



POWER PLAY: Dams like the Merowe Dam in Sudan can provide a mega boost to Africa's power needs.

UNTAPPED

Experts believe Africa's extraordinary potential for hydropower development could play a vital role in solving the continent's electricity crisis

By DAVID SPARKES

More than a century ago Thomas Edison revolutionized the industrial world by establishing the first electricity distribution network. It was an achievement that laid the platform for a new age of economic development. Yet today Africa is still shackled by the lack of reliable electricity and experts say it is directly hampering economic growth.

"Sub-Saharan Africa is really lagging behind in terms of energy consumption per capita," said Leonard Kassana, Associate Director of Greening the Tea Industry In East Africa. "And there is a strong correlation between electricity production and economic growth."

Kassana, a member of the Institution of Engineers Tanzania, is one of a passionate band of experts who believe Africa possesses an energy resource with the potential to put a massive dent

in the continent's energy shortage; hydropower.

Potential

The potential for hydropower in Africa has insiders chomping at the bit. Most estimates put the potential capacity at 100,000 MW. To put that in perspective, the current installed generation capacity of all energy sources in Sub-Saharan Africa is only 68,000 MW, according to the World Bank. What is more staggering is that hydropower remains almost entirely untapped. The Southern African Power Pool (SAPP) estimates that only 4.3 percent of Africa's hydropower capacity potential has been developed, a figure in line with most other authoritative estimates. Three main countries are said to hold enormous potential - Ethiopia, Guinea and, in particular, the Democratic Republic of Congo (DRC). The Inga

region on the Congo Basin in west DRC is said to have potential generation capacity of 39,000 MW and export much needed power to national grids all over Southern Africa.

But despite this astonishing potential, not everyone is jumping for joy. Critics hold grave reservations about the environmental and social impacts of hydropower in Africa and the debate on Africa's great, untapped energy source is running hot.

Cost effective

"It would take Sub-Saharan Africa to another level if we could exploit the hydropower resources we have," says Kassana, who has worked extensively on hydropower projects around Africa. "In my view it [hydropower] contributes to poverty reduction, through creation of income generation

activities."

World Bank statistics show that only 24 percent of Sub-Saharan Africans have access to electricity (some studies put that figure as low as 10 percent) and African manufacturing enterprises experience power outages on average 56 days each year.

The economic consequences of such blackouts can be crippling. A report produced by Frost & Sullivan estimates that power outages in Nigeria cost the nation's economy \$1 billion per year, as manufacturers lose productivity.

"There is a strong correlation between electricity production and economic growth. So, access to modern energy services, which hydropower is part of, can directly contribute to economic growth," Kassana said.

Another campaigner for hydropower in Africa is Wim Jonker Klunne, a senior researcher on Rural Energy and Economic Development at Council for Scientific and Industrial Research in South Africa. He specializes in small-scale hydropower plants (less than 10 MW capacity) and believes Africa should be developing both small and large-scale hydropower plants. "There is a huge potential there," he says.

Perhaps the most appealing aspect from an economic viewpoint is the cost effectiveness of hydropower. In terms of cost per KWh produced, various sources place hydropower as either the cheapest energy source or a close second to nuclear power.

"If you compare hydropower with other sources of electricity, then you need to consider three categories of costs; namely fuel, maintenance and operation," said Kassana. "The cost effectiveness of hydropower is huge since it uses water as fuel and if you compare water with other fuels [such as fossil fuels and nuclear fuel], water is almost free. So this brings down cost of power production compared with other sources."

The other benefit is that hydropower produces no carbon dioxide while generating electricity, a huge advantage over coal-fired power plants in an era of climate change awareness.

How renewable?

For all the benefits, there are still question marks. Critics of hydropower in Africa point to its reliance on a constant supply of water and question whether a continent already struggling with water supply can really sustain such huge dams.

The United Nations Development Program predicts that population growth and economic development will lead to one in two Africans living in countries facing water shortage crisis in 25 years. If that happens, water is set to become a highly valuable commodity.

Most experts and organizations, including the World Bank, classify hydropower as a renewable energy source. But critics question the label and argue that if climate change reduces the supply of

water in Africa, some dams may not have enough water to drive the turbines.

"It is renewable energy," said Kassana. "But [that is based] on the large assumption that climate will not change so much, because we depend on the hydrological cycle. If the hydrological cycle continues, and is not changed, then hydropower continues to be renewable."

Jonker Klunne says the size of a hydropower plant needs to be taken into account when answering the "renewable" question.

"Small-scale hydro definitely is renewable," he said. "I have a little bit of hesitancy in saying that large-scale hydro is renewable, because of the issues [relating to climate change] and also because of the environmental and social problems that come from large-scale hydro. But small scale [doesn't have these problems] and is therefore definitely renewable." The controversy's loudest criticisms concern the downstream impact from large-scale dams. The Gilgel Gibe III dam, under construction in Ethiopia, will hold back 14.7 million cubic meters of water on the Omo River. From that location, the Omo River then runs across the border into Kenya where it feeds Lake Turkana, the world's largest desert lake. Critics say the dam's trans-border impact spells disaster for the 290-km-long lake.

Ikal Angelei is from Friends of Lake Turkana (FoLT), an organization opposing the Gibe III project. She said the dam will have "catastrophic effects" on the lake and claims the Environmental Impact Assessment (EIA) was carried out after construction of the dam had already begun.

"The EIA done by the Ethiopian Government is inadequate and did not even mention Lake Turkana," she told *ChinaAfrica*. "It only did mention it in a new EIA after we raised issues about the Omo River being trans-boundary and the main inlet for Lake Turkana, providing 80 percent of the lake's water."

Angelei claims the dam will drastically reduce inflow to the lake and have a significant effect on salinity. Apart from affecting biodiversity, FoLT also says the project will cause upheaval for some 200,000 indigenous people dependent on Lake Turkana for their livelihoods.

For their part, Ethiopian authorities insist that the project is ecologically sound. Moreover, they point out that it will have a capacity of 1,870 MW, of which half the energy produced will be consumed domestically and the rest exported to Kenya, Sudan and Djibouti.

Jonker Klunne acknowledges that large-scale power stations require particular care when planning for environmental and social impacts. But he said that in general, African hydropower plants are well scrutinized.

Versatile

Government and private groups are pushing to

China's involvement

China is no stranger to hydropower, having installed a mind-boggling 190,000 MW of capacity by the end of 2009 and aiming for 300,000 MW by 2020. Analysts say the construction of several massive dams in China has provided a training ground for engineers specializing in hydropower plants. Now China is actively involved in developing hydropower in Africa, both in providing financing and through Chinese hydropower companies bringing expertise. Some examples of these are:

- Synohydro is involved in numerous projects around the continent, including the 200 MW Memve'e Dam Project in Cameroon, the 300 MW Tekeze Hydro Power Project in Ethiopia and the 400 MW Bui scheme in Ghana. (Synohydro is also involved in several other African hydropower projects)
- The China International Water and Electric Co. is part of a consortium building the huge 1,250 MW Merowe Dam in Sudan.
- China National Machinery & Equipment Import & Export Corp. is constructing two smaller dams in Gabon.
- China Gezhouba Water and Power Group is responsible for the development of the 254 MW Genale Dawa III scheme in south Ethiopia.

further the progress of hydropower in Africa. A number huge projects are planned that will link up to national grids and even cross national borders, which is the plan of attack for hydropower in the Southern Africa Power Pool.

But Kim Jonker Klunne said that while such large-scale projects will only benefit people living on the grid, the beauty of hydropower is its suitability to be installed on a smaller scale in off-grid locations.

"Those smaller plants are ideal for rural areas [beyond] the end of the national grid," he said. "So, I think small-scale hydro has tremendous role to play for rural electrification providing electricity to [remote locations]. And in most cases I think that will be a cheaper option than expanding the national electrical grid." ■