

Government Meets Demands of Narmada Protesters

by Malavika Vartak

More than 2,000 tribal people from India's Narmada valley, along with representatives from the affected villages from the states of Madhya Pradesh and Gujarat, launched an indefinite mass action in Mumbai (Bombay) in early September to protest treatment of oustees affected by the Sardar Sarovar dam project. The mass action, which ended September 27, was organised by the Narmada Bachao Andolan (NBA – Save the Narmada Movement) and supported by a variety of peoples' movements and trade unions from all over India.

The purpose of the protests was to pressurize the government of Maharashtra to settle land rights of tribal people in the submergence zone, to oppose further construction of the Sardar Sarovar Project until rehabilitation is satisfactorily completed, and to implement recommendations of a report by the government, which had exposed grave irregularities in the rehabilitation situation in Maharashtra.

It was only after intense pressure from

the protesters, eleven days of hunger strike by activist Medha Patkar and seven other members of the NBA, and long negotiations that the government of Maharashtra conceded to most of their demands.

On September 27, the Maharashtra government agreed to oppose further construction of the Sardar Sarovar project until rehabilitation was completed. It said it would form a task force to verify the status of resettlement in every project-affected village in the state. The task force would include representatives of the affected people, and members of the NBA and other local groups.

Although from the start of the protests the Chief Minister, the Minister for Rehabilitation and others had admitted to irregularities in rehabilitation processes and had expressed willingness to accept the demands of the protestors, no positive steps were taken towards fulfilling the same. As a result, groups of villagers began relay fasts from September 14. On September 17, seven members of the NBA including Medha Patkar launched an indefinite fast. The pub-

lic pressure finally caused the government to agree to the NBA demands.

Medha Patkar said, "The state government could have done all this within a day by holding proper discussions with the NBA. But the tribals and peasants have to struggle with their lives for just and fair demands."

While the state of Maharashtra seems committed to protecting tribal rights by acceding to the demands of the people, experience shows that there might be a longer struggle ahead in monitoring government actions and ensuring that promises are kept.

In a separate incident related to the SSP, on September 28, scores of villagers were injured when police beat up villagers at Chotta Badada in the Narmada valley, as 500 people peacefully resisted a survey of their villages and demanded that the government first convince them that it had adequate land for rehabilitation. A 13-year-old girl was hospitalized with serious head injuries after the incident. This incident closely follows two other incidents of violence against peaceful protestors in the last month. ■

Special Focus: Aluminum

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Dam-Related Flooding Ravages Northern Nigeria

by Ryan Hoover



Map: Hadejia-Jama'are River Basin project, University College London

Kano, Jigawa and Benue states all experienced dam-related flooding.

In what has become an alarmingly regular occurrence, floods devastated heavily populated areas of northern Nigeria in August after rapidly rising reservoirs behind the upstream Tiga and Challawa Gorge dams overflowed following the heaviest day of rain in ten years. The Lado Dam in neighboring Cameroon also overflowed, leading to deaths and a cholera outbreak in Nigerian villages in Benue state. According to estimates from officials in three states, the floods killed over 140 people in the states of Jigawa and Kano, affected some 300,000 families, and destroyed some 350 villages and vast amounts of farmland. The total damages are estimated to approach US\$100 million.

"The consequences were disastrous – the worst in the history of dams in Nigeria," said Leo Atakpu of the Nigerian group African Network for Environmental and Economic

Justice (ANEEJ) in a report released shortly after the floods.

in part to control floods – a role that Nigerian dams have repeatedly failed to fulfill. Atakpu reports that "flooding has become a frequent (almost annual) occurrence in the desert-prone North-Central part of Nigeria." In 1999, dozens of people living along the Niger and Kaduna rivers died and thousands more were left homeless when the Kainji, Jebba, and Shiroro Dams unleashed waters following heavy rains. At the time, dam operators were concerned that the dams could have otherwise burst. Such a disaster actually took place in 1988 in Kano State when a portion of the Bagauda Dam gave way, killing 23 people.

History of Problems

Dam failure continues to be a concern at Tiga where as early as 1974 engineers found design flaws and severe erosion at the base of the dam. A crack developed in the dam wall

in 1986, and the structure reportedly has no instrumentation to check on movement of the wall – a disturbing omission for a dam six kilometers long and holding 1.8 billion cubic meters of water. According to the ANEEJ report, if the dam collapsed, the cities of Kano and Dutse and their combined population of seven million people could suffer huge losses.

Tiga and Challawa Gorge dams are also meant to provide water for irrigation of land upstream, and it is for this reason that their water levels were so high when the rains fell. Since the dams' construction, an important wetland downstream at the confluence of the Hadejia and Jama'are rivers has gradually desiccated. Fulani pastoralists have long used the area to water their livestock during the dry season and an increasing number of farmers have begun growing sugar cane and wheat there. With the shrinkage of this wetland came a corresponding intensification of the conflict over its land and resources. It also had the effect of drawing dense populations of people far within what was normally an annually flooded plain. Thus, when the dams overflowed, thousands of people were literally in harm's way.

According to a report by Dr. Julian Thompson, a geographer at the University College London, "No overall basin-wide approach to the management of the Hadejia-Jama'are's water resources currently exists." The report asserts, "What is required is the establishment of a basin-wide water management plan which seeks to ensure an equitable distribution of water resources between all users, from large-scale irrigation to fishermen and farmers within the floodplain."

The recent disaster has prompted many Nigerians to re-evaluate their attitudes toward their nation's dams. According to Atakpu, flood victims have already begun to demand reparations for their losses from dam authorities. Many of them are refusing

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Rivers and Justice in a Violent World



Since the atrocities of September 11, all of us at IRN, like people all over the world, have gone through feelings of shock, anger, sadness, bewilderment and fear for the future. In trying to come to grips with the horror of what occurred and how it has changed our world, we have discussed the importance of our commitment to non-violence. And we have reaffirmed that striving for human rights and against economic and environmental injustice and oppressive fundamentalism must always be at the core of our work.

Because of the work we do, we are all too familiar with the violence and intimidation faced on a regular basis by so many of the activists and communities with whom we work. Yet, it would be disingenuous if we did not recognize that the crimes against humanity of September 11, and the violent response to them, carry a particularly virulent horror of their own, and that the world seems a more unstable and unjust place than it did just a few weeks ago.

As the shock of September 11 fades, we face even more violence, its perpetrators not restricted to terrorists, but now including governments as well. There can be no long-lasting success against violence of any kind without understanding the political and economic conditions that fuel it. Far from condoning violence, gaining this understanding and then changing the diet of conditions on which it feeds is essential for bringing it to an end.

Through our support of healthy rivers and watersheds, and our opposition to destructive river projects, we have learned that these projects are a symptom of pathological social and economic relations within and between nations. Big dams epitomize how development policies can increase inequality, strip the poor of their livelihoods and lead to violence. In recent months two activists who had opposed the expropriation of the livelihood resources of the poor by dams – Kimy Pernía Domicó in Colombia and Ademir Alfeu Federrici in Brazil (see page 13) – have been murdered because they dared to speak out.

We realize that global economic inequality, human rights violations and environmental degradation in the impoverished nations of the globe are inextricably linked to many policies adhered to and promoted by the US and other powerful nations. We understand, too, that global inequalities in wealth and power are mirrored within nations. And we realize that inequality, oppression, and the loss of livelihood-sustaining resources lead inexorably to hatred and, often, violence.

We intend to maintain our focus on the relationship between environmental health and respect for human rights and cultural integrity at all levels – from the local to the global. We will continue working with those who encourage the pursuit of justice, nonviolence and compassion; to discourage the continuation of war, and the misery and devastation it brings; to contribute to a world of reason, tolerance, equity and respect for life.

We strongly believe that hope lies in the movement for global justice which we strive to strengthen, and in the friendship and solidarity we have with fellow activists of many nationalities, ethnicities and beliefs.

We welcome and encourage views from readers about the ever-changing context around us, what it means for our work, and how we can succeed in our efforts.

Juliette Majot and Patrick McCully

IRN**Staff:**

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Elizabeth Brink, Selma Barros
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Angana Chatterji, Gigi Coe, Bob
Hass, Dorka Keehn, Lauren Klein,
Joshua Mailman, Brian Smith

Contact Information:

IRN
1847 Berkeley Way
Berkeley, CA 94703 USA
Tel: (510) 848-1155
Fax: (510) 848-1008
E-mail: irn@irn.org
World Wide Web:
<http://www.irn.org>



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Vietnam's Model Dam-Resettlement Project Fails Villagers

by Aviva Imhof

People displaced by the Yali Falls dam in Vietnam are suffering severe shortages of food and other hardships since the dam flooded their homes and land in 1999, according to a new study. In addition, four downstream villages have lost crops, boats, livestock, and many other vital possessions in a series of floods that took place after construction began on the dam in 1994.

The Center for Natural Resources and Environmental Studies (CRES) in Vietnam studied the impact of the dam on communities earlier this year. CRES interviewed 45 households in six resettlement villages and 21 households in four downstream villages to determine what kind of compensation communities had received, whether they are satisfied with it, and how their standard of living today compares with their former lives.

More than 6,700 people were relocated to make way for the US\$1 billion Yali Falls Dam, which was completed in 1999. The 720MW hydropower project is located on the Krong PoKo, a tributary of the Se San River, which is itself a major tributary of the Mekong. The Yali Falls Dam came to international attention early last year when a survey in Cambodia revealed that since 1996, dam-induced flash-floods had drowned at least 32 people and thousands of animals, and destroyed crops, property and natural habitat along the Se San River in Cambodia. More than 20,000 people living along the Se San in Ratanakiri Province alone have been affected. The CRES survey was conducted to determine the impacts of the dam within Vietnam.

Resettled Communities Worse Off

CRES found that compensation was not distributed fairly and fully, and many people have not received what was promised to them. Many families are suffering severe shortages of food because most oustees have not been given cultivatable land or rice paddies as promised. None of the households interviewed had received land. Promised supplies of rice, seedlings, fertilizers and money for animal husbandry have not been given.

One person commented: "We like the new house, although it is small. However, we are all hungry because there is no land left here for us to cultivate to feed the family. The government promised to give us land and we have been waiting and waiting, but nothing happened. We could not survive without land."

Local leaders report that there is no cultivatable land left at the resettlement site to give villagers. While many Kinh people have money to buy or lease land, the majority of ethnic people have to clear new swidden fields in the forests. This places additional pressure on natural and regrowth forests which are already threatened from poaching, logging and resource competition.

Other people have had to rely on simple laboring to survive, earning less than one US dollar a day. However, this work is only seasonal. In one resettlement site many women have become scavengers. A woman in Konkngo Klah village said, "I go to the dump site everyday to look for plastics and clothes... On average, I earn 5000 Vietnam Dong/day [around 30 US cents], which is enough for me to buy some rice and a bag of salt for my children. Meat is something which is really luxurious for us. We haven't eaten meat for a long time."

While all resettlement villages have primary schools and health clinics, many people cannot afford to use these services. Many children have to work instead of going to school. Health care standards are declining. Traditional medicinal plants are now very difficult to find because native forests are being cleared for agriculture.

Villagers downstream of the dam reported that unusual and dramatic fluctuations in the Se San River levels have changed the environment and affected the lives of the indigenous people who live along the river and depend on it for their survival. Villagers have noticed changes in the river's water levels and quality since 1996.

In 1999, the villages were hit twice by huge floods. Floods occurred several more times, but the water levels were not as high as the first two times. The first two times, the floods occurred suddenly, and villagers were unprepared. Three villages lost 24 boats. Other possessions lost in the flood include livestock, food supplies and fishing nets. None of the villagers have received any compensation for these losses.

Villagers also reported that since the dam was closed fish populations have declined significantly and many species have disappeared. Many now have to buy fish from traders. Villagers have also noticed changes in water quality, and reported experiencing itchiness, eye irritations, skin rashes, diarrhea and other sicknesses after contact with the water. These findings are consistent with the reports from villagers in Cambodia.

History of Dam Troubles

Yali Falls Dam is not the first project in Vietnam to encounter problems with resettlement. The Hoa Binh Dam was completed in 1994 with devastating consequences for the 58,000 people who were relocated to make way for the reservoir. These communities face extreme impoverishment, food shortages and greatly reduced levels of material well-being.

The Vietnamese Government recognizes the problems with Hoa Binh resettled communities and states that it has taken steps to improve its resettlement policies and practices. Testimonies by Vietnamese officials to the World Commission on Dams indicates that the government considers the Yali experience to be far superior to that at Hoa Binh. Dr. Pham Thi Mong Hoa from the National Center for Social Sciences and Humanities of Vietnam stated: "Based on experiences from Hoa Binh dam project, the Electricity of Vietnam (EVN) has improved very much the policy on resettlement and rehabilitation for dam-affected people. The good example is Yali project, where resettlement planning has been made very carefully and effectively implemented. As a result, the living standards of the project affected people have been restored and improved."

The CRES study shows that the living standards of those affected by Yali Falls Dam have not been restored, and that considerable additional investments of money and land are required. CRES recommends that resettled communities be provided with rice and land, and suitable farming systems should be developed in cooperation with the villagers. Rural development programs should be designed and carried out at the same time in order to help local people improve their living standards. Downstream villages should be compensated for their losses as a result of the dam.

The situation at Yali Falls does not auger well for the communities who would be resettled for the proposed \$4 billion Son La Dam. If built, this dam would displace up to 135,000 people. The National Assembly is due to make a decision late this year on the exact size of Son La, and the government hopes to start construction as early as 2004. ■

The full report will be available at www.irmn.org shortly. The report is available in English and Vietnamese.

Dam Industry Group Gets a Dose of Reality

by Peter Bosshard

Peter Bosshard's presentation in Dresden this September marked the first time that a dam critic had ever given a talk at a meeting of the industry group the International Commission on Large Dams (ICOLD). The seminar at which he spoke was billed by ICOLD as an opportunity to discuss the report of the World Commission on Dams and to learn from dam opponents. This new openness from ICOLD, and particularly from the German organizers of the seminar, is very much to be welcomed.

But ICOLD still has a long way to go before they can claim that they are really listening to other points of view. Out of 19 speakers in Dresden, only 2 were from outside the dam industry and government – and the second NGO speaker, Shripad Dharmadhikary from India, had to share a single 20 minute slot with Bosshard.

ICOLD speakers at Dresden showed clearly that the dam industry has been badly shaken by the WCD report. Some see that they cannot continue with business as usual and must engage with their critics. The old-guard of dam fundamentalists in ICOLD's leadership, however, wholeheartedly reject the WCD's findings and recommendations. They are now trying to minimize the report's impact by setting up their own committee to make WCD-style recommendations on decision-making for dams. They are deeply deluded if they think that the world will put aside the WCD report and instead accept the findings of a dam industry cabal. **Patrick McCully**

Thank you for giving me the opportunity to speak. The symposium organizers told me they are interested to learn more about the "counter-arguments" to the construction of large dams. I am happy to briefly summarize some concerns of the international NGO community relating to large dams. I will also comment on the WCD process from an NGO perspective, and will conclude by offering some thoughts on the reactions to the report which we have seen so far.

First, Repair the Harm

It is a basic principle of social justice that development projects should not come at the expense of the poor, that "the people directly affected by a project should always be the first to benefit," as ICOLD's 1997 Position Paper on Dams and the Environment stipulates. Personally, I have not seen one project in which affected people were indeed better off after construction among all the large dams which I had the chance to visit. All of us have however witnessed so many cases in which the affected people lost their livelihoods, their cultural identity, their human dignity and their hope due to large dams. The report of the World Commission on Dams confirms that affected communities have again and again gone through traumatic experiences of involuntary eviction, and have often ended in misery and marginalization. The document estimates, conserva-

tively, that large dams have displaced 40-80 million people. They have also impoverished millions of other people, such as those living in downstream areas, who are often not even officially recognized as being project-affected.

Large dams have impounded an area of more than 400,000 square kilometers or roughly ten times the size of my home country, Switzerland. They have thus disrupted most major river systems on the planet, and have submerged some of the world's most diverse habitats and fertile farmlands. Their impacts on the complex riverine ecosystems are not fully understood yet, and for the most part cannot be mitigated. As Alessandro Palmieri from the World Bank documents in a presentation to this symposium, 300-600 new large dams would need to be built every year only to offset the sedimentation of existing reservoirs. This fact alone demonstrates that large dams are not a sustainable answer to the world's energy and water problems.

Many ICOLD members argue that consumers of electricity and water are an affected party of the large dams debate as well, and that NGOs hinder economic development by trying to stop large dams. Indeed, consumers are an affected party too, even if certainly to a lesser degree than people who must sacrifice their livelihood for a large dam. Yet with all the available water and energy options, is it really in the interest of

consumers to invest scarce resources in large dams? The economic development impact of large dams is doubtful at best. The WCD found that dam economics have never been evaluated in a comprehensive, ex-post manner. And of all the large dams the Berne Declaration [a Swiss NGO the author worked for] has opposed, none was a least-cost option for providing energy or water. Consumers in Brazil, China or Turkey would be better off if scarce resources were (or had been) invested in efficiency gains or in the co-generation of power in heavy industries rather than in the Itaipu, Three Gorges or Ilisu dams, to name just three. Other projects – including Bakun (Malaysia), Maheshwar (India), Manantali (Mali/Senegal) or Yacyretá (Paraguay/Argentina) – were and are outright economic disasters.

The WCD report confirms that dams are often not planned and built for economic reasons, but rather based on narrow, vested financial and political interests. Poor societies which have pressing water and energy needs cannot afford to squander public resources for vested interests. Instead, a comprehensive and unbiased assessment of all the needs and options as proposed by the WCD is an imperative of rational planning – and especially important for poor societies.

ICOLD President C.V.J. Varma argues that large dams should be built not necessarily because they are a least-cost option, but because they can more easily be implemented than efficiency measures or "complex" demand-side management programs. This argument confirms that many dams are built not because they make economic sense, but because they respond well to (and in fact, express) the unequal power relations within a society. In India the pressing electricity gap could be narrowed by increasing the efficiency of existing plants, by abolishing the power subsidies to large land owners in order to encourage an efficient use of irrigation pumps – or by building the hugely controversial Tehri Dam. For many decades, it has been easier for those in power to displace hundreds of thousands of poor people for a large dam than to touch the interests of the powerful large landowners. The growing resistance of NGOs and social movements is now changing this unequal power relationship. We may hope that this trend will encourage a more democratic, balanced and comprehensive water and energy planning process as it is promoted by the WCD report.



Peter Bosshard

The WCD Process

The creation of the World Commission on Dams was an expression of the unresolved social, environmental and economic problems of large dams, and of the strong resistance of social movements and NGO networks to the construction of such dams. NGOs such as the Narmada Bachao Andolan, Berne Declaration and IRN participated in the WCD process from the very beginning. They hoped that the establishment of empirical evidence on large dams in an independent and comprehensive process would make it more difficult to defend such projects on the grounds of self-interest or ideology. I personally participated in the WCD Forum and prepared several submissions for the Commission, and the Berne Declaration supported the WCD financially.

While most NGOs generally supported the creation and work of the Commission, they still had some serious misgivings about the WCD process. Even if the Commission made an effort to be more participatory than any other such body, affected communities found it very difficult to bring in their experiences. The lack of time and of translations made participation difficult for anybody who was not familiar with the professional jargon of experts. Conversely, consultants who had made a career working for the dam industry had all the more influence on the process. They wrote most of the WCD's input papers, thereby becoming the primary judges of the performance of their own profession; sometimes they were even paid to evaluate their own projects. It is therefore not surprising that the WCD report is not

always as candid as it should be. Finally, NGOs regretted that the Commission did not examine more ongoing projects. It was prevented from looking at controversial ongoing projects by the governments of China, India and Turkey – ironically the very governments which are now the shrillest critiques of the WCD report.

In spite of such shortcomings, most NGOs welcomed the WCD report when it was published in November 2000. Even if it is a compromise document, the report is the first independent and comprehensive review of the impacts of large dams. The WCD's knowledge base is the richest collection of comprehensive data on dams, and is based on the most representative sample of case studies which exists. The report has an added legitimacy because it was signed by all Commissioners, in spite of their extremely different backgrounds.

It is encouraging to see the widespread support which the report has already found. It was welcomed and is being used by international organizations (including UNEP and WHO), governments (including Germany and South Africa), multilateral development banks (such as the Asian Development Bank and the African Development Bank), companies (such as Skanska), and also some national committees and prominent representatives of ICOLD. We already see how this support is turning the WCD guidelines into soft international law. This will not exclude the interpretation of guidelines within different national contexts.

In contrast, the reaction of the World Bank to the report has been a cause of great concern. The Bank applauded the WCD process as a model case of multi-stakeholder dialogues as long as it could get free public credit for it. Once the report was published, it chose to side with the dam-building agencies of its borrowing countries, thus supporting one single stakeholder in the conflict over large dams. The Bank has made vague and non-committal declarations in public, but behind the scenes it has used every opportunity to discredit the report and block its implementation. By doing so, it has lost all credibility as a convener of future multi-stakeholder processes. Alessandro Palmieri's assertion that "the World Bank role as honest broker (...) is and will be more and more in demand" can only be interpreted as wishful thinking.

Many representatives and members of ICOLD, including several national committees, have also rejected the recommendations of the WCD report. They have done so in public statements, and are certainly doing so in their daily business practices. Right

now, we can witness a scramble of reputed international companies for contracts related to the Bakun hydroelectric power project in Malaysia. There is no demand for this project except for the greed of corrupt politicians and their business cronies. By bidding for such contracts, companies harm their public reputations. They indicate that they are not prepared to learn from past mistakes or from the WCD report, and that they rather try to profit from "business as usual" as long as they still can.

The Way Forward

Many companies and national agencies are still grappling with their response to the WCD report. I wish to call on these actors to formally adopt the WCD guidelines, to follow them in their business practices, and to support and participate in the follow-up processes on the national and international levels. At this symposium, many ICOLD members have expressed a strong confidence in the great benefits of large dams. Mümtaz Turfan claims that in Turkey, dams are producing an agricultural and energy value of US\$64 billion each year, or almost 40% of the national GNP. With such confidence, it is unclear to me why Turkey's dam builders or the dam industry more generally, are not prepared to accept a comprehensive and balanced assessment of needs and options, a process of gaining public acceptance by making affected communities beneficiaries of their projects, or a responsibility to help overcome the unresolved problems of existing dams, as stipulated by the WCD report.

Personally, I am convinced that ever fewer large dams will be built in the future. As President Varma has said, "change is inevitable," or in the words of the symposium organizers, "the glamorous days of unlimited barrage construction are definitely gone." Destructive projects with hugely negative impacts on the poor and on the environment are simply not acceptable anymore in today's world society. In his presentation, Kader Asmal reminded us of the many bitter conflicts over large dams which are still going on. If industry adopts the WCD guidelines, if it engages in the follow-up process and in a dialogue with dam critics, it will at least enjoy more predictability in its operations, it will learn to early on screen out projects which would certainly end up in political conflicts and legal disputes. ■

The author was with the Berne Declaration, a Swiss advocacy group, from 1987 until March 2001. He was involved in numerous dam campaigns as part of his work there.

One Drop at a Time

An Interview with Water Conservationist Amy Vickers



Amy Vickers

Amy Vickers has devoted her professional life to sustainable water supply and water conservation. Her new book, *Handbook of Water Use and Conservation* (Water-Plow Press, 2001), is the first encyclopedia of water demand-management techniques and programs in the US. IRN interviewed her to find out what is working, what is not, and how we can better conserve this most precious resource.

IRN: What has made you such a strong advocate for water demand management?

AV: A life-long love of water and a protective nature for the things I love. The experience of clean, clear and vibrant water is vitalizing and inspiring to me in every way. Some of my most memorable times in life are water related – things like hearing the roar of the ocean and riding its waves, experiencing the tides at the Bay of Fundy, visiting the source of water supply for communities. Those are sacred places to me. Each of us has a reflecting pool – the river, lake, aquifer, or ocean into which we literally pour our lives – and it reflects how well or ill we conduct ourselves in relationship to nature.

I've always seen the waste of water as totally needless and due largely to ignorance – ignorance on the part of water managers and water users. In recent years, I've become more adamant that water systems need to reduce their unaccounted-for water (many US systems have water losses and leaks in the 15-25% range, some more, and many other countries are much worse than that). Water efficiency has to start with the utility itself: it's really hypocritical for any city or water system to expect water users to conserve when it's not minding its own store. That said, the reality is that many water utilities are not given adequate funding or support to have good maintenance practices, so the culture of inefficiency is strong.

IRN: The US has the highest per-capita use of water in the world (in part because of relatively low population per landmass and a very high use of water for agriculture). How good a job is the US doing on water demand-management (WDM)?

AV: On the whole, US water systems are doing very poorly in terms of aggressive water conservation efforts. The water-conservation superstars – Seattle, Albuquerque, New

York City, Boston – have put major resources into it, with stellar results. All have reduced water use by at least 20%. Those are the role models, and why other utilities haven't followed them is a big question. Partly it's the "engineering mentality" which says if you have a water shortage you build new supply. The incentive for engineering firms to build new infrastructure is great – there's a lot of money to be made in large dams and water treatment plants. Another problem is that politicians don't want to fund infrastructure that voters can't see.

A major factor is the growing corporate influence in the water world, which I believe is the fastest-growing disincentive to conservation. The increasing role of for-profit water systems is creating a mindset in which efficiency and conservation are not valued options. German, British and French firms are now buying up water supply systems in the US and around the world; these companies earn their profits by the amount of water they sell, not by how much they save. Privatization also often leads to the development of the surrounding watershed: the companies sell off lands surrounding a watershed as real estate, thus eliminating the first barrier to protecting the watershed from polluted runoff. Ultimately, consumers will pay more and have inferior service from private water systems, I believe.

IRN: What countries are doing the best job at promoting WDM?

AV: It's a mixed bag. Israel is certainly very efficient in its agricultural water use, but they're also building swimming pools in the West Bank. England has for the past 10 years resurrected itself in the area of preventing leakage. They had a 30% leakage rate in the early 1990s, but they've turned that around. Their rate is still a bit higher than in the US, but they've been moving down. This all started with the privatization of their water supply, which was very controversial and led

to greatly higher water rates. Then a big drought hit them, and citizens learned about the huge leakage rates at the same time their water bills had skyrocketed, so it became a public embarrassment. Now they have a very sophisticated computer modeling system to detect leaks and are actively making repairs.

IRN: What are some trends in the water world that citizens should be aware of?

AV: There is a tendency for water suppliers to look to desalinization and grey-water reuse systems when they face a water supply problem. These options – which are really a new form of supply, not conservation – are very energy-intensive. They are also high-cost, and usually supplant efforts at conservation and efficiency. The influence, I suspect, is from engineering and construction firms who stand to benefit.

IRN: What would you say is the best first step that a water supplier can take to become more sustainable?

AV: That's easy: each water system should set an immediate goal of meeting the American Water Works Association (AWWA) water-loss guidelines of 10% maximum unaccounted-for water. This is the most important thing, but often the last thing to be done, because it's "out of sight, out of mind" and politically embarrassing. Often what gets water systems to address their waste issues is when their leakage rates are reported by the media.

IRN: How can citizens get that information?

AV: People have the right to know, so ask for this information from your local water supplier. There is no system-wide accounting of water losses, and no law that requires a water company to give you the information, unlike with pollutants (which has to be reported under the Safe Drinking Water Act). It may be hard to come by, but it's worth trying to get this information. We need to start breaking this cycle of citizens being unaware of where their water goes, and where it comes from.

IRN: Are there other steps we should press our water utilities and communities to take?

AV: If we truly wish to entertain any hope of a sustainable water future in industrialized

continued opposite

Excerpts from *Handbook of Water Use and Conservation*

Conservation or efficiency measures can be grouped into two general categories: (1) "hardware" devices or equipment and (2) behavior or management practices. Hardware measures are generally more reliable in achieving long-term water savings because they typically need to be installed only once and require no ongoing effort to maintain water savings. For example, a low-volume 1.6 gallon per flush (gpf) toilet installed to replace a leaking 3.5 gpf fixture will have an operational life of at least 20 years, saving considerable amounts of water without any additional effort beyond normal maintenance. In contrast, educating people to adopt low-water-use or native landscaping and irrigation practices, though essential to reducing outdoor water use, requires considerable time, and ongoing reminders are necessary if water-efficient landscapes are to be maintained.

Potential water savings from repairing leaks can be significant. For example, repairing a leak that is losing 1.5 gallons per minute can recover 788,400 gallons of water a year. If the combined cost of water and sewer service is \$4 per thousand gallons, repairing this leak would save more than \$3,100 a year. With a cost of \$50 for the repairs, this measure would yield a payback in less than one week.

Drip irrigation has some unique benefits compared with other irrigation systems. For example, because drip systems wet smaller areas, soil waterlogging and related water losses are minimized, weed growth is inhibited, smaller amounts of farm chemicals are needed, salt accumulation is reduced, runoff and erosion

are reduced, and associated labor costs are lowered. Drip systems can achieve application efficiencies as high as 95%....A study of the production of potatoes, apples and bananas in Israel showed a 60% reduction in water demand when growers used drip irrigation compared with the conventional irrigation practices. Drip irrigation of avocados and cotton achieved a 30% reduction in water demand.

The Energy Office of the city of Portland, Oregon sponsors a free program, Businesses for an Environmentally Sustainable Tomorrow (BEST), offering technical support, assistance with applications for tax credits and other financial incentives, and related services to businesses that implement efficiency measures. The program's primary goal is to promote environmentally sustainable practices that help local businesses operate with greater efficiency and profitability, steps assumed to enhance local economic development and environmental protection. Fifty-five Portland-area "BEST Business Award" winners have quantified the results of the measures they have taken to boost water and energy efficiency, reduce waste and promote clean and efficient transportation. As of 2000, their combined savings total:

- 857 million gallons of water
- \$11.5 million in avoided costs
- 38.3 million kilowatt-hours of electricity
- 6.6 million therms of natural gas
- 687,000 gallons of gasoline
- 98,000 tons of carbon dioxide emissions

countries, then we've got to overturn the culture of the irrigated lawn. Our lawns are a primary reason we are, in so many communities, over-drafting our aquifers and poisoning our drinking water. Lawns use about four times the amount of pesticides as farmland. [Americans maintain over 25 million acres of lawn, using as much as 200 million pounds of pesticides on lawn care alone.]

There is a burgeoning natural landscape movement in the US that is I think the wave of the future. This involves habitat restoration that converts ornamental landscaped areas like lawns back to native plantings like prairie grasses and other native plants. Schools, cemeteries, parks and even industrial parks are adopting it. The Midwest is where most of the action on this is happening, but it's cropping up in other parts of the country, too.

As for other steps for water utilities to

take, we need to do more to reduce water use in the industrial sector. There's a significant opportunity for savings – up to 50% at many sites. But often there is no immediate cost-benefit to the industry, which usually only takes such steps voluntarily if they can recoup their investment within one to two years. We need public pressure to get these programs off the ground.

The industrial sector can often move quite quickly to reduce water waste when there is a drought or emergency situation. For example, when California was experiencing a drought in the 1980s, some Silicon Valley firms were quickly able to reduce their water use by 40-80%. And Intel in New Mexico reduced its water needs by 60% through a combination of water-efficiency operations. Moreover, Intel's reductions in water use corresponded to a 70% increase in chip productivity. These savings are permanent, too.

Some utilities have taken the creative step of combining efforts at water conservation, pollution prevention and energy conservation; Oregon and Massachusetts are two states where some utilities have taken this approach, primarily with large industrial customers.

Another tactic to reduce water waste is to price water according to use, especially to discourage excessive lawn watering. But in the US and some other wealthy countries, the cost factor only seems to have a short-term effect of getting people to reduce their use. We need to develop a water ethic. People have to understand the cause and effect of their actions. We need to bring people full circle, to educate them about the value of water. If we truly seek to ensure that the world has enough safe water in the future, then we must act more aggressively to preserve what we claim to hold dear. ■

Northern Nigeria continued from page 1

to return to their homes for fear that they will simply be flooded out again next year.

ANEEJ and other local groups cite the disaster as evidence of the need to maintain natural ecosystems. Hope Ogbuide of the Society for Water and Public Health Protection (SWAPHEP) said, "The intervention of

mankind on natural processes has again proven to be the swiftest pathway to our doom." The manner in which Nigerians respond to the crisis is now of utmost importance, says Atakpu. ANEEJ and other local NGOs have called on the Nigerian government to employ the World Commission

on Dams (WCD) guidelines in the planning of future dams and the management of existing ones. ■

The ANEEJ report on the flooding is available from IRN, or contact ANEEJ: aneej2000@yahoo.co.uk

IT'S IN THE CAN

Aluminum Industry Forges Ahead with Dam Plans

by Lori Pottinger

Large dams have become increasingly hard to build in recent years. The result has been a big drop in completed dam projects, which fell from a peak of 5,400 in the 1970s to about 2,000 in the 1990s. Because of the efforts of dam opponents, and because of the poor economics of dams and simple "site depletion" (the best dam sites are getting used up), the rate of new dam construction is dropping fast in every region of the world. And yet, despite the dam industry's "reverse renaissance," the aluminum industry

needed almost as much electricity just to convert alumina into aluminum as was used in all of Africa. The Worldwatch Institute notes that the electricity required for smelting a ton of aluminum could power a US household for a year and a half.

World aluminum production has grown 16-fold since 1950, and reached record levels in 2000. The amazing growth of the aluminum industry, while bringing many benefits to society, has also led to numerous large, destructive dams blocking the world's rivers, in addition to the many impacts of alumina mining and smelting.

Today, more than half of the aluminum industry's energy supply comes from hydropower (and about one-third is coal-fired, which has major global warming impacts). Many companies build private dams solely to supply their smelters; such dams account for about 14% of the industry's hydropower; the rest is from grid-connected dams. The aluminum industry is responsible for some truly massive (and massively destructive) dams, including Ghana's Akosombo Dam, Tucuruí Dam in Brazil, the Kemano Dams and James Bay projects in Canada, to name just a few. Today, many more are planned, some of which are described elsewhere in this issue.

These dams have led to horrible environmental and social impacts. In most cases, the economic benefits of the aluminum smelters and their dams have not offset their many negative impacts. For example, the Ako-

sombo Dam drowned 4% of Ghana, forcibly resettled 80,000 people, and drastically increased waterborne diseases such as schistosomiasis (which affected 100% of children living near the reservoir for many years). Tucuruí displaced 24,000 people, led to widespread deforestation and loss of wildlife habitat in the Amazon rainforest; increased malaria and other diseases, and flooded 2,400 sq. km. Canada's Kenney Dam diverted almost 40% of the Nechako's flow, greatly reducing its once productive fisheries and thus harming tribal people's livelihoods. None of these dams would have been built without the aluminum smelters pushing for them.

Aluminum companies have an incredible thirst for cheap power, and have historically been granted huge subsidies for their power supply. The favorable rates granted aluminum smelters often result in utilities actually losing money from their aluminum contracts, forcing other ratepayers and taxpayers to pick up the bill. A 1994 report by the Columbia Research Corporation estimated that the cost of serving the power needs of the aluminum industry in the US Pacific Northwest exceeded the power utility's income by \$935 million from 1986-95.

The Northwest aluminum companies used the recent Western energy crisis to increase their profits. When the energy crisis first hit California, the aluminum companies promptly idled their plants, sent thousands of workers home, and sold their subsidized power to California to capitalize on the skyrocketing rates. The aluminum companies made millions off of this deal.

Many governments in developing nations are eager to lure aluminum plants, and use generous energy subsidies as the bait. Because electricity expenditures comprise 20-30% of the total production cost of aluminum, while transport costs from the mine to the smelter are less than 1% of the total cost, it is standard practice to ship either bauxite or alumina halfway around the world to take advantage of these cheap electricity contracts.

The developing world's share of global production of aluminum has doubled consistently every ten years since 1960, according to Greenpeace. The 1999 industry report "The Economics of Aluminium" notes that although the market for aluminum is currently depressed due to oversupply, "most of the recent growth in output has come from the developing countries: Asian aluminum output more than doubled between 1988 and 1997." Asia/Oceania now accounts for almost 26% of worldwide primary aluminum production (China is a major producer), according to the Aluminum Association, while Latin America's share is 10%. The US and Canada together account for more than 28%.

Throw-Away Energy

Aluminum has been called "frozen energy" because it takes so much energy to produce.

continued opposite



Wall of aluminum cans in a typical US supermarket.

remains a fervent supporter of dams, and continues to push governments around the world to build hydro projects to supply its smelters with hugely subsidized electricity.

Primary aluminum production is one of the more energy-intensive industries on earth. (It is also highly water-intensive, a major producer of greenhouse gases, and a serious polluter of land and water from the mining of bauxite.) Each year, aluminum production uses at least 250 gigawatt-hours of electricity, or about 2% of global energy consumption (or about 6% of the world's hydroelectric generation). According to a 1992 Greenpeace study, the world aluminum industry in 1990

Photo: Jeanette Madden



The energy embodied in a soda can is equivalent to a 12-ounce can one-third full of gasoline, according to the Georgia-based GrassRoots Recycling Network (GRRN). "In the year 2000, the energy wasted by not recycling aluminum cans in the United States could have supplied over 2.5 million American homes with electricity," according to Jennifer Gitlitz of the Virginia-based Container Recycling Institute. On a more personal scale, one recycled aluminum can saves enough electricity to run a computer for three hours.

All of this energy consumption translates into greenhouse gas emissions: while aluminum cans only comprise 1.4% of the entire

US waste stream by weight, they contribute a whopping 14% of the emissions embodied in a ton of waste sent to landfill, according to *Solid Waste & Recycling* (April 2000).

The aluminum industry, which benefits from greatly reduced energy costs by using recycled material in its products, has been a major sponsor of recycling efforts, especially in the US. Making aluminum ingot from recycled aluminum uses only 5% as much total energy as making ingot from

bauxite ore. Post-consumer recycled aluminum now provides about 14% of the US supply. Using recycled aluminum also reduces greenhouse gas impacts: net carbon emissions are 40 times lower when materials are produced from recycled aluminum, according to the US Environmental Protection Agency. Aluminum can be recycled indefinitely.

But efforts to encourage greater recycling have not always been welcome. For example, a shareholders'

resolution to Coke that proposed the company achieve a recycling rate of 80% of its beverage containers by 2005 was defeated in April. The recycling proposal was submitted by shareholders representing \$50 million in company stock and included well-known socially responsible investment funds like Trillium Asset Management and Domini Social Investments. The GrassRoots Recycling Network, which started the Coke campaign as well as one aimed at Pepsi, says Coca-Cola creates 2 million wasted bottles and cans every hour and that US beverage container waste increased 50% between 1992 and 1999.

Keeping cans out of landfills obviously keeps this energy use way down. But as the use of aluminum packaging (like cans) has grown, the amount being thrown away has grown, too. And the biggest wasters are, not surprisingly, the world's richest countries. The Washington-based Worldwatch Institute has estimated that residents of the industrialized world comprise only about 20% of the global population, yet consume 86% of the world's aluminum. About 22% of the US market for aluminum is for packaging – foil, cans and other food containers. According to Container Recycling Institute (CRI), Americans bought 100 billion aluminum cans in 2000: more than a can a day per person. Although the Aluminum Association has a national recycling rate goal of 75%, recycling rates have actually been declining in many places in recent years, from a US high of 65% in 1992, to the latest figure of 54.5% in 2000, according to CRI. That means 45 billion US cans were landfilled or otherwise destroyed in 1999, according to the Container Recycling Institute. By contrast, the Swedish aluminum can recycling rate was 87% in 2000, and Japan's is around 74%.

A Better Way

Aluminum's benefits are many, and its importance to the world's economies and industries is not in dispute. In addition, the

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US Recycling Rates Dropping

by Jennifer Gitlitz

More aluminum cans are being wasted than ever before. In 2000, 691,000 tons of cans were landfilled, incinerated or littered in the US, almost 25% more than were wasted in 1992. This despite a tripling in the number of curbside recycling programs in the US. More than 8,000 Boeing 747 airplanes could be built from the aluminum cans wasted last year. The value of the more than 30 billion cans trashed by Americans since 1972 would be worth more than \$15 billion today.

Some reasons for the decrease in recycling include:

- Total annual per capita consumption of single serving beverages has increased over the last decade, from 348 cans/person/year to 358. Compounding the problem, the US population increased by 30 million in the decade ending 2000, each consuming over 350 cans per year.
- "Away-from-home" consumption has increased as vending machines and convenience stores have proliferated, and as people spend more time in their cars.
- Inflation has gradually diminished the value of a nickel, making redemption less attractive to many in the nation's 10 states with beverage container deposit legislation.
- The economy has been strong enough (until recently) to make "scavenging" less attractive to some segments of the population.
- Public attention has been redirected to other environmental issues (e.g., global warming), and there is a perception that recycling "has arrived," and that we're doing a good job.
- There has been decreased public spending on recycling education and promotion.

The US is hardly the only culprit in this growing problem, but is the worst offender because of the sheer volume of its aluminum waste. While some countries have achieved extremely high rates of recycling (e.g., Sweden, Japan), the trend is that canned beverages are becoming increasingly popular in places that have not yet developed a recycling infrastructure. The problem is exacerbated by a global oversupply of primary aluminum: production exceeds global demand. Since the breakup of the former Soviet Union, Russia has been exporting millions of tons of aluminum for much needed cash. This global oversupply drives primary aluminum prices down, which in turn suppresses secondary prices, thus reducing the market incentive to collect cans for recycling.

What would it take to improve the situation? The following are four key strategies:

- raise the deposit in existing bottle bill states to 10 or 15 cents per container, to keep pace with inflation, and with the original legislative intent of these bills.
- Implement more bottle bills, or better yet, have a national bill. In May 2001, Rep. Lynn Rivers (D-MI) introduced HR 1667, "The National Beverage Container Reuse and Recycling Act of 2001." Sen. Jim Jeffords (I-VT) is expected to sponsor a similar Senate bill in the coming year.
- Expand recycling opportunities in public places, such as office buildings, stadia, malls, airports, parks, etc.

The author is with the Container Recycling Institute (see <http://www.container-recycling.org/>). She is also the author of the 1993 IRN report "The Relationship Between Primary Aluminum Production and the Damming of the World's Rivers." The report is available from IRN for US\$15 plus shipping. Please contact Soudary Kittivong-Greenbaum (email: soudary@irn.org; phone: 510.848-1155) to order.

Damming the Zambezi for Aluminum

Proposed Dam a "Power Play" to Gain Control of Upstream Dam?

by Ryan Hoover

For a couple of weeks in late September, sooty plumes of black smoke billowed from the stacks of the Mozambique Aluminum (Mozal) smelter on the outskirts of the Mozambican capital, Maputo. A year after the plant opened, a cooling tower in the treatment plant corroded and gave way, spewing sulfur dioxide and toxic fluoride into the air. A company official admitted that fluoride was in fact being released, but was quick to claim, "While the black plume now issuing from the top of the treatment plant is unsightly, it is not dangerous."

Anabela Lemos of the Mozambique environmental group Livaningo is skeptical. "I don't believe it's not dangerous," she says, "If after only one year of operation they have suffered such a breakdown, what will happen in the future?"

Through much of its recent history, Mozambique has been a Cold War battleground, with Western-backed guerrilla forces carrying out a horrific destabilization campaign against the country's Marxist govern-

ment. Peace finally came to the country in the early 1990s following the collapse of the Soviet Union and the fall of South Africa's apartheid regime, which played a key role in instigating and protracting the war.

desperately poor population's quality of life. It is an open question, however, if the benefits derived from these schemes will be adequate compensation for their impacts.

One of the larger recent foreign investments is the Mozal smelter. A consortium led by the multinational mining giant BHP-Billiton developed the Mozal project with financing from the World Bank's private-sector lending arm, the International Finance Corporation (IFC). Eventually, Mozal hopes to produce 500,000 tons of aluminum ingots annually at the plant from raw alumina that is shipped to Mozambique from Australia's Worsley mine, which is also owned by BHP-Billiton.

Why ship raw alumina across the Indian Ocean to a country almost 5,000 miles away? The answer lies in the fact that electricity in Mozambique is very cheap. The Mozal smelter already uses 450MW of electricity, and if a planned second phase is completed it will use a total of 900MW. This amount dwarfs the total amount of electricity used by the entire rest of the country

(307MW). With such enormous amounts of electricity required (and with a glut of primary aluminum on the market in recent years), the smelter's profitability therefore depends on it obtaining cheap electricity. Terms for the sale of electricity to Mozal are confidential, but according to a 1999 report in *Africa Energy & Mining*, the cost was pegged to the price of aluminum and amounted to less than US\$0.02 per kWh, cheaper than anywhere in the world outside of Canada.

Surprisingly, Mozal's electricity does not come from the giant Cahora Bassa Dam in northern Mozambique, which has a capacity of 2,075MW. Instead, the smelter receives its power from Motraco, a consortium comprised of electricity utilities from South Africa (Eskom), Swaziland (SEB), and Mozambique (EDM). Analysts suggest that the Portuguese company that owns and operates Cahora Bassa (known by its Portuguese acronym HCB) was cut out of the Motraco consortium to supply Mozal in part because of its past conflicts with Eskom over

Fluoride Fallout from Smelters Poses Global Problem

Toxic smoke laden with fluoride has been belching from a Chinese government aluminum smelter into the Rongwo valley of Tibet for years. The smoke settles on hillsides and grasslands, where goats and sheep graze. Tibetan farmers believe the aluminum fallout is responsible for their animals suffering from an ailment that makes their teeth brittle and fall out. Out of fear of being labeled Tibetan separatists, the farmers do not protest the smelter's lack of pollution control equipment. China is one of the world's top ten aluminum producers.

The US Department of Agriculture states that airborne fluorides "have caused more worldwide damage to domestic animals than any other air pollutant."

Fluoride ions in the body prevent calcium absorption in bones. Fluoride toxicity in humans can result in acute symptoms including nausea, and chronic effects ranging from osteoporosis to skeletal deformation. Because fluoride compounds are not biodegradable, they gradually accumulate in the environment, in the food chain, and in bones and teeth.

Most processes which take raw materials from the earth's crust and subject them to high temperatures liberate fluorides. Fluorine compounds are involved in the production of aluminum, steel, uranium and plastics, and present a major waste disposal problem.

Evidence that industrial fluoride has been killing and crippling human beings and animals has existed at least since the 1930s.

Doris Shen

rates charged for the dam's electricity. Another reason is thought to be Mozambique's discontent with Portugal's continued ownership of Cahora Bassa, a growing irritant that is having surprising side-effects: Mozambique is reportedly considering the

continued opposite



Photo: The Zambezi Society

People living on the Zambezi Delta could be affected by Mepanda Uncua.



closure of its embassy in Lisbon, in part over the Cahora Bassa issue.

As BHP-Billiton and the IFC gear up for construction of the second phase of the smelter, they have made little secret of the fact that they will need to locate additional power supply. Instead of now negotiating electricity from the existing Cahora Bassa, however, BHP-Billiton and the Mozambican government have proposed to build a new dam, named Mepanda Uncua, 70 kilometers downstream from Cahora Bassa on the Zambezi River. This proposal has prompted some observers to question whether the new dam is not actually a ploy to wrest control of Cahora Bassa from the former colonial powers.

This political maneuvering could come at a heavy social and environmental price. The proposed US\$1.2 billion Mepanda Uncua Dam will displace some 2,000 people from its 100 sq. km. reservoir. These people are primarily pastoralists who are struggling to rebuild their herds, which were decimated during the protracted civil war. Thus far, only an "informal" resettlement program is planned, and proposed development programs involve little more than the provision of additional water supply.

People living downstream of the dam will also be affected. The completion of Cahora Bassa in 1974 prevented seasonal flooding on the Zambezi and changed the behavior of people living near its floodplain. Before the dam's construction, they annually migrated onto the floodplain to farm and then moved back to safety before the floods arrived. In recent times, infrequent flooding forced communities to farm the flood zone because formerly productive farmland is now marginal without the

floods' regular deposits of silt. These new settlement patterns mean that hundreds of thousands of people are literally in harm's way when the big floods inevitably spill over upstream dams. The Mepanda Uncua Dam could exacerbate this problem by further regulating the Zambezi's flow. The dam, although situated on the mainstem of the Zambezi, will capture the flow of the Luia River, one of the three most important tributaries on the Zambezi below Cahora Bassa Dam.

Mepanda Uncua will also most likely further decrease the amount of sediment carried by the river. The upstream dams of Cahora Bassa and Kariba have already caused drastic environmental changes downstream by trapping this silt, especially affecting the ecologically sensitive Zambezi delta with its large mangrove swamps.

As the recent breakdown at the smelter illustrates, however, the dam is not the only component of the project with big environmental and social problems. According to the Environmental Impact Assessment (EIA) for the smelter, the plant emits 26 times more sulfur dioxide than other smelters, because it does not have a "wet scrubber" installed, a standard component in many modern smelters. Interestingly, the EIA does not recommend the installation of a wet scrubber because ambient levels of sulfur dioxide in the area before the smelter's construction were deemed "not a problem."

Labor disputes have also dogged the project. At press time, more than 300 Mozambi-

can workers had walked off the job to protest low wages and safety concerns; they were subsequently fired. Mozambican middle managers reportedly receive only a third of what is paid to Australian and other foreign middle managers at Mozal, and the Mozambican workers hired to build the plant received less than \$50 per month. "Our efforts to get more information on these and other concerns have thus far proven fruitless," says Livaningo's Mauricio

Sulila. The group's meetings with Mozal representatives are frequently cancelled, representatives are unable to answer questions, and a general air of secrecy surrounds the plant's operation. According to Lemos, Livaningo is increasingly convinced that the Mozal plant is a menace. "We believe any continued investment in the second phase of the Mozal smelter will result in major problems in the areas of public and environmental health for us in the future," she says.

Mepanda Uncua Dam may have a life even without the smelter, however – as a way to meet Mozambique's growing energy demand. Livaningo disagrees that Mepanda Uncua is the least-cost alternative for meeting demand, however. "If Cahora Bassa Dam was better managed," says Lemos, "there would be no need for another dam to be built." A proposal to add an additional 600MW power plant to Cahora Bassa would provide enough electricity to power a second phase at Mozal with plenty of power to spare.

A source working within the Mozambican energy sector believes development of the nation's natural gas reserves is the most viable option for providing power to the vast majority who are currently without access to the power grid. This energy economist believes that it would be cheaper to use natural gas for power generation in these isolated locales than it would be to extend transmission lines from hydropower plants. These pockets of "small" demand far from the main power grid might also be best served by small-scale renewable projects, including biomass, solar, or wind.

The Mozambican government is making steps in this direction. Recent legislation encourages power co-generation to facilitate the electrification of smaller cities and towns, recognizing it as the most efficient way to provide power to the 95% of Mozambican citizens who are currently without electricity. It remains to be seen, however, if they will be similarly active in protecting the Zambezi from further damming. ■

Bui Dam Dead?

The August issue of *WRR* reported on the proposed Bui Dam in Ghana, which would flood part of a national park, destroy habitat for rare hippos, forcibly resettle 2,600 people and affect thousands more. On October 8, tentatively good news came: the government announced that the project has been shelved – at least for now.

The Accra newspaper *Public Agenda* reported that Dr. Charles Wereko-Brobby, Chief Executive of the Volta River Authority (VRA), made a public statement that the dam will not meet Ghana's immediate energy needs and is more expensive than other alternatives. It is the first statement by a government official that seems to indicate the project is on hold.

"One can no longer assume that hydropower generation is cheaper anymore," said Wereko-Brobby. "If you are running thermal with gas, you can run it half the cost of hydropower from Bui."

VRA has initiated a thermal plant project and is currently searching for funds to pay for its share of the West Africa Gas Pipeline project. Every day in southern Nigeria, almost 2 million cubic feet of natural gas is burned during crude oil production, more than is flared anywhere else in the world. According to the World Bank, gas flared in Nigeria is equivalent to total annual power generation in sub-Saharan Africa. The West African Gas Pipeline will tap this resource for use in Ghana, Benin and Togo.

Aluminum Companies Press for Dams on Amazon

by Glenn Switkes

Brazil's ongoing energy crisis has cast the public's attention on the enormous consumption of aluminum companies in the country, which are responsible for about 8% of total electrical energy use in Brazil. Angry consumers facing threats of cutoffs in energy service and energy planners looking to reform Brazil's energy system to avoid long-term energy shortages have identified the aluminum industry and other energy-intensive industries as the most likely places to find significant energy savings in coming years. The energy crisis has also caused transnational aluminum giants operating in Brazil to move ahead with plans to construct their own new dams, mainly in the Amazon region, to ensure electricity for expanding current operations.

The largest dam ever built in the tropical rainforests, Tucuruí, already powers two enormous aluminum plants: Alumar (owned by Alcoa, Billiton, Alcan) in São Luis, Maranhão state, and Albrás (Companhia Vale do Rio Doce, Nippon Amazonian Aluminum Consortium) in Bacarena, Pará state. Each of these smelters produces about 370,000 metric tons of aluminum per year. As with all

smelters, the plants require energy 24 hours per day to operate – any prolonged energy interruption would mean millions of dollars in damages to the smelters. Together they use more than 3% of all the energy consumed in Brazil, and five times more electricity than the Amazon's largest city, Belém, with a population of 1.2 million people.

The national energy crisis has revived calls to eliminate subsidies in the form of cheap energy for Brazil's aluminum industry. Twenty-year contracts signed by Alumar and Albrás in the 1980s guarantee that the price they pay for electricity will not rise above 20% of international aluminum prices, which have been depressed in recent years due to global overproduction. This deal means they purchase electricity at about US\$18 per MWh, one-quarter of the actual cost of generation at Tucuruí, and about one-fifth the rate paid by residential consumers. In other words, the Brazilian government has been paying a subsidy to the aluminum companies estimated to be worth between \$200-400 million per year. Tucuruí, originally estimated to cost \$4 billion, ended up costing \$8.77 billion, not including inter-

est payments on the transmission lines, according to a case study on the dam by the World Commission on Dams.

The cost of electricity accounts for about 35% of the costs of producing aluminum in Brazil. The aluminum industry is not only energy-intensive, it is also extremely energy-inefficient in Brazil. A study by the Brazilian government showed that 47% of all energy entering aluminum plants is dissipated as waste heat, compared with 33% in industrial facilities as a whole.

Aluminum companies initially responded to nationwide mandatory 25% cut-backs in energy use by cutting production. Aluminum production nationwide was off 18% in July from 2000 figures. (Brazil exported \$2 billion worth of aluminum in 2000.) Now, industries are being rewarded in the form of "off-hour reprieves" on their energy use, and the Alumar and Albras plants in northern Brazil have had their rationing quotas cut back to 15%. Despite announcements in the national press in May that the Brazilian government was "negotiating the closing of multinational aluminum plants" to save energy, the government's energy planners have stepped back due to political pressures. At any rate, the uncertainty surrounding the Brazilian energy picture for years to come has now caused aluminum companies to look to build more of their own dams to sustain and support the expansion of aluminum plants (or perhaps, to export production – see box this page).

According to the Brazilian Aluminum Producers' Association, companies have already invested \$1.5 billion in new dam construction. Alcoa says it alone plans to spend \$1 billion building new dams in Brazil in the next five years.

In all, some 14 dams have been proposed for the Tocantins and Araguaia river system. Billiton (Australia, UK, South Africa) and Alcoa (US) have carried out feasibility studies for the Serra Quebrada Dam on the Tocantins River (with a projected cost of \$1.35 billion and installed capacity of 1,328 MW) and Santa Isabel Dam on the Araguaia River (projected cost of \$1 billion and installed capacity of 1,080 MW). Alcoa, together with the Vale do Rio Doce mining company, has also publicly expressed its interest in Estreito Dam (at a cost of \$1.2 billion, installed capacity of 1,200 MW). These Amazon region dams will affect protected areas of the rainforest, as well as indigenous tribes. Santa Isabel would impact the Suruí and Karajá indigenous people, as well as the Serra das

Brazil Looks to Africa Rivers to Power its Aluminum Smelters

The South African "Engineering News" website reported on October 10 that "Africa could be the beneficiary of a plan under consideration by Brazilian aluminum company Aluvale to move its aluminum production activities out of Brazil." The news article reports that the proposal by Aluvale (94,74% owned by Companhia Vale do Rio Doce) is in response to the current electricity crisis in Brazil.

"We know where to find cheaper energy in Africa and Central America," said company CEO Roger Agnelli.

Although it is clear that this plan is still in the very early stages of development, a comment by Agnelli suggests that Africa currently leads Central America as the most probable site for such a move.

"We find interesting the option of using a hydroelectric power station in Africa, if, in fact, we can get cheaper energy there," he said.

The article reports that the proposed move seems to have already secured political approval in Brazil. Ministry of Mines and Energy Secretary Afonso Henriques Moreira Santos has said that there will be no major problems with such a transfer of smelting operations. "Our energy should be used for industrial activities more interesting than the production of aluminum," he asserted.

Mozambique may be a likely option for the Brazilian company, because of its existing hydro at Cahora Bassa, its proposal for a dam at Mepanda Uncua, its own Mozal aluminum complex, and the fact that, like Brazil, it is a Portuguese-speaking country. BHP Billiton, which owns Mozambique's Mozal plant, also owns a company with ties to CVRD. According to Engineering News, "Relations between BHP Billiton and CVRD are known to be close and friendly, so the idea of at least unofficial consultations between the two on this issue are entirely credible."

If the plan is implemented, bauxite would be mined and refined into alumina in Brazil, sent to Africa for smelting into aluminum, and the metal then returned to Brazil to use in the manufacture of aluminium products.

Six Dams in Chile's Alumysa Project

by Monti Aguirre

Noranda Holdings Limited, a leading Canadian mining and metals company, announced in August it had filed an environmental impact study (EIS) for the Alumysa Project with COREMA, the Chilean environmental agency in charge of approving environmental studies.

The Alumysa Project, co-owned by Alumysa Joint Venture Limited and Noranda Holdings Limited, involves the construction of an aluminum plant for the production of 440,000 tons of aluminum; construction of up to 6 large dams with an installed capacity of 1,154 MW, construction of the Bahía Cha-

cabuco Port, transmission lines and new roads. The dams range in size from 15 meters for the smallest to 116 meters for the largest. All but 12 MW from the project's dams will be used by the aluminum plant.

The project owners intend to supply aluminum ingots to national and international markets. Production will require the import of close to 846,000 of alumina, possibly from Australia, Brazil or Jamaica. Southern Chile was selected as the project location for its hydroelectric potential, proximity to deep waters for the port, and for the stabili-



ty of Chile's "social, economic and political conditions," according to the Executive Summary of the EIS. A decision by COREMA is expected in six to nine months.

Noranda is also seeking additional investment partners and funding for the US\$2.75 billion project.

Some of the project's foreseen impacts include the flooding of 9,600 hectares which comprise habitats for 12 vulnerable species, three rare species, and five in danger of extinction; fish migration impeded by dams; diminishing of water quality by contamination of mercury and other heavy metals; resettlement of farmers from the Río Blanco Valley, and impacts on tourism. ■

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Andorinhas ecological reserve. Serra Quebrada would drown seasonally flooded forest ecosystems, displace 14,000 people and affect the livelihood of thousands of fishermen, as well as affecting the lands of the Apinajé and Krikati Indians.

Aluminum companies are already participating as partners in the construction of new dams, including Machadinho Dam in southern Brazil, which is being considered for financing from the Inter-American Development Bank. This dam will flood 7,177 hectares along the Pelotas River (a tributary of the Uruguay River), and displace more than 6,000 people. The private consortium building the project, which includes Alcoa and other aluminum companies, will receive 83% of the project's power. The Companhia Brasileira de Alumínio, a subsidiary of the powerful Votorantim industrial group, continues to push for construction of dams on the Ribeira do Iguape, the last major undammed river in industrialized São Paulo state. These dams would directly impact the Atlantic Coast rainforest (only 7% of its original expanse remains) and communities of *quilombolas* (descendants of escaped African slaves).

Environmental groups are using the new public awareness about energy issues created by Brazil's energy crisis to call for the end to public subsidies for energy-intensive industries. Civil society networks in the Amazon, such as the Carajás Forum, are training regional activists regarding the impacts of large dams. The Movement of Dam-Affected People (MAB) is organizing protests and teach-ins in the national capital Brasília in October which will focus on the need to change national development policies to move the country away from "exporting energy" in the form of aluminum and other energy-intensive products. ■

Leader of Movement to Stop Amazon Dams Murdered

by Glenn Switkes

Ademir Alfeu Federicci, popularly known as "Dema," was murdered on August 25 by two men who entered his home in Altamira. Federicci had led the fight to stop Belo Monte Dam, which would be the second largest dam in the world. The huge dam would be the first of a planned series on the Xingu River in the Brazilian Amazon.

The 36-year-old activist had worked to organize communities and labor unions along the Transamazon Highway for development alternatives to the construction of Belo Monte, and had helped write a letter in July protesting the Brazilian government's lack of consultation with local communities regarding plans for dams on the Xingu (see below for excerpts). He had also made enemies by fighting corruption in local governments.

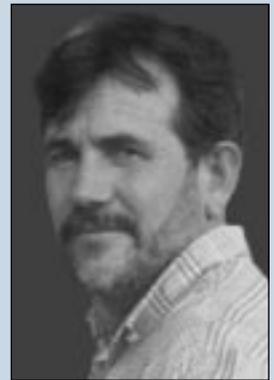
Local police called the murder the result of Federicci's resisting a robbery attempt. Unconvinced, the Federal Police began an investigation of the crime. Three thousand people attended Federicci's burial.

Excerpts from the "SOS XINGU" letter:

"We call on all social and environmental organizations in Brazil and the entire World to join us in opposing the model of development being implanted in the Amazon rainforest by the Brazilian government based upon the construction of hydroelectric dams, hidrovias (channelization of rivers for industrial waterways), support for intensive agriculture with high use of chemicals, cattle ranching, and mining ... No one can say with certainty what the impacts of Belo Monte and the two other dams on the Xingu now being discussed will be. Why sacrifice the Xingu River by building dams, when its basin represents one of the country's most important sites of ecological capital in its natural state, capable of contributing as an instrument for sustainable economic development, in harmony with other investment options such as green tourism, fishing and by furnishing clean water?"

"Does it not appear unreasonable that the G-7 countries are investing about US\$300 million to control deforestation in the Amazon while international financial institutions are utilizing public resources of billions of dollars from these countries in projects which adversely affect ecosystems."

"In the case of the Xingu, with three dams planned for the coming years, what will be left of the river for human populations, such as indigenous peoples, and for the riverbank dwellers who depend upon these ecosystems?"



Icelandic Dams and Aluminum Smelter Meet Resistance

Norsk Hydro Dams Would Drown 100 Waterfalls

by Arni Finnsson

A hydropower project in Eastern Iceland, one of the largest dam projects ever planned in Europe, aims to dam two of the three main rivers north of the Vatnaojokull Glacier, Europe's largest glacier. The project would deliver 750MW to a proposed aluminum smelter with an annual output of 420,000 tons aluminum. The project is a joint venture of Norwegian and Icelandic interests: the Norwegian multinational corporation Norsk Hydro is a major project developer of the smelter, while the Icelandic national utility plans to build the dam.

The joint venture expects the aluminum smelter to start production in 2006, when the first phase of the Karahnukar power project is to start producing energy. The smelter and dams are expected to cost more than US\$2 billion.

The hydroelectric project is in the hands of Iceland's National Power Company, Landsvirkjun, which provides 90% of the country's electricity and is looking for new ways of expanding its business. While the dams will not be built without a buyer for its power, Norsk Hydro in joint venture with Icelandic parties is planning to buy the dam's entire output to run the giant Reydaral aluminum smelter it hopes to build.

Rare Wonders

The area north of the 8,500 sq. km. Vatnaojokull Glacier forms the heart of the Icelandic highlands and represents Europe's largest remaining wilderness area. Three glacial rivers surge over waterfalls and into narrow canyons, reindeer graze at the foot of Mount Snæfell and thousands of pink-footed geese settle to molt in mud-lined hollows.

More than 100 waterfalls, including some of the most beautiful in the country, would be drowned by the dams. The biggest dam, with a 57-sq. km. reservoir and a dam wall more than 200 meters high, would harness the Jökulsa in Dal River. In addition, the intention is to collect water from every brook and river above 600 meters altitude in the middle of the eastern highlands. This means that almost all rivers that run north – about ten in all – will be diverted into canals and tunnels. These ten rivers feed more than 100 waterfalls, ranging from 2-40 m high.



Photo: Fridthjofur Helgason

The Magic waterfall in Iceland is one of 100 waterfalls that would be dammed for the Noral aluminum project.

It is estimated that some 14% of prime reindeer habitat on the western side of Mount Snæfell will be lost to the project. The average number of reindeer in this area in July is about 1,300 (almost half of Eastern Iceland's total reindeer population). The impact to the reindeer from increased human activity in this area remains unknown, but research suggests that it might be proportionally much greater than the 14% loss in habitat would indicate.

Previously, Icelandic conservationists managed to stop dam plans that would have drowned the important Eyjabakkar wetlands, which is the world's largest molting area for the pink footed goose. Approximately 7% of the total goose population (which numbers as many as 13,000 birds) depend on the wetlands, which is globally significant according to the Ramsar Convention on Wetlands. That dam was to be the first in a series to produce energy for an aluminum smelter to be partly owned by Norsk Hydro.

The Achilles heel of the Eyjabakkar Dam project was that it had not undergone a formal Environmental Impact Assessment (EIA), required by law since 1994. Landsvirkjun, supported by the government, claimed it was

exempt from the national EIA law, since the project was decided upon prior to the adoption of the law. Icelandic conservationists gathered 45,000 signatures from citizens who insisted that an EIA be carried out. Norsk Hydro later withdrew from that project. This campaign enjoyed great support from WWF/Norway and other Norwegian NGOs.

After being defeated on the Eyjabakkar project, the Icelandic Government in partnership with Norsk Hydro came back with a new and much larger development scheme, the so-called Noral Project to dam the rivers of the Vatnaojokull glacier. While this project has an EIA, its serious impacts are galvanizing environmentalists against the project.

On August 1, 2001, the Icelandic Planning Agency (IPA) issued a very clear ruling against the project. IPA stated that the EIA suffered from incomplete data, but that given what was known, the project would have excessive environmental impacts. Its "great hydrological changes would have an effect on the groundwater level in low-lying areas which in turn would have an impact on vegetation, birdlife and agriculture," the agency wrote. IPA noted that the project

continued opposite

would impact rare species, and “and would alter the conditions for life in lakes and rivers,” among other serious consequences.

The IPA decision has been heavily attacked by Iceland’s Prime minister, foreign minister and minister for industry, who went so far as to question the integrity of the agency’s staff. Landsvirkjun has now appealed the decision.

Decision Postponed

In early September Norsk Hydro announced it had decided to postpone the decision to build the aluminum smelter by six months, until late 2002. The reason given by the company to the industry press is that more time is required “on environmental issues related to the power project and the financing of the aluminum company.” In other words, it is not possible to finance the project until Iceland’s environment minister has ruled on the

appeal of the IPA decision.

In his New Year’s statement last year, Norway’s Prime Minister Jens Stoltenberg said that “the value of unspoiled nature is increasing” and “the era of large hydropower developments is over.” In keeping with these sentiments, Icelandic NGOs are pressing Norsk Hydro to accept IPA’s ruling and to withdraw from the Noral project. Prime Minister Stoltenberg’s assessment certainly applies to Icelandic wilderness areas as well and the Iceland Nature Conservation Association will continue to work with the WWF Arctic Programme and Norwegian NGOs in order to force the Norwegian government and Norsk Hydro to use the same standards in Iceland as it does in Norway.

The Norwegian government owns 43% of the shares in Norsk Hydro, and activists hope



it will use its influence to prevent the company from taking part in destroying valuable wilderness areas in Iceland. The Iceland Nature Conservation Association (INCA) and a number of other NGOs in have demanded that, at a minimum, the conservation value of the area be evaluated prior to any decisions on development. So far, the government of Iceland has not heeded the demand. INCA is also pressing to have the area surrounding the glacier be granted status as a National Park, which could strengthen the local tourism industry and boost international awareness of Iceland’s natural wonders. ■

The author is Chairman of Iceland Nature Conservation Association. For more information, contact INCA at nsi@mmedia.is.

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aluminum industry’s efforts at recycling have been praiseworthy. But clearly there is a need for change, as evidenced by the growing problem of aluminum waste, the instability of energy supply in many parts of the world, and the huge “energy footprint” that primary aluminum smelting has on the world.

For developing nations looking to the aluminum industry to boost their economies and levels of industrialization, some experts believe they would be better off focusing on the recycled metal industry rather than primary aluminum production. Dr. Ulrich Hoffmann of the United Nations Conference on Trade and Development has written, “Most fast-growing developing countries are not abundantly endowed with primary commodities and energy resources. The refining and processing of primary metals are highly energy-intensive and would therefore aggravate the energy shortages faced by many of these countries ... [T]he balance of payments situation in many countries has limited the availability of foreign exchange for primary commodity imports. Furthermore, secondary recovery is usually a much simpler and less costly process than primary production. At the beginning of the 1990s, for instance, it was estimated that the required investment per annual ton of primary aluminum was about US\$10,000, compared with US\$500 per annual ton produced from aluminum scrap.”

As for those who buy beverages in cans and use aluminum foil for cooking, the most simple thing individuals can do is to increase their efforts to “reduce, re-use and recycle.” A growing international “Zero Waste Movement” is calling for radical resource efficiency and eliminating rather

than managing waste. Zero Waste is a “whole system” approach to resource management that maximizes recycling, minimizes waste, reduces consumption and ensures that products are made to be reused, repaired or recycled back into nature or the marketplace. A “zero waste” approach to aluminum would greatly reduce the industry’s environmental and social impacts.

Governments can influence the industry, too, both the recycling end and the primary production side. It can pass laws that would require manufacturers of aluminum products to take them back when consumers are finished with them (Germany has taken this approach). It can set energy-efficiency standards. Governments also can reduce subsidies to aluminum companies, making a more level “playing field” for materials that compete with aluminum. If aluminum reflected the true costs of its production, the resulting price-hikes would certainly increase the value of recycled aluminum as well as increase the price of primary aluminum. The removal of such subsidies come with weighty political ramifications, as well as economic ones. It must be noted that the aluminum industry is only one of many modern industries that benefits from hiding their “true costs” to the environment and society as a whole.

Many would argue that there needs to be much greater emphasis on “reduction” rather than simply “recycling” in the aluminum industry. Some activists working on aluminum-industry issues believe that single-serving aluminum cans should be phased out, because of primary aluminum’s impacts and the reality that a 100% recycling rate may never be achievable.

Can the world really afford seven more “Pepsi Generations” and other can-hogs? One thing is abundantly clear: as the world’s population increases, and the economy becomes increasingly globalized, world demand for aluminum cans and other aluminum products will rise. This increased demand will create a need for new smelters, which will continue to place a very heavy burden on the world’s rivers, its atmosphere and on other natural resources, and the human communities which depend upon them. ■

Get Off Your Can!

Join the GrassRoots Recycling Network (Athens, Georgia), which has a container recycling campaigns for Coke and Pepsi, among other initiatives: Tel: 706-613-7121
Fax: 706-613-7123,
Email: zerowaste@grrn.org
Web: <http://www.grrn.org>

Join Container Recycling Institute (Arlington, Virginia): Telephone: (703) 276-9800· Fax: (703) 276-9587·
Email: CRI@Container-Recycling.org
Web: www.Container-Recycling.org

Press for a nationwide container recycling bill in the US:
<http://www.bottlebill.org/>

Join the Zero Waste movement’s efforts to greatly reduce or eliminate all kinds of waste (see for example http://www.grrn.org/zerowaste/zerowaste_index.html or <http://www.ZeroWasteAmerica.org/>)