

SolaRwanda delivers solar savings



Illustration: Rebekka Gröhn

Mornings and evenings are peak periods for electricity consumption in the Rwandan capital Kigali as families start and finish the day. To meet this demand, the city relies on electricity generated from imported and costly fossil fuels.

The NDF-backed SolaRwanda project is tackling this challenge by promoting zero-electricity solar water heaters as an economical and climate-friendly alternative to electric water heaters. Shifting the energy supply to solar results in savings for the national economy as well as emission reductions.

“SolaRwanda is a key energy efficiency initiative for Kigali,” explains **Emmanuel Kamanzi**, Managing Director of NDF’s local partner, Rwanda Energy’s Energy Development Corporation Ltd (EDCL). “By replacing electricity-intensive water heaters with sustainable solar units we can reduce peak demand on the grid – and help participating households save on their utility bills!”

The project has been building up the local market for solar water heaters on both the supply and the demand side since 2010. Four local firms have been lined up as

technology and maintenance providers; while media campaigns have been encouraging households to shift from electric to solar with support from a package of grants and interest-free loans administered by EDCL.

“About 2,300 solar water heaters have been installed so far, and in the latest phase of the project we’re preparing to partner with a local technical college, Integrated Polytechnic Regional Center (IPRC) North, to manufacture solar water heaters that will be competitive in price and quality with imported models,” says NDF Country Program Manager **Charles Wetherill**.

“This project has always been about market creation. We’ve already built up awareness and

proven the technology and the benefits – so now we are looking to build up local manufacturing capacity,” adds Wetherill.

The planned partnership with IPRC North is part of the long-term sustainability plan for SolaRwanda, alongside a revolving fund capitalised by repaid loans, which will continue to support purchases of heaters well after the financing agreement between NDF and EDCL ends in 2017.

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This issue focuses on the outcomes of NDF projects around the world as our climate-related portfolio matures and results become visible.

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Photo: University of El Salvador - Regional Geothermal Training Program

A trainee from the course in El Salvador practises fieldwork techniques for the exploration of subterranean geothermal potential through measurements taken on the surface.

Geothermal energy a hot topic in Central America

Central America is a volcanically active region with great potential for the use of sustainable geothermal energy. An NDF-backed project, financed jointly with the Inter-American Development Bank, has been utilising expertise from the UN University's Geothermal Training Programme in Iceland to set up a major new training programme based at the National University of El Salvador.

"Iceland has pioneered the use of geothermal energy since the 1950s, so it's been very beneficial to use Icelandic expertise to design and run a training programme for our Central American partner countries," says NDF's Country Program Manager **Hannu Eerola**. "The courses cover all aspects of geothermal energy from geophysics, exploration and drilling to practical engineering, financing, and social and environmental impacts."

A total of 82 trainees from 8 countries have so far completed three 5-month training courses organised in El Salvador together with the local power company LaGeo. Participants have included graduate students and the employees of energy companies. Further courses will be completed by the end of 2016 and during 2017, while a parallel on-line training course is also under way, with 83 participants from 12 countries in Central and South America.

"Local energy companies are significantly benefiting from the training programme, since it has a great impact in building up groups of specialists covering most aspects of

geothermal exploration and development," says La Geo's Geothermal Exploration and Resource Assessment Manager **Kevin Padilla**.

More than 7% of Central America's electricity is already generated geothermally. Existing capacity across El Salvador, Nicaragua, Guatemala and Costa Rica today adds up to nearly 600 MW; but specialists reckon that there is potential to increase regional capacity to more than 3,000 MW, which would greatly reduce the region's dependence on fossil fuels.

"Thanks to the programme, Central American countries with geothermal potential will have more qualified professionals better able to respond to different situations with an integral approach, and contribute to clean energy development," adds Padilla. "We hope geothermal energy utilisation in Central America will grow considerably in the near future, since there is such big potential still to be developed – but the availability of trained professionals is a key factor."

The training programme also represents NDF's contribution to the wider Geothermal Development Facility for Latin America, a major multi-donor initiative that aims to mitigate financial risks related to costly geothermal developments. "In future we envisage the training scheme in Central America evolving into a more permanent regional centre of excellence for geothermal energy," adds Eerola.

In a separate initiative NDF is also financing a pre-feasibility study for a projected major new geothermal plant in Nicaragua.

NAMAs as a tool for climate actions

Nationally Appropriate Mitigation Actions (NAMAs) are emerging as a potentially useful tool for future work on the Nationally Determined Contributions (NDCs) to global emission reductions targeted in the Paris Agreement.

"One important feature of NAMAs is that the focus is not only on emissions, but also on the wider development impacts of the proposed actions," explains **Martina Jägerhorn**, who is currently following several NDF projects addressing NAMAs for various sectors and countries.

At some stage countries will need to start measuring and reporting on their NDCs. NAMAs typically include Measurement, Reporting and Verification (MRV) systems covering both greenhouse gas emissions and development impacts. Projects or sectors for which NAMAs have been developed may form advantageous building blocks for NDCs, since investments are linked to plans for MRVs.

"Developing countries want to contribute to global climate action, but obtaining financing for their national actions is often a critical issue. Structuring planned investments within a NAMA framework may help them demonstrate their impacts in terms of emissions and development," she says.

In **Vietnam**, NDF has supported a pioneering NAMA Readiness Programme run under the Nordic Partnership

Initiative for the cement industry, aiming for major reductions in national climate emissions. "Almost all of Vietnam's cement plants have collaborated. They're very keen to attract financing for investments in energy efficiency, for instance, since this will also save them money," says Jägerhorn.

In **Bangladesh**, a project funded by NDF and the Asian Development Bank (ADB) has been building up a NAMA framework for the rail sector, to help identify necessary investments and quantify future emission reductions. Expected outcomes include financing plans, a NAMA report for the UNFCCC, and a new carbon footprint unit within Bangladesh Railways.

NDF also supports a Transport NAMA Support Facility operated by ADB. "The facility's pilot schemes have focused on transport systems in Dacca, Bangladesh, and Ulan Bator, **Mongolia**. Related studies have compared the benefits of investing in bus-based or metro-based rapid transit systems from climate and development perspectives," adds Jägerhorn.

NDF's Nordic Climate Facility has also supported NAMAs for the waste sector in **Mozambique** and the steel industry in Bangladesh, as well as the creation of a road map for NAMA actions in the livestock farming sector in **Honduras** and **Nicaragua**.

Harvesting rainwater in rural Nicaragua

Rural communities in central Nicaragua are highly vulnerable to natural disasters, and climate change may worsen problems such as droughts and occasional floods. But a major five-year project, supported by NDF, the Inter-American Development Bank and the Nicaraguan government, is now improving local capacity to withstand extreme weather events.

"The project area is in a zone known as "the Dry Corridor", so one top priority has been to enable rainwater to be collected reliably for use in homes and on farms," explains NDF's Country Program Manager **Aage Jørgensen**.

Four large rainwater reservoirs, lined with impermeable sheeting and clay, have been constructed to serve hundreds of people in nearby

villages. "Many people are already benefiting from these new water harvesting plants, including farmers who can now more easily get water for irrigation and their livestock – as well as many women, who no longer have to walk so far to fetch household water," says Jørgensen.

"But at the same time, when it does rain here, it really pours!" he adds. "For this reason other measures have been realised to prevent flooding by stabilising river banks and improving drainage systems."

Three new bridges across seasonally flooding rivers have also been built through the project. Officials have additionally been trained on issues related to disaster management and climate change, while new climatic models have been created to help them plan for the future.



Photo: Aage Jørgensen.

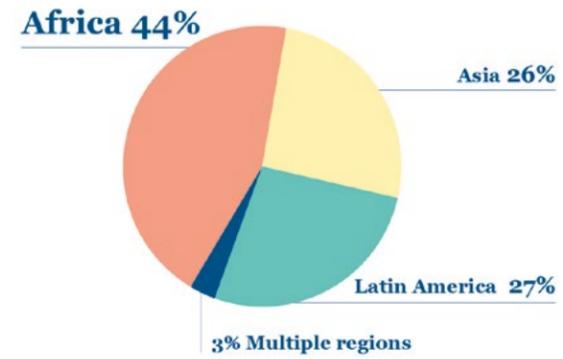
Workers constructing a new reservoir that will give local residents much easier access to water for their homes and farms.

Results from completed projects on three continents

15 NDF-backed projects have been completed since the Nordic Development Fund switched to its current climate-related mandate in 2009. The map shows the locations and reference codes of the completed projects, with the outcomes of six projects highlighted.

The fully implemented projects have all been assessed with regard to their initial objectives through NDF's project performance rating system, which rated 87% as highly satisfactory or satisfactory. Detailed reports are available for all finalised projects.

Almost half of NDF's approved project funding, which has totalled EUR 258.5 million since 2009, targets schemes to be realised in Africa.



Several investment projects have been set up to promote climate change adaptation in the water sector in **Honduras and Nicaragua**.

● (NDF C30)



C30 C40

C43

Detailed climate action plans have been created for **3** major pioneering cities in **Honduras, Nicaragua and Bolivia**.

● (NDF C40)



AWARD WINNER



C40

Assessments of the vulnerability of infrastructure to climate change have been conducted in **7** major African river basins and across **4** African regional power pools.

● (NDF C28)



More than **90** priority actions have been identified to facilitate climate change adaptation in **coastal Tanzania and Zanzibar**.

● (NDF C29)



C29

More than **5,000** people in **Laos, Vietnam and Cambodia** have been trained on the use of climate-friendly bioenergy solutions, while pilot schemes have successfully promoted improved cooking stoves and the use of biogas, bioslurry and biochar.

● (NDF C21)



An extensive toolkit containing practical solutions for climate-resilient urban planning has been created for planners across the **Mekong Region**.

● (NDF C42)



AWARD WINNER



- C1 ● Energy and Environment Partnership for the Mekong region
- C5 ● Study to facilitate climate adaptation in the Lao city of Pakse
- C8 ● Capacity building for climate change adaptation measures in Laos
- C18 ● Support for Vietnam's National Target Programme on Climate Change
- C19 ● Improved water resource management in Cambodia
- C25 ● Enhancing the climate resilience of roads in the highlands of Vietnam
- C34 ● Promoting climate change mitigation in Vietnam's cement industry
- C37 ● Study of the impacts of drought on farmers in Sub-Saharan drylands
- C43 ● Global review of the role of social analysis in climate change responses

Partnerships for piloting innovative approaches



NDF's Nordic Climate Facility (NCF) is continuing to provide co-financing grant support for innovative development projects designed to help low- and lower-middle-income countries mitigate and adapt to climate change. NCF projects all involve Nordic organisations working in close collaboration with local partners.

A total of 7 projects approved under NCF's fifth round, whose theme is "Climate resilience in urban and private sector contexts", are now in the initial implementation phase. Contracts are meanwhile being negotiated for 14 projects selected from about 30 shortlisted detailed project proposals for NCF's sixth round, under the theme "Green growth for sustainable livelihoods".

NCF's funding application and evaluation process is currently under review, but a new call for project proposals is likely to be launched early in 2017.



Photo: Matis

The appetising smell of fish smoked in the new efficient kilns is already familiar to residents of Muyobosi in Tanzania's Kigoma district, by Lake Tanganyika.

Tastier and healthier fish for Tanzanian consumers

Collaboration between experts from very different parts of the world can be highly productive. Fish processing specialists from the Icelandic R&D company Matis are working with the Tanzanian Fish Research Institute (TAFIRI) and the United Nations University's Fisheries Training Programme (UNU-FTP) to share effective techniques for smoking and drying fish.

Matis's project manager **Margeir Gissurarson** explains that traditional open drying and smoking methods practiced in the Great Lakes region of Tanzania use large amounts of firewood and cause frequent respiratory problems among fish smokers. Enclosed fish drying and smoking kilns designed through an NCF-backed project can greatly reduce such problems, while also improving local incomes and food security.

"So far 45 integrated fish drying and smoking units have been constructed and installed at 15 locations, and we aim to install a total of 100 units by the end of the project," says Gissurarson. "The new units are working very well, and we've achieved the main goal of reducing firewood use by

80%. Since very little smoke is released from the new units, we expect respiratory illnesses to be reduced among the fish processors, who are mainly women."

Reduced problems with oxidation, bacterial contamination and carcinogenic compounds in charred fish mean that the fish smoked in the new kilns is also healthier and tastier – making it popular in local markets. Reducing the use of firewood slows local deforestation and cuts greenhouse gas emissions.

Training has also been an important part of the project. "A trainee from TAFIRI came to UNU-FTP in Iceland for six months to study the technical aspects of fish smoking and the new smoking kilns, and acquire useful skills for the project implementation and follow-up activities. Well-attended courses have also been run in Tanzania for fish processing workers," adds Gissurarson.

The 30-month project's benefits will therefore be sustainable, upscalable and replicable, since further kilns can easily be constructed from affordable local materials using freely available design drawings.

Kenyan farmers adopting agroforestry

Subsistence farming families in Western Kenya face climate-related threats including droughts, extreme variability in rainfall, and soil erosion. An NCF4 project realised by the Kenyan office of the Swedish NGO Vi Agroforestry is encouraging farmers to adopt techniques that will help them cope with climate change, improve their crop yields, and shift from subsistence agriculture to commercial agroforestry.

"The project is spreading Sustainable Agricultural Land Management (SALM) practices such as the use of compost, manure, cover crops, mulch and agroforestry, to add organic carbon and other nutrients to soils," explains **Amos Wekesa**, Vi Agroforestry's local adviser. "This will increase their productivity, and help farmers adapt to climate change impacts such as increased runoff, dry spells, pests and diseases."

Growing trees in addition to food crops has many benefits for farmers, including water and soil protection,

shelter and shade, as well as products ranging from timber, firewood and fodder to fruits and even medicines.

"The project also encourages farmers to diversify their crops and embrace collective marketing," adds Vi Agroforestry's Deputy Regional Director **Wangu Mutua**.

"Farmers will grow both trees suitable for local conditions, as well as food crops like maize, beans, sorghum, millet, cassava, local vegetables and sweet potatoes."

The project also has a microcredit element through which Village Savings and Loaning Associations fund the investments needed to shift to market-oriented agroforestry.

"So far more than 4,000 farmers have been trained on SALM and agroforestry, business management, beekeeping and dairy goat production at 8 demonstration sites – and SALM

and agroforestry practices are used in about 1,400 hectares of land," says Wekesa.

Photo: Elin Williams – Vi Agroforestry



Farmers in Bungoma County in Western Kenya are adopting agroforestry techniques that will improve their productivity as well as their ability to cope with extreme weather conditions.

Clean electricity for Ethiopian families and microbusinesses

Though low-income households and microbusinesses may be well aware of the benefits of small-scale renewable energy technologies, they all too often remain out of reach due to upfront costs. To solve this problem, an NCF4 project in Ethiopia has launched a micro-financing scheme that will reduce greenhouse gas emissions while also improving living standards.

"In Ethiopia energy poverty is a huge barrier to development and well-being, but a wide variety of clean energy technologies are available if people can only afford the initial investment," explains Project Manager **Paula Tommila** from Gaia Consulting. "To overcome this, the project has connected the providers of energy technologies with three active Ethiopian microfinance institutions (MFIs) to create a new business model for the sustainable financing of small-scale investments in clean energy."

The project partners – including the three MFIs supported by Gaia, MicroEnergy International and

Ethiopian-based Swan Management – soon realised that the scheme should focus on small solar systems useful for individual farms and households – or microbusinesses like mobile phone charging services and stores.

After initial needs assessments and technology reviews, the project developed a new green credit mechanism for the MFIs and the technology providers. Pilot schemes are now well under way, with more than half of the microloans targeting women.

"Demand for credit has been even higher than we expected, demonstrating the huge need for such schemes," says Tommila. "The local micro-financiers are very enthusiastic, and keen to

establish further credit lines; while key solar providers are also deeply committed."

Tommila sees huge potential for upscaling the scheme in Ethiopia, and replicating it in other countries.



Beneficiaries of the new microloan scheme can choose from a range of solar system fittings available locally in Ethiopia.

Photo: MicroEnergy International/Maryama Daykova



Photo: Landell Mills

Nepalese farmers make biochar by burning waste biomass in low-tech Kon-tiki flame curtain kilns.

Biochar fertiliser trials in Nepal bear fruit

Nepalese farmers have been discovering how nutrient-rich charcoal fertiliser made from waste biomass – known as biochar – can greatly improve their crop yields, in a recently completed two-year technical assistance project supported by NDF and implemented by the Asian Development Bank (ADB).

Commercial fertilisers are an unaffordable luxury for many small-scale farmers in Nepal, but waste biomass suitable for conversion to biochar is widely available in many forms – including twigs, rice husks and harmful Eupatorium weeds, known locally as “forest killer”.

Farmers were trained to make biochar by experts from project consultants Landell Mills, working with low-tech Kon-tiki flame curtain kilns, which resemble giant wok pans, or simple hand-dug soil pits lined with clay. Free or low-cost solutions are essential in a country where most farmers cannot afford major financial investments.

The results showed that adding crushed biochar to soils particularly improved yields when the biochar was soaked in readily available nutrient-rich cow urine.

“Yield increases were observed in field trials for all the crops tested, across Nepal’s three main agro-climatic zones,” explains ADB’s Kathmandu-based project officer **Vidhisha Samarasekara**. The figures are certainly eye-catching,

“The farmers who took part in the field trials were very enthusiastic about the potential benefits of using biochar.”

with yield improvements ranging from 20% for tomato and 70% for tea to 200% for cabbage and chilli – and up to 300% for pumpkin.

“There are now good opportunities for this technology to be applied in the context of rural development in Nepal – also because biochar-based fertilisers offer a good way to scale up organic farming production,” says Samarasekara.

Enriching the soil with biochar soaked in urine, instead of chemical fertilisers, reduces emissions of nutrients and greenhouse gases, and creates a carbon sink. The main pluses for the farmers themselves are higher crop yields and welcome savings on fertiliser costs.

“The farmers who took part in the field trials were very enthusiastic about the potential benefits of using biochar. In our final workshop in Kathmandu, which many of them attended, they were very vocal about the need for follow on support,” adds Samarasekara.

ADB hope that agencies working in Nepal will now help the Government of Nepal explore upscaling opportunities that can build on the successful field trials and apply the project’s recommendations.

The project partners believe this idea can also be productively replicated in other countries. “Awareness of biochar is increasing globally, and at NDF we’re starting to see more project proposals involving the use of biochar for its dual benefits in soil enrichment for climate-smart agriculture and in carbon sequestration,” adds NDF Country Program Manager **Emeli Möller**. “We hope the lessons learnt from this successful project in Nepal will be widely shared and applied in future projects.”



The Nordic Development Fund is a joint Nordic development financing institution that supports climate-related projects in Africa, Asia and Latin America.