would mitigate the river's floods, provide irrigation to nearby fields and improve navigation for merchant boats that came up the Min to Chengdu. Using a labor force numbering in the tens of thousands, Li Bing completed China's oldest and most renowned water engineering project. The result was a highly successful irrigation system that has since made the Sichuan Basin one of China's most fertile regions, and Chengdu one of the country's most important economic, cultural and political centers. When it was first completed, Dujiangyan irrigated 160,000 hectares; today, after several major expansions of the irrigation network, it serves over 670,000 hectares.

Along with the Great Wall, the Grand Canal and China's other ancient achievements, the irrigation system at Dujiangyan represents for the Chinese not only the glory of their country's past, but also the ingenuity of their people at engineering, and Li Bing is an honored historic figure.

Li Bing's irrigation system was just the first of more than 2,000 years' worth of hydraulic projects built on the Min River. Today there are 15 dams either in operation or under construction on the river. Ironically, it is the latest and largest in this series of efforts to utilize the waters of the Min River that is threatening to make China's oldest irrigation system obsolete.

Zipingpu Dam lies only 10 kilometers upstream from Yuzui, the tip of the Dujiangyan dyke. Though intended originally to complement and expand the coverage of the current irrigation system at Dujiangyan, the proximity of the dam to Yuzui and the modern construction methods employed have made experts concerned about whether Zipingpu would damage the ancient dyke at Dujiangyan. Already, a major battle has been fought regarding the building of a smaller, second dam, which would span the section of the Min River directly upstream from the dyke. It was only after a protracted struggle on the part of local environmental organizations, Chinese scientists, national media and international organizations such as IRN and UNESCO that the government finally backed out of its plans to build this second dam.

Spectacular Headwaters

Three days after my visit to Zipingpu and Dujiangyan, I found myself along the banks of the Min River again, this time on a 12-hour rickety bus ride from Chengdu to

northwestern Sichuan. After some 150 kilometers, much of modern China seemed to have disappeared. Rugged and high in elevation, northwestern Sichuan is poorly suited for industry and has thus managed to protect much of its traditional culture and natural environment. Under the snow-capped Min Mountains, goats and yaks roam the roads and Tibetan pilgrims travel along the highway, stopping to pray on their knees. The Min River flows through this valley untouched. Its roaring, turbulent waters, originating from mountaintops some 4,000 meters above sea level, flow uninhibited along the same path that it first carved out eons ago.

The water in the Min River originates from one of China's most spectacular national parks, Huanglong. Located in Songpan County near the Sichuan-Gansu border, Huanglong is one of those rare Chinese tourist destinations whose lush mountains and translucent lakes have managed to be preserved despite the daily hordes of tourists.

Huanglong's main attraction is a series of terraced calcium carbonate ponds which contain water so clear that they reflect a translucent turquoise color. Found at a breath-stopping 3,000 meters above sea level, the water here has a reputation of

being the most pristine and beautiful in China.

But it is not for its untouched beauty that this water will ultimately be valued. At Huanglong, this water leaves this protected sanctuary and becomes part of the Min River, where it will run up against dams, be contaminated with pollutants from riverside factories and mix with wastewater runoff from Sichuan's cities and towns. Its clear streams will darken first to green, then brown and then black as pollution in the river increases; its robust currents will first slow and then dry up as water is extracted to serve each population center it passes; and its admirers will change from nature-seeking tourists to China's engineers, farmers and industrialists.

In the end, it appears that this water's legacy is destined to lie not in the value of its untouched beauty, but rather in its potential to better Chinese society. Just as the waters of the Min have been used for thousands of years to solve the problem of waste disposal, today the river is employed to solve some of modern China's biggest problems – developing its industry, feeding its people and powering its buildings. If such is the case, what will provide for the solutions of tomorrow when the Min River is drained dry? ■

China River Protectors Honored

China's nascent environmental movement got a boost in April with major international recognition for two of its main figures. Nominated by IRN, Yu Xiaogang, the Founder and Director of Chinese NGO Green Watershed, was awarded the prestigious Goldman Environmental Prize for his pioneering work in protecting China's rivers and watersheds. Only six environmental activists receive the prize each year.

Mr. Yu spent years creating groundbreaking watershed management programs while researching and documenting the social and environmental impacts of dams on riverine communities. His reports are considered a primary reason that the central government paid additional restitution to villagers displaced by existing dams and now requires social impact assessments for major dam developments. Yu has also been a key player in the movement to protect the Nu River, one of only two undammed major rivers in China.

"We face so many environmental problems that these successes are only the first steps in the Long March. To realize true sustainable development throughout China, we need the full participation of all Chinese citizens," said Yu.

Just days after the Goldman Prize announcement, another Chinese river activist, Ma Jun, was honored as one of the "Time 100," *Time* magazine's list of people making a difference in the world.

According to *Time*, Ma Jun's 1999 book *China's Water Crisis* (published in English with help from IRN) "may be for China what Rachel Carson's *Silent Spring* was for the U.S. – the country's first great environmental call to arms."

In 2004, another prominent Chinese environmentalist, Wang Yongchen, was awarded the Conde Nast Traveller Environmentalist of the Year award for her work in protecting the Nu River from a series of destructive dams. IRN congratulates each of these brave and strong activists for their marvelous work in protecting China's rivers and watersheds!

The Impact of Dams and Aquatic Migration in Mesoamerica: Worldwide Implications

by William O. McLarney and Maribel Mafla Herrera

There are ever so many reasons to question dams. Issues of social justice, indigenous rights and property rights are a common problem. Shaky economic assumptions are often exposed. Loss of recreational values and aesthetic damage can have serious economic implications. The extensive ecological damage from damming is well documented. And an endless list of site-specific issues can also arise – for example, the submergence of archaeological resources of the Rio Usumacinta watershed in Guatemala and Mexico or the Ilisu valley in Turkey, should proposed dams go forward.

But there is only one issue that applies across the board, to every dam ever proposed: All dams act as barriers to the movement of aquatic animals, and “fish ladder” type technology is, at best, a partial solution (see box). No discussion of any dam scheme is complete without an assessment of which species of fish and other aquatic creatures need to move up and down the river past the dam site. Yet, except in those cases involving high-profile commercial or recreational fisheries, this issue often goes unremarked.

This is a global issue, but applies with particular force to islands and narrow land masses, such as the Mesoamerican isthmus, where rivers are characteristically short. The experience in the Changuinola-Teribe watershed of Bocas del Toro Province, Panama, described herein, details the critical nature of this problem. As aquatic conservation biologists, we are embarrassed that so many of our professional colleagues are asleep on this issue. River activists concerned with dams have also largely neglected to take advantage of this universal issue. It is time for a worldwide wake-up call on this critical problem.

Dam Proposals in Panama

Our involvement in dam issues in Mesoamerica grew out of the ANAI stream biomonitoring program in the Talamanca region of Costa Rica. This region is, so far, not faced with specific dam proposals. In November 2004 the biomonitoring team was asked to give a series of workshops for leaders of the Naso and Ngobe indigenous groups from Bocas del Toro Province, just across the Rio Sixaola in Panama. Our original focus was on issues like deforestation, organic pollution and overfishing – the

kinds of problems rural communities have a hand in creating and can learn to resolve.

But just prior to the workshops, a historic event occurred. The Naso (the only hereditary monarchy in the Western Hemisphere) deposited their king for signing off on a proposal for a hydro dam to be built on a tributary of the Rio Teribe, in Naso territory. We soon learned that the neighboring Ngobe tribe, located just over the hill along the Rio Changuinola (to which the Teribe is tributary) were facing four dam proposals. All this in an area so remote that some of the workshop attendees had to walk three days to reach the nearest bus stop.

The cultural rights and economic issues were being addressed by the Naso and Ngobe and by Alianza para la Conservacion y el Desarrollo, a small Panamanian NGO; there was little for us to do at that level beyond being sympathetic. But fundamental biological issues were not being raised, a fact later confirmed when we reviewed the weak Environmental Impact Assessments for the four dams.

So we modified our workshops to include a strong emphasis on the role of barriers to the movement of aquatic animals. A key word to understand in this situation is “diadromy.” Some aquatic animals are relatively sedentary; others are highly migratory. Some migrate within fresh water, but for many, free transit between fresh and salt waters is an essential feature of their life cycle. Such animals are referred to as “diadromous.” One of the most familiar diadromous fish sagas is the spawning migrations of the salmon of the US Pacific Northwest and the role of dams in decimating many of these salmon runs. But from an ecosystem point of view, it can be argued that diadromy is even more important in places like Panama than in the North Pacific.

Because the Mesoamerican isthmus is so narrow, but also because during geological time this region was frequently cut off from the large North and South American land



Mesoamerica's "Joturus Picardi" is threatened by dams.

masses, relatively few purely freshwater fish were able to colonize the area. A high percentage of the “fresh water” fauna of the isthmus is obliged to spend part of its life in the ocean and estuaries. Seemingly paradoxically, the higher one goes in a watershed, the greater the dominance of diadromous forms. In our research in Costa Rica we have found that 70-91% of individual fish (and all of the usually abundant shrimps) in small upland streams far from the sea belong to diadromous species.

A Diadromous Diet

The diadromous species happen to include almost all the larger bodied fish utilized as food by the Naso and the Ngobe. As for ecological importance, anyone who has ever observed the phenomenon of the *tismiche*, when giant mixed schools of larval shrimp and gobies pass upstream like dark clouds, cannot doubt the importance of diadromy in maintaining the food chain of rivers draining into the Caribbean. We have no hard numbers, but it is certain that the greater part of the animal biomass (the total weight of living animals) is composed of diadromous species.

There was no documentation of the fish and shrimp communities in the upper reaches of the Changuinola-Teribe watershed, but we were able to train Naso and Ngobe field workers to do biological surveys in the upper watershed. Their findings backed our assumptions about the high proportion of diadromous animals in the watershed. For example, in the reach that would be impounded by the proposed Bonyic Dam, 95% of the fish and all of the shrimp were diadromous. (These findings contributed to a decision by the Inter-American Development Bank to discontinue consideration of funding Bonyic, citing “potential impacts on stream ecosystems,” but that is just one source of financing for one of the dams.)

Most of the sites monitored by the indigenous field workers were within the La Amistad International Peace Park and Biosphere Reserve, a World Heritage site. The first stated purpose of the creation of La Amistad was to “protect a significant sample of the biological diversity of one of the richest faunal and floral zones which still remains relatively unaltered in the Republic of Panama.” Construction of the lowermost dam on the Changuinola, known as Chan-75, would eventually compromise that biodiversity by eliminating all diadromous species from 848 km of permanent streams within La Amistad. Not every river can claim an internationally renowned protected area in its watershed, but the potential for ecosystem damage is similar in every case.

The Current Crisis in Mesoamerica

When we began to look for precedents, we were startled to find no research at all from Mesoamerica (which still has relatively few dams). We did discover relevant studies from the West Indian islands of Puerto Rico, Guadeloupe and Curaçao, where the native diadromous fauna is similar to that of Mesoamerica – and where it has been decimated in all three cases. Perhaps the best example is from Puerto Rico, which, as part

of the United States, was a victim of early enthusiasm for dam construction. Most major rivers in Puerto Rico are dammed, with the result that the majority of the fresh water fish and shrimps have disappeared from more than a fifth of the island in river stretches above dams. This situation has provided a “laboratory” for predicting ecosystem effects elsewhere in the region. Changes documented by researchers in Puerto Rico, in addition to the virtual disappearance of fish and shrimp, include increases in sedimentation and algal growth and dramatic changes in the aquatic insect community upstream, with severe damage to fisheries downstream.

A recent study by Conservation Strategy Fund documented plans for no less than 381 new dams between southern Mexico and the Panama/Colombia border. These and other infrastructure projects are clearly part of the “globalization” phenomenon, fueled by the various hemispheric Free Trade agreements.

Worldwide Implications

These examples from Meso-America are hardly isolated cases. Concern over the role of dams as barriers to animal migration is a valid component of every anti-dam case. Even far inland, or in rivers already blocked

by some dams, where diadromy is not an issue, there is the matter of “potamodromy” (migrations within fresh water). No dam assessment should be considered complete without an effort to collect all relevant biological information. By “relevant” we mean not only the environmental impact studies which are often mandated for the areas directly impacted by the dam, reservoir and associated infrastructure, but also information about long reaches of river up- and downstream of the dam site and the migratory species present in the watershed. Most dams do not include such studies.

No biologist is exempt from responsibility for making this information publicly available, and no activist should be reluctant to be the first to raise this issue. River protectors everywhere need to start connecting the dots, and spread the word about how damming rivers with diadromous species is creating a global biodiversity crisis. ■

Bill McLarney and Maribel Mafla are, respectively, Director and Coordinator of the Talamanca Stream Biomonitoring Program of Asociacion (ANAI), based in the Canton of Talamanca, Costa Rica and the Province of Bocas del Toro, Panama.

The Failure of Fishways

Fish “ladders” or, more properly, “fishways” represent a largely unsuccessful attempt to find a technological fix for the blockage of migratory routes by salmon. Their limitations are partly in terms of cost of construction and maintenance, but are also behavioral in nature. While a significant measure of upstream migrating adult salmon may be able to use fishways, downstream return by the juveniles is another thing. In many instances, downstream migrants become disoriented in the slack water of reservoir lakes and never reach the dam. In others, they may enter the turbine area and be chopped to bits. The best-case result will always be survival of a fraction of the pre-dam population.

In the tropics the situation is much more difficult, for three reasons: 1) Proper construction and maintenance of fishway facilities is much less probable or feasible under the prevailing economic conditions, coupled in many cases with difficult access. 2) Salmon are “anadromous” (large, vigorous adults migrate out of the sea to reproduce in fresh water). Most tropical diadromous animals are amphidromous – that is, they reproduce in fresh water, with the eggs and larvae drifting downstream to the estuary, to later migrate upstream as larval fish and shrimp. Even when planktonic eggs and larvae do not settle out in reservoirs, the returning migrants are much smaller and weaker than an adult salmon, making the trek extremely difficult if not impossible. 3) The far

greater diversity of species (involving members of several families) creates a far more challenging design problem – and there is no complete life history for even one of the amphidromous fish species. Where a structural approach to facilitating migration around dams has been attempted (notably in Guadeloupe), the results have been disappointing.

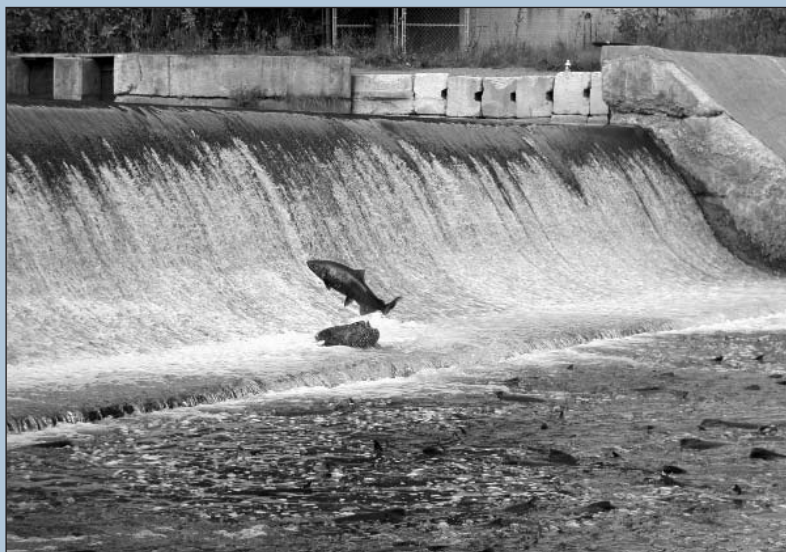


Photo: Rachel Potvin

Larger diadromous fish such as these salmon do better with fishways than tropical species.

Africa Hydro continued from page 3

and five representatives from dam-affected communities – was made. Less than a week before the conference, and with pressure from conference donors and friendly government agencies, ARN was told they could submit up to 30 names.

But invitations themselves were not forthcoming, and the clock was ticking. Last-ditch efforts were made to get invitations and visas in hand, and flights booked. On Friday afternoon, a government liaison contacted the embassy in Ethiopia, opening the closed visa office for three Ethiopians set to travel the next morning. But in Zimbabwe, Sudan and Zambia, similar efforts were unsuccessful, and several invited ARN members were left behind.

The good news is that ARN succeeded in facilitating the attendance of 23 members, but the inclusion was bittersweet. “While we were pleased with the final count of members at the conference, the struggle to get there shouldn’t have been necessary. This has to improve as more national and regional dialogues about dams, river development and energy planning take place,” said Bryan Ashe of ARN.

Equally important, ARN’s struggle critically impaired its ability to prepare input for the conference. “Our full participation, through presentations and framing the discussion, still wasn’t possible,” said Ashe. ARN was shocked that of the six panels scheduled for the event, no one from African civil society was included. Initially, only two NGOs, both non-African, were given formal presentation slots— former WCD Commissioner Ms. Joji Carino, and Dr. Ute Collier

from WWF. Early requests from ARN to include a representative of African civil society received no response. Due to Ms. Carino’s lobbying, a last-minute opportunity was given to a representative of the Bujagali dam-affected community in Uganda to participate as a panelist on the conference’s social-issues panel.

The Right Question?

The conference’s stated aim was to “unlock the hydropower potential of Africa as a major energy option.” In keeping with the sales-pitch nature of this premise, the organizers chose not to introduce any debate about the appropriateness of large-scale damming for Africa, or how to ensure that the continent pursues a balanced energy portfolio that minimizes risk and negative impacts. Discussion questions such as “What are the priority actions to facilitate regional hydropower and/or transmission projects?” were one-sided. Terms such as “meeting the Millennium Development Goals” and “sustainable development” seemed to be tacked onto conference messages to make the pro-hydro message more palatable. The event’s tunnel-vision view of large hydropower for industrial development lacked any focus on Africa’s rural areas, where 80% of the population lives, far from national grids.

Outcomes

At the end of the conference, the Ministers released a declaration that, overall, includes many positive statements about the participation of affected communities, efforts to

alleviate poverty, and proper management of environmental and social impacts. But NGOs fear it is just rhetoric coating the conference’s real purpose – to legitimize and fast track large-scale regional hydropower projects. The real test will be in whether steps are taken to build a legal framework that guarantees justice to affected communities, and ensures that projects which benefit average African citizens are prioritized.

An NGO statement released the day before the Ministerial Declaration reveals some of the concerns that remain: “We observe that lessons have not been learnt from past experiences and that civil society, especially communities at the grassroots level, are yet to be given the space to be involved in the decision-making processes of energy development in Africa.... Before new hydropower investments commence, the historical injustices must be addressed. We call upon our governments to share both the cost of breaking the eggs and benefiting from the omelets equitably....”

A ministerial action plan was also released after the conference. It includes the development of an “Africa Energy Vision 2025” and an African Hydro Symposium to be housed under the African Energy Commission (AFREC) in collaboration with the International Hydropower Association. “ARN is pledging to monitor these and other follow-up activities from this conference, and will press for the inclusion of civil society and due justice for the historical social and environmental impacts of African dams,” said Ashe. ■

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Public Utilities Commission, counters that legal restrictions would likely prevent this. Given the already contentious nature of water rights in California, it seems unlikely that these issues could be easily resolved.

The Environmental Defense study also contends that energy conservation could address much of the loss in power generation. But San Francisco City Attorney Dennis Herrera, in an August 2005 editorial in the San Francisco *Bay Guardian*, notes that the natural gas projects that would be needed to replace some of the dam’s hydropower raise issues of environmental justice. “Over the last several years, San Francisco city officials, working with community advocates, have made serious strides toward shutting down polluting fossil-fueled power plants” which were concentrated in San Francisco’s poorest neighbor-

hoods. “The loss of Hetch Hetchy Reservoir would ... represent a needless setback in our efforts to shutter existing polluting facilities. We need more publicly owned renewable resources to win this battle, not fewer.”

Jim Wunderman, president of the business association the Bay Area Council, said at the November public debate, “There are tremendous threats to the San Francisco bay-delta ecosystem, and we think this is a far more immediate threat to the state. Our levee system’s safety is in question, and that system provides water to many millions. This is not the time to spend billions of dollars on an issue that is primarily about recreation when we face so many greater threats to the environment. There are limited resources in this state and this world, and we have to make choices. It always boils down to that.”

Still, the urge to regain the wilderness treasures that now lie dormant under 300 feet of water is a strong one. Don Hodel, referring to San Francisco’s “unfair use” of the Yosemite National Park, said at the November debate, “The arguments for restoring Hetch Hetchy are overwhelming, and ultimately they will prevail. There is widespread support for preservation and protection of national parks. The issue will become how do you do it, and who will pay for it.” ■

For more information:

<http://www.hetchhetchy.org/>
<http://www.sierraclub.org/ca/hetchhetchy/>
<http://www.environmentaldefense.org/hetchhetchy/>
The SFPUC rebuts the dam-removal study here:
http://www.sfwater.org/detail.cfm/MSID/16/MTO_ID/NULL/MC_ID/5/C_ID/2588/holdSession/1

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tion and intimidation, and the authorities are using all possible tricks to play down the number of affected people. The landless are not counted as project-affected, those to be displaced by project canals are not counted as project-affected, and even those labelled project-affected are often deprived of their legal right to land-for-land compensation and intimidated into accepting meager cash handouts.

Construction of the Sardar Sarovar Dam started in 1988. At that time, a young social scientist named Medha Patkar was wandering through the villages to be submerged and asking people whether they knew where to go after submergence. Almost 20 years later, the largest struggles over dams, and for that matter over development more generally, still center around the issue of displacement and resettlement.

On the surface, the current debate in India is about whether the affected people are adequately resettled and compensated. However, the debate is superfluous, as the facts speak for themselves: ministerial commissions agree with the NBA that resettlement and rehabilitation is inadequate. Yet, the government appoints commission after commission, sets up meeting after meeting, just to buy time while construction is ongoing. The dam will reach the height of 122 meters before the next decisive meeting where the government could suspend construction activities. Medha

Patkar talks about a "fait accompli."

The Sardar Sarovar struggle is symbolic of the clash of two different development models now affecting contemporary India, the clash over resources and justice. One model's premise is that the poor may have to suffer for the greater common good. The other model claims that the resources belong to the people of the land and they have a right to determine their own future. It is about poverty and representation, about who benefits from development and who pays for it.

The dam advocates claim that the waters from the reservoir will benefit drought-prone areas in Gujarat and deliver water to the poor there. In reality, most of the water is being diverted to big cities and big agriculture in Gujarat, to industry and for the production of water-intensive cash crops such as wheat and sugarcane. Less than 15% of the canal waters from Sardar Sarovar will benefit the poor in the arid areas of Gujarat.

The World Bank notes that "India's economic success is not reaching the poor people of the country." The *adivasis* and *dalits*, India's indigenous and lower-caste people, are not being lifted out of poverty by the current economic growth rates, and in fact are left poorer by being displaced for the sake of development. In a recent interview, Arundhati Roy said: "Displacement is becoming an urgent issue for millions – both in cities and in villages. The situation is out

of control. Every single development project – whether it's an IT Park in Bangalore or a steel plant in Kalinganagar or the Pollavaram Dam – the first move is to take land from the poor. People are being displaced at gunpoint. Cities like Delhi and Bombay are becoming cities of bulldozers and police."

The fact that the stakes in the current battle over the height of the dam are so high may not give the advantage to the NBA activists in this particular case. The cameras and microphones, the VIPs and the front-page news have made the government realize how much there is to lose on the extremely symbolic Sardar Sarovar battle, and the entrenched interests seem ready to do whatever it takes to prevail. And yet, the movements of the poor are getting stronger every day. The plight of 35,000 families can no longer be ignored by those in power: the Sardar Sarovar debates and the related decision-making process demonstrates that it is getting increasingly difficult to defend the displacement of thousands with arguments of national interest.

Medha Patkar, after breaking her fast, said that after 30 days of protest, the NBA was now 30 times stronger than before. The NBA will need this strength when it returns to the Narmada valley to continue the fight for better rehabilitation and adequate resettlement for the hundreds of thousands of people to be displaced by planned dams in the valley. ■

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the Amazon basin, transporting an estimated 750 million tons of sand, silt, and clay annually from the Andes Mountains to riverine lands downstream. This is nearly three times the sediments carried by the Mississippi. Furnas and Odebrecht have acknowledged that sedimentation is a critical factor in determining whether or not the dams' effective lifespan will justify their construction.

The Madeira project's US\$9 billion price tag, which does not include the estimated \$4.5 billion cost of 4,000 km of transmission lines or navigation works, has come under attack by Claudio Sales, director of Brazil's Chamber of Investors in Electrical Energy (CBIEE). Sales has described the Madeira dams as "white elephants," and has argued that smaller dams could be built and put into operation during the time it takes to obtain licenses and financing for the mega-projects on the Madeira.

Biodiversity Hotspot

The Madeira River is one of the hotspots of aquatic diversity in the Amazon, and the

proposed dams will also have serious impacts on migratory fish. Large catfish migrate 4,500 km (nearly 3,000 miles) annually from the Amazon River's estuary to the upper Madeira River to spawn. The blocking of sediments and nutrients by the dams would also affect the fertility of downstream floodplain soils used by farmers, as well as the survival of fish, otters, river dolphins and other species.

Environmentalists and social activists who met in Porto Velho called for the suspension of plans for the dams' construction. The president of Porto Velho's fishermen's organization, Walter Canuto Neves, said: "We want progress, but this project offers nothing for us." Families living along the Madeira River are also critical of the project. Some were already displaced in the 1980s by the construction of Samuel Dam, on the Jamari River, a tributary of the Madeira. Said Elissandra Costa, "The companies promise everything, but in the end we will be left with nothing."

The project's fate is to be decided by

Brazil's environmental protection agency, Ibama, which must rule on the dams' environmental feasibility. Ibama has found the environmental impact studies submitted by the companies to be inadequate regarding several key impacts of the project, including sedimentation, impacts on aquatic species, and impacts on downstream populations and fishermen. The agency directed the companies to provide additional studies, which are currently under analysis. Public hearings on the project are expected to take place in July or August, and then Ibama will decide whether or not to provide a preliminary go-ahead for the projects.

If the dams get Ibama's approval, the Brazilian government will then auction them to consortia of state companies and private investors interested in building and operating them. Furnas and Odebrecht say they plan to invest in the dams, and other companies, including state electric company CHESF and the Spanish company Endesa, have also indicated their interest. ■