



Newsletter No. 118

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ABOUT CED

Christian Engineers in Development (CED) is a Christian professional consultancy service dedicated to development work with overseas communities, and through service, to witness to the Christian faith. Operations usually comprise a tri-partite arrangement between a developing country organisation, a funding agency and CED providing technical assistance. CED responds to various requests for assistance. Improved water supply is the most frequent but by no means the only request. CED promotes self-help with the maximum use of local resources.

CED's services include site visits, feasibility studies, assistance with project proposals, design, contract documents, procurement, tender evaluation, project supervision, direct labour employment, on-the-job training of local staff, project monitoring and evaluation, assistance with fund-raising and the management of project funding.

CED's income comes primarily from grants for projects together with donations from churches, trusts, members and supporters, and membership subscriptions. Most of the expenditure goes to operations; management costs are kept as low as possible. CED is not a funding agency and therefore cannot directly fund major projects but it can, and often does, fund preliminary investigations for potential projects.

The Association is registered as a Company Limited by Guarantee (without shares) and being a non-profit organisation, it is registered as a charity. It is managed by an Executive Committee overseen by a Board of Trustees, all of whom give their services voluntarily. CED Members participate in the work of the Association either voluntarily or if they depend on earnings for their livelihood on negotiated payment for their services.

Membership of CED is open to any person who is professionally qualified, supports the Aims, accepts the Statement of Faith, supports the activities of CED in any way, or serves as an employee or volunteer, both in the UK and overseas. Becoming a Supporter of CED is open to any person or group that supports the Aims, and wishes to be kept informed of CED matters. Anyone wishing to become a Member or Supporter should contact the Secretary.

Newsletter

The newsletter is published twice annually. We would be delighted to provide additional copies for friends, colleagues, church book stands etc. Please contact ian@ced.org.uk and let us know how many you would like. The newsletter can also be downloaded from the CED website.

The editor would be happy to receive contributions for the next newsletter. Please send to ian@ced.org.uk

PrayerPoints

Copies of our monthly prayer bulletin are available by e-mail or post. Please request a copy by email to pray@ced.org.uk or by writing to the Secretary.

Privacy Statement

For administrative and mailing purposes we hold your name and contact details in our records. They will not be given to any other person or organisation. If you prefer not to receive publicity and information literature, then please inform the CED Secretary (admin@ced.org.uk).



**SHARING SKILLS
CHANGING LIVES**

From the Chair of the Exec.

Welcome to the November Newsletter! It was great to see many of you at our Open Day on 9th September in Bermondsey – thank you to all who came along and helped make it a success. Jonny Burns has written a report of that day *which you can read on the next page.*

One thing which I mentioned at the Open Day is the relative lack of projects “in the pipeline” (forgive the water-themed pun!) and the consequent need to identify more projects and partner organisations overseas, as well as members who are able to help develop the work. So I’m taking the opportunity in this newsletter to re-iterate that need. Suggestions and ideas are always welcome, so please don’t hesitate to get in touch with someone on the Executive Committee. The Committee

Editor’s reflections

Thanks to everyone who responded to the call for articles, and my appreciation to Dick Waller for chasing up people with ideas; articles for the Spring newsletter are already underway!

Living overseas means I feel a little less in touch with CED. It’s always disappointing to have to miss meetings... even when said meetings go beyond my attention span. (you will note that newsletter articles are generally short). The upside of living in a Tanzanian household is that I get a perspective on another culture from the inside. Living in the nation’s capital is a hugely different experience from my previous stay here 30 years ago in a more rural area. Cheap Chinese steel has replaced thatch for roofing everywhere, walls are usually cement blocks instead of mud, people we visit have tiled floors



Ian and Simba from Handeni discussing rainwater tanks



members at present are Roger Holland, Ian Bell, Alan Michell, Angus Armstrong, Ian Rankin, Barbara Brighthouse, David Beak and me.

Jonathan Appleby

in their homes (Chinese factories within Tanzania produce tiles at a fraction of the price we pay in UK), people have inside toilets - often 2 or 3 of them! In rural areas Asian squat latrines require a fraction of the water needed to flush a pedestal w.c. and are being used with offset septic tanks in preference to pit latrines. There are more cars on the road every month despite the horrendous accident rate. Our AICT church is not only building its own building but also contributing to a new car and house for the bishop and a new denominational headquarters. I get the impression other denominations with stronger overseas links have an easier time. In Dar Es Salaam it’s possible to get most things now, from solar panels to professional services. We have 16 panels and 8 batteries from India insulating us from load shedding by the municipal supplier. Architects and engineers abound. There are still occasions when an expatriate professional can make a useful contribution but CED’s role is going to change, and in the not-too-distant future. That’s something we need to be sensitive to; perhaps a Newsletter discussion? Thoughts welcome!

Ian Rankin



Open Day and Annual General Meeting

The Annual Members Meeting / AGM took place on a sunny 9th September in London, hosted by Alan Chadborn at City Hope Church in Bermondsey. The event was attended by 34 CED members and was the first in-person AGM since 2019 in York, due to COVID-19 and then a rail strike, which converted last year's event into an online meeting.

The morning began with refreshments and a time to catch up with some familiar faces as well as meet some new ones. We then moved into a time of worship, with Rob Wakeling leading our singing, and a message from Jonathan Appleby. Jonathan then gave an update on current CED projects, before we had a talk via Zoom from Marga Jann, our keynote speaker, on 'Furthering Development Through 'Live Project' Design in Academe: The Church in the World'. Marga ran through a number of architectural projects that she has been a part of across the world and encouraged us to consider academia as a means of taking our faith and skills to far-flung places.

Following lunch there were a number of workshops for everyone to attend. Alan Chadborn led a practical session where he took CED members through the building method of rainwater harvesting tanks, as well as a variety of methods for compostable toilets in the developing world. Ian Rankin currently runs workshops on building these tanks in Tanzania. Richard Franceys led an open discussion on 'Capacity Building' where members were able to give their views on how to increase the exposure to our projects and what they involve. The discussion initially

focused around the positive work done on the 'Tech Talks' arranged by Angus (and how these videos can be used as a resource for other groups), and developed from that into potentially making project videos based on our overseas work, and the use of social media. The final workshop was based around Lwamba Pico-hydro scheme in DR Congo led by Jono Cox, Graham Miller and Rob Wakeling. This talk focused on the specific challenges of building a pre-packaged pico-hydro system which could then be assembled by non-engineers in the field.

After the workshops we had the AGM itself where our treasurer David Bleak ran through the CED accounts, and Rob Brighouse and Colin Gibson were re-elected as directors. In the Open Forum session following the AGM, Angus highlighted Ian Rankin's proposal for a 'tap twinning' scheme which could be a means for individuals or churches to support specific rainwater harvesting installations in East Africa.

As the evening began we walked across to a local community centre where Alan encouraged the members to have a go at some traditional woodworking equipment and blacksmithing. Several members had a go – some having more luck than others!

The evening finished with a meal in a local pub beside the Thames where the all enjoyed some good food and fellowship with one another.

A big thanks to everyone involved with organising such an enjoyable day!

Jonny Burns



Commissioning the Lwamba Hospital mini grid

The hospital in the town of Lwamba serves the local population and its surrounding villages in the Katanga province of DRC. Patients travel long distances to get treatment at this hospital which is owned by the 33rd Pentecostal Church of the DRC supported by CAM International, a UK based independent Pentecostal mission. Lwamba hospital is in an off-grid region of the country. For some years now the hospital has been without electricity after the original, 'first generation' pico-hydro turbine / generator literally wore out. Indeed, the original generator had already provided 30 plus years of service in the UK before starting a second life of service as part of the original scheme in the 1990s.

CED partnered with CAM International in early 2021 to help develop the 'second generation' Pico hydro based mini-grid that would replace much of the original equipment, extend the mini-grid around more hospital buildings and address safety issues related to electrical earthing and lightning strikes, as this hazard is roughly 100 times more likely to be encountered in the Katanga province than in the UK.

CED reviewed the situation at the hospital and produced a report with various options and recommendations regarding the generation and supply of power. CAM International decided that the option they wished to pursue was refurbishment of the scheme with modular (rather than bespoke) equipment. This would feature 2 x 1.2kW pico turbine generator sets, battery storage and a charge controller with maximum instantaneous output of close to 5kW. CED then specified the equipment needed and assisted CAM with its

procurement, with CAM International covering the costs. Given its specialist nature, it was agreed that all the equipment should be supplied to Preston in the UK for 'dry' assembly and limited testing. This verification work was conducted in June 2022 over a period of several days and CED were on hand to assist.

In parallel with marshalling and testing of the equipment, CAM International met obstacles to their plans for shipping. For various reasons shipping had to be delayed and installation and commissioning was deferred to September and October 2023. The relatively short 'window' is because road travel to Lwamba from the city of Lubumbashi is more-or-less impossible in the seven-month wet season. The silver lining to this delay was that Paul Miller of CAM International was able to visit the hospital in the 2022 'window' and completely rebuild the power house, quadrupling its floorplan area and reversing the roof pitch (to face northwards) so that it would be ready for installation of the equipment in 2023.



Rob Wakeling with Paul Stephenson, Preston, June 2022



Water working: newly installed turbines.



Water working twice (after going through the turbines)

A very versatile mini grid

This mini-grid is versatile because different generators can be integrated into it and varying loads can be supplied by it. As commissioned this year, it has 2 x 1.2kW pico-turbines which can run continuously all year long together. However, for the next few years the operators will only need one turbine running at a time as the load is not sufficient to require both to run together. Longer term, there is the provision for fitting PV solar panels and battery banks with a capacity of up to 3kW. This would add energy into the system during the day when load (demand) will be at its highest.

It is the substantial battery bank that delivers (or absorbs) electrical energy more-or-less instantaneously to make up the difference between (varying) load on the system and supply of the equivalent power. Another feature akin to energy storage is the intelligent immersion heater loads which can heat up water in hot water cylinders as well (rather than waste the energy). The controller varies the frequency of the alternating current on the distribution line very slightly to indicate to the immersion heaters when to turn on or off!

For emergency situations, the hospital 4kW petrol generator set can add energy via an input provided for this purpose. On-site testing has demonstrated that the SMA Sunny Island controller struggles a bit with this; so, generator input power has been limited to 2kW if connected.

Jonathan Cox

It is good to report that the 'second generation' pico-hydro mini-grid went live on the 19th September and for the following six weeks the equipment has been tested in a variety of situations, equipment settings configured, operating protocols finalised, training of operations conducted (using material in English and French prepared by CED) and the mini-grid extended around the hospital which itself has a new building.

Public acknowledgement and thanks to Hugh Piggot of Scoraig Wind Energy are very much in order. As the UK dealer for the majority of the equipment, he has played a vital role in advising on technical details related to the assembly and commissioning of the equipment.

CAM International have produced their own website article on recent events which features a number of interesting photos of the people involved. Type the following the link into a web browser to see it: <https://caminternational.org.uk/let-there-be-light/>.

Collaboration with CAM International and Scoraig Wind Energy has broken new ground for CED as a multi-purpose project involving water supply to the hospital (and community beyond), off-grid electricity supply and, it is hoped, income generation ventures using surplus energy generation. CED has not been able to visit the site at all and the project is in French speaking part of Africa.

It is early days, but we thank the Lord for what has been achieved and trust that the system will operate to the benefit of the hospital community and the glory of God.

Jonathan Cox



Graham Miller and Nick Delpont during UK testing in June 2022

What does “sustainable” look like?

When Joseph Louis Lambot presented his ferrocement boat in 1855, little could he have realised that his invention would lead to cement tanks being built all over the world in the 20th century. We have a fair few in Tanzania. Cement rainwater tanks are robust and economical but despite many programmes for building them, there are still huge areas where people have nowhere to store their water. When a water programme ends, so does tank building. In 2023, with more people starting to purchase plastic tanks and with steel having replaced thatch, is there finally an opportunity to see cement tank building develop sustainably under its own steam?

We think there may be, though are using the word “sustainable” very loosely as we are encouraging tank building with generous grants. The hope is that these can gradually reduce and that we can generate a flow of donations that will allow the subsidies to flow indefinitely, hence making tank building “sustainable”. Alongside ongoing help for the poorest, ordinary people will, it is hoped, choose cement rather than plastic for their water storage. They’re cheaper, after all!

Imagine if, every time you wanted to wash or have a cup of water, you had to pour from a jerrycan brought from a far-off source. For many people, a large chunk of the day is taken up with fetching water. It makes a huge difference to their lives if people have somewhere to store water and an even bigger difference if they are able to collect rainwater easily. There is great enthusiasm for the CED

tanks. People always say how much they appreciate them. The investment required, however, is enough to put most people off.

Twin your Tap

Many of us have joined with Tearfund’s toilet twinning scheme where people here pay for someone’s latrine. CED would like to offer you the opportunity to twin your kitchen tap with the tap on a water tank in Tanzania. In return we will send you a fridge magnet to invite your friends to join the scheme too. We will provide the geolocation on a QR code so that you can see the location and eventually your tank will be visible on Google Maps. If this is of interest please visit the CED website and hit <https://ced.org.uk/get-involved/> to participate. For individuals – or small groups – a 1000 litre tank for a widow would cost £120 + Gift Aid. Larger groups may consider a 10,000 litre tank for a church or school. These cost around £650 but we ask the recipients to make a contribution so that, if the gift is Gift Aided, a donation of £420 will cover the cost.

Ian Rankin



Map data ©2023 Imagery ©2023 CNES / Airbus, Maxar Technologies



Tanks are visible on Google Maps!
5000 litre tank at Kagera Cathedral on Google Maps.



Family with new tank funded through CED

In other news...

Not all the work of CED is particularly visible. Whilst you may read about projects in the newsletter, we are sometimes asked for advice or other assistance which does not result in a CED project, but nevertheless helps to alleviate the difficult living conditions experienced by some communities.

Two years ago, I received an email from Claudia, a lady in our village in Devon who had been given my contact details by a neighbour who knew of my involvement with CED. A meeting followed where I learnt more about Claudia...

A couple of years previously she went to Zanzibar and met two Maasai on the beach... and so began a long-term relationship with these two men and their village near Handeni, about 160 miles northwest of Dar es Salaam, Tanzania. Claudia now spends every winter living in their village and doing whatever she can to help them.

Lack of water was their greatest problem. Having done some brief research on the area it seemed that the best option was likely to be rainwater harvesting and so I put Claudia in touch with Ian Rankin. Ian introduced her to Amos who had attended a CED rainwater

Claudia lives in UK and in Tanzania



harvesting course and Amos agreed to travel to the village. With the participation of the Maasai in collecting sand and crushing stones, Amos built the first of three 5,000 litre tanks. Claudia raised small amounts of money from her contacts for these, but also expected the villagers to make a contribution too, which they did by selling a cow.

The tanks are kept for emergency use. They have what is basically a rudimentary valley tank nearby and the water is reported to be of reasonable quality, so this is used until it dries up. During the last year, the water in the tanks lasted the community of about 280 people for a month and prevented them from having to leave the area completely to find water elsewhere.

Shortly Claudia will be heading back, intent on helping the community build a further three tanks and with the hope that the knowledge of their use and how to construct them will spread to neighbouring villages.

Barbara Brighthouse

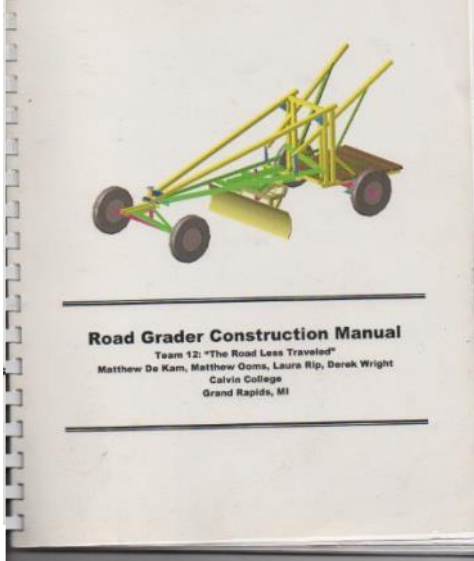


New tank in Handeni village (slightly more squat than standard as roof is low).

Is there a role for small graders in rural areas?

Arterial roads in African countries are often tarmac but roads between towns are gravel / murrum. These are to be maintained by grader. But the self-propelled machines are hugely expensive to buy and to run. Tracks between villages and to farms are narrow, for foot or bike travel, so are difficult for motor vehicles or ox-carts. In 2004, just before my time in Uganda was up, I made a grader, designed for animal draft by 4 students at Calvin College Michigan, following correspondence with me. With the help of a farmer who had bought implements from me, I was able to test it. Two years later I made a short visit to find that it had not been used again.

This autumn "Landwards", the professional journal of agricultural engineering, published an article by Robert Petts advocating the use of smaller graders pulled by farm tractors. This would be low in capital cost, using tractors borrowed from farm duties. I wrote to Mr. Petts about my grader. He was interested, and told me of a Canadian-based group concerned about Africa's rural roads. So I wrote to Calvin College whose professor sent details about it from their archive. I sent Mr. Petts my copies of the students' report (with all their sources and calculations of forces and steel sizes) as well as the instruction manual for its construction. As I had been able to obtain the steel in Soroti and weld it up in a small workshop there, this grader could be made locally in any country, saving imports.



I hope this may enable development of rural roads and tracks in various countries in Africa. This would benefit not only farmers for their crops, but access for getting sick people and pregnant women to health centres, and CED partners getting pipes etc to site.

Alan Chadborn

Surveying hacks for the field.

CED have a Total Station instrument (a Leica TC407), which is available for carrying out topographical surveys in the field. It is a good instrument, much faster than the pre-digital theodolites, but rather slower than the latest GPS-based surveying equipment which is commonly used on UK projects nowadays.

But what if you don't have the time or equipment for a full Total Station survey? Here are some simpler and quicker alternatives –



Grader pulled by team of oxen



Abney level



Clinometer

especially useful at the "optioneering" stage of a project:

Abney level: You would be hard-pressed to find one of these in the UK (except in the back of a cupboard in a college somewhere), but these are still widely-used in East Africa. It is basically a spirit level + protractor + sighting prism, allowing you to measure the declination (angle from horizontal) of a distant object.

Clinometer: A more modern version of the Abney Level, the one shown above is made by Suunto (of Finland) and was originally developed for foresters. It measures angles from the horizontal, and if you know the distance to a tree you can work out how high it is (simple trigonometry). It is an excellent instrument for measuring slope angles, and has the big advantage that it fits in your pocket.

Tape measure: Combine either of the above with a 30m tape and two locally-sourced poles of equal length and you have a winning combination which will allow for a broad-brush survey of a pipeline route, without the hassle of lugging heavy equipment around the bush.

GPS: And to complete the picture, before you do your tape-and-angle/level survey, turn on the GPS function of your phone or watch, and record the route. Positional accuracy is often 5m or better, which gives impressive results when the track is loaded onto GoogleEarth later on. (Be aware though, that height accuracy is much lower, and is not generally good enough for our purposes.) Just remember to pack a notebook and pencil so that you can record what you are doing, and relate the survey data to the GoogleEarth track later on!

Jonathan Appleby

I wish to give to CED:
I enclose a cheque to the value of:
 made payable to
Christian Engineers in Development.

or

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Front cover: the dam wall at Buhuri, waiting for CED to advise on repair.

This picture: Another successful 5000 litre tank, Kagera