

MOZAMBIQUE News reports & clippings

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In this issue

Mphanda Nkuwa & hydrogen special report

- + Could Mozambique become a hydrogen hub?
 - + Mphanda Nkuwa dam on the agenda again
 - + Is there a market for the electricity?
 - + Hydrogen to prevent climate change
 - + Hydrogen is already happening
 - + Could hydrogen promote development?
-

Could Mozambique become a hydrogen hub?

Hydrogen is expected to become the major global fuel in coming decades because it has no carbon. Just like natural gas, hydrogen will be liquefied at very low temperature and transported around the world. The best way to make hydrogen is hydro-electricity, which is used to split water (H₂O) into hydrogen and oxygen.

The proposal for the Mphanda Nkuwa dam 60 km downstream from Cahora Bassa, and using the same water to generate more electricity, is back on the table. The dam has been proposed since the colonial era, but there has never been a market for the electricity. Producing hydrogen would be the perfect market.

"Mozambique wants to be the energy hub in southern Africa because it has natural resources for that," said the director of the Mphanda Nkuwa Hydropower Project Implementation Office (GMNK), Carlos Yum, said at he project launch on 21 May. Could this include hydrogen?

In this special issue, we look at Mphanda Kkuwa and the potential for hydrogen.

Mphanda Nkuwa on the agenda again

The latest version of the Mphanda Nkuwa dam proposal was launched on 21 May. The dam would be in a gorge on the Zambezi river, 60 km downstream from the Cahora Bassa dam and roughly half way between Cahora Bassa and Tete city.

The dam has many obvious advantages. The environmental damage has already been done to build Cahora Bassa, and the new dam would simply use the water again. The lake behind Cahora Bassa is massive, at 2,675 square kilometres, while the reservoir at Mphanda Nkuwa would be only 100 square kilometres. And using the water twice should cause little further downstream disruption.

The dam would cost \$2.4 bn and the linking power line another \$2 bn. It would generate 1500 megawatts of electricity, compared to 2075 MW for Cahora Bassa. Foreign investors would own 60% of the dam, and two Mozambican state companies - the electricity company EDM and the Cahora Bassa dam company HCB - the other 40%.

It is estimated that the dam would take seven years to build and could be generating electricity by 2030.

The project has a long history. It was first proposed by the Portuguese colonial authorities building Cahora Bassa. After independence, Mozambique did a feasibility study in 1996 and there was an investment conference in 2002 in which South African, Brazilian and Chinese investors showed interest. In 2006 the Export-Import Bank of China signed a Memorandum of Understanding with the Mozambican government to finance the Mphanda Nkuwa dam. But none of these plans went ahead. After Mozambique took control of Cahora Bassa in 2007 there was another unsuccessful try.

President Filipe Nyusi tried to relaunch the project yet again in 2018, and the Mphanda Nkuwa Hydropower Project Implementation Office (Gabinete de Implementação do Projecto Hidroeléctrico de Mpanda Nkuwa, GMNK) was launched. Carlos Yum, a former EDM administrator, took office as head of GMNK a year ago, in June 2020.

Is there a market for the electricity?

Each time the dam was proposed, builders and finance were available, but who would buy the electricity to pay the construction costs? Mozambique's demand is growing, but not that much. The only obvious buyer is South Africa, which takes most of Cahora Bassa's production under a deal first negotiated by apartheid South Africa and colonial Portugal. But energy nationalism meant South Africa would never sign a contract for a long enough period to pay for a new dam. The result was a disaster for both sides. Various hydro and coal electricity projects in Tete never went ahead. South Africa has become dependent on its own coal and has inadequate generating capacity, causing a decade of rolling power cuts known as "load shedding".

Two weeks ago South African Minister of Mineral Resources and Energy, Gwede Mantashe, came cap in hand to his Mozambican counterpart Max Tonela asking to purchase more power from Mozambique, in order to cover the deficit caused by the closure of coal-fired power stations. If South Africa had agreed to buy Mpanda Nkuwa electricity 10 or 15 years ago, the problem would not exist. And there is still the same problem - will South Africa agree to buy electricity from a dam that will only be producing in a decade, and how will the current gap be filled?

Mantashe said "We are decommissioning coal-fire stations, and we have taken a concrete measure to replace these power stations by gas technology, and this will increase the amount of gas that we hope Mozambique will provide". Mantashe added "We have 16 coal-fired stations, and all are under pressure to close so that they can be replaced by technologies that allow the reduction of carbon emissions. This is an opportunity that Mozambique can grab".

None of Mozambique's other neighbours will take the electricity, and so far no long term contracts are on offer from Pretoria - although panic might lead to a deal to linking more gas now to an Mphanda Nkuwa contract.

But hydrogen might change everything.

Hydrogen will be essential to prevent climate change

Zero-carbon hydrogen as a fuel is central to reducing carbon emissions enough to limit global heating, according to most analysts including the International Energy Agency. Hydrogen is produced by literally breaking apart molecules. Much hydrogen is produced from natural gas, which is mostly methane, CH₄, and breaking that up gives off carbon as a by-product. This is known as "grey" hydrogen and to make it more acceptable the carbon must be captured, traded, etc.

But water is H₂O, which when broken up leaves oxygen as the waste product, which is harmless. Electricity can be used to break up the water, and using hydro-electricity or wind power is very low carbon, thus directly producing "green" hydrogen. Could Mphanda Nkuwa be used to produce hydrogen, sell it on the global market to pay for the dam and, most importantly, put Mozambique on the cutting edge of preventing the climate emergency and perhaps create local jobs and industries.

Hydrogen is largely transported in the same way as natural gas, cooled to very low temperatures and liquefied. But the hydrogen technology is 50 years behind gas. Global, large volume liquefied natural gas (LNG) movements began in the 1970s. The first liquefied hydrogen (LH) boats are only now being built in Japan, South Korea and Norway. LH is used as a motor fuel, including for buses in London and many other cities.

But to meet climate targets LH is going to have to come into widespread use much more quickly than LNG did, definitely within the next decade - exactly when Mphanda Nkuwa will be coming on stream. Like LNG, LH is likely to require billion dollar liquification plants.

But the finance should be there. Banks lent money for the Cabo Delgado gas, and the US, UK and other countries provided billions of dollars of export credits. Banks and governments have stopped lending for coal, and will be forced to stop lending for oil and gas quite soon. The lending could and probably will shift to hydrogen, especially as governments and banks want to earn environmental praise.

The move to hydrogen is happening

The EU is pushing very hard on hydrogen. Portugal's Environment Minister Joao Matos Fernandes said on 25 February that "green hydrogen will, over time, allow Portugal to completely change its paradigm and become an energy exporting country." He expects Portugal to start producing green hydrogen next year (2022) using either wind or solar to produce the electricity. The Portuguese electricity company EDP, now owned mainly by China Three Gorges, announced in March it is developing green hydrogen projects, which it sees as a growth area.

Spanish energy company Iberdrola has launched what will be the largest plant producing green hydrogen for industrial use in Europe. It will use electricity from solar panels. On 24 May Iberdrola announced it had teamed up with British engine company Cummings to develop large-scale green hydrogen plants in Spain and Portugal.

South Africa is also moving on hydrogen. The Fischer–Tropsch process was developed in 1925 in Germany and can be used to make liquid fuels from coal and gas. It was important to produce fuel for Germany in the World War II and then was used by Sasol in apartheid South Africa to help beat the oil embargo. It continues to produce fuel and chemicals from South African coal and Mozambican gas. And the process has been adapted to produce "grey" (dirty) hydrogen. Sasol now produces 2% of the world's "grey" hydrogen. And Sasol is a top emitter of greenhouse gases in South Africa.

In a 13 April statement, Fleetwood Grobler, Sasol President and CEO, said the next step will to introduce carbon capture and storage to make what is called "blue" hydrogen. Grobler said Sasol planned to change its Sasolburg operation to move away from the Fischer–Tropsch process to directly produce "green" hydrogen using renewable energy by June 2023.

Elsewhere Air Products, the U.S. industrial gas giant, announced plans last year to build a \$5 bn green hydrogen plant in Saudi Arabia. A \$2 bn green hydrogen plant is under construction in Brazil. Australia is building a \$16 bn plant.

Despite all these investments, Forbes (19 Oct 2020) estimates that only 3 million tons per year (Mtpa) of hydrogen production is now being built, significantly short of expected global green hydrogen demand of 8.7Mtpa in 2030.

This is exactly the gap that Mpanda Nkuwa could partly fill in 2030.

Could hydrogen promote development?

Mozambique has suffered from two resources curses - coal and gas. Ordinary Mozambicans gained no benefit from valuable resources, and never will as both are fossil fuels losing their value. In both cases, short term cash in hand took precedence over investment in development. At the top, government prioritised income to the state budget. At lower levels were contracts for Frelimo-linked businesses. Together this squeezed out training, jobs, support for local people and a general expansion of the economy. Immediate needs overrode any thinking about longer term development.

The sad story of the Cabo Delgado gas provides many examples. Natural gas is a mature industry with many possible downstream linkages. Chemicals and plastics are well known products from gas, but were never even considered. Gas is commonly used to make nitrogen fertilizers. Mozambique is one of the lowest users of fertilizer in Africa, which means peasant agriculture production is very low, and this perpetuates rural poverty. As well as nitrogen from gas Mozambique has unexploited reserves of phosphate, another fertiliser component. Yara, the Norwegian company that is one of the largest fertiliser companies in the world, spent more than a year trying to convince Mozambique to build a local fertiliser production and distribution industry, which would have transformed agriculture and the rural economy. Government rejected the proposal, and only agreed a smaller contract for Yara to produce nitrogen fertilizer from gas.

The reason was short term profit. Under its gas contracts, the government receives a certain amount of physical gas, which in other countries is used to develop local industry and cheap fertilizer for farmers. Yara is a private company needing to make a profit and all its proposals involved buying gas from the government at a reduced price. Government could sell its gas back to producers Anadarko and now Total at a higher price. So the Yara contract was abandoned. It was a simple trade - government revenue increased and rural development was abandoned.

The irony was that rural development from fertilizer use would have created an economic boom that would have generated far more tax revenue than the money that was lost through cheaper gas for Yara - but that would have come several years later. An investment was not made in order to gain short term money from gas.

Similarly government could have, in its contracts and in subsequent negotiations, put much more pressure on the gas companies for jobs, training, and support for local businesses and communities. But the gas companies would have treated this as costs, reducing short term government revenue, which was the priority. The Cabo Delgado war is, at least in part, the much more expensive outcome of not investing in local jobs and development.

Third time lucky? Mozambique may have the unique chance of a third try to avoid a resource curse. The obvious quick cash from Mpanda Nkuwa is selling electricity to South Africa, which has been the dream for 50 years, but still seems unlikely. The next choice would be an enclave, like the gas, where a foreign company builds the dam and a hydrogen liquification plant, and pays royalties to Mozambique as direct government revenue.

But there is a third choice. Mpanda Nkuwa plus hydrogen is a ten year project. That allows time for training people in construction skills and supporting the development of domestic supply chains. Hydrogen is an industry which will be huge and essential to preventing the climate emergency, but it is just starting. Can Mozambique find partners who would help to create the engineering and

research capacity at local universities, and support the development of industries and transport using hydrogen?

Mozambique's first two resource curses not only harmed most Mozambicans but also unwittingly contributed to the climate emergency. Now Mozambique has a chance to contribute to ending the climate emergency and be an early entrant into a new global industry. That will require imagination as well as investment and deferred income. Is it possible? *Joseph Hanlon*

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Important external links

Covid-19 daily updated data <https://www.facebook.com/miguel.de.brito1> and <https://covid19.ins.gov.mz/documentos-em-pdf/boletins-diarios/>

Daily flood and monthly dry season reports - <http://bit.ly/Moz-flood21>

Cyclone trackers, <https://www.cyclocane.com/> and <https://www.metoc.navy.mil/jtwc/jtwc.html>

Cabo Ligado weekly report on civil war <http://bit.ly/CaboLigado>

Previous editions of this newsletter: <http://bit.ly/MozNews2021> and bit.ly/MozNews2020

Downloadable books: <http://bit.ly/Hanlon-books> Election data: <http://bit.ly/MozEIData>

My Mozambique archive: <http://bit.ly/Mozamb>

Cabo Delgado

Archive with reports, detailed maps, and census data <https://bit.ly/Moz-CDg>

Special reports on the war

Evolution of the war: global vs local. 27 Feb 2020 <http://bit.ly/CDelgadoOrigins>

Religion is shaping Cabo Delgado civil war. 30 April 2020 <https://bit.ly/CDelgadoReligion>

Intensifying argument over roots of war. 28 June 2020 <https://bit.ly/Moz-492>

Are the drums of war silencing any hope of peace? 26 July 2020 <http://bit.ly/Moz-496>

A history of violence presages the insurgency. 13 August 2020 <http://bit.ly/Moz-498>

Military & economic intervention. 3 Sept 2020 <https://bit.ly/CDelgadoIntervene>

Mozambique heroin transit trade

English - LSE - 2018 - <http://bit.ly/Moz-heroin>

Portuguese - CIP- 2018 - <http://bit.ly/HeroinaPT>

2001 first article- *Metical* - English and Portuguese <https://bit.ly/MozHeroin2001>

Gas for development?

Gas_for_development_or_just_for_money?_2015 bit.ly/MozGasEng

Gás_para_desenvolvimento_ou_apenas_dinheiro?_2015 bit.ly/MozGasPt

Background reading

Special reports

Social protection report - 2017 Mozambique - <http://bit.ly/MozSocPro>

Special report on four poverty surveys: bit.ly/MozPoverty

Minimum wage and exchange rates 1996-2018 -- <http://bit.ly/MinWage18>

\$2bn secret debt - in English

Kroll - Full report on \$2bn debt - <http://bit.ly/Kroll-Moz>

Kroll report summary - <http://bit.ly/Kroll-sum>

Key points of Mozambique parliament report - Nov 2016 - <http://bit.ly/MozAR-debt-En>

Following the donor-designed path to Mozambique's \$2.2 bn debt - <http://bit.ly/3WQ-hanlon>

In Portuguese:

Parliamentary Report on the Secret Debt (complete) bit.ly/MozAR-debt

2018 Constitution - <http://bit.ly/2KF588T>

Election study collaboration: We have detailed election data from 1999 through 2014 and are inviting scholars to use this data collaboratively. <http://bit.ly/MozEIData>

Election newsletters are on <http://bit.ly/2H066Kg>

Nine books by Joseph Hanlon can be downloaded, free: <http://bit.ly/Hanlon-books>

Bangladesh confronts climate change (2016)

Chickens and beer: A recipe for agricultural growth in Mozambique (2014) is on <https://bit.ly/Chickens-Beer>

Há Mais Bicicletas – mas há desenvolvimento? (2008)

Moçambique e as grandes cheias de 2000 (2001)

Mozambique and the Great Flood of 2000 (2001)

Paz Sem Benefício: Como o FMI Bloqueia a Reconstrução (1997)

Peace Without Profit: How the IMF Blocks Rebuilding (1996)

Mozambique: Who Calls the Shots (1991)

Mozambique: The Revolution Under Fire (1984)

Apartheid's 2nd Front (1986) <available shortly>

These are still available for sale:

Galinhas e cerveja: uma receita para o crescimento (2014) (free in English)

Zimbabwe takes back its land (2013)

Just Give Money to the Poor: The Development Revolution from the Global South (2010)

Do bicycles equal development in Mozambique? (2008) (free in Portuguese)

Beggar Your Neighbours: Apartheid Power in Southern Africa (1986)

Mozambique media websites, English:

Club of Mozambique (free): <http://clubofmozambique.com/>

Zitamar (paywall): <http://zitamar.com/>

Mozambique media websites, Portuguese (all with partial paywall):

Notícias: www.jornalnoticias.co.mz

O País: www.opais.co.mz

@Verdade: <http://www.verdade.co.mz>

Carta de Moçambique <https://cartamz.com>

Mozambique think tanks and pressure groups, Portuguese:

Centro de Integridade Pública: CIP <https://cipmoz.org/>

Observatório do Meio Rural: OMR <https://omrmz.org/>

Instituto de Estudos Sociais e Económicos: IESE <https://www.iese.ac.mz/>

Centro Para Democracia e Desenvolvimento CDD <https://cddmoz.org/> (some CDD in English)

Also CDD now controls Fórum de Monitoria do Orçamento - FMO (main debt group) <http://www.fmo.org.mz>
and RMDDH - Rede Moçambicana dos Defensores dos Direitos Humanos (a human rights group).

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