

# Chinese Pledge to Support Zambezi Dam

by Lori Pottinger

**T**he China Export-Import Bank agreed in April to finance the proposed Mphanda Nkuwa Dam on the Zambezi River in Mozambique. The river basin and its delta are already suffering major environmental impacts from numerous dams upstream, including two of Africa's biggest, Cahora Bassa and Kariba. The environmental degradation in turn affects about a quarter of Mozambique's population, who depend upon the river's natural support systems for their livelihoods.

Chinese engineering company Sinohydro will lead the consortium to build the US\$2.3 billion project. According to local media, the Beijing government, in return for its support of the dam, is negotiating to have Chinese firms enter into mining projects and large-scale agriculture in the Zambezi Valley.

China's announcement came just days before the release of a plan to help restore the lower Zambezi by changing water release patterns from Cahora Bassa Dam to more closely mimic natural flows. This study analyzed how more-natural flows would bring back ecosystems that support small-scale farmers and fishers, wildlife, large-scale farm-

ers, and public health. Experts say the restoration effort could be undermined by Mphanda Nkuwa, which will require Cahora Bassa to operate according to its current destructive patterns. The new dam will also reduce the natural flow of river sediments that are critical to the delta's health.

Electricity from the 1,300MW dam would be used for export and to attract energy intensive industries to Mozambique, but this power would come at a high price. Some 1,400 people would be displaced by the dam, and an untold number by the transmission lines. The project would compromise the livelihoods of an estimated 200,000 subsistence farmers and fishers living downstream. Says Anabela Lemos of the local group Justiça Ambiental, "Currently, there is no plan to compensate downstream communities. Adding insult to injury, those who are most impacted by the dam's negative impacts will not benefit from its electricity, as it is too expensive to extend transmission lines to rural villages, and in any event they could not afford to pay for electricity."

A new risk assessment by a South African academic details the dam's expected social

impacts and predicts that Mphanda Nkuwa will leave thousands worse off. Author James Morrissey states, "Given the current compensation plan, the apparent indicators of political risk and lack of local participation, this project represents a developmental initiative which is neither just in terms of the level of risk it will generate nor equitable in terms of its likely distribution of potential gains and losses. As such, funding should be withheld from the project."

The project itself risks becoming uneconomic because of climate change. Scientists expect the Zambezi will see substantial reductions in its flow because of reduced precipitation.

"This project may be good for the relationship between China and the Mozambique government, but it's not good for the relationship between our government and the rural poor," says Lemos. "If the government wants what is best for Mozambique, the dam should be stopped, and efforts to restore the Zambezi prioritized." ■

The risk assessment is available at <http://www.irn.org/programs/mpbanda/>

## Special Focus on Africa

**Climate Change:** The West must act to ensure that Africa does not slip into climate-induced chaos. **Page 1**  
**Commentary:** African rivers are facing a watershed moment. **Page 2**  
**China:** Africa's new best friend is building dams with serious impacts. **Page 3**  
**Ethiopia:** A water storage dilemma is being played out in Africa's "water tower." **Page 4**  
**World Bank:** An internal conflict pits "small is beautiful" against those pushing for more water solutions for the poor. **Page 6**  
**Congo River:** An update on the proposed Grand Inga project, the world's largest dam. **Page 14**  
**Dam Legacy:** Affected communities and NGOs fight for justice. **Page 10**  
**Renewable Energy:** A compendium of good news. **Page 12-13**  
**Map:** A look at Africa's proposed dams, plus an alternative vision for Africa's rivers. **Page 8**  
**Dam Legacy:** Affected communities and NGOs fight for justice. **Page 10**  
**Renewable Energy:** A compendium of good news. **Page 12-13**  
**Congo River:** An update on the proposed Grand Inga project, the world's largest dam. **Page 14**  
**World Bank:** An internal conflict pits "small is beautiful" against those pushing for more water solutions for the poor. **Page 6**

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International Rivers Network



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# World Rivers Review

Volume 21, Number 4 / August 2006

Published by International Rivers Network

## Africa's Perfect Storm?

### *Extreme Vulnerability to Climate Change Increases Pressure on Rivers*

by Lori Pottinger

Africa has yet another huge burden to bear: it has been deemed "the continent most vulnerable to the impacts of climate change" by the UN Intergovernmental Panel on Climate Change. The problem is complicated by a mix of political, social, environmental and economic realities. But one thing is clear: a concerted international effort is urgently needed to ensure that Africa does not slip into climate-induced chaos because of the rich world's addiction to fossil fuels. Without such help, a recent spate of international efforts to alleviate poverty in Africa will be even less likely to succeed.

"If carbon pollution is left unchecked, climate change will have a pervasive effect on life in Africa. It will threaten the people, animals and natural resources that make Africa unique," said Paul Desanker, a Penn State professor from Malawi who focuses on climate change and adaptation in Africa.

A 2005 report, *Africa – Up in Smoke?* by a group of UK-based aid and environmental groups, states, "[Africa's] high sensitivity to climate is exacerbated by other factors such as widespread poverty, recurrent droughts and floods, an immediate daily dependence on natural resources and biodiversity, a heavy disease burden, and the numerous conflicts that have engulfed the continent. There are further complications introduced by an unjust international trade system and the burden of unpayable debt."

Africa already has extreme variability of rainfall, and an uneven distribution of water resources. Climate change is expected to increase this variability.

Most rural Africans are directly dependent on surface water – rivers, wetlands, springs and lakes – for their water supply. Experts predict that much of the continent is likely to get dryer, and that surface water sources will be dramatically affected. A recent study by climate experts at the Uni-

versity of Cape Town reveals that even a small decrease in rainfall on the continent could cause a drastic reduction in river flows. The study predicts that a decrease in water availability could occur across about 25% of the continent. For example, a 10% reduction in rain over the Johannesburg area could lead to a 70% drop in the Orange River's levels. A similar situation could hit Botswana, while in parts of northern Africa, river water levels would drop more than 50%.

"It's like erasing large sections of the rivers from the map," said Maarten de Wit, who headed up the study.

Currently, according to the UN Environment Programme (UNEP), 14 African nations are considered water stressed or water scarce, and an estimated 11 countries will join them in the next 25 years. Under such conditions, free-flowing, healthy rivers will become an even more valued resource than they are today.

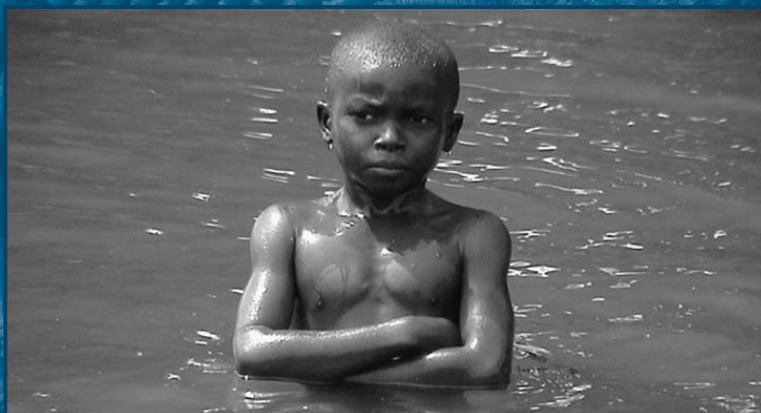
In some parts of Africa, increasing rain and run-off will lead to worsening floods and increases in water-borne diseases. For example, South Africa's Environmental Affairs Minister estimates that the number of South Africans at high malaria risk could quadruple by 2020.

If not addressed, climate change is expected to place up to 120 million people at risk of hunger, of which 70-80% will be in Africa. About one in seven Africans depend on rain-fed agriculture for their livelihoods and food. Africa has a huge population of poor farmers who are already vulnerable to flooding, soil erosion, drought, and crop failure. Predicted increases in weather extremes will only worsen their poverty and suffering.

A changing climate will not only affect the fundamental ability of Africa's rural majority to feed themselves and their livestock, but could undermine most development efforts now underway or being proposed for Africa. Less reliable water sources

*continued on page 15*

## Special Focus on Africa



This issue reveals some of the challenges and opportunities facing Africa as it contemplates further development of its rivers.

*(Photo of boy in Lobaye River, Central African Republic, by Richard Franco)*

## COMMENTARY

# A Watershed for African Rivers

As the stories in this issue illustrate, African rivers are facing a watershed moment. Climate change, the growing influence of Chinese dam builders, and a long list of proposed dams threaten to damage these lifelines and weaken the support systems they naturally provide to millions of Africans. But as this issue also shows, there is growing awareness that reducing poverty in Africa requires maintaining the health of the continent's rivers of life.

The increasing attention being paid to African development issues by rich nations, high profile rock stars, China and the World Bank has raised awareness that Africa needs help to reduce poverty and meet its human potential. But if rich countries want to best serve Africa's people, they will have to avoid repeating the mistakes of the past. Financing environmentally benign projects that build local economies and help Africans protect their rivers, forests, lakes and other ecosystems that support human well-being are key to ensuring such development helps African communities move out of poverty and adapt to climate change.

Rivers are lifelines for the majority of Africans, and cutting off their flow with dams and diversions has serious "trickle-down" repercussions. Many of Africa's major rivers have already been dramatically altered by big dams, and the social and environmental consequences have been serious and long-lasting. As the map on page 8 shows, billions of dollars' worth of new dams are being planned. Most of these projects have been put forth with little consideration as to whether they are the best options for meeting citizens' energy and water needs. Indeed, they are not likely to electrify rural villages or bring water to poor farmers. Instead, they are intended to promote energy- and resource-intensive industries, such as mining and aluminum smelters.

A different paradigm for water and energy development in Africa is possible, and gaining traction. Modern energy services would bring enormous benefits for health, education and livelihoods to Africa's rural majority, and a growing body of experts and institutions agree that such development must be scaled to meet local needs. Energy development that invests in a local energy sector and creates skilled jobs for Africans should be prioritized. Decentralized, renewable technologies such as wind, micro-hydro, geothermal, improved biomass and solar allow for higher rates of job creation and technology transfer, in addition to meeting local needs for efficiently.

Reducing dependence on hydropower is another compelling reason to prioritize greater development of renewables, as even solidly pro-dam institutions are beginning to acknowledge. A recent editorial in the Ugandan government-owned newspaper *New Vision* stated: "To date, hydropower has been the main source of energy for electricity production in Uganda. However, it is clear that this reliance on a single power source is undesirable, especially when that source is dependent on climatic fluctuations." The article supported developing Uganda's abundant geothermal potential "to reduce Uganda's dependence on hydropower."

Democratic, transparent decision-making is also key to good development projects, and here the challenges are daunting. China ExIm Bank is not the only untransparent, undemocratic player working in Africa (see p. 3). The new African Infrastructure Consortium (formed by the G-8) will act as a funding clearinghouse for major infrastructure projects. The African Development Bank, still lacking a track record of public participation, will not only house the consortium, but is expected to begin playing a primary role in infrastructure lending and development. The European Investment Bank, one of the most untransparent international financial institutions, is focusing more attention on Africa. Banks from India, Malaysia and Brazil, private banks, and Islamic development banks are all making lending services more available for African projects. The growing pool of funds could mean African governments feel less pressure to ensure that environmental and social impacts are properly monitored. The competition for lending to Africa may even decrease compliance with existing international standards.

African NGOs in Uganda, Togo, Nigeria, South Africa, Mozambique and elsewhere are working hard to gain national compliance with the World Commission on Dams' recommendations for public participation in the planning process for large dams, and for comprehensive assessments of energy needs and best options for meeting those needs. This work should be supported and encouraged.

Decisions taken now on energy and water infrastructure could not only have impacts over the next 50 years or more, but will need to carry the continent through the growing disruption that climate change is expected to bring. International funding should be prioritized for energy projects that support economic development for the rural poor, help nations adapt to climate change, and protect and preserve the vital services that Africa's rivers provide.

Lori Pottinger and Terri Hathaway

## World Rivers Review

Volume 21, Number 4

ISSN Number 0890 6211

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**Printing:**  
Hunza Graphics

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# China Conquers Africa's Hydropower Market

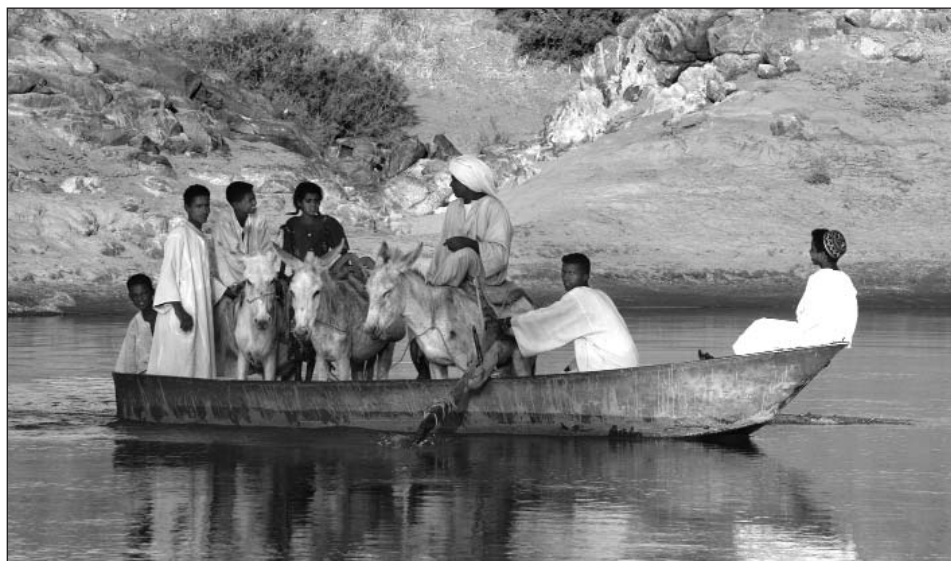
## International Standards on the Block

by Peter Bosshard

**C**ompanies from China, Germany, France and Sudan are currently building the Merowe Dam on the Nile in Northern Sudan. As the reservoir builds up behind the dam, 50,000 people are being displaced from the fertile Nile Valley to barren resettlement camps in the Nubian Desert. Tensions over displacement have flared up in repeated violent conflicts.

A French company applied for export credits for the Merowe project from the French government, but was rejected because of serious concerns over human rights violations. The World Bank also showed no interest in the project, having ceased funding in Sudan in 1993.

In the old days, large African dam projects that did not receive funding from the World Bank or Northern governments were doomed to fail. No longer. Thanks to the technology that Western companies transferred to China through projects such as the Three Gorges Dam, Chinese companies



*The Nile is a lifeline for Sudan's farmers. But lives are being turned upside down with forced resettlement for dams like Merowe, which is being built with Chinese funding.*

### China's African Dams

In addition to Merowe in Sudan, China is involved in the following large dam projects:

In *Zambia*, China's Sinohydro is working to develop the 660 MW Lower Kafue Gorge dam. China may also be interested in the proposed 120 MW Itezhi-Tezhi Dam.

In *Ethiopia*, Chinese companies are building the 300 MW Tekeze hydroelectric Dam (see page 4). A Chinese power company is also competing for the contract to build a 100 MW hydropower dam on the Neshi River.

In *Ghana*, China has expressed an interest in developing the Bui Dam, a project that would flood parts of a national park.

In *Mozambique*, China Exim Bank recently agreed to finance Mphanda Nkuwa Dam on the Zambezi (p.16).

In *Togo/Benin*, China Ex-Im Bank has announced it will provide partial financing for the Adjarala Dam. The project will displace over 8,000 people, and have serious environmental impacts.

have become active contenders in the global market for large dams.

Three Chinese companies won the main construction contract for the Merowe Dam. Chinese dam builders are also promoting hydropower projects in many other African countries (see box). They are not concerned about the social and environmental impacts of the dams they build. This seriously undermines international efforts to make such projects more sustainable.

### Commercial and political interests

The Chinese government supports the commercial interests of its dam-builders through generous lending by its export credit agency, the China Exim Bank. Within a decade after its creation, China Exim Bank became the world's third-largest export credit agency. It provided loans of almost \$400 million for the construction of the Merowe Dam.

China is not only pursuing commercial interests through its support for questionable dam projects. The Chinese government is also trying to strengthen its economic ties with countries such as Sudan, Nigeria and Burma that have large oil and mineral reserves. Finally, China is hoping to find political allies by wooing repressive regimes that are shunned by other governments. The undemocratic regimes of Burma, Sudan and Zimbabwe have found a reliable ally in the Chinese government.

The Chinese government does not appear

to be troubled by the environmental and human rights impacts of the projects it finances. "Business is business. We try to separate politics from business," China's deputy foreign minister Zhou Wenzhong said in 2004. In the case of the Merowe Dam, China did not mind financing a project that was clearly bound to impoverish the people affected by it, and did not have a thorough environmental impact assessment.

There are indications that Chinese dam builders are even putting pressure on African governments to lower their own environmental standards. According to reports received by an expert of WWF, Chinese dam builders told the Zambian government that in the case of the Lower Kafue Gorge Project, the government should only assess the project's economic return, and should not bother with assessing its environmental impacts.

Within China, civil society groups have succeeded in creating public awareness about the social and environmental impacts of large dams. In recent years, the Chinese government has strengthened its environmental guidelines considerably, and has ordered the suspension of several large dam projects. Civil society networks have no choice but to bring about similar changes for China's role in building dams in other countries. In the meantime, African NGOs are pressuring their own governments to pay more attention to social, environmental and human rights concerns in planning water and energy projects. ■

# Ethiopia's Water Dilemma

Ethiopia is a land of hydrological contrasts. Its uneven, often unpredictable distribution of water greatly impacts its efforts to address poverty. Ethiopia has become something of a poster child for the dam industry, which contends that big dams are critical for ending its poverty. But most development analysts believe the rural poor need smaller-scale water projects more suited to meeting their immediate needs. *Uwe Hoering* looks at the range of ways Ethiopia is harnessing its waters for poverty reduction.

**W**ater in abundance. Over the Simian Hills in the highlands of Tigray it is raining heavily. In no time, there are large pools of water standing in the fields behind the low stone walls marking the plots. Dried-up erosion gullies turn into brownish torrents, and the Tekeze River down in the valley swells from a small, harmless and lazy stream into a wild monster of rapids, whirlpools and cataracts.

*Water shortage.* Every year in June, Tadesse Desta hopes for the timely start of the rainy season to start sowing *tef*. Only a few weeks later he has to worry that the grain will dry up and there will be another failed harvest. For at least six months of the year he and his family are dependent on food aid, like one in four people in Tigray.

Earlier this year, agricultural advisers from the provincial government turned up and asked Tadesse Desta and his neighbors to "harvest the rains." For digging the pit in which the downpours would be stored, he got a few days' rations of maize. To coat the pit with a blue plastic sheet, he had to borrow money. The advisors told him that the small ponds, about eight by eight meters with a holding capacity of hardly more than 60 cubic meters, would help him save his crops if the rains should be not sufficient. Since the government made "rainwater harvesting" into an official program, setting targets for local officials to meet, the slopes in the highlands are now punctuated with thousands of these "household tanks."

Unfortunately, these ponds are of little use except as breeding grounds for mosquitoes. They are too small to really save the harvest in case of emergency. Tadesse Desta doesn't know how he will ever pay back the loan for the blue plastic sheet.

The flaws in this program does not mean that all rainwater harvesting programs will fail at helping Ethiopia's rural poor improve their lives. Nor does it lend support to the arguments now being put forth by the Ethiopian government and the World Bank that large-scale dams will solve the nation's woes. But it does reveal that even well-

intended programs aimed at reducing rural poverty can miss the mark substantially if they are poorly conceived.

## The Underdammed Argument

"Ethiopia is poor because it doesn't use its enormous water potential," claims the World Bank. True, in the mountainous regions, precipitation is normally quite high. It is also true that most of the waters there rush down the steep slopes unused, dragging along vegetation, soil, stones, roads and bridges, digging ever more and ever deeper gullies, and causing heavy floods in the lowlands.

Coming with the tags "economic growth" and "poverty reduction," the World Bank's solution for Ethiopia is: Dams would control the floods and utilize the abundant waters for energy and agriculture. Therefore, whoever builds them should be considered "holy men," says John Briscoe, until recently the Bank's senior water adviser. For new hydraulic infrastructure, the Bank and other multilateral finance institutions are willing to lend billions of dollars to Ethiopia, one of the poorest countries in the world.

The Bank's new Country Water Resources Assistance Strategy for Ethiopia says that to develop water storage capacity "must be seen as a development priority across the entire country" in order to improve water availability year-round. With just 43 cubic metres of storage capacity per capita, Ethiopia is far behind South Africa, whose 750 cubic metres of storage capacity per capita is being put forth as a rough water-security standard by the World Bank. The cost of attaining the "South Africa standard" is estimated at US\$35 billion – five times the current gross national product of Ethiopia. Because of the "far reaching potential benefits of multi-purpose dam development, and the unique qualifications of the Bank to support these investments," the Country Strategy argues, a first priority for future Bank assistance in water resource management should be support for large dam development and river-basin water transfers in the Nile River Basin.

The idea itself is not so new. As early as the nineteenth century, Ethiopia's Emperor

Menelik II had plans to divert the Blue Nile from its deep gorge into the arid, sparsely populated lowlands in the western part of the country. Since then, time and again governments in Addis Ababa have devised elaborate plans for dams and irrigation projects. But again and again, Sudan and especially Egypt have managed to torpedo the implementation of these projects with diplomacy and military threats. They were afraid that any diversion of water in the upper regions of the Nile would negatively impact their own farmers downstream and their expansionist plans for huge new plantations and settlements in desert areas.

## Nile Basin Initiative is Born

The pressure worked on the World Bank too. As part of an effort to get consent from Khartoum and Cairo for funding new dams on the tributaries of the Nile in Ethiopia, Uganda and Tanzania, the Bank spearheaded the Nile Basin Initiative about 10 years ago, functioning as the donor coordinator while the Ethiopian government serves as the facilitator. Progress to bring the riparian states together for an integrated river basin management plan benefitting all member states has been slow. But recently, the Council of Ministers accepted four hydropower and four irrigation development projects proposed by Ethiopia.

The biggest and most ambitious ongoing project is not part of this initiative. It is fundamentally altering a remote area at the tail end of a Africa's deepest canyon (2,000 meters deep in places) cut by the Tekeze River. In this stunningly beautiful canyon, construction is underway on a huge dam. At 185 meters, Tekeze Dam looms 10 meters higher than the gigantic Three Gorges Dam on China's Yangtze River. Tunnels several kilometers long are being driven through the rocks, and will divert the flow of the Tekeze into a huge reservoir, generating 225 MW of power, thus increasing Ethiopia's installed capacity by nearly one third.

Because Addis Ababa became impatient with the slow pace of negotiations at the Nile Basin Initiative, four years ago the government decided to go it alone on this project. There were no consultations with neighboring Sudan, nor with its longtime foe Eritrea, which would like to use the border river itself. In far-away Beijing, which is systematically building up its engagement in Africa (see page 3), Addis Ababa found a sympathetic financier for the \$224 million

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Ethiopia's water variability and lack of public development of water resources leaves farmers with shriveling crops in drought times, and women struggling to get enough water for their families' needs on a daily basis. The group RAIN with local partner WaterAction is building rainwater harvesting tanks in dryer parts of the country. The project has benefited 3,000 people so far. Here, people line up for water at a WaterAction-built tank.

project. The state-owned China Water Resources and Hydropower Engineering Corporation not only undercut all other competitors, but also offered valuable experience with mega-projects because of its involvement in the Three Gorges Dam. "Tekeze Dam is for Ethiopia what Three Gorges is for China," claimed Sun Yue, Director of the international department of the CWHRC, at the contract signing ceremony. And it looks as if this is only the beginning. In July it was announced that China's Gezhouba Water and Power Co. is likely to win the contract to build a 100 MW hydropower dam on Ethiopia's Neshi River.

Although the World Bank has concerns about this bilateral move, economically, it thinks along the same lines: Tekeze's power could help Ethiopia's economic growth, the water storage would reduce the threats of floods and create opportunities for an intensification of food production. David Grey, the World Bank's Senior Water Advisor for Africa, contends that large-scale dams like Tekeze would be to the advantage of Ethiopia's poor. "There is no precedent for a country developing without harnessing its rivers and utilizing its water resources," says Grey.

But there is a fundamental flaw to this argument. This dam's power will go mainly to the cities or will be sold to neighbors with more developed industrial economies, and the water will irrigate fields downstream in the lowlands. But the poor – like Tadesse Desta, who year after year are in need of food aid – live in the densely populated

highlands far above the dams. The expansion of irrigation will only benefit richer farmers and foreign-owned plantations, because they have the influence and the money to make use of the new opportunities, developed with public money. Such developments also don't mean that there will be more food, because the production of low-priced food crops for local markets is not considered economically viable against the cost of new large dams. Instead, water and newly reclaimed lands will be used for the production of flowers, fruits or spices for export, or for cotton and sugar cane – water for cash and for profit, not for food.

### Neither Too Big Nor Too Small

The dam near the village of Adis Nifas, not far away from the provincial capital Mekelle, is meeting quite different needs from Tekeze. The medium-sized structure (around 15 meters high and 300 meters long) has been built by the people themselves with the support of the Relief Society for Tigray (REST), a parastatal development agency. REST provided machinery and money, the villagers their labor. The reservoir is close to the fields, and most of the material used is local stones and sand, apart from some cement for the overflow canal and some valves and pipes to regulate the flow. Six months after the end of the rainy season, there is still a shallow pool of water left in the reservoir.

In the valley below the dam, each family received a quarter of a hectare of irrigated land, fruit tree seedlings, and elephant grass

to plant on the earthen walls dividing the fields to reduce soil and water erosion. A water-users association has been formed to manage the distribution of water from the dam and maintenance of the small canals. Improved cultivation methods were introduced, which bring higher yields while also saving scarce water resources. Some families try their hands at cotton, sesame and vegetables. But most of them planted chilies, which are in high demand. Hardly any Ethiopian food goes without *Berbere*, the hellishly hot red paste.

Farther below the irrigated fields, the groundwater level is rising. From open wells 4-5 meters deep, farmers can lift water with a treadle pump onto their small fields. The longer the additional water is available beyond the rainy season, the better the crops and the higher the yields. Increased incomes would allow for further improvement in cropping methods, for improved seeds and fertilizer, but also for school fees, a new iron sheet for the hut, or a radio. "Tigray is not a hopeless case," says REST's Mulugeta Berhanu.

The priority for water development in Ethiopia should be many thousands, even tens of thousands, of small and medium sized dams like the one in Adi Nifas, says Helmut Spohn, who has been assigned by the German funding agency Bread for the World to assist small farmers in Ethiopia. The dams should be accompanied by afforestation, gully plugging and terracing of the hills to avoid further erosion of the remaining soils. That would allow the rains to seep into the ground and recharge groundwater and aquifers which still are the best and cheapest water storage, releasing it slowly over time, giving new life to perennial streams. It would also stop soil, sand and stones from being washed into the rivers with every rain.

Without such a program, the new mega-dams and their reservoirs will be silted up after a few years. The result would be less additional power than calculated, less irrigation, less economic growth and less foreign exchange for the government in Addis Ababa. By that time, the consultants and construction companies would have been long gone, with their booty. But the government would still be sitting on its debt with the Chinese government or with the World Bank – rather like Tadesse Desta, who still owes the local money lender for the blue plastic sheet on his own ill-conceived water-harvesting project. ■

*Uwe Hoering works as a freelance journalist on development issues, with a current focus on water and agriculture. His most recent trip to Ethiopia was in 2005.*

# Conflict Over Water Policy at the World Bank

## New Report Supports the Small-scale Solutions Favored by NGOs

by Peter Bosshard

Using water more efficiently and promoting small-scale solutions are the best means to reducing poverty in the water sector. This approach is gaining widespread acceptance among a growing list of agencies and experts working on water and poverty.

As early as 1996, the Food and Agriculture Organization recommended that “sub-Saharan Africa give first priority to the development of small-scale, technically simple and low-cost irrigation systems. While by no means problem-free, such systems have proved to be more successful where tried, being less costly and easier to operate and maintain.”

More recently, IRN’s 2006 report *Spreading the Water Wealth* makes a strong case for a soft approach to water sector development, stating, “The basic water, food and energy needs of the world’s poorest people can be met by redirecting investments in water infrastructure to cheap, decentralized and environmentally sustainable technologies.”

The tenet that small is beautiful has now found support from an unexpected quarter: the World Bank. In March 2006, the Bank’s Agriculture and Rural Development Department published a new report, *Reengaging in*

**“A water revolution is going on in agriculture, and many of my colleagues at the World Bank don’t even know about it.”**

Kevin Cleaver

*Agricultural Water Management.* The report states that large dams and modern irrigation projects have “increased the vulnerability of people – particularly the poor.” In the future, there will be “less scope for the large dams that store water over years and transfer from areas of high rainfall to dry areas.” Instead, the Bank report gives priority to improved water use on the rainfed lands where most poor farmers live, low-cost irrigation technologies such as treadle pumps, and water conservation measures such as drip irrigation. “The potential for expansion [of drip irrigation] is enormous,” the report points out. “In India the current area under drip is less than 200,000 ha, but the potential is in excess of 10 million ha. On-farm water productivity generally doubles with drip.”

In a recent meeting with IRN, Kevin Cleaver, the director of the Agriculture and Rural Development Department, explained the shift in the World Bank’s approach with the sobering track record of large irrigation projects. “In countries like Kenya, the experience with large-scale irrigation has been horrible,” says Cleaver. Alternative techniques like drip irrigation allow farmers to irrigate their crops with much lower inputs of water and fertilizer, save costs and protect the environment at the same time. “A water revolution is going on in agriculture,” Cleaver suggests, “and many of my colleagues at the World Bank don’t even know about it.”

### Swimming Upstream

In spite of the new report from the agriculture department, the prevalent view of the World Bank “watercrats” is still that big is beautiful. The Water Resources Sector Strategy that the Bank adopted in 2003 asserts that “low-cost, often community based solutions” and “easy and cheap options” have been “mostly exploited,” and as a consequence “re-positioning the World Bank vis-à-

vis controversial infrastructure is a vital, but complex and contentious task.” The water sector strategy prepared the ground for the support of new high-risk dam projects such as Nam Theun 2 in Laos.

Once again, many Bank staff argue that governments should invest in new projects first, and worry about water conservation later. Even though efficiency improvements are usually the most cost-effective option, a recent Bank report proposes that “most early investment [in the water sector] should be in new infrastructure, rather than improving the management of existing resources.” The infrastructure promoters are thus proposing to pour more concrete, even though the agriculture specialists who work with the consumers of the water say they do not need this.

Cleaver explains that the World Bank is not a monolithic institution, and that the discussions within the institution can be “as controversial and emotional” as with civil society advocates. Sushma Ganguly, a sector manager in the Bank’s agriculture department, adds that the conflict between the different approaches will play out on a country-by-country basis. In the water assistance strategies that the World Bank recently prepared for India and Pakistan, the dam promoters kept the upper hand. Both strategies support large-scale dam building, but do not include any measures to realize the huge potential for drip irrigation and other efficiency improvements.

Africa, and particularly countries like Ethiopia (see page 4), will be a hotspot of future water sector development. Although a number of Bank senior water staff are strongly advocating for large-scale damming as a way to help places like Ethiopia and the broader Nile Basin reduce poverty, the Agriculture sector has a different idea. “We will reengage in Africa’s water sector, but in spite of strong pressure, not with large-scale irrigation projects,” says Kevin Cleaver. He points out that the vast majority of Africa’s poor farmers live on rainfed lands. Supporting these farmers in improving their yields is more important for poverty reduction than creating islands of modern irrigation that mainly benefit large landowners.

While the change of course being set by the World Bank’s agriculture department is welcome, it is also contested. Conflicts over the right approach to water will continue – inside and outside the World Bank. ■



Low-cost technologies like micro-drip and treadle pumps are the best way to meet the water needs of the world’s poorest farmers. Here, a Zambian farmer uses a treadle pump on his fields.



# Reducing Dam Impacts in the Kafue Flats

by Ute Collier

**T**he Kafue Flats in Zambia are an amazing wetland landscape of grasslands, lagoons and reed beds, covering about 6,500 square kilometers of the Kafue River Basin, a tributary of the Zambezi. They are home to more than 470 species of birds and a wide variety of mammals, including the endemic Kafue lechwe, a rare species of antelope. There are two national parks which together have been designated as a Ramsar site – a wetland of international importance. Apart from being a haven for wildlife, the Flats are also important for people's livelihoods. It is estimated that about 700,000 people live in, or in the vicinity of, the Flats and many depend on floodplain agriculture, dry season cattle grazing and traditional fisheries for their livelihoods.

The ecosystem has been heavily influenced by natural cycles of floods and droughts, but this changed radically after the construction of two dams in 1969 and 1976. First, downstream from the wetlands, a hydropower plant was built in the Kafue Gorge. This dam now supplies approximately 40% of Zambia's electricity needs. Because of the geography of the Kafue Flats a second dam was needed to ensure a steady supply of water, so the Itezhi-Tezhi storage dam was built 250 km upstream, with the Kafue Flats left wedged between the two dams.

As a result of the construction of the two dams, the river's natural flood patterns were replaced by a stable river level throughout the year. This change in water regime contributed to the decline of many species in the Kafue Flats area. The number of Kafue lechwe decreased to a third of its original 1970 population of 100,000, although poaching also played a role in this decline. In addition, lower fishery yields and reduced availability of grazing land as a result of the altered flooding regime have had detrimental effects on livelihoods.

The good news is that a partnership has been formed between key players, with the aim of addressing these problems. WWF has been working with the Zambian Ministry of Energy and Water and the Zambian Electricity Supply Company (ZESCO) to adjust the operational regime of the upstream dam, so that a more natural pattern of water releases is achieved. The work has included sophisticated (and expensive) modelling work, as well as the re-establishment of hydrological monitoring stations which had fallen into disrepair.

Initially, the partnership focused primarily on technical and institutional aspects.



Kafue Flats, Southern Province, Zambia.

Photo: © WWF-Canon/Sarah Black

Subsequently, the importance of working with local communities was recognized by the partners. Addressing their specific needs in relation to the dam operations became a major focus. Numerous workshops were held with local communities in which the crucial importance of more water for cattle grazing emerged.

New operational rules for the Itezhi-Tezhi Dam, aimed at better balancing hydropower, ecosystem and livelihood needs, were launched in May 2004. Unfortunately, they are yet to be fully operationalized, as some problems with the model used to trigger releases emerged. Nevertheless, during the 2006 wet season, additional water releases were made by ZESCO. The follow-up work now focuses on tweaking the model and extensive monitoring of wildlife and fisheries in the Flats, to ensure that the changes really are beneficial.

ZESCO is planning to build two more hydropower plants on the Kafue River. At Itezhi-Tezhi Dam, where currently tons of water run over the spillway every day, an 80 MW power plant is planned to exploit the energy of the released water. The original design of the dam provided for a power plant but finances were lacking at the time. This is one case where a new hydropower plant is likely to have a negligible additional environmental impact, as it would operate at an existing dam. So far, finance for the scheme has remained elusive. Furthermore, a second power plant is planned in the Kafue Gorge, just downstream from the existing

plant. According to ZESCO, these two new plants are fully compatible with the new operational regime, as they would work with existing water releases. WWF will continue to work with ZESCO to ensure that this is the case and that the agreed changes will be fully operationalized and yield benefits for people and wildlife.

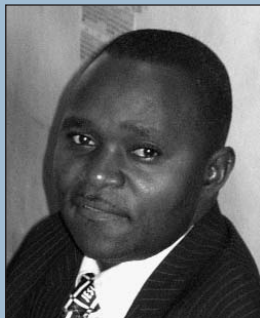
The Kafue experience shows that it can be worthwhile to look at mitigation options at existing dams, as recommended by the World Commission on Dams. Environmental flows in particular can be introduced retrospectively and can be extremely important for reducing environmental and social impacts. However, getting dam operators and governments to agree to releasing environmental flows is not necessarily easy, as any additional water release tends to incur a power generation penalty. Too often such water releases are seen by dam operators as a waste, yet their impacts on people's livelihoods can be dramatic. Examples like Kafue show that it is possible to find a more balanced approach, provided dam operators and decision-makers have the will and the sense of responsibility toward other users of the river basin. What has been achieved in Kafue can and needs to be replicated in more places, in Africa and elsewhere. ■

*The author is with the WWF Global Freshwater Programme. A full report on the Kafue project can be downloaded at: <http://assets.panda.org/downloads/restoringkafueflatsschellepittocriver-symposium3sept05.pdf>*



The map shows the most prominent dam projects now proposed for Africa's rivers. If all were built, Africa would see its external debt increase by billions of dollars. Hundreds of thousands more people would become dam-refugees, and downstream environmental impacts would affect millions more.

But another African development model is possible. The quotes on these pages are from members of the African Rivers Network, a three-year-old network of NGOs and dam-affected communities from more than 20 countries working toward social justice in the arena of large dams. The work of these tireless advocates for social and environmental justice gives us hope.



My vision: Africa gaining confidence, African leaders working for the well being of the people. I see the African Rivers Network voicing African concerns to the international community, about how communities are marginalized in the planning of big projects.

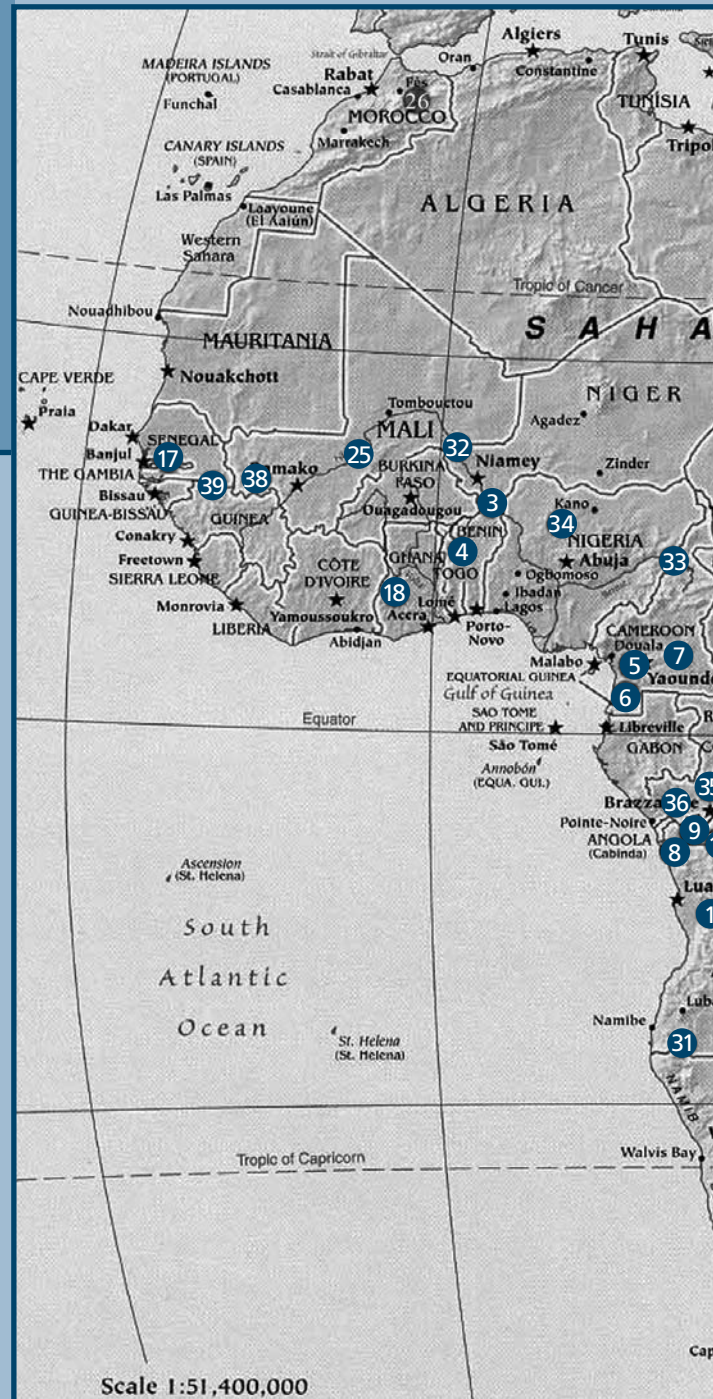
*Jacques Bakulu, DRC*

I hope that Africans can work together as brothers and sisters to resolve the issues that are affecting us. I want to see people who are being affected by the building of dams also benefiting from the wealth coming from those dams. We must be able to share in the economy that is created by the dams, and have access to the opportunities they create. I would love to see the recommendations of the World Commission on Dams implemented to make sure we do not repeat the injustices that happened in the past.

*Miriam Kibi, South Africa*



# Africa's Dam



## MAP KEY

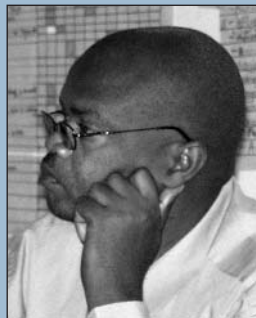
1. Angola: Capanda Dam, Kwanza River
2. Angola: Seven new dams plus rehabilitations, Kwanza River
3. Benin/Niger: Dyodyonga Dam, Mekrou River
4. Benin/Togo: Adjarala Dam, Mono River
5. Cameroon: Lom Pangar Dam, Sanaga River
6. Cameroon: Memve Ele Dam, Ntem River
7. Cameroon: Nachtigal Dam, Sanaga River
8. DRC: Inga 1, 2 Rehabilitation, Congo River
9. DRC: Inga 3, Congo River
10. DRC: Grand Inga Dam, Congo River
11. Ethiopia: Tekeze Dam, Tekeze River (Nile tributary)

12. Ethiopia: Gilgel Gibe 2, Omo River
13. Ethiopia: Gojeb Hydropower Project, Gojeb River
14. Ethiopia: Baro and Karadobi dams, Baro River and the Blue Nile
15. Ethiopia: Neshi Dam, Neshi River
16. Ethiopia: Kesem and Tendaho Dams, Kesem River and Awash River
17. The Gambia: Sambangalou Hydropower Project, River Gambia
18. Ghana: Bui Dam, Black Volta River
19. Kenya: Sondu-Miriu Dam, Sondu River
20. Kenya: Ewaso Ng'iro Project (Aka Amala Project), Mara River Basin

21. Lesotho: Metalong Dam/Lowlands Water Supply Project, Phuthi-atsana River
22. Lesotho: Mashai Dam, Phase 2 — LHWP, Orange River
23. Malawi: Pumped Storage, Lake Malawi
24. Malawi: Kaphichira Phase 2, Fufu Dam, Kholombizo Dam, Mpatamanga Dam
25. Mali: Talo Dam, Bani River
26. Morocco: 15 Dams, Moulouya River
27. Mozambique: Mphanda Nkuwa Dam, Zambezi River
28. Mozambique: Cahora Bassa North, Zambezi River
29. Mozambique: Rehabilitation of Massingir Dam, Oliphants River
30. Namibia: Popa Falls Dam, Okavango River



# Projects at a Glance

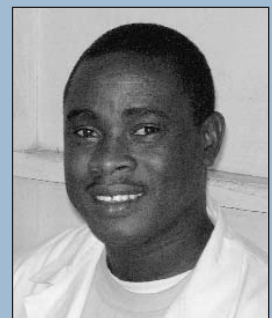


My vision for Africa is to have sustainable development embedded in Africa's development agenda. I hope ARN can become a strong network that advocates for this vision.

*Frank Muramuzi, Uganda*

I want to see African leaders take a leadership role in ensuring the sustainable development of the continent, and in protecting our natural heritage. Most initiatives being put forth for Africa are coming from outside, imported technologies and consultants are draining our resources.

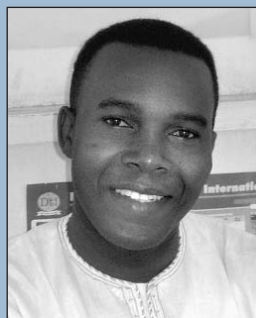
I would like to see Africa becoming independent, finding solutions to our own problems, our own development strategies. I want to see a growing, strong grassroots to help us get there.



*Hope Ogbeide, Nigeria*

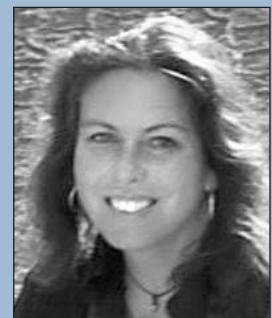
I want to see Africa stand on its own two feet, and develop the use of its own resources sustainably – more small projects, less centralized big projects.

*Liane Greeff, South Africa*



I want to see independence from external influences, and have Africans really profit from Africa's resources.

*Sena Alouka, Togo*



31. Namibia/Angola: Epupa Dam, Cunene River
32. Niger: Kandadji Dam, Niger River
33. Nigeria: Mambila Dam, Mambilla Plateau, (Benue River?)
34. Nigeria: Zungeru Dam, Kaduna River
35. Republic Of Congo: Imboulou Dam, Lefini River
36. Republic Of Congo: Sounda Gorge Dam, Kouilou River
37. Rwanda/Tanzania/Burundi: Rusumo Falls Dam, Akagera River
38. Senegal/Mali: Manantali/Diama Dam expansion, Senegal River Basin
39. Senegal/Guinea: Sambangalou Dam and Kaléta Dam, River Gambia and Konkouré River

40. South Africa/Namibia: Vioolsdrift and Boegoeberg Dams, Lower Orange River
41. South Africa: Thukela Water Project, Thukela River
42. South Africa: Skuijsdam Dam, Berg River
43. Sudan: Merowe Dam, Nile River
44. Sudan: Kajbar Dam, Nile River
45. Tanzania: Rufiji Basin Projects, Rufiji River
46. Tanzania: Rumakali Dam, Rumakali River
47. Uganda: Bujagali Dam, Nile River
48. Uganda: Series of large hydropower dams proposed on Nile River: Karuma, Kalagala, Ayago, Murchison Falls, Masindi
49. Zambia: Kafue Gorge Lower, Kafue River

50. Zambia: Itzhi-Tezhi, Kafue River
51. Zambia: Kariba North Rehab and Extension, Zambezi River
52. Zambia: Numerous dams proposed, including: Batoka Gorge, Devil's Gorge, Mputa Gorge, Mambilima, Mobututa, Lumange Falls, Kabwelume Falls, Lusiwasi, Lunsemfwa, Kalungwishi
53. Zimbabwe: Kariba South Extension Project, Zambezi River
54. Zimbabwe: Gwayi Shangani Dam, Zambezi River
55. Zimbabwe: Tokwe-Mukorsi Dam, Tokwe River
56. Zimbabwe: Bubi-Lupane Dam, Bubi River

# Left High and Dry: African Communities Seek Justice for Harm Caused by Dams

by Terri Hathaway

**K**ariba Dam on the Zambezi River in what is now Zambia and Zimbabwe was the engine for the African copper mining industry, generating wealth for colonialists, and then spurring development of the two countries after independence. It was the World Bank's first dam project. It is also one of Africa's most notorious cases of a people wronged in the name of national development.

Today, it symbolizes Africans' quest for reparations for development-induced displacement, thanks to a home-grown alliance that is working to document the past wrongs and suggest ways forward for the affected communities.

Between 1954 and 1962, some 57,000 people – the entire population of Tonga people – were removed from their lands along the Zambezi River to make way for Kariba. The reservoir flooded the communities where for centuries these people had farmed, fished, worshipped, raised their children and buried their dead. They were resettled to poor lands with no development assistance, and left to fend for themselves.

Forced off their land before harvest, 1957 became known to the Tonga as “the year of eating bones.” Fifty years on, their lives have met a standstill in the dusty lands where the next generation is continuing the struggle to redress the problems wreaked by the dam on their communities. In a quest to restore their lives and find justice, the Tonga formed their own advocacy group in 2000, the Basilwizi Trust. Basilwizi sees itself as a culmination of numerous efforts by the affected people to be heard by the government authorities. They are working to define their needs, and to help the whole community gain skills to directly lobby decision-makers.

In 2005, Basilwizi conducted extensive research on the socio-economic status of the Tonga people. Their report states: “[The Tonga] are not able to farm and produce three crops a year as they used to on rich alluvial soils that have since been submerged under water. These areas also lie in the low and unreliable rainfall regions ... where efforts to grow small grains that are drought resistant have even failed. Besides, extraordinarily large flocks of quelea birds and elephant herds that freely roam peasant-farming areas are common menaces to crops. Food security in these areas is there-



The Tonga people have never prospered since Kariba Dam developers forced them off their fertile lands fifty years ago. NGOs are pressing for reparations for this resettlement disaster.

Photo: Jacques Leslie

fore compromised and every year, very few families are able to harvest enough crops to last them until the next harvest.” Basilwizi is now undertaking new activities to revive the Tonga culture, and to build local access to education. They are also focusing on food security and access to electricity, still lacking after 50 years.

The group is also calling on the World Bank and other parties involved in building the dam to bring justice to the Tonga. “Calls for reparations, coming many years after the displacement of these people from the land of their ancestors, have not yielded any significant benefits,” observes Basilwizi in its recent report. “Such compensation could be in monetary terms, de-commissioning of the dam, official recognition of past and current injustices suffered, or complete restoration of the ecosystems. A new dialogue to correct the wrongs committed should commence. The Tonga are ... trying to find solutions to their predicament and to rise out of the imposed poverty. The perpetrators should not look at this as a social obligation but a realization that this could have been done better and so

what economic, political and cultural programme can follow.”

Kariba may be one of the worst examples of forced resettlement for an African dam, but it is hardly the only case where those who sacrificed the most were treated poorly and left worse off. From the High Aswan Dam in Egypt, to Akosombo in Ghana, to the Lesotho Highlands Water Project, and numerous other large dam projects across the continent, many Africans have been forcibly displaced or lost their natural resources because of dams. While this African legacy is far from settled, communities are seeking their justice in creative and steadfast ways.

## Apartheid Dams

South Africa has the most dams on the continent, and many of its 600 large dams have come at a great human cost. “Africans had no rights, no say in the decisions because of apartheid,” remembers Miriam Kibi, whose family was forced out to make way for Gariep and Vanderkloof dams. In 1913, unfair land laws saw 80% of the land handed over to white colonialists, just 13% of the

*continued opposite*



population. Under the racist apartheid government, blacks were forcibly dislocated for dams without compensation. Because apartheid laws required blacks to have permits to enter city limits, dislocated blacks couldn't move into urban areas. "We lost lots of property," said Kibi. "No attempt was made to give us another roof over our heads. We had to squat on the side of the road."

Through a national multi-stakeholder dialogue on dams, reparations were identified as a priority. "We need to get benefits out of the dams and we need to restore the dignity of our people," says Kibi, who has also served as a representative for affected communities on the dialogue's steering committee. While financial reparations for affected communities have all but been dismissed by the government, there is now a social audit underway for 10 dams in the country. But the audit's slow start concerns affected communities, who say a lack of political will continues to stall dam-related reparations. Says Kibi, "It's frustrating, and the momentum of the people starts to get lost."

In Democratic Republic of Congo (DRC), the Inga 1 and 2 dams have lit up mining enterprises in Katanga and major urban areas as far as South Africa. The dams were built in the 1970s and 1980s without thorough environmental or social impact assessments, and the communities say the dams have brought nothing good to them.

A report released in March by two Congolese NGOs found that compensation was never paid to communities harmed by the dams, and no local benefits provided. Health problems have increased, and water quality has decreased. People now often get skin rashes from bathing in the river. There is little access to health care. Upstream of the dams, fishermen's catches have decreased sharply, causing their incomes to fall.

Today, the Inga 1 and 2 dams are facing an injection of financing to rehabilitate the projects so they produce more electricity (see page 14), and the communities want to make sure they are not left behind. As pointed out by the World Commission on Dams, "Opportunities to restore, improve and optimize benefits from existing large dams should be used as an entry point to address unmitigated social problems associated with the dams in that river basin." But the Inga affected communities have been threatened with further expulsion once again to make way for new Inga dams. Although they are preparing their demands for the World Bank, a key funder of the rehabilitation project, they are worried that any attempts to meet and discuss the issues will be violently shut down by local authori-

ties. Already, one man from the affected area who wrote a letter about his rights has been threatened with arrest.

### **Nigeria: Flood of Dam Problems**

In northern Nigeria's Hadeija-Nguru wetlands, historical flood patterns upon which one million farmers, herders, and fishermen depend changed patterns after two dams were built, drying up seasonal river channels and causing homes and roads elsewhere to flood. Livelihoods of downstream communities were shattered, and years were spent accusing each other for the changes before enough work was done to come to a common understanding about the changing watershed. "Now the communities understand that the [Tiga and Challawa] dams are a main root cause of the changes," said Dr. Idris Muslim, Director of Water Supply and Quality Control for Jigawa State. A Wetlands General Council was formed in recent years to help the communities tackle the problem and identify their needs. Interestingly, they are not seeking cash or other compensation. "They see justice as restoration of their wetlands. They are asking for the floods to be controlled, and to make water go where it used to," said Muslim. Work is being done to initiate Integrated Water Resources Management (IWRM) committees in the five affected states and to work together, with community representation, to find comprehensive mitigation measures.

Unfortunately, the experience for those affected by Nigeria's Kainji, Shiroro, and Jebba hydropower dams have not had such luck in garnering ongoing political support for their justice. Legislation known as HYPPADEC that provides for a benefit-sharing scheme with the communities passed both parliamentary houses, but needed presidential support to be signed into law. "It was in the spirit of dialogue that 4 state governors met in 2000 to deliberate on the plight of our communities living up and down stream of the hydroelectric power stations in the country," wrote CAPP, a local NGO. "The National Assembly graciously passed the HYPPADEC bill into law as promised. However, Mr. President promised to visit affected areas before he finally gives assent to the bill." Although a joyous visit occurred in 2003, "nothing has been heard or done about [HYPPADEC] while the communities continue to languish in neglect and deprivation."

### **Lesotho Legacy**

In Lesotho, two large dams have left the people of the rural Highlands communities struggling, despite the World Bank's best

efforts to ensure that people were not left worse off by the giant Lesotho Highlands Water Project (LHWP). Working with the Transformation Resource Centre, a local NGO, the dam-affected communities have formed their own advocacy organization, Survivors of Lesotho Dams (SOLD). Says SOLD's Mantsila Seleke, "The dam project is like Lesotho's diamond. We want to know how this diamond can be broken up so we can all have a little piece of it."

Adds Mabusetsa Lenka of TRC, a longtime field worker with the dam-affected communities, "The project authority is only now beginning to realize that they should have started yesterday on restoring livelihoods. The affected communities have not been prepared for a life beyond compensation."

SOLD will focus on trying to get more training for those who lost their livelihoods when the dam drowned their farms, and other help. "It's like we're trying to climb a very high mountain; we just want help reaching the top of this mountain," says Seleke. "We would like the project authority to work cooperatively with these communities and help them develop projects that will bring them money, and help them solve their life problems." TRC recently published a book, *On the Wrong Side of Development: Lessons Learned from the LHWP*, which they hope will help avoid such problems with future dams.

### **Lessons from the WCD**

Dozens of new dams are proposed for Africa, and grassroots groups and affected communities are trying to ensure that past mistakes are not repeated. Proactive mechanisms for benefit-sharing can help reduce the risk of long-term problems down the line. Progressive legislation and government policy can also ensure less risk of injustice. But, as the WCD notes, it also requires the political will to make it happen.

The WCD states that, "a continuation of the legacy of inequity associated with many large dams is not only unacceptable, but unnecessary." Examples of financial reparations made to Native Americans in the US shows that it is possible to rectify some outstanding issues. However, it also requires the financial investment to be able to rehabilitate, restore, and repair lives. The WCD calls for governments to spearhead reparations efforts for past dams. This is not yet happening in Africa.

In the meantime, across Africa, communities left with a legacy of uncompensated impacts from large dams are finding their strength as survivors, and working to restore justice in their river basins. ■

# Renewing Africa: Clean Energy Makes Inroads Across Continent

**M**ini-hydro in Uganda, solar power in Namibia, wind farms in Ghana, geothermal in Ethiopia, wave power off the coast of South Africa ... Africa has huge potential for renewable energy. These technologies hold promise for the millions of Africans who have no access to modern energy services, but development has been slow. But we take heart with every advancement that energizes African lives in ways that leave rivers undammed and able to maintain their critical "life support" role. Here is a roundup of some recent developments in the greening of Africa's energy sector.

•**WIND:** Africa is well behind the rest of the world in developing wind farms (only North Africa has developed large wind farms – Egypt and Morocco have installed 150 and 60 megawatts of wind capacity, respectively), but more is on the way. Kenya hopes to develop 30 megawatts of wind in the next few years, while the African Wind Energy



Association (AWEA) is trying to encourage a market in second-hand turbines being upgraded in Europe. According to the African Wind Energy Association, the turbines "range from

30 to 1000 kW, often represent state-of-the-art technology, have 10 to 20 years of remaining life expectancy, and are available at relatively low initial costs."

•**CLEAN STOVES:** Roughly two-thirds of African households depend on wood fuels for their daily cooking and heating needs. The result is widespread respiratory illnesses and deforestation. Now, a clean-burning stove is drawing crowds at markets across Southern Africa. Ethanol gel stoves and lamps offer a healthier, safer and more efficient alternative to paraffin, charcoal or coal fires. Ethanol gel is made from renewable crops such as corn, sugar or casava, and burns carbon- and smoke-free. A main purveyor is GreenHeat South Africa, which has branches across the country. The company's two-burner stove

sells for about US\$25. A new factory is planned for neighboring Swaziland. The product was brought to commercial development with the help of a World Bank renewable energy award about six years ago.

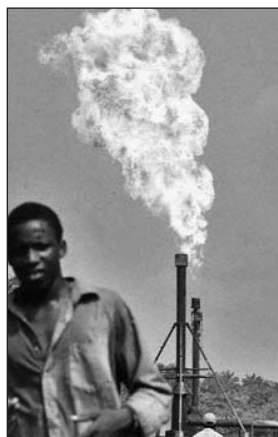
## •GAS FLARING TO END:

While not a renewable resource, the pending end of the wasteful, unhealthy practice of burning off natural gas by-products in Nigeria's oil fields is certainly environmental progress. Flaring in Nigeria releases more CO<sub>2</sub> than all other climate-related emissions in Sub-Saharan Africa combined. After 40 years of flaring, Nigeria and the oil companies are finally ending the practice in the next 2-4 years, and will capture and re-use the gas for export and local use. President Obasanjo has said that Nigeria could be earning about \$12 billion yearly from the export of natural gas, a product which Nigeria has more of than oil.

•**FUEL CELLS:** A South African company plans to install 400 fuel cells in remote areas and cities across South Africa over the next three years. The project will power about 1,300 households. According to the company, the project will represent the largest number of commercial fuel cells to be installed in a developing country to date. The fuel cells will likely run on methane. Fuel cells emit virtually no greenhouse gases.

•**GARBAGE POWER:** A UK company is looking into tapping into methane released from rotting garbage at landfills in South Africa. The company estimates the energy potential at about 97 megawatts. The first sites will be developed within the year. Methane is a more powerful greenhouse gas than carbon dioxide, so capturing it from African landfills could be eligible for carbon credits set up to reduce global warming.

•**THIN-FILM SOLAR:** Engineers at the University of Johannesburg have made breakthroughs in solar power that allow for very thin solar-power-generating compounds to be coated onto a variety of materials (like roof shingles or walls). The product is expected to be much cheaper than current typical solar PV modules (though also less efficient). The development of the technology has been licensed to a German company, because Ger-



many has market incentives to stimulate the uptake of renewable energy, while South Africa currently does not. However, research on the potential for a manufacturing plant in South Africa will be undertaken later this year, according to the company.

•**BIOFUELS:** Evergreen Bio-fuels announced in September that it will launch the first large-scale commercial production of biodiesel in South Africa. The company will build a refinery in

Mpumalanga that will manufacture fuel from soy beans. And the Nigeria National Petroleum Corporation has established an ethanol program (based on sugar) that is expected to save the nation US\$130 million over the cost of oil. The project also has the potential to generate up to 15 MW of electricity from a biogas-fed cogeneration plant.

•**GEOTHERMAL:** Kenya remains Africa's only nation with serious geothermal energy production (which now supplies 10% of its energy, with more on the way), but if all goes to plan, a number of its neighbors could join the steam revolution in coming years. Ethiopia is currently working to bring geothermal online, and Uganda is exploring three potential sites. A program to help boost geothermal energy in African Rift countries is moving forward. The African Rift Geothermal Development Facility (ARGeo) will provide technical, economic and policy support for geothermal projects in the Rift region. The group has set a target of 1,000 MW of geothermal energy development. The program will "address technical capacity and confidence barriers through shared experience and technical assistance for the early stages of geothermal development." A Geothermal Resource Network will help project developers with expertise, information, technical resources, environmental management guidance, capacity building and general policy support.

•**RENEWABLES RESEARCH:** In July, the Namibian government launched the Renewable Energy and Energy Efficiency Institute (REEEI) in the nation's capital. REEEI and the Ministry will explore technologies like

*continued opposite*

# Micro-Hydro Powers Rural Cameroon

by Stefan Rostock and Coney Njinkeng

**I**t is cooking time in Bansoa, and rush-hour for Mrs. Tagme at her corn mill and cassava grater. She offers her services to other women in the small village situated in the hilly West Province of Cameroon. Her corn mill and cassava grater are the only ones within a 5-kilometer radius. A small Pelton turbine connected with pipes to the creek behind her house turns her mill. In the evening she connects it to a generator for electricity. Her children use the light for additional learning hours; she listens to the radio and can even offer TV evenings to friends.

The Pelton turbine is produced in the major regional town, Bafoussam, by local technicians, using local materials. The technicians have been brought together by ADEID, a local NGO that has been working for 15 years on small hydropower solutions.

ADEID has installed micro-hydro in Cameroon and other African countries. It helps local communities find donors for the high initial costs of the installations and to create local committees for maintenance and management. Training by ADEID for women and men from the concerned vil-



A local technician explains how the turbine works. All four valves are used to increase water pressure to the turbine.

lages creates rural capacity for administration and maintenance.

In Baleng, 5 km west of Bafoussam, two communities organized as Community Group Initiatives are building their own micro-hydro installations. The German Protestant Church Development Service supports them with loans for the high initial investments. (An installed system, with training for maintenance, can run up to \$12,000.) The villagers are contributing as well. When electricity production starts, every consumer contributes monthly to pay back the loan. After the loan is paid off, the monthly contribution can be used for maintenance or other development efforts in the villages.

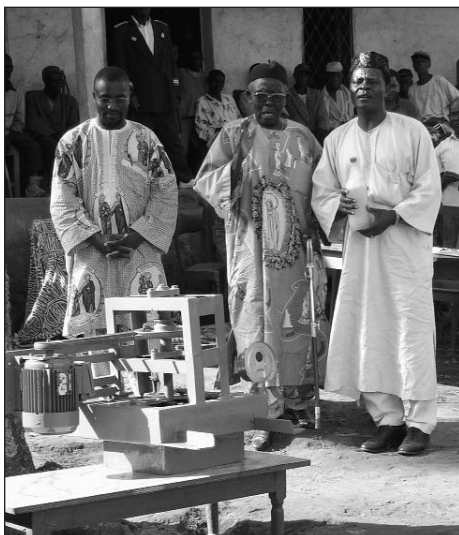
Technically, micro-hydro is not very complicated. A small dam directs water into a chamber that traps sediments. From there, two or four valves direct the water to the Pelton turbine, which turns an alternator. ADEID's alternators are producing between 2 and 25 kilowatts – enough to supply up to 250 houses with light and music. The villagers often vote for using the electricity for a health post or a bar with TV.

Currently, 96% of Cameroon's grid-based electricity comes from large dams located on the same river system, the upper Sanaga River. This increases vulnerability to changing rainfall patterns from climate change. Droughts in 2002 gave a taste of things to come.

Local electricity solutions are the only chance for rural areas. Since the privatization of Cameroon's electric utility in 2001, the prices of electricity have gone up; connection costs are often unbearable, and new electrification is concentrated in urban areas.

It is evening in Bansoa. In most houses candles or oil lanterns bring some light. Mrs. Tagme and her neighbors are using energy-saving light bulbs. The children are studying longer. Her son will open a bar and her daughter continues maintaining the mill and grater, and with the incoming money she is going to open a small kiosk. Electricity is bringing new ideas into rural Africa. ■

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At a micro-hydro training in Cameroon.

**Clean Energy** continued from page 12  
wind energy, biogas, biomass, solar and ocean power.

•**OCEAN POWER:** Unlike conventional hydropower, sea-based hydropower is not subject to drought. A number of African countries have great potential for this new technology. South Africa's coastline alone

has an estimated 56,000 MW of ocean-power potential; the national utility Eskom is now studying the possibilities for tapping the fast-flowing, consistent Mozambique current off the coast of KwaZulu-Natal. This current could provide "continuous and virtually unlimited power" for South Africa's growing

energy needs, according to an Eskom spokesperson. Drought-plagued Tanzania is another possible ocean powerhouse; in May, it was reported that investors from the United Arab Emirates will put up US\$168 million in seed capital for investing in an ocean-power facility off Tanzania's coast. ■



# Congo's Inga: Great Power for Whom?

by Terri Hathaway

Midway between Kinshasa and the Atlantic coast lies what energy developers see as a panacea for Africa. With an estimated hydropower potential of 40,000 MW, the Inga rapids on the Congo River have engineers and dam builders salivating. Two dams, Inga 1 and Inga 2 (built in 1972 and 1982, respectively) are preparing for an overdue facelift and a new dam, Inga 3 is the next anticipated step. The final stage could be a river diversion scheme called Grand Inga, a dam builder's mighty jewel, dwarfing every hydro site worldwide.

But the lack of benefits from the existing dams to local communities, and the social and environmental problems left in their wake, are raising questions about who exactly will benefit from the expansion of large hydropower on the Congo River. If future projects do not bring benefits to those Africans most in need, it will have the double effect of making development dollars less available for projects that would better meet their needs.

Currently, only 6% of DRC's population has access to electricity. Some NGOs are advocating that if future projects are developed, the first priority should be to increase the rate of access to electricity to 60% of DRC's population. Without such a national benefit from the development, some fear it would cause new civil unrest. They argue that lighting the rest of Africa while leaving most of DRC in the dark would be politically and morally unacceptable.

## Let the Moving Begin

Earlier this year, local officials told communities that are home to about 8,000 people to move off their land by May 1, presumably to make way for the new hydro development. Community representatives say they were offered no explanation for the order, and authorities did not provide any compensation payments, social assessment, written agreements or resettlement plan. The communities were not sure what to do. Authorities have more recently said they will provide land to those told to move, but rebuilding their homes and their lives will come at their expense. Without further direction, they continue to remain in their homes.

"Things seem tense on the ground around Inga," according to Nikki Reisch of the Washington-based Bank Information Center, who recently visited the region with

Shannon Lawrence of Environmental Defense. "The local communities lack even basic information about planned rehabilitation and further development of the Inga site, but officials from the electricity utility and local authorities appear unwilling to talk. Political sensitivities are high, and some residents have said they are afraid to speak out or be seen discussing their concerns."

Local NGOs report that communities were never consulted about Inga 1 and 2 and have not been consulted about any proposed future developments. If the communities already affected by Inga 1 and 2 are now forcibly displaced, it could further harm their lives and livelihoods.

MagEnergy, a subsidiary of Canadian-based MagIndustries, has signed an undisclosed deal with the Government of DRC to rehabilitate half of the turbines at Inga 2 in exchange for guaranteed power for its industrial operations across the border at Point Noire, Republic of Congo. The World Bank has provided funding to rehabilitate at least three turbines at Inga 1 and is expected to include funding for the rest of Inga 2's turbines in a loan package that will go to the Bank's board in March 2007.

The rehabilitation provides an opportunity to rectify the social and environmental problems that have plagued communities surrounding Inga. A thorough assessment of the affected people's needs and documentation of the dams' likely environmental and social impacts should be completed and the communities given a proper forum to voice their grievances and resolve the issues of this legacy. If problems from Inga 1 and 2 are not resolved as the dams are rehabilitated, it could serve as a warning of what is to come with more hydro development on the Congo River.

Westcor, a consortium of five state-owned utilities in the region interested in developing Inga 3 and additional projects, will be operational this year. The Canadian International Development Agency (CIDA) is funding a feasibility study for Inga 3, now underway by Canadian consultants SNC-Lavalin. However, there is some interest by officials in DRC to skip Inga 3 and proceed straight to development of Grand Inga.

## Lack of Information

Virtually the only available project information is intended to boost the interest of potential investors. For example, a list of

companies who are making early investment deals under Westcor for guaranteed power from an expanded hydro supply has been circulated; it includes mining and aluminum giant BHP Billiton and other energy-intensive industries. These companies are likely to be provided with subsidized, long-term power, as incentive to develop factories and industrial plants in Africa. It's difficult to know for certain, because the agreements will almost certainly be unavailable to the public. More importantly, there is no framework in place to ensure that the revenues to the national budgets, generated by these new industries, actually reap public benefits. The absence of any such mechanism raises concerns, given that pervasive corruption in the DRC's revenue-generating sectors – diamonds, copper, timber – has yet to be overcome.

In March, a two-day national roundtable was organized by the government of DRC with support from the African Development Bank (AfDB) to discuss the proposed developments of Inga 3 and Grand Inga. While the AfDB stated that local communities were represented at the national roundtable by their local members of parliament, information before and after the meeting never reached local communities. The few local NGOs following the issue had no information about the forum, until some details were disclosed to Reisch and Lawrence while meeting with government officials.

An international forum on future Inga developments is planned for late 2006 in Johannesburg, South Africa. Again with financial support from the AfDB, this forum is intended to help recruit funds for project development. Congolese and other regional NGOs have sought access to the South Africa forum for affected community representatives as well as themselves. At the time of printing, they were still expected to be excluded from this elite gathering.

The lack of transparency or public input, and the high stakes for revenue and industrial exploitation call into question the economic rationale for this project. IRN and partner NGOs will work to vigilantly monitor progress on the project, and assessments of the social and environmental impacts of these proposed new projects. ■

For more information, visit  
IRN's Grand Inga campaign page at:  
<http://www.irn.org/programs/congo/>

**Climate Change** continued from page 1

will hamper expansion of irrigated agriculture and hydropower (and the effectiveness of existing dams), the ability to meet the Millennium Development Goals and other poverty-alleviation efforts, the success of efforts to calm conflicts (especially as they relate to control over natural resources), and so on. The costs of adaptive strategies will cut into governments' budgets for health, education, and other basic services. In the long run, no human endeavor will be untouched.

### Adapting to Change

The most important step for adapting to climate change is, of course, out of Africa's hands: rich nations must do more to cut their greenhouse gas emissions. Still, there is much that African governments can do to reduce vulnerability to climate change. International aid and technical support will be critical to avoid a human and ecological disaster across the continent.

Climate-change adaptation plans must focus on three key principles: increasing the climate resilience of the poor; prioritizing flexible, cost-effective approaches, and mitigating environmental harm. Taking an ecosystem approach to adaptation will ensure that the natural resources upon which most of the world's poor depend will be used in a sustainable manner.

Improved governance and increased transparency will be key to good decision-making. "For climate change adaptation to be effective, empowering civil society to participate in the assessment process, including identifying and implementing adaptation activities is especially important," according to *Poverty and Climate Change*, a recent report by major international financial institutions.

Adopting "no-regrets" measures – strategies that move Africa toward sustainable development goals whether or not climate change proves as destructive as is predicted – would lead to improvements in water management and poverty reduction as well as reduced vulnerability to climate change.

Adaptation plans for Africa will need to greatly increase support for small-scale farmers. Two-thirds of Africans live in rural areas, struggling to make a living from a difficult landscape. Small-scale projects such as rain-water harvesting structures, affordable drip irrigation and pump technologies, and water-saving farming techniques will be critical for helping them adapt to a changing climate. Such measures can also reduce poverty more effectively and at lower cost than the conventional approach: for every US\$1 billion spent on large dams, five million small farming families could be lifted out of poverty.

### Large Dams and Climate Change

Much of Africa's energy supply is already being set back because of climate change. Outside of coal-based South Africa, most sub-Saharan African nations are dangerously over-dependent on hydropower for their grid-based electricity, and many have already suffered drought-induced energy shortfalls. A dryer Africa could also see shrinking forest reserves, and a reduction in fuelwood for cooking (which now accounts for the majority of Africans' energy use).

Diversifying away from over-dependence on hydropower is key to increasing the resilience of African economies to climate change. Climate change models predict major declines in the flows of several major African rivers – which would of course translate into major declines in hydro production.

The economic impacts of hydro-vulnerability will be felt both in the costs of power cuts upon industrial output, and the cost of wasted investments in non-performing dams. Gareth Harrison and Bert Whittington of the University of Edinburgh have studied the potential impact of climate change upon the proposed Batoka Gorge hydro project on the Zambezi. They found that a reduction in flow levels over Victoria Falls of 35% would cut annual power production by 21% and dry-season production by 32% (the drop in generation is less than the drop in streamflow because, unlike most hydro plants, Batoka Gorge would spill a large amount of the water entering its reservoir if river flows were to continue as in the past). Harrison and Whittington calculate that such a drop in output would render the Batoka Gorge scheme uneconomic (in other words, it would have an internal rate of return well under the normal investment benchmark of 10%).

Large dams could also be vulnerable to failure in the event of the unprecedented floods expected in the greenhouse world. The current push to build more large dams in Africa will only exacerbate this vulnerability, and further harm river-supported ecosystems and communities downstream of dams.

### Energy Diversity

Like water security, energy development for Africa in a changing climate will require a greater emphasis on small-scale, decentralized supply, and diversity in the type of supply. Not only will hydro-dependency be a problem in a warming world, but renewable technologies such as solar and wind could be affected by climate change as well. The more diverse the energy mix, the less risk from climate change.

A 2005 report by UNDP, "Scaling Up Modern Energy Services in East Africa to

Alleviate Poverty and Meet The Millennium Development Goals," emphasizes "a focus on energy options that are easy to implement, involving local capacity and low operational costs." The UNDP report identified a number of technologies that match the high impact, low cost, scaleable profile, including modern biomass, improved cook stoves in combination with smoke hoods; liquefied petroleum gas (LPG), and mini-hydro. This kind of "no regrets" energy planning fits in well with plans for helping all of Africa adapt to climate change.

The World Bank, however, has proposed more dams for Africa, linked with electricity grids across basins, which is says will reduce regional energy risks. "Africa has an extremely volatile climate and it needs reliable power," said David Grey, the World Bank's senior water advisor for Africa. Another senior member of the Bank's Africa energy group concurs, stating: "We need to look at hedging the risk of one river basin with another" – giving the example of building dams on multiple rivers in East Africa, where drought has cut into hydropower output in recent years. Under the Nile Basin Initiative, for example, the Bank is encouraging a massive rise in hydropower. Not only does this approach have huge costs (grid expansion and large dams are both costly) and does nothing to meet the needs of the poor, it also ignores the fact that most droughts are broadly regional, and are apt to affect multiple river basins at once. Still, many African governments are buying into this argument, lured by high-profile proposals by the World Bank and dam developers.

In an uncertain world, this much is indisputable: Africa's rivers will become ever more valued yet ever more stressed in coming years. How the rich world chooses to help Africa adapt to a changing climate, and the consequences of that assistance on Africa's natural support systems, could mean the difference between an Africa that is finally able to realize its potential, or one that continues to languish despite large amounts of aid and good intentions.

Choosing "no regrets" measures that protect natural resources upon which Africa's majority depend – rather than relying on grand plans for multiple dams to "hedge" against climate change – will result in less vulnerability and less risk for the rural poor, who are most at risk of climate change. It is the best way to help preserve the continent's rivers, forests and other natural systems upon which most Africans depend. Such an approach is critical if we are to avoid a devastating "perfect storm" climate crisis across the world's largest continent. ■