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Series 5: Programme 1 (of 9) - 'Energetic'

Pumping it Up – Senegal

Water is the source of all life. Communities in Senegal have been lacking a reliable supply of water to use at home and in their fields. Many of the wind pumps installed to address the shortage have not been maintained. A new credit scheme, devised by a local entrepreneur, means villages have access to an affordable water supply service. The entrepreneur can now buy the spare parts needed to rehabilitate the wind pumps and his clients have been able to increase their crop yields and their incomes.

Energy and the Environment

All of Senegal's electricity production comes from burning fossil fuels. The nation also consumes all of the natural gas it produces, and imports more than 30,000 barrels of oil per day. From an environmental perspective, Senegal is the most ecologically diverse country in the Sahel region. It boasts many species of animals and is a vital location for migrating birds. Senegal has problems with a pattern of periodic droughts, deforestation, over-grazing, soil erosion and desertification. In the north of the country, particularly, desertification is an ever-increasing problem that has only been partly eased by construction of the Manantalli Dam on the Senegal River. The dam has, in fact, had knock-on negative environmental impacts. Biological pollution has rendered local water supplies in neighbouring Mauritania unfit for human consumption, while many villagers who previously depended on fishing have been deprived of their livelihoods. In Senegal itself, sea fish stocks are being rapidly depleted by over-fishing while wildlife populations are threatened by poaching. Senegal is, meanwhile, a signatory to international treaties on biodiversity, desertification, endangered species, marine life conservation and climate change, including the Kyoto Protocol.

Water Supply

Given Senegal's problems with drought and diversification, along with the dependence of a high percentage of the population on agriculture, ensuring reliable water supplies is obviously a key issue. According to the World Water Assessment Programme of the United Nations, moreover, the world faces an impending crisis of water supply that will make the UN's mission of eradicating hunger inside the next thirty years impossible. Indeed, by 2020 average water supply per person is expected to be a third smaller than today across the globe. Meanwhile, water consumption has doubled since the 1950s and continues to rise. As Unesco's director-general, Koichiro Matsuura, has put it: 'Water supplies are falling

while the demand is dramatically growing at an unsustainable rate.' With sub-Saharan Africa set to be one of a few regions that will host the bulk of agricultural expansion in the next 30 years while the trend of massive urbanisation continues, countries may be forced to make the untenable choice of allocating water for agriculture or for urban supply.

Senegal

Dominated by rolling plains, Senegal is the most westerly country in Africa and was a French colony until 1960. Completely encapsulating its tiny neighbour, The Gambia, Senegal is slightly smaller than Great Britain. The predominantly rural population is rising towards the eleven million mark. Brash and bustling, the capital city of Dakar was built by the former colonial power as an administrative centre. Though Senegal has the reputation of willing participation in international peacekeeping efforts, the country itself has been plagued by a long-running conflict with separatists in its Casamance region.

During the 18th and 19th centuries Senegal was pillaged for slaves, gold and ivory. The 20th century saw the economy become predominantly agricultural, and this sector still accounts for some 18 per cent of Gross Domestic Product (GDP) and 70 per cent of employment. Agricultural exports include peanuts, millet, corn, sorghum, rice, cotton, tomatoes, green vegetables, cattle, poultry and pigs. Meanwhile, fish is also an important source of foreign exchange. Unsurprising perhaps, given the nature of the contemporary global economy, Senegal's main imports include processed foods and beverages. Capital goods and fuels are other significant import items. Apart from fish stocks, the country lists phosphates and iron ore as its principal natural resources. Meanwhile, industry accounts for some 27 per cent of GDP and important industries are agricultural and fish processing, phosphate mining, fertiliser production, petroleum refining and building materials production.

Senegal has a heavy international debt burden and receives substantial economic aid. In recent years, stringent economic reforms and privatisation have served to increase GDP, which has an average annual growth rate of around 5 per cent per annum. Foreign investment continues a reasonably steady rise while there is a continuing battle with inflation, which nevertheless – fluctuating around between 3 and 4 per cent - is manageable and compares favourably with neighbouring states and competing economies. Though their advocates tout them as unavoidable and only short-term, the economic reforms invariably come with a high social cost. With almost half of the workforce unemployed and more than half of the population living below the poverty line, Senegal faces the perpetual social crisis familiar to many African countries that are obliged to follow similar economic policies. Urban youths in particular are turning to delinquency, including crime and drug use. Naturally, the trade union movement has resisted reforms and this has led to tension between the workers movement and government.



A Kijito wind pump (Photo © ITDG)

Power from the wind

When we talk of 'wind power' we mean either mechanical or electrical energy that has been reaped from the wind and put to work. Wind is caused by the sun heating air to different temperatures in different regions around the earth. This creates areas of high and low pressure between which air flows as wind. Being freely available and non-polluting, wind is referred to as a renewable or ambient energy source.

We know that, as many as four thousand years ago, both the Babylonians and the Chinese used wind to pump water to irrigate crops. In medieval Europe people used wind to grind or mill grain, hence 'windmill'. The wind was also used extensively to power sawmills. Both pumping water and milling grain need a lot of torque or rotational force but relatively low speeds. Wind pumps and windmills therefore tend to be designed with many blades or sails and they rotate quite slowly. In the modern world we are perhaps more used to wind generators or turbines, which harvest the wind to produce electricity. Wind generators have fewer blades or rotors and turn much more quickly.

Whichever type of wind harvester we employ, the power available from the wind is proportional to the product of the circular area 'swept' by machine's blades and the cube of the of the wind speed. Meanwhile, the power that can be extracted is the product of the torque produced and the rotational speed of the blades. So, a slow turning wind pump may be rated at the same power as fast spinning wind generator, the difference being the form of the power each produces – mechanical or electrical.

Local water supply for villages and agricultural production is a development issue that agencies working in Senegal have been trying to begin to address for a number of years. In the 1980s donor money was used to install hundreds of wind powered water pumps in Senegalese villages. It is estimated that fewer than 10 per cent of those pumps continue to work today. Unfortunately, it is quite common for such development efforts to be well conceived but inadequately realised. Projects are often subject to short-term funding and fads in development thinking. At some point the focus of attention and funds shifted away from Senegal and water supply. Moreover, project planning has evidently failed to involve the village communities via participatory practices. Communities have not taken ownership of the wind pumps and they have no mechanisms in place to fund maintenance and repair work, which reflects a very poor exit strategy on the part of the donor and implementing agencies.

Rehabilitation of wind-driven water pumps

One local man who had worked on installing the wind pumps in Senegal was determined not to see them fail, however. In true entrepreneurial spirit, Michel Tine formed a company, VEV, to take up where the donors and aid organisations had left off. He understands the need of villages for water and is completely committed to their cause. Michel knew of 130 wind pumps that had been abandoned and were failing due to a lack of expertise for maintenance and spares for repair. Unfortunately, the villagers did not have the cash to pay for his services. It was a vicious circle wherein they could not grow crops to sell in order to pay for repair of the wind pump because they did not have enough water and so on. To break the circle and get the process of change started, Michel realised that villagers would need a bridging loan – something he did not have the capacity to provide.

He did, though, contact Enda-Energy, the Senegalese partner in the AREED programme. Enda-Energy is a branch of the organisation Environment and Development Action in the Third World (ENDA-TM). Founded in 1972, ENDA-TM is an international non-profit organisation based in Dakar. Intentionally dynamic, Enda seeks to identify and support community development initiatives. As its name implies, Enda-Energy works on specifically energy issues and focuses on links between energy and economic development in Africa. In this context, Enda-Energy works towards implementing UN Conventions on Climate Change and Desertification in Africa. A particular area of concern is promoting the use of renewable energy sources.

Bringing Together Wind Power, Skills and Appropriate Finance

Michel Tine and ENDA were able to put together a simple loan finance scheme that allowed VEV to buy essential equipment and spare parts. Promoting wind pumping fitted the AREED agenda. It would meet the energy needs of the poor without damaging the environment by releasing carbon dioxide to contribute to climate change, as would have been the case with, say, petrol powered pumps. Villagers pay for wind pumped water by the bucketful and allow VEV to repay the loan and invest a modest profit back into the company.

For example, in the village of Tatene Mbambara the wind pump had lain idle for years simply because of corroded pipes and a worn piston pump seal that needed replacing. During that time villagers struggled to grow enough to make ends meet.

Having negotiated with the villagers and secured the loan finance through Enda, VEV carried out the relatively simple task of fixing the wind pump.

When it was up and running the delighted villagers invited Michel and his team for a feast. For Michel, seeing his previous efforts not go to waste and sharing the pleasure of a job well done with the villagers is reward in itself. Next year, he knows, after the crops come rolling in, the feast can be bigger and more joyful still!

As is often the case in village projects, then, it was not the hardware or the skills that were the missing link in a technological package but rather access to appropriate credit facilities and the absence of a sustainable strategy. In Senegal new water pipes are readily available to replace those that are corroded and VEV has the skilled people able to do the work. Now, with ENDA administering the AREED initiative, it has become possible for that work to be done. And having water allows village agriculture to flourish and people to increase their cash income. In other words, credit plus renewable energy equals water, increased crop yields and sustainable livelihoods.

Acknowledgements

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Further Information

Hands On Case Study References

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Wind Power

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Kijito wind pumps

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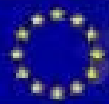
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