Tapping Local Green Power Could Light Up Mozambique

New Plan Shares the Wealth, Spares the Zambezi

Mozambique is painting itself into a corner. Already extremely hydropower-dependent, the poor Southern African nation's next priority energy project is yet another large, costly dam on the Zambezi, at a time when climate change threatens to make the river's flow more erratic and hydropower more risky. The Mphanda Nkuwa Dam's power will primarily be for export to South Africa, since Mozambique's people are too poor, and its national grid too small, to make the dam economically viable for domestic use. Local NGO Justiça Ambiental contracted energy expert Mark Hankins to analyze what it would take for the nation to embrace market-ready renewable energy solutions. This excerpt from his new report discusses changes needed to reach this green future. (Look for the full report on our website.)

Mozambique is three countries.

The "first country" is a power house for the Southern Africa region. Based on low-priced electricity from Cahora Bassa Dam, it is able to pump hundreds of millions of dollars worth of power into South Africa and to attract investors that set up energy-intensive megaprojects such as smelting plants and refineries. Electricidade de Mozambique (EdM), the national power company, is a leader in the region, with an electrification program that is expanding at the rate of 100,000 new connections per year. This "country" is negotiating with international investors to build the multi-billion-dollar Mphanda Nkuwa Dam, and inject still more power into the Southern African Power Pool (SAPP) grid.

The "second country" is predominately off-grid, poorly served by electricity infrastructure, and – at less than 50 kWh/capita/annum – has among the lowest per capita use of electricity in the world. This second country is unable to extend or build power stations in remote regions, and its planned transmission infrastructure forces most of the power it produces to be exported to South Africa, before re-importing it at higher cost. It relies on international donors to fund over 75% of its slow-moving rural electrification programs. Its rural areas have poor access to communications, roads and income generation, in large part because there is little economic activity or ability to process agricultural products.

The "third country" is energy-rich with a vast potential for decentralized clean electricity and fuel production. It has virtually unlimited solar power across the entire country and large biomass resources that could be used for electrical production in strategic areas. It has over 1,000 MW of mini-hydro potential, much of it in areas that are currently electricity-starved. It has the second largest coastline in Africa, with unexplored wind resources that could contribute to the national grid.

Mozambique's future development will largely be determined by whether it utilizes the ample energy resources of the "third country" to bring power to the "second country." However, at a time when many countries in the world are actively implementing renewable energy programs, Mozambique still does not have such a program and is primarily focused on the "first country's" mega-power needs.

Mozambique's huge untapped potential of renewable energy technologies is well-suited for both urban and rural energy development. But its electricity sector has a short-sighted and risky reliance on electricity from large dams, which is primarily driven by a need to sell low-cost power to South Africa and industry. Because of this focus on power prices and large projects (and, typically, an avoidance of addressing environmental and social costs in pricing these projects), Mozambique is missing out on critical global developments in new clean sources of energy that could benefit its population, create new industry, jobs and capacities, and bring ample, high-quality power to its own population.

Moreover, a lack of leadership, implementation capacity, policy and incentives is causing Mozambique to miss out on viable renewable opportunities that would benefit the country for the long term. The lack of government-designed incentives constrains renewables development and lowers investment appetite for rural electrification.

Mozambique's close integration with South Africa impacts immensely on the way energy projects are developed. Like many African countries, Mozambique has followed a centralized approach to electricity supply, selecting power sources according to criteria that are largely determined by cost – and ease of financing. Its current supply focus on large-scale energy projects is directed primarily at electricity for industry and for export to the Southern African Power Pool – which has rapidly increasing demands for power.

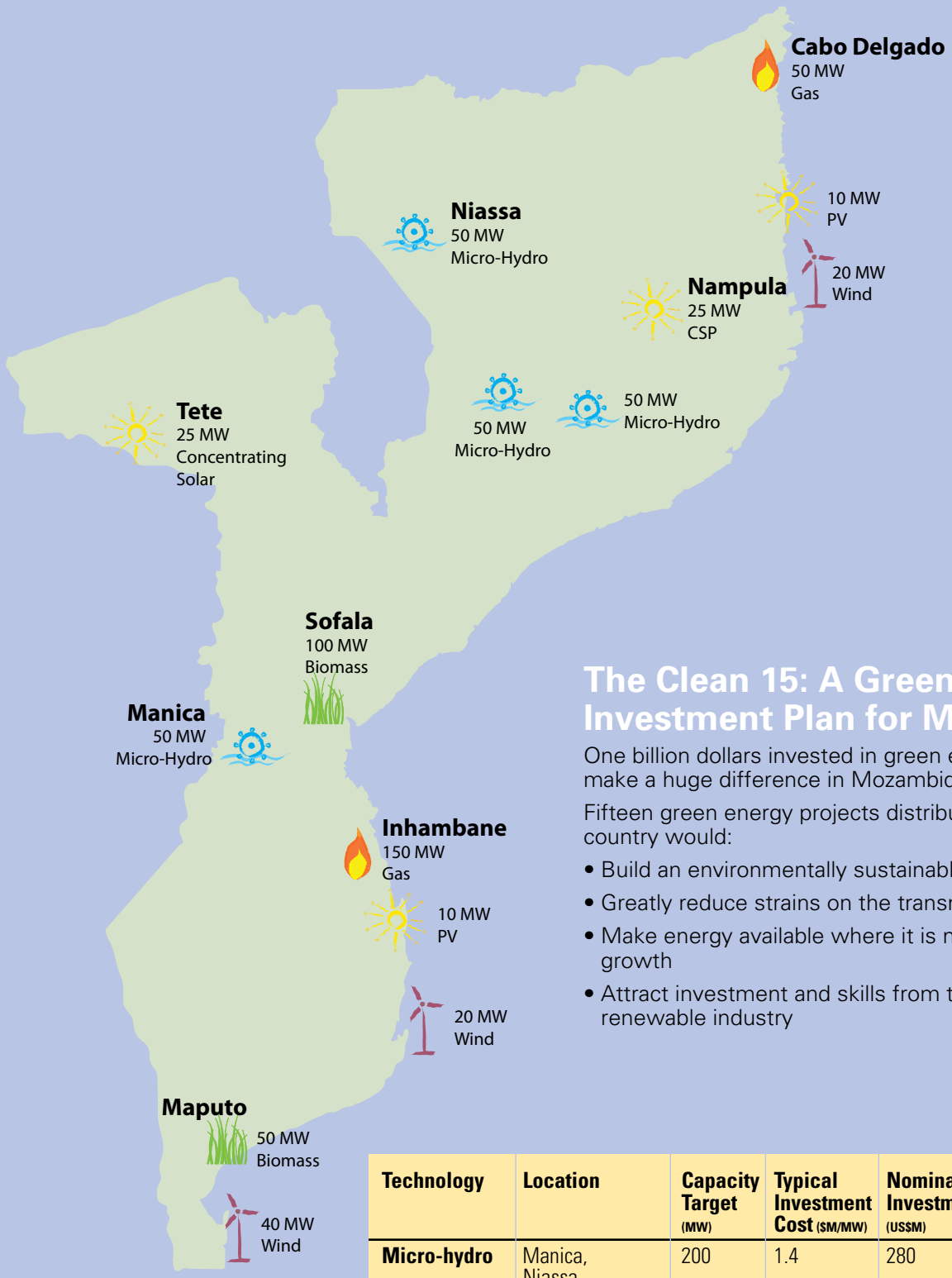
In fact, through use of energy efficiency programs, South Africa has the potential to quickly reduce its own electricity consumption by an amount equivalent to 3 to 5 times Mozambique's entire consumption!

As long as Mozambique's power planners focus on the huge consumer next door, they will never adequately meet the needs of their own country, which remains largely off-grid and unconnected.

Mozambique is now in the awkward position of having to export electricity from Cahora Bassa Dam via South Africa's transmission system, and re-import it for use in the capital city of Maputo. The transport of electricity via this system encourages a relatively high waste of electricity, as large amounts of power are lost in these transactions.

Mozambique has a wealth of unexploited biomass, solar and wind resources. And unlike Cahora Bassa and Mphanda Nkuwa, which focus narrowly on the Zambezi corridor, Mozambique's renewable energy resources are widely distributed throughout the country and can be rapidly deployed both off-grid and on-grid. Mini-hydro schemes can supply firm power to remote parts of the country in both mini-grids and to support weak end-of-line transmission within the grid network. Wind can feed into grid lines in the south and east of the country. Solar PV is suited for both off-grid and on-grid applications. Biomass resources could be tapped immediately from the sugar industry to feed into the central part of the grid.(See map opposite.)

Article continues on page 6



The Clean 15: A Green Energy Investment Plan for Mozambique

One billion dollars invested in green energy sources could make a huge difference in Mozambique's energy future.

Fifteen green energy projects distributed throughout the country would:

- Build an environmentally sustainable energy base
- Greatly reduce strains on the transmission systems
- Make energy available where it is needed and stimulate growth
- Attract investment and skills from the booming worldwide renewable industry

Technology	Location	Capacity Target (MW)	Typical Investment Cost ($M/MW)	Nominal Investment (US$M)	Capacity Factor	Electricity Cost (US$/MWh)
Micro-hydro	Manica, Niassa Zambezia	200	1.4	280	45%	60
Wind	Cabo Delgado Maputo Nampula	80	1.7	136	30%	60
Cogen	Sofala, Gaza	150	1.2	180	80%	45
Solar PV	Maputo Inhambane	20	7	140	20%	180
Concentrating Solar	Nampula Gaza, Tete	50	5	250	30%	100
Gas	Cabo Delgada	200	0.8	160	90%	55
Totals		**700MW**		**US$M1146**		

Despite the ample resource and large number of potential sites (as well as the positive government policy towards small- and micro-hydro), the overall development focus has been on mega-projects such as Mphanda Nkuwa. Only a handful of small and micro-hydro projects have been completed over the past five years. This is largely due to the lack of capacity to implement small-scale microhydro projects, lack of clear process and lack of focus on the sector.

What's the Problem?

The following summarizes the key obstacles to developing Mozambique's ample renewable potential.

A Lack of Leadership, Capacity, Policy and Incentives

Renewable energies are constrained less by cost and technical feasibility than by a lack of leadership and political will to utilize existing resources.

As is the case in many African countries, the development of large-scale renewable energy projects in Mozambique is still in its infancy. Because of climate change and the need for diversified power sources, Germany, Spain, Japan, China, India and the US (and, soon – with its new feed-in tariffs – even South Africa) are rapidly recognizing the need to make systematic shifts away from large hydro and coal-fired power. They have developed strong policy drivers, such as feed-in tariffs, renewable targets, and special-purpose incentives to rapidly build up their renewable energy industries.

Mozambique's power sector is only beginning to consider such moves, and on a relatively small scale. Senior players in the government and energy sector have not demonstrated knowledge of or interest in the rapid policy changes being made in other countries, or of the need for leadership and strong incentives in the development of renewable energy markets.

The government-led approach to renewable projects has prevented the growth of the private sector in PV, wind, cogen and small-scale hydro.

Given the relatively large private sector investment flows into other sectors (i.e., tourism, agriculture), it is surprising that there is little encouragement of the private sector to enter power generation in areas where EdM cannot reach. Worldwide, virtually all successful on- and off-grid PV sector developments have been private-sector based, not based on government procurements.

Thus far, Mozambique's isolated renewable energy generation for mini-grids and remote stand-alone power is dominated by government. Although the World Bank attempted to stimulate private sector initiatives, this was abandoned by the government and to date the sector remains government controlled.

Private and community-led development – with incentives – of solar, wind, small-scale hydro and biomass resources is much more efficient than government-led initiatives. For example, in Germany and California, incentives offered for renewable energy production caused rapid development of capacity as consumers took up the incentives and as companies rushed to take advantage of new markets. GEF-supported incentives have resulted in installation of hundreds of thousands of solar home systems in Bangladesh, China, Sri Lanka and Uganda. Private sector led installation of microhydro systems in Rwanda is also increasingly successful. In these situations, the government does not procure – instead, it provides resources and actively facilitates the installation of systems to private consumers. Companies are able to use these incentives to sustainably build their markets.

Action Priorities

The suggested actions presented below would allow Mozambique to aggressively implement a clean energy plan. Such actions will encourage the development of locally available energy solutions that can be used to meet the needs of the vast majority of the presently unserved population. As well, the actions will promote local opportunities for investment while limiting harm to water resources and reducing vulnerability to climate change.

1. Develop a renewable energy policy that sets aggressive targets for priority renewable energy technologies. The policy should contain specific and separate guidelines for the development of renewable energies on-grid and off-grid. There should be some type of equity between rural and urban projects to ensure that a fair allocation is made to areas that have, to date, received little focus from planners.

2. Remove all duties and tariffs on renewable energy technologies. This will ensure costs are further reduced for consumers and help ensure that renewable energy technologies can compete on a level playing ground with traditional technologies. This should be done before any incentive or subsidy program is introduced.

3. Actively encourage private-sector investment in renewable projects in Mozambique. Create clear incentives for investors, manufacturers and developers to utilize and promote renewable energies when making investments in the country. Renewable energy support should not be targeted exclusively to off-grid initiatives and poverty alleviation; renewables should be encouraged in economically active sectors including tourism, telecommunications and commercial, as well as among middle- and high-income households.

4. Create feed-in tariffs and standard agreements for grid-connected mini-hydro, solar, wind and biomass cogeneration projects. Such tariffs can be based upon similar programs in South Africa or other neighboring countries. Actively seek revenue through energy export taxes and donors to support feed-in tariffs and off-grid renewable energy projects.

5. Expand subsidy funds for off-grid renewable energy projects that support PV, wind, microhydro and biomass projects in isolated and mini-grids. Open this fund up to community groups, the private sector investors and/or EdM.

6. While stimulating the growth of a local renewable energy sector, increase programs for training qualified personnel in engineering, installation and maintenance of renewable systems. Such training would require a balanced mix of university-level engineering training, community-level instruction to decentralize maintenance and service, as well as support for private sector training initiatives. These efforts would necessarily require government certification to fit within existing policy.

7. Actively encourage energy efficiency in Mozambique through policies and programs. First steps would be appliance and building standards, and working with the largest industries to reduce energy use. A program to retrofit public buildings would also send a strong message.

8. Seek to harmonize SAPP efforts to introduce decentralized energy technologies, energy efficiency standards, demand management and feed-in tariffs for renewables. Seek support for region-wide funds to develop renewable energy projects that benefit the SAPP. SAPP needs to adopt policies that prepare for climate change – in whatever form it takes – by quickly shifting its focus from mega-coal and dam projects to smaller, environmentally friendly solutions.