

WORLD RIVERS

REVIEW

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World Bank Returns to Big Dams

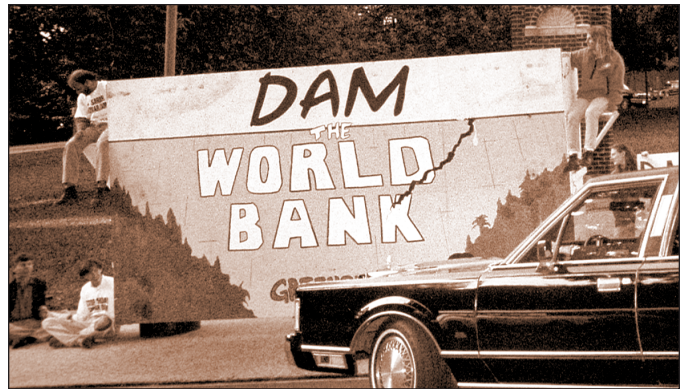
BANKRUPT MODEL WON'T OVERCOME ENERGY POVERTY

By Peter Bosshard

The World Bank, long the world's most influential supporter of large dam construction in the global south, has announced its return to funding huge hydropower projects. After nearly two decades of caution, the Bank will join countries such as China and Brazil in funding a new generation of mega-dams, focusing especially on projects in the Congo, the Himalayas and the Zambezi Basin.

On July 16, the World Bank adopted a new energy strategy paper that limits future support for coal projects to "rare circumstances," but proposes to increase lending for large hydropower and gas projects instead. The Bank argues that such projects could "catalyze very large-scale benefits to improve access to infrastructure services" and combat climate change at the same time. The paper singles out the Inga 3 Dam on the Congo River as an example of this approach.

The World Bank has financed more than 600 large dams in the past 60 years, and currently has about 150 active



A 1990s Washington, DC protest against the World Bank's role funding big dams.

projects related to the hydropower sector in some way. Just under half of these projects are located in the Africa and South Asia regions. These projects are smaller than the next generation of mega-dams now being considered by the Bank.

Transformation or Stagnation?

The Inga 1 and 2 dams on the Congo River illustrate the sorry experience with past large dam projects in Africa. After donors have spent billions of dollars on these projects, 85% of the electricity in the Democratic Republic of Congo is used by

energy-intensive industries and urban consumers but less than 10% of the population has access to electricity (see article on p. 4). Instead of offering a shortcut to prosperity, such projects have become an albatross on Africa's development. Large dams have also helped turn freshwater into the ecosystem most affected by species extinction.

The World Bank has identified the \$12 billion Inga 3 Dam on the Congo River – the most expensive hydropower project ever proposed in Africa – and two other multi-billion dollar schemes on the Zambezi River as key examples of its new approach. All three projects would primarily generate electricity for mining companies and middle-class consumers in Southern Africa.

NGOs working on energy poverty are alarmed at the megaproject approach being taken in one of Africa's

International Rivers and other groups will advocate against a return to mega-dams at the World Bank's annual meeting in Washington, DC on October 12. Under the motto **Power for People**, we will call on the institution to shift its lending from destructive megaprojects to energy conservation and decentralized renewable energy projects. As long as the Bank is not prepared to do so, governments should direct their funding to other institutions that are better equipped to reduce energy poverty and protect the environment.

Learn more: www.internationalrivers.org/node/2377

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Commentary

HERE WE GO AGAIN

A dozen years after the World Bank-backed World Commission on Dams (WCD) issued what remains the most comprehensive and inclusive assessment of the dam-building spree of the 20th century and offered a roadmap for moving forward, it seems that collective amnesia has set in at the World Bank. In announcing “we’re back” in the business of financing large and mega-dams, and specifically promoting hydro schemes that would dam the mighty Congo River, inundate the rapids below Victoria Falls, deliver the final blow to the Zambezi Delta, and dot the Himalayas with climate-risky big dams, the Bank is turning a blind eye to the prudent recommendations of the WCD.

Beyond taking aim at Africa and Asia’s great rivers and the ecosystem services they provide, there is so much that is retrogressive in the World Bank’s assertive shift to financing large hydro. In this issue of *World Rivers Review* we highlight key episodes in the ignoble history of the World Bank’s investments in damming rivers for electricity, critique the new hydro investment strategy, and identify the winners and losers in this so-called poverty reduction strategy. Peter Bosshard’s cover story calls into question the fundamental contradictions and the very relevance of an institution that continues to champion a “bigger is better” approach to infrastructure development in an era when more effective, smaller, faster to deploy and cheaper technologies are available for poverty reduction and energy access.

So the World Bank is advancing a lending strategy that runs counter to its stated mission of poverty alleviation and shared economic development – again. Doesn’t this all sound so familiar?

As a student living in Zimbabwe in 1993, I learned first hand the negative impacts of the World Bank’s top-down approach to poverty reduction on rural communities. When I returned to California, I joined the student movements working to amplify the voices of civil society groups throughout the world that had come together to ask: Isn’t 50 years of this failed institution enough?

When examining the Bank’s current bankrupt strategy – its reliance on large and destructive dams (and too little attention to scaling up true renewable and distributed technologies); its failure to demonstrate how mega-projects will actually reach the hundreds of millions of rural off-grid people compromised by energy poverty (while it focuses on electrifying industrial and extractive private corporations), and the lack of vision and creativity to promote projects that build ecological and economic resilience in an increasingly chaotic climate – it seems that 20 years of mounting evidence of the limitations and consequences of dam-generated “development” has not shaken the institution out of its memory loss. Must we really revisit the past century’s critiques of the Bank and update our past rallying cry to “70 Years is Enough”?

As much as any nation, the United States has reaped the benefits of the extractive and exploitative economic models of the past century. And the US – as well as European and other G20 nations – have an obligation to lead on climate justice and poverty alleviation. The US Government’s position and contributions in the atmospherically-focused international climate framework conventions (think of those “COP” meetings in Copenhagen, Cancun, Johannesburg) can at best be described as embarrassing; given what’s at stake for climate-vulnerable populations, many in the Global South would call the weak governmental actions criminal.

Despite all the implications of globalization and the recent economic ascendancy of nations such as China, Brazil and India, US interests still wield important influence at the World Bank. Last year President Obama selected the current World Bank President, Jim Kim, and American taxpayers (via appropriations from the US Senate) hold critical purse strings for the institution and its latest ambitions. The livelihoods of dam-threatened peoples from the rainforests of the Congo to the valleys of the Himalaya are once again in the hands of the World Bank and its donor nations. In October, International Rivers will be joining with a wide range of US-based and other international NGOs to descend upon the World Bank annual meetings in Washington, DC. Our unifying message is simple and clear: invest in *Power for People*. Better solutions are at hand, and the Bank has a responsibility to lead on investing in energy efficiency, on- and off-grid renewables, and community-scaled infrastructure projects that are less prone to corruption.

To support these actions – from near or from afar – you can keep posted at internationalrivers.org. In the meantime, we’ll hope to see you in Washington on October 12 for our *Power for People* day of action because... here we go again.

Jason Rainey



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MAKING WAVES



The Iraqi Marshlands return to life. Photo: Wikimedia Commons

Iraqi Marshlands Get National Park Status

The Mesopotamian Marshlands have been officially recognized as Iraq's first National Park, in large part due to the work of Nature Iraq, led by 2013 Goldman Prize winner Azzam Alwash. The marshes were nearly destroyed under Saddam Hussein, who dammed and diverted their waters to control the Marsh Arabs (Ma'dan) who made their living in this fertile region. Since Saddam was ousted, reflooding of the marshes has helped restore the ecosystem, making the area once again habitable to Ma'dan and the unique species that call it home.

As a next step, Nature Iraq and Waterkeepers Iraq will journey down the Tigris River using traditional vessels to document and bring awareness to the threats facing the river and its wetlands, and the unique cultural heritage of Mesopotamia. The event will start on September 15. Learn more: <http://www.connectmesopotamia.org/>

In Memory

In sadness, we honor the lives of river defenders Noé Vazquez Ortiz from Mexico and Tomas Garcia from Honduras, whose peaceful opposition to dams on their rivers was met with deadly violence. Tomas Garcia, a leader of the Lenca indigenous community in Honduras (and the group COPINH), was shot dead by a soldier on July 15 as he led a group of peaceful protesters to the 106th day of their sit-in in opposition to the Agua Zarca hydroelectric dam, now under construction on the Guacarque River in ancestral Lenca territory. According to Lenca leaders, there was no prior consultation on the project.



Tomas Garcia

Many other leaders of COPINH have been threatened and harmed because of their opposition to this Chinese-built dam.

Noé Vasquez Ortiz, a 30-year old community leader in the state of Veracruz, Mexico, was killed on August 2 while preparing an "Earth & Water" ceremony for the tenth anniversary of MAPDER, the Mexican Movement of People Affected by Dams and For Rivers. A member of the *Collective Green Defense, Nature Always*, Vasquez Ortiz was an activist who opposed construction of El Naranjal Dam in Amatlán de los Reyes, Veracruz – a project that would forcibly displace close to 30,000 peasants and indigenous peoples. His body was found beheaded and his ankles tied to his wrists on his back. The National Commission of Human Rights has begun an investigation into his murder.

Environmental and human rights defenders throughout the world are under attack and their rights being violated for their opposition to dam building, resource extraction and other so-called "development projects." Threats, assaults, fabricated criminal charges, lawsuits and assassinations are increasingly common practices in the context of dam building. The rights of freedom of expression, participation, association and even the right to life are being routinely violated.

International Rivers supports the vibrant movement to organize to protect rivers and the rights of communities. We all grieve the loss of these two community leaders whose conviction and courage will be remembered and honored.

Monti Aguirre

Indian Supreme Court stalls hydropower projects

Last month the Supreme Court of India – in the aftermath of the Uttarakhand flood disaster – directed the Ministry of Environment and Forests not to grant any further clearances for any hydroelectric projects in the Himalayan state, home to the headwaters and tributaries of rivers such as Ganga and Yamuna.

Civil society activists have been adamant that the impact of the June floods was exacerbated by dam projects, as well as other encroachments in the Ganga's riverbed and flood plains. With the government keen on expediting projects, the high court formed a committee to explore whether existing or under construction hydroelectric power projects contributed to the June tragedy, whose death toll exceeded 5,000. The committee must report back in three months; a stay on further dams has been issued.

More recently, the High Court of Uttarakhand, also concerned with the encroachments on the Ganga floodplain, prohibited construction projects within 200 meters of the banks of all rivers in the state.

The courts have been active since the June floods exposed the state government's inability to curb encroachments on the riverbank, and its penchant to fast-track dubiously evaluated hydro projects.

Bharat Lal Seth

World Bank Gambles on Megadams in Congo

WORLD'S BIGGEST DAM WON'T SOLVE WORLD'S BIGGEST ENERGY GAP

By Rudo Sanyanga

There is a sad irony in the fact that of one of Africa's poorest nations, the Democratic Republic of Congo (DRC), plans to build the world's most expensive hydropower dam – the Grand Inga, proposed for the Congo River's Inga Falls. While the dam's proponents at the World Bank say the project will “transform” the African energy landscape, International Rivers and local partners believe the dam could fuel corruption and conflict, while leaving the majority of poor Congolese still without electricity.

In May, World Bank President Jim Kim visited the DRC and gave a boost to Grand Inga by announcing that the Bank would be increasing its funding in coming years for big hydropower dams and the region. At the same time, I was heading to DRC to see for myself what challenges damming the Congo River at Inga Falls would bring.

The huge project took a significant step forward with the signing of a “cooperation treaty” by the DRC and South African governments in May. The multinational engineering firm Lahmeyer had just completed a feasibility study that convinced the DRC government, the World Bank and African Development Bank that Grand Inga's impacts would be minimal. The AfDB funded this study for US\$15 million. Both the World Bank and the AfDB have been giving technical support for the development of Grand Inga.

The treaty makes South Africa the principal purchaser of the power generated at the Inga III power plant, the first phase of Grand Inga. Under the agreement, South Africa will buy 2,500 megawatts of the project's total 4,800 MW capacity. The balance will be sold to mining companies in southeastern DRC. The signing event, held in Paris in May, attracted a lot of media coverage and excitement within government circles in the DRC, South Africa and internationally. It made headline news within the DRC for a week running.



These people will be resettled for Inga 3 Dam. Photo: Rudo Sanyanga

A First-Hand Look

The sprawling DRC capital of Kinshasa is full of contradictions. There are more than 10 million people, and less than 30% have access to electricity (nationwide, only 1% in rural areas have access), with fewer than 10% having electricity for 24 hours a day. The majority rely on wood biomass. Charcoal is the most traded good, and is seen being transported to the urban centers and along the inland roads and outside most urban centers.

On the other hand, electricity is used without any thought to conservation. The tariffs do not encourage efficient use; most consumers are charged for being connected, not for how much they used (less than 10% of those with connections have meters). To overcome power outages, many wealthier people rely on huge, noisy diesel generators.

Some communities will have to be relocated to make way for the construction of Inga III project. I visited one of these communities – Mvuzi III, currently in an area approximately 100km from the Inga III dam site. It is sad to report that, despite being in the path of this huge dam project, the people here very little information about the dam and the impacts it will bring to their lives. This situation is the same everywhere in Africa where poor communities are being relocated to make way for huge infrastructure projects. The governments and developers thrive by providing little or no information to the affected.

The villagers I spoke with knew that they would be relocated when Inga III construction starts but had no details of how the exercise would be conducted. They reported that the World Bank had carried out a survey in 2007 to establish the size of the affected communities and at the time informed them that they would receive US\$900 compensation per household to relocate. Government and World Bank officials later informed me that a plan for the relocation would be developed to ensure fair compensation to the affected people. But the devil will be in the details – most especially how and if it will be implemented properly. The communities believe that they cannot go against the government's wishes but would like a compensation package that does not compromise their lifestyle and livelihoods. They told me they also hope that the project would create employment opportunities for them.

The World Bank has yet to answer our other questions on key issues arising from this megaproject. Foremost is, how will these huge, costly, centralized projects fulfill the basic energy needs of the poor majority? How do the job-creation prospects of Inga III compare to renewable options? How are the issues of climate change being addressed? And critically, what is being done about the very real issues of governance and corruption?

World Bank Backing

“Large hydro is a very big part of the solution for Africa ... I fundamentally believe we have to be involved,” said Rachel Kyte, the bank's vice-president for sustainable development, in a May interview. Yet the International Energy Agency (IEA) has found that grid-based electrification – including large hydropower projects – is not cost-effective for much of rural Sub-Saharan Africa, because of the continent's low population density. According to the IEA report, 60% of the world's unelectrified rural areas are best served through mini-grids or off-grid solutions.

Continued opposite

The World Bank has been a strong backer of dams on the Congo for decades. For the past 40 years, the Bank and other donors have poured billions of dollars into dams and associated transmission lines on the Congo River. The projects have been plagued by rampant corruption, perform far below capacity, and have failed to benefit the poor. About 85% of the electricity in the DRC is consumed by the mining industry. Worse, the centralized nature of these investments has created a winner-takes-all system that has encouraged tension and civil war.

The World Bank argues that a new generation of mega-dams such as Grand Inga could “catalyze very large-scale benefits to improve access to infrastructure services” in Africa. But the projects on the Congo are designed to power the mining industry and urban centers. More than half of the electricity generated by Inga III would be exported to South Africa and the rest to mining companies in Katanga Province. Billions of dollars in aid for the energy sector will once again bypass most Congolese.

If past dams are an indication of how things will go for Inga III and Grand Inga, these projects are in trouble already. The existing Inga I (351 MW) and II (1,424 MW) dams, built in 1972 and 1982 respectively, have never operated efficiently since they were commissioned due to lack of maintenance – partly a result of years of war, partly a problem of lack of local skills, partly a problem with the corrupt and mismanaged state energy utility. Rehabilitation of the Inga I and II hydropower stations is now underway, and is expected to be completed in 2016. It is now estimated to cost \$883 million – more than four times the World Bank’s original 2003 estimate, which put the project’s costs at just under \$200 million. The rehabilitation of the power stations will include replacement and refurbishing of turbines, and construction of a second transmission line to Kinshasa that will enable 35,000 more consumers to be connected. The Inga-Kolwezi grid, which is operating at 25% capacity, will also be rehabilitated. The World Bank embarked on the rehabilitation project in 2003 with a justification that the rehabilitation of the two power stations and transmission line would enable the DRC to earn \$40 million yearly through exports of electricity. Ten years down the line this dream has been marred by slow, barely satisfactory progress and huge cost overruns.

An \$80bn Gamble

At least \$12 billion will be needed for construction of Inga III and an astonishing \$80 billion for the Grand Inga Dam. It does not make sense that DRC failed for over 10 years to complete the rehabilitation of Inga I and II, yet now is expected to manage a bigger and more complex project. One cannot help but question whether there is human capacity to handle such a project and even capacity to absorb the huge amounts of money targeted for these developments. Is it realistic that Inga III can be completed in eight years when the rehabilitation has taken a decade and is still incomplete?

Inga III is a commercial project that will supply power for export and to the mines in Eastern DRC, not for the Congolese people. The Inga III project is a “trickle down” development, based on the assumption that it will attract investment into the country, which will in turn create employment that will benefit local people indirectly. This has been proved over and over again to be a fallacy, especially for developing countries where the state is weak. It is almost a given that the majority of Congolese people will not receive any benefits from the project. Instead, the population will remain in the dark and the country may remain one of the poorest nations on the African continent, and among those with the lowest amount of electricity use per capita.

On the other hand, those with power and influence stand to benefit from corrupt deals. Transparency International recently rated the DRC 160th for governance and corruption out of 176 countries in the world. The Inga I and II rehabilitation process was not spared of corrupt deals. In 2008, two of the utility’s top directors were interrogated after the disappearance of \$6.5 million earmarked for Inga II rehabilitation. The money was never recovered or accounted for. An emergency multi-sector loan approved by the World Bank in 2002, which included \$116 million for power-sector rehabilitation, became mired in corruption. It would be a sad day for the DRC if the Inga dams’ potential for corruption turns out to be as grand as their scale. ●

Energy Poverty in DRC

Lack of access to modern electricity services impairs the health, education and income-generating potential of millions of Congolese people. The Congolese government has set a highly aggressive target to provide 60% of the population with access to electricity by 2025, but is vague on how to meet this target. Investments in decentralized power supply projects, including small- and medium-scale hydro across the country, could be more effective than mega-dams in finally beginning to close DRC’s energy divide, but so far have not been prioritized.

International Rivers’ main focus on the Grand Inga is its inappropriateness for meeting the energy needs of Congo’s poor majority, in spurring economic growth in the country, and addressing social and environmental concerns. A clear and detailed strategy must be developed for achieving the DRC’s own target of 60% access to electricity. In the coming year, we’ll be commissioning research on decentralized energy investments that would help the country achieve this target, such as through financing small- and medium-scale power projects all over the country rather than another massive dam project.



International Rivers recently visited people who will be affected by Inga III. Rudo Sanyanga, who heads our Congo work, is in the lower left.

New Large Dams in Amazon Could Lead to Ecosystem Collapse

By Paul E. Little

The Amazon Basin is being transformed into a global economic frontier by intense global demand for commodities and energy, which is fueling rapid expansion of monocultures for grains and biofuels, large-scale hydroelectric dams, industrial mining activities and petroleum and gas development. One of the most significant changes in this wave of Amazonian frontier expansion is the growing importance of mega-development projects currently planned or under construction at a pan-Amazonian scale. The magnitude of the socio-environmental impacts caused by these projects is of a qualitatively higher order than those of prior waves of frontier expansion due to the size and geographical range of the projects, the large number of them under simultaneous construction, and the enormous amount of capital invested in them.

The first decade of the 21st century experienced a major restructuring of the financing of development projects in Amazonia. Brazil and China forged new national development strategies based on the policies of the globalization of national companies and the establishment of regional hegemonic spaces dominated by their national capital investments. The Brazilian National Economic and Social Development Bank (BNDES) and the Chinese Development Bank grew rapidly in this period and became the largest investors and creditors of mega-development projects in Amazonia.

The electricity sector

The rapid expansion of the Brazilian economy has generated a growing internal demand for electricity, which in turn has stimulated the Brazilian government to embark on an ambitious program of building hydroelectric dams throughout Amazonia, heavily financed by BNDES. In November 2012, BNDES gave a 30-year, US\$11.25 billion loan – its largest ever – to the Norte Energia S.A. Consortium to finance the construction of the massive Belo Monte Dam on the Xingu River. Just a few years earlier, BNDES gave out loans for the construction of two large dams on the Madeira River: \$3 billion for the Santo Antonio Dam and \$4.75 billion for the

Jirau Dam. BNDES also has a growing portfolio of dams it plans to finance in Argentina, Bolivia, Ecuador, Guyana, Paraguay, Peru and Venezuela.

The Andean countries have also adopted a strategy to increase the generation of hydroelectricity, which has gained the interest of foreign investors, particularly from Brazil and China. A recent study identified 151 proposals for the construction of hydro dams in the Andean countries, a 300% increase over its 48 existing dams. More than half of these proposed dams are located in the Marañón River Basin. In all, a total of 17 mega-dams with a generating capacity of over 1,500 megawatts each are currently proposed for Amazonia.

The Peru-Brazil Energy Agreement, signed by the two presidents in 2010, projects the production of up to 7,000 megawatts of hydroelectricity in the Peruvian Amazon for export to Brazil, with a portion to be reserved for Peruvian consumption. This agreement has not yet been ratified by the respective national congresses, nor has it received widespread public input or consent from Amazonian peoples.

Underlying this new wave of dam building lays the strategy of transforming the rivers of the Amazon into industrial factories for the production of electricity for metropolitan areas and large-scale economic projects. The engineering logic requires control of the flow of water in a river from its source to its mouth through the construction of numerous dams along its course. With this control, the energy companies which operate the dams will be able to adjust the flow of the river to the water capacity needs of different dams along the river, with this capacity being bought and sold between companies, thus transforming river flow into a commodity.

Summary of Impacts

Hydrological: One of the most dramatic impacts of large-scale dams in the Amazon stems from the major disruptions in the unique hydrological and biological characteristics of large, free-flowing tropical forest rivers. The blockage of long-distance fish migrations and the destruction of spawning habitats by dams could produce major biodiversity loss, as well as harm riverine fishing communities that depend upon the river for their sustenance.

The construction of many large-scale dams in the vast headwaters region of the Amazon Basin – encompassing parts of Bolivia, Peru, Ecuador and Colombia – will produce critical changes in continental water flows, with little knowledge of the ecological consequences of this policy. When these changes are combined with the continuing environmental events in the Basin related to global climate change, one can postulate that this new wave of dam building in the headwaters of the Basin represents a “continent-wide hydrological experiment” with the subsequent risk of provoking major ecosystem collapse. Recent studies of the phenomena known as “Amazon dieback” warn of the potential for a significant decline in biomass (carbon) of the tropical forest and its subsequent transition to savannah. Other researchers have calculated that the disruption of flooding cycles and sediment deposits by the dams will cause a drying out of numerous wetland forests downriver, both temporarily and permanently, causing deforestation by dehydration.

Continued opposite



The Marañón River is threatened by multiple megadams.

Social: For the many Amazonian peoples who maintain sustainable, low-impact adaptive practices – indigenous peoples, fishing communities, rubber tappers and others – rivers are essential to their very existence as a people or community. The most directly impacted communities are those forcibly relocated to other lands due to the flooding of their homes and the fertile floodplains by reservoirs. Large-scale dams also provoke *downriver impacts*, such as drying out of portions of the river, reduction in fisheries and interruption of seasonal floods which fertilize the floodplain; *upriver impacts*, such as flooding, disruption of fish migrations and sediment flows; and *reservoir impacts*, such as changes to water quality, and an increase in the release of climate-damaging methane gases. By interrupting the use of the river as a transportation waterway, dams also sever social ties between families and communities located along the rivers.

Networks of resistance and activism

In general, there is a lack of transparency in decision-making about dam building in the Amazon: most dams are approved by politicians and bankers with little or no public input. For many Amazonian communities, by the time they first hear of a hydroelectric project that will greatly impact their lives, the major decisions regarding its construction have already been made.

Social and legal mobilization: Indigenous peoples from across the Amazon Basin have been at the forefront of numerous social mobilizations that have contested the policies of the construction of major development projects in their lands and rivers. Peru's National March for the Right to Water, the Ecuadorian Indigenous People's March for Water, Land and Dignity, and Bolivia's March in Defense of the Isiboro-Sécure Indigenous Territory and National Park are just three examples from recent years. Another tactic of resistance to dam building is international campaigns designed to support indigenous peoples in their effort to stop the building of dams in their rivers, notably the Belo Monte Dam on the Xingu River. Meanwhile, a group of Brazilians filed and won a petition from the Inter-American Commission on Human Rights to force the Belo Monte project to conduct adequate prior consultation with indigenous peoples. Yet, after a forceful rejection of the Commission's ruling by the Brazilian government, the Commission backtracked and the construction of the dam proceeded.

Labor issues: The construction of massive hydroelectric dams in the middle of the rainforest requires importing thousands of migrant laborers into the enclaves where the dams are built. The working and living conditions in these enclaves tend to be precarious. Since most of the workers are temporary and non-local, they do not have strong union ties nor a capacity to conduct a successful strike. However, the experiences of the first three large Brazilian Amazonian dams in the current wave of dam building – Santo Antonio, Jirau and Belo Monte – reveal how difficult it is to completely suppress these demands. In 2010, for example, workers at the Jirau enclave revolted, burning buses and destroying buildings to protest bad conditions and low pay. The response of the energy company was swift: it expelled all 22,000 workers from its enclave for three weeks, leaving them to fend for themselves far from their homes. Meanwhile, the Belo Monte Dam has suffered nine work stoppages, of varying lengths of time, during the first two years of its construction. This is in addition to 18 external occupations of the work site by indigenous peoples and environmentalists. Unfortunately, the demands by the workers are rarely aligned with the demands of indigenous peoples and environmentalists, even though they are pressuring the same set of energy companies.

Social and environmental safeguards: While regional and global financial institutions such as the Inter-American Development Bank and the World Bank operate according to an



Indigenous peoples have kept up steady resistance to megadams in their Amazon territories. Photo: Ueslei Marcelino/REUTERS

established set of safeguard principles, the Brazilian and Chinese national development banks are entering the field of international finance with few of these safeguards in place. During the past two years, several civil society activist networks have targeted these banks via campaigns designed to guarantee that they conduct adequate prior consultations with indigenous peoples; respect their basic territorial rights; mitigate environmental impacts, and compensate for irreversible damage. To ensure that an adequate system of safeguards is established, environmentalists propose the assessment of cumulative, long-term impacts of multiple projects – dams, roads, oil and gas development, industrial mining projects – slated for construction within a watershed framework.

A better path

Putting the entire hydrological functioning of the Amazon Basin under a single, productivist logic will serve to limit and, in some cases, eliminate the multiple uses and functions that rivers have for Amazonian peoples: fishing, cooking, floodplain agriculture, hygiene, transport, recreation, identity. An alternative model for hydrological planning in the Amazon uses “watersheds” as the basic environmental unit of analysis and policy. The nested quality of watersheds allows for political action and policy formulation at differing scales, ranging from small watersheds to major tributaries and, finally, the entire Amazon watershed.

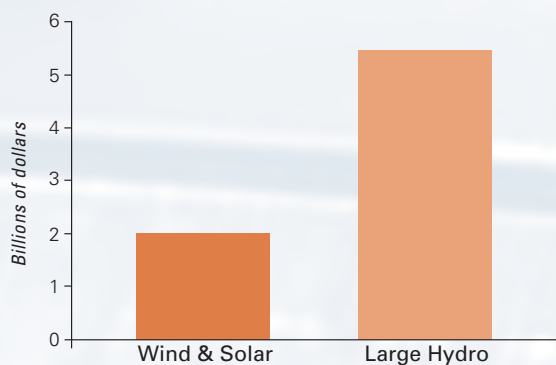
An integrated watershed management approach is founded upon the multiple, interdependent social uses of the river; as such, it proposes that policy decisions regarding river use be discussed in public forums. Across the Amazon Basin, indigenous peoples, along with a host of local Amazonian communities and their allies in civil society, are demanding that the energy policies of their governments be redesigned in order to guarantee the sustainability of their livelihoods. In the process they are building a movement that is also attempting to develop a new model of development that accommodates the specific needs of their rainforest communities. If they are not successful in these efforts, these vibrant rivers and the tropical rainforests that depend upon them may enter into a cycle of ecosystem collapse that will not only destroy the rainforest, but their lives as forest peoples as well. ●

The author is an environmental anthropologist. He has been involved in Amazonian research and policy formulation for the past 25 years. He recently published (in Spanish) a policy paper on mega-development projects in the Amazon, upon which much of this article is based.

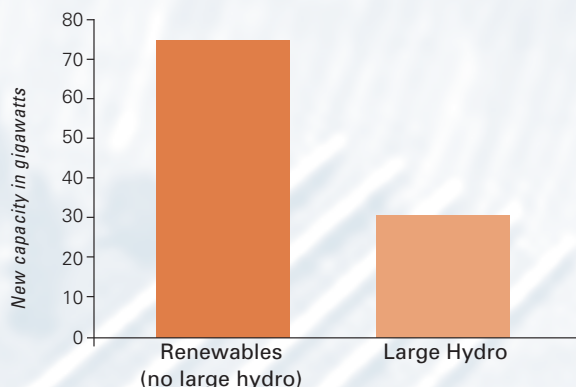
The World Bank's Big Dams: A River of Ruin

In the past 65 years, the World Bank has funded some 600 dam projects for a total of approximately US\$100 billion (in current terms). These dams have caused untold environmental destruction, sowed corruption, displaced more than 10 million people, and impacted hundreds of millions more. This graphic will help you navigate the Bank's dam building over the decades.

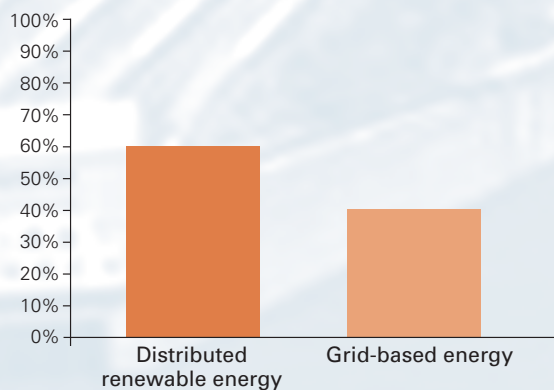
WORLD BANK ENERGY LENDING GOES AGAINST THE TIDE



World Bank energy sector spending, 2007-12



Global energy priorities, 2012



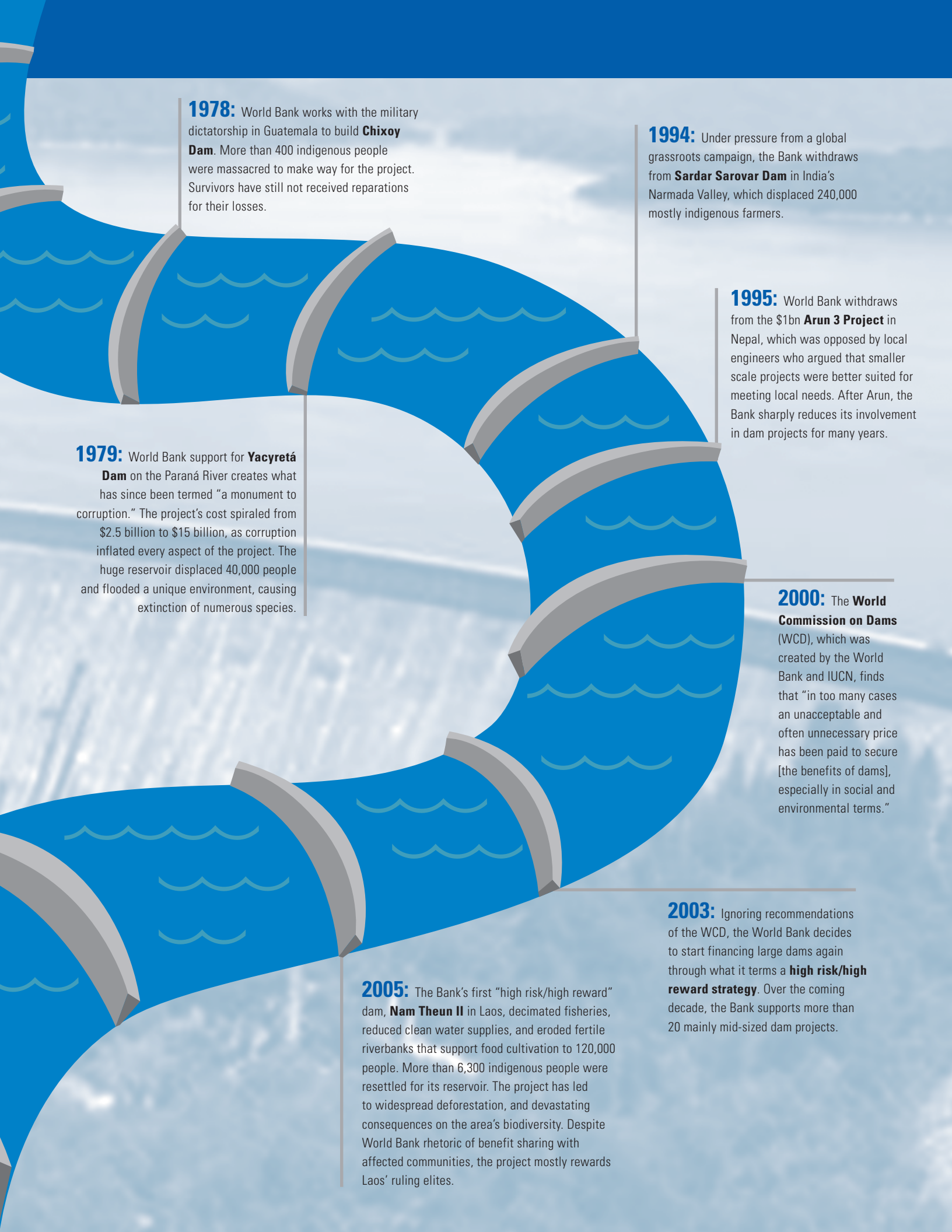
International Energy Agency recommendation for achieving universal energy access

1950s: Bank-supported **Kariba Dam**, the first mainstem dam on the Zambezi, left 58,000 people in Zambia and Zimbabwe impoverished, and major irreversible degradation of a pristine natural habitat. The huge project sets off a decline of the Zambezi Delta. Today, the Bank is considering support for two more damaging Zambezi dams.

1974: As Bank-supported **Tarbela Dam** (Pakistan) begins to fill, a series of technical failures nearly causes the mammoth dam to breach, putting millions of people downstream at risk of a massive flash flood. Efforts to repair and stabilize the dam almost doubled the cost of the project. Today, the Bank is considering funding for a number of Himalaya dams that would have similar risks and high costs.

2012: Although it declined to support the controversial **Gibe III Dam** in Ethiopia, the Bank chooses to support the project through the back door by funding the transmission line that will enable Ethiopia to sell the dam's electricity to neighboring countries.

2013: The World Bank decides to limit its support for coal projects, and step up lending for large dams instead. The Bank makes the **Inga 3 Dam** on the Congo River a symbol for a new generation of proposed mega-dams.



1978: World Bank works with the military dictatorship in Guatemala to build **Chixoy Dam**. More than 400 indigenous people were massacred to make way for the project. Survivors have still not received reparations for their losses.

1994: Under pressure from a global grassroots campaign, the Bank withdraws from **Sardar Sarovar Dam** in India's Narmada Valley, which displaced 240,000 mostly indigenous farmers.

1995: World Bank withdraws from the \$1bn **Arun 3 Project** in Nepal, which was opposed by local engineers who argued that smaller scale projects were better suited for meeting local needs. After Arun, the Bank sharply reduces its involvement in dam projects for many years.

1979: World Bank support for **Yacyretá Dam** on the Paraná River creates what has since been termed "a monument to corruption." The project's cost spiraled from \$2.5 billion to \$15 billion, as corruption inflated every aspect of the project. The huge reservoir displaced 40,000 people and flooded a unique environment, causing extinction of numerous species.

2000: The **World Commission on Dams** (WCD), which was created by the World Bank and IUCN, finds that "in too many cases an unacceptable and often unnecessary price has been paid to secure [the benefits of dams], especially in social and environmental terms."

2003: Ignoring recommendations of the WCD, the World Bank decides to start financing large dams again through what it terms a **high risk/high reward strategy**. Over the coming decade, the Bank supports more than 20 mainly mid-sized dam projects.

2005: The Bank's first "high risk/high reward" dam, **Nam Theun II** in Laos, decimated fisheries, reduced clean water supplies, and eroded fertile riverbanks that support food cultivation to 120,000 people. More than 6,300 indigenous people were resettled for its reservoir. The project has led to widespread deforestation, and devastating consequences on the area's biodiversity. Despite World Bank rhetoric of benefit sharing with affected communities, the project mostly rewards Laos' ruling elites.

Interview

Ethiopia's Biggest Dam Oversized, Experts Say

In May, Ethiopia diverted the Blue Nile to begin building its largest dam project to date, the 6,000 MW Grand Ethiopia Renaissance Dam (GERD) – a move that angered Egypt, which fears its water supply will shrink over the many years it will take to fill the huge reservoir. Besides the tensions this huge project is causing politically, there is growing concern that the dam will not produce nearly as much power as it has been designed to. A number of engineers have questioned the dam's design. Asfaw Beyene, a Professor of Mechanical Engineering and Director of the Center for Renewable Energy and Energy Efficiency at San Diego State University, has written a technical article about the dam being over-sized; here he answers questions about this issue.*

WRR: What would be the consequences if the dam is "over-sized"?

AB: It means that more than half of the turbines will be rarely used. It is like buying a 10-story building for a personal residence. You may fill it a few times a year when you have enough guests, but the rooms will be unused most of the time. The dam height and the natural flow rate of the water are the factors that fix the potential power output. The GERD's available power output, based on the mean flow rate (the average of river flow throughout the year) and the dam height (145 meters), is about 2,000 MW. There is little doubt that the system has been designed for near-peak flow rate, but that high flow only happens during the 2-3 months of the rainy season. The planned 17 turbines are in excess of what can be produced given the dam height and the river flow rate. Targeting near peak or peak flow rate makes no economic sense.

Engineers use a calculation called "plant load factor" to describe the ratio of a power plant's actual output over a period of time, to its potential output if it were possible for it to operate at full capacity indefinitely. In the case of GERD, the load factor for the dam designed to produce 6,000 MW would be about 30%. If it were "right-sized" to 2,000 MW, its load factor would be about 90%.

WRR: What questionable assumptions do you think the GRD engineers made?

AB: I think the dam is sized for the peak flow rate of the river, which lasts just a few months. The peak flow rate of Blue Nile is under 6,000 cubic meters per second (mcs), even exceeding 6,500 mcs once in a while. With 145 meters of dam height, this peak flow can produce about 7,000 MW. The average flow rate of Blue Nile is reported to be much lower. So, given the height of the dam and the flow rate, there is no way the dam can produce 6,000 MW for more than three months of the year even if the dam stored the difference between peak-flow and design-flow rates. The only scenario under which the power output will be annually consistent is if the hydroelectric dam is designed for a mean flow, which is about 1,456 mcs. This will provide just less than 2,100 MW.

WRR: What are the economic implications for the dam producing so much less power than is supposed to, if your predictions are correct about the dam being designed for an overly optimistic river flow?

AB: It is simple: the extra 10 or so turbines will be parked for about nine months of the year. The size calls for about seven turbines with 350 MW each. Even if we add one extra turbine for maintenance downtime, the appropriate design target should not exceed 2,800 MW. This assures year-round supply of electricity at almost constant level, also requiring a shorter period for initial reservoir filling. The total price at \$800/kW rate (I get this by dividing \$4.7 billion by 6,000 MW, which is a common approach in the power industry) will be about \$2.3 billion dollars – much less than the \$4.7 billion for the 6,000 MW.

What does this mean in human terms? According to the World Bank, Ethiopians use on average of about 200 kWh of electricity per capita per year. A per capita comparison is however less than useful because it shifts with population growth. A better comparison is kilowatt-hours used per household per year, which is about 500 kWh for Sub-Saharan Africa. (For comparison's sake, the global baseline is around 13,000 kWh/year, and the average US household uses 18,000 kWh per year, including natural gas and electric.) If we assume 500 kWh/year per household, the 4,000 MW of "missing power" could have covered more than 70 million households (not including the cost of transmission lines). If we take a South African household average of 5,000 kWh/year, it could affect cover seven million households.

WRR: Do you have a recommendation for Ethiopia in this case?

AB: It is clear that the issue is highly politicized, and the politics seems to suppress legitimate engineering inputs and environmental discussions. My suggestion to the concerned authorities is to make the matter transparent, rethink the number of turbines that are to be installed, and resize the hydroelectric power output by reducing the number of turbines. A few weeks ago I visited a hydropower plant near La Serena, Chile that was turned off because of the drop in water level. The engineers there regretted that they didn't size the turbines for a much smaller head. The GERD faces the same fate unless the dam's sizing is corrected. ●

FAST FACTS: Grand Ethiopia Renaissance Dam

Where: Blue Nile, near Sudan border

Dam size: 145m, 1,708m long

Reservoir size: 1,680 sq km, will hold about 70 bn cubic meters of water (larger than Ethiopia's largest natural lake)

Resettlement: 20,000 people

Dam Cost: US\$4.8bn (equal to about 15% of Ethiopia's GDP in 2012, and about 60% of the annual budget)

* <http://bit.ly/15ioZRB>

Uganda's Dams Leave Affected People Behind

By Betty Obbo

The government of Uganda has been on a dam-building binge for years now. While Uganda clearly needs more electricity for its development, these huge projects are creating difficult-to-solve problems that are often not resolved by the time construction is complete. The latest big dam proposed for Uganda's rivers is Karuma, which will be built by China on the Nile River. The dam was first proposed in 1995, but it failed to take off thanks to the World Bank's efforts to prioritize Bujagali Dam instead, as well as a corruption scandal with the dam's contractor.

Norwegian energy company Norpak was awarded the contract to build a 250 MW dam at Karuma Falls, but it pulled out in 2009. The Ugandan government then repossessed the project in 2010 and hired an Indian firm, Energy Infratech, to undertake new feasibility studies and re-engineer the dam for a higher capacity. Infratech re-designed the project to a target of 750 MW using a 9-km "tailrace tunnel" running through Murchison Falls National Park. The project has since been scaled back to 600 MW. To save resources and match the available water flow, international energy experts' advice is that 450 MW would be appropriate.

In 2010, the Ugandan Energy Ministry invited bids for the construction of dam. But the project has been mired in controversies, raising a multitude of questions from experts about the bidding process, the project design, qualifications of the project manager, and the realistic amount of power the project can generate. Last year, more than 10 government officials from the ministries of Energy, Finance, Works, Water and Environment faced police investigations over alleged bribery to prequalify incompetent contractors for the project.

Three years after restarting the project, a Chinese firm, Sinohydro, was finally given the contract to build the hydropower project and transmission line. The project is expected to cost US\$2.2 billion (including the transmission system). Construction is slated to start before the end of 2013 and take at least five years to complete.

However, this might be overly optimistic, following fresh wrangles that threaten to delay the project. A rival Chinese company, China International Water and Electric Corporation (CWE), has gone to court to challenge the award of the contract to Sinohydro. The project-affected communities, too, have petitioned the government over unfair compensation for their land and property by the company.

Community concerns

The Karuma Dam project will displace approximately 300 people in the four villages of Karuma, Awoo, Nora, and Akurudia, according to the official list from government. The project-affected people have expressed displeasure with replacement lands and the property valuation process, saying that the company is under-paying them. The affected people are concerned that the rates used by government and the company are inconsistent with inflation trends in the country.

More than 54 people petitioned the Electricity Disputes Tribunal on behalf of the project-affected people, seeking to halt construction of the dam until the "meager" compensation rates are revised. Ogik William, a resident of Awoo village, said: "We also want electricity, and we want the project, but we need to be reasonably compensated. We want the right value for our property. We will not accept to be cheated."

The Government has promised to look into these concerns and find ways to resolve their problems. Yet it has also said it is determined to fast-track Karuma Dam, which could lead to the prioritization of engineering and construction issues, leaving the sometimes complicated mitigation of the problems the dam might cause to another day. This was one of the lessons of the now-complete Bujagali Dam.

Lessons from Bujagali

The Bujagali Dam faced numerous social, economic and environmental challenges that delayed the dam construction for more than ten years while the underwent investigations over bribery claims and reviews of the dam design and capacity. The dam cost kept on growing from \$580 million at inception to \$860 million and finally \$902 million (\$3.6 per megawatt) at completion. Independent investigations by the parliamentary ad hoc committee on energy put the dam's actual cost at \$1.3 billion (\$5.2 per MW or more). In Africa and other continents, construction of hydropower plants more typically cost between \$1.0-1.7 per MW capacity.

The Karuma Dam is off to a poor start. Its planning process is already mired in corruption allegations. The dam's size has jumped from 200 MW to 450 MW to 750 MW, and now 600 MW. The final cost of the project is anyone's guess. Affected people are concerned that they will be on the losing end of Uganda's latest big dam project. Karuma Dam's proponents should tread carefully, to avoid becoming a white elephant. ●

The author is the information officer at National Association of Professional Environmentalists (Uganda).



People who would be affected by Karuma Dam meet to discuss compensation issues. Photo: NAPE

News Briefs

By Kate Ross



The San Clemente Dam in California is coming down.

Dams coming down in Maine, California

Two major dam removals on US rivers began this summer: the Veazie Dam on Maine's Penobscot River, and California's largest dam removal project to date, the San Clemente Dam on the Carmel River.

The Penobscot has long been listed as one of the US's Most Endangered Rivers. The removal of the Veazie Dam – following years of advocacy efforts by American Rivers, the Penobscot Restoration Trust and the Penobscot Indian Nation – will help revive fisheries and restore local cultural traditions. It is the second major dam to be removed on the Penobscot; removal of the Great Works Dam began last summer. The combination of the two restoration projects will give 11 species of fish, including the Atlantic salmon – the Penobscot's iconic species – better access to 1,000 miles of spawning habitat for the first time in two centuries. No other dam removal has opened up access to this much habitat.

July also saw the beginning of a three-year project to remove San Clemente Dam in California. The dam has been out of commission since 2002. Declared seismically unsound in the 1990s, it is now 95% filled with silt; a collapse or spillover would threaten more than 1,500 homes downstream. The amount of sediment makes the dam removal more challenging: letting the sediment wash downstream would increase flood risk and cause severe environmental degradation. Project developers have decided instead to move the river channel, diverting half a mile of the Carmel River into the bed of a nearby creek that flows into the river just above the dam. The project's watershed restoration process will bring the Carmel River back to life, and open up 25 miles of spawning and rearing habitat for threatened populations of steelhead trout.

According to American Rivers, 65 dams were removed in the US during 2012, joining the nearly 1,100 dams that have been removed since 1912. Some 800 of these were removed in the past 20 years. Other dams starting to come down this summer include on the Taunton River (MA), Town Brook (MA), Battenkill River (VT), Raritan River (NJ), and Delaware River tributaries (PA).

Solar PV fast approaching grid parity

Thanks to a steady drop in prices and a rise in the efficiency of solar panels, the global solar photovoltaic (PV) industry is expected to reach “grid parity” (the point at which it is equal or cheaper than the cost of grid power) by 2020, predicts Navigant Research's *Solar PV Market Forecast*. Several trends are shaping the future of the global solar PV market, including the development of a larger volume of utility-scale solar plants as well as the rapidly declining cost of PV modules. Prices have fallen 80% since 2008 and 20% in 2012 alone. New developments are expected to pave the way for further cost reductions.

“By the end of 2020, solar PV is expected to be cost-competitive with retail electricity prices, without subsidies, in a significant portion of the world,” said Dexter Gauntlett of Navigant Research. Only 10 years ago, the generating capacity of the entire world's solar PV systems totaled just 2.8 gigawatts, about the same as that of six average-sized coal power stations. Today systems with a capacity to produce more than 102 gigawatts are installed. The industry predicts global capacity will double to 200 gigawatts by 2016.

Other renewable energy technologies are seeing similar advances, as technology and market dynamics drive down the cost of renewable power generation while increasing the cost of non-renewable generation. In many regions, wind power is already at grid parity. For example, wind is now cost competitive with new-build coal plants in India, according to a report by HSBC.

Nigerian dam starts with no environmental assessment

The Government of Nigeria recently granted approval for construction to begin on the 700MW Zungeru Dam in Niger State. Approval was granted despite a lack of a project Environmental Impact Assessment, according to local media. The dam was first proposed more than 30 years ago, but never moved forward due to technical difficulties and high project costs. An initial feasibility study for the project was carried out in 1982, but since then no other studies have been done.

The dam is being built by Chinese consortium of CNEEC-Sinohydro Consortium and 75% funded by China's Exim Bank. Standard industry practices require that an EIA be carried out for projects of this scale.

Environmental Rights Action and Friends of the Earth Nigeria are demanding that the government produce an EIA for the dam, incorporate input from neighboring communities, and allow the document to be subject to public presentation.

According to the Nigerian newspaper *Leadership*, a local expert who declined to be named said: “This is not the type of project to be embarked on without an environmental impact assessment. Unfortunately, we are in a country where anything goes. Government is of the opinion that this project will benefit generations unborn, but it could turn out to be a nightmare if things are not properly done now.”

Continued opposite

US energy sector vulnerable to climate change

A recent report by the US Department of Energy assesses the vulnerabilities of America's critical energy and electricity infrastructure to the impacts of climate change. In the US, 2012 was both the warmest year on record and included the hottest month since the country started keeping records in 1895. These historically high temperatures have been accompanied by droughts, heat waves, more and larger wildfires, and several intense storms, including Hurricane Sandy. One of the main impacts identified in the report is the

reduction of power generated from hydroelectric power plants due to drought and declining snowpack. Climate change has also created an increased risk of shutdowns at coal, natural gas and nuclear power plants due to decreased water availability. A study of coal plants in the US found that 60% of the current fleet is located in areas of water stress. There is also higher risk to infrastructure located along coastlines due to rising sea levels, potentially disrupting oil and gas production, refining and distribution. Risk of physical damage to power lines, transformers and electricity distribution systems from hurricanes, storms and wildfires is growing more frequent. In addition to identifying the critical areas

affected by climate change, the report also identifies activities at the federal, state and local levels to address these challenges and make the energy sector more resilient.

Mangroves fight climate change

Mangrove forests provide a surprising amount of vital environmental services – for example, protecting coastal regions by reducing the impact of storm surges and waves, and acting as a secret weapon against climate change by storing carbon in their root systems. A new report by The Nature Conservancy and Wetlands International addresses the importance

of protecting mangroves for these valuable services. The report shows that in some circumstances, mangroves can protect themselves from rising sea levels by building up soils at similar rates to local rises in sea levels. Many mangrove ecosystems are suffering from reduced sediment flows, caused by large dams (which not only hold back sediments but also reduce water flows into them). The report highlights the need to maintain, restore or enhance sediment supplies to mangrove areas, which is key to their ability to build soils in advance of rising seas. Mangroves are considered one of the most threatened tropical ecosystems. Learn more: <http://bit.ly/15QyPg9> ●

Climate Change and Dam Safety in the News

Climate-change-fueled storms are making dams more hazardous, as this trio of recent dam safety incidents shows.

Himalayan floods a man-made disaster: The Northern Indian Himalayan state of Uttarakhand experienced widespread flash floods and landslides in mid-June. The scale of the disaster was huge; at least 1,000 people were confirmed dead, and more than 11,600 more may have perished. Hundreds of buildings were washed away, roads and bridges destroyed, and more than 10 hydropower projects damaged or destroyed. According to local experts, human interventions worsened the situation. At the root of the floods was a disregard for the “carrying capacity” of this fragile area's natural systems. The human-induced assault included unregulated, unsafe and unplanned infrastructure development along local rivers, including the development of a large number of hydropower projects built in the fragile zone without proper checks and balances. Since Uttarakhand state was formed in 2000, it has been on a path of massive growth with various projects including mining, roads, and a large number of hydropower projects, buildings and tourism. But the state's vulnerabilities have been completely ignored. There is no credible cumulative impact assessment process, and therefore no way to analyze the disaster vulnerabilities, carrying capacity and climate change implications for any of the river basins of Uttarakhand. The tragedy in Uttarakhand has led to widespread debates over the safety of dams. More than 4,500 large dams in India are operating without an emergency action plan, putting vast areas at risk of dam failure.

Elbe River dam burst: Thousands of people in eastern Germany were evacuated when a dam burst on the Elbe River, following heavy rains and widespread flooding throughout the region. Floods hit Germany, Austria, Slovakia, Poland and the Czech Republic in June, causing river levels to rise more than eight meters above normal, and surpassing levels reached in 2002 when devastating floods hit Europe. Tens of thousands were forced to abandon their homes when a dam at the confluence of the Elbe and Saale rivers burst, despite attempts to stabilize it. Working with citizens and emergency services crews, over 10,000 German soldiers were deployed to help fight the floods.

Vietnam dam collapse prompts nation-wide safety concerns: The Deputy Prime Minister of Vietnam has called for all hydropower dams across the country to undergo thorough safety examinations following the collapse of the Krei 2 Dam in the Central Highland province of Gia Lai. An investigation into the dam breach revealed that the dam was not constructed in accordance with the approved design. The inside of the structure was supposed to be covered by a 20cm thick layer of cement, but instead, much of the inside face was built with soil, leaving the dam much weaker than planned. Local officials reportedly instructed project developers Bao Long-Gia Lai Hydro-Electricity-Industry Company to completely re-build the dam weeks before its failure, but this did not happen. The dam was already impounding about five million cubic meters of water when it collapsed. Earlier this year Vietnam's Prime Minister issued a similar request for the country to evaluate all of its hydropower projects, after the safety of three other dams – the 190-MW Song Tranh 2, 7.5-MW Dak Mek 3 and 2,400-MW Son La – was called into question.

Energy Poverty: The Hidden Energy Crisis

By Teodoro Sanchez and Andrew Scott, Practical Action

More than 1.3 billion people – almost a quarter of humanity – have no electricity. This means they have no light in the evening, limited access to radio and modern communications, inadequate education and health facilities, and not enough power for their work and businesses.

Worldwide, more than 3 billion people depend on dirty solid fuels to meet their most basic energy need, cooking. At least 2.5 billion cook with biomass (i.e. wood, dung and agricultural residues), and over half a billion cook with coal.

The international community recognizes a number of basic rights: the right to water, the right to food, the right to health, the right to adequate housing, the right to gain a living by work and the right to take part in cultural life. Missing from this list is the right to energy. Yet, everyone needs energy to cook food, to heat the home, to earn a living, to benefit from good health and education services. Energy poverty denies people a basic standard of living that should be available for all.

To fulfill the right to energy for everyone, the biggest challenge lies in providing access to energy for the poorest sectors of the population – those without capital, capacity, knowledge and influence; those whom private sector energy suppliers are not interested in serving.

The World Bank and other international development agencies have recognized the strong link between energy access and the Millennium Development Goals (MDGs). Most now agree that achievement of the MDGs is dependent on adequate energy access for the poor. However, there has been a complete failure to agree on any international targets, strategies, programs or actions towards reducing energy poverty globally.

The current dominant development model is focused on achieving macro-economic growth, and investment in large-scale energy infrastructure to provide energy for growth (i.e. large scale coal, large hydro, transmission grids, and pipelines). Much of the infrastructure for energy in developing countries is for the export of energy to industrialized countries or urban centers, not for local use.

Over the past 30 years the international community has continually failed to make headway to reduce the number of energy poor. The approach has either not focused on actually delivering the needs of the poor, so the benefits have gone to wealthier groups, or has been unsustainable and driven by short-term donor requirements.

There is a need for much more attention and investment directed towards the supply of local energy services for poverty reduction. National development strategies need greater emphasis on local energy delivery alongside large-scale infrastructure development.

Funding gap

The energy needs of the poor are small, but small amounts of energy can make a significant difference to their lives. However, the great majority of people without adequate access to energy live on less than US\$2 per day, making it difficult for them to access modern energy services. Energy access is not without cost and the initial expenditures on electricity connections or better technologies can be high.

There is a large funding gap in providing energy access for the poor that has not been seriously addressed by existing financial mechanisms and financial institutions. Political will and the commitment of donor agencies and governments is urgently needed to prioritize investment in energy as critical for the poorest sectors. An estimated US\$435 billion would be required to provide electricity to all of the population presently un-served. An estimated investment

of \$135 billion would enable about half of the population currently cooking with biomass to switch to other fuels, and provide access to clean cooking for the rest. Compared to current energy sector spending, the cost of delivering energy to meet the needs of poor people is only about 2.85% of total global energy investment. This has to be funded by international aid, multilateral financing, climate change financial mechanisms, governments and local private sector investment.

While the private sector will be a key player in financing energy for development, private investors are not attracted by the idea of providing energy access to the poor – unless financial incentives are in place and clear policies on tariffs and risks are set in advance.

Besides the conventional involvement of the private sector in energy businesses, there are good opportunities for the mobilization of local capital towards increasing energy access for the poor. The private sector includes small businesses, small farmers and local traders looking for investment opportunities in small local businesses. If a level playing field existed, they could consider business opportunities in energy supply, and could reach the poor and the isolated more effectively than conventional private energy investors or government. However, the mobilization of local capital is only possible with strong, long-term commitment from governments and development agencies, enshrined in regulations, incentives (subsidies), and support for local capacity and energy literacy among energy consumers.

Better models needed

Sustainable models for energy service delivery to the poor – that is, the continuous supply of reliable energy services, long after the original energy access program has ended – require a clear focus on capacity building, appropriate technologies and affordable financing.

Poor sustainability of decentralized energy systems has created mistrust from decision-makers, hindering the wider uptake of options that could provide energy access for the poor. In urban areas it is frequently the case that after just a few months of connection to electricity, poor people stop using it. In rural areas, small energy generation systems are too frequently abandoned after a few months. This is caused by the original program not addressing underlying problems of poverty and household cash flow, and a lack of technical capacity and institutional support.

Simple and effective technologies are available to deliver clean and efficient energy to poor communities in urban and rural settings. Alongside conventional means of rural electrification and fossil fuels (such as LPG or diesel generators), decentralized technologies which use local energy resources – such as micro hydropower, improved cook stoves, wind turbines and solar power – can effectively supply the energy necessary for poverty reduction.

Reaching the poor with basic modern energy services would increase global commercial energy consumption by about 900 terrawatt-hours each year, which is less than 1% of global energy demand. It is not just a question of increasing the quantity of energy produced in a country, but the delivery of that energy to the people who need it most.

Way Forward

The main issues to be tackled on sustainable energy promotion for the poor are:

- **Recognizing the right to energy**

Despite the common acceptance that energy is critical for development, energy is not a high enough priority issue in policy

Continued opposite

debate. Therefore modern energy should be considered a basic right, and should be provided on the basis of justice for the poor.

- **Political will from governments**

There is sufficient evidence that important changes will only be possible with political willingness at the highest level. The market approach is not the right one for energy access for the poor – governments have to consider it their responsibility.

- **Closing the funding gap**

It is clear that there is a huge funding gap that cannot be paid by the poor, especially for initial investments. Comparing this with the huge investment on energy security, reducing energy poverty represents less than 3% of the total investment required on energy security by 2030. Yet compared with the real money currently available for energy access, this amount is large. New funding mechanisms and sources must be found.

- **Clear and specific pro-poor policies and strategies**

Neither global nor country strategies have been clear enough to tackle energy poverty. New pro-poor strategies for energy access, linked to the delivery of the MDGs, need to be implemented rapidly.

- **Sustainability of energy access**

To achieve sustainable delivery of energy to the poor, the following should be promoted widely and vigorously:

- The creation of local capacities (national and local) is the most effective way to ensure affordability, accessibility and sustainability;
- Mobilization of local capital can contribute to energy access for the poor;
- Energy literacy can contribute to the sustainability of the systems and improve relations between provider and user of energy.

- **Alternative climate change mechanisms**

The most important existing financing mechanisms, such as the CDM, the GEF and the climate change funds of the World Bank, should be regularly assessed against their real impact in addressing energy poverty and ensuring energy access for the poor. A new mechanism should be developed which can transfer increasing amounts of the growing carbon market funds toward projects that directly reduce energy poverty. ●

This is an excerpt from Energy Poverty: The Hidden Energy Crisis, first published by Practical Action in 2009. For more information: www.practicalaction.org

World Bank *from page 1*

poorest, most corrupt countries. “Projects such as Inga 1 and 2 have not unleashed economic development, but have been major contributors to African countries’ unsustainable debt burden,” states a May 15 letter to World Bank President Jim Kim from 19 civil society organizations and networks from Africa and internationally. “In a period of growing hydrological uncertainty, focusing support on centralized dams will also increase the climate vulnerability of poor countries that are already highly hydro-dependent.”

The Bank claims it has learned how to better handle some of the major drawbacks of big dams, including resettlement issues and environmental aspects. “This is not your grandfather’s hydropower,” Julia Bucknall, manager for the World Bank’s water practice, told Bloomberg BNA. The Bank indeed routinely commissions numerous environmental assessments and other reports when it prepares new dam projects. But such measures often patch over the serious impacts of new dams rather than resolving them.

The Lom Pangar Dam in Cameroon is an example of the World Bank’s recent mid-sized hydropower projects. The project will flood 30,000 hectares of tropical hardwood forest, including part of the Deng Deng national park – a refuge for gorillas, chimpanzees and other threatened species. The project’s electricity is primarily intended for the multinational aluminum industry that is by far Cameroon’s biggest energy user. “Projects like Lom Pangar raise questions about the World Bank’s seriousness in meeting the energy needs of the poor as well as its ability to learn from past mistakes,” says International Rivers’ Rudo Sanyanga.

Power for People

Better solutions are readily available. In the past 10 years, governments and private investors installed more new wind power than hydropower capacity. Last year, even solar power caught up with new hydropower investment. Wind and solar power are not only climate friendly, they are also more effective than big dams in reaching the rural poor in sub-Saharan Africa, most of whom are not connected to the electric grid.

The International Energy Agency (IEA) found that grid-based electrification – including through large hydropower projects – is not cost-effective for much of rural Sub-Saharan Africa because of

the continent’s low population density. Decentralized renewable energy solutions such as wind, solar and micro-hydropower projects are more effective at reaching the rural poor. Distributed renewable energy solutions would provide the triple benefits of increasing energy access, strengthening climate resilience and protecting the environment.

The IEA recommends that more than 60% of the funds required to bring about universal access to electricity be invested in such distributed renewable energy projects. Yet so far, funding for bringing these promising technologies to Africa has been woefully lacking. Like other donors, the World Bank is behind the curve on this. In 2007-12, it spent \$5.4bn on hydropower, but only \$2bn on wind and solar projects combined. A renewed focus on mega-dams would make matters worse.

In addition to pressure from dam-building nations, the Bank’s return to mega-dams is likely being driven by institutional self-interest. A strategy paper leaked from the bank in 2011 recognized that the increase in project size “may seem somewhat at odds with the goal of scaling up activities in areas where many potential projects — such as solar, wind and micro-hydropower ... tend to be small.” Yet, the paper argued, the “ratio of preparation and supervision costs to total project size” is bigger for small projects than large, centralized schemes, and so bank managers are “disincentivized” from undertaking small projects.

This business model has harmed World Bank project quality for decades. Beginning in 1992, internal reports have castigated the Bank for its pervasive “pressure to lend.”

For the past 20 years, World Bank presidents have promised to fix these perverse incentives. On July 16, the Bank management once again assured its Board of Directors it would address the issue through a new working group. Yet the energy directions paper published by the Bank that same day clearly focuses on mega-projects.

“The World Bank is currently focusing on a number of large storage dams in the fragile Himalaya, including some in Nepal whose main purpose will be to export power to India,” says Nepali activist Ratan Bhatari. “The Bank should instead turn to cheaper, sustainable and eco-friendly energy alternatives like, solar, wind, micro-hydro, rather than mega-destructive dams.” ●

Water Use in the US Energy Sector: Thirsty Hydro Tops the List

By Quinn Van Valer-Campbell

A US Department of Energy (DOE) report released in July details widespread risks of climate change on the energy sector. Increasing temperatures and a decreasing snowpack will greatly contribute to a lower water supply (which is already becoming a fact of life). Hydropower plants are especially at risk, for three reasons: they rely on water as their primary source of energy; higher temperatures cause them to evaporate more water (thus reducing their ability to produce energy), and they are at greater risk of damage from flooding.

With climate-induced changes to precipitation and snowmelt, there is more scarcity – and therefore more conflict – for water. According to Sara Reardon's article in *New Scientist*, a hydropower plant can use anywhere from 15,000 to 68,000 liters of water per megawatt-hour generated. To put this into perspective, a nuclear power plant uses about 2,650 liters per megawatt hour, and coal around 1,900. Rooftop solar and wind turbines use virtually no water.

Higher temperatures brought on by climate change will increase the rate at which water evaporates from large dam reservoirs.

Currently, the amount that evaporates from dam reservoirs alone is more than consumed by the industrial and domestic sectors together, according to UNEP.

Less water in rivers means a drop in generating capacities of hydropower plants. According to the DOE report, California's hydropower output decreased by 38% in the past year alone. In the Southwest, Hoover Dam's shrinking water levels cut its generating capacity by more than 20%. And drought isn't just affecting the drier Western part of the country – the Southeast's Chattahoochee River suffered a drought in 2007 that reduced its flow by 20%; overall, that region saw a 45% drop in hydropower generation.

The United States' era of dam-building is often put forth by dam proponents in the Global South as a model to emulate. But our growing understanding of the climate vulnerability of large-dam hydropower in the US reflects more current information, and offers important lessons. Forward-looking energy planners must consider these risks in their own context, and aim for no-regrets energy choices that reduce climate vulnerability. ●