



2022 Newsletter



A message from the Board of Directors:

This past year has been one of renewal and revitalization for The SAM Project. The pandemic accelerated a shift in our approach, putting more responsibility on our client communities for program design and implementation. The rest of our team and our partners research and procure the required equipment, services and other program necessities. This is a logical division of labour: put the people with the best understanding of the problems in charge of solving them, and task the people who have greater access to diverse technologies and funding sources with finding the tools for the job.

Although the challenges have been considerable, in many ways this approach has produced the most strategically important and productive period of our 15-year existence. The outcomes for 2022, illustrated in this newsletter, represent an excellent return on the invested effort and resources. The results demonstrate the impact that can be achieved by a local group of dedicated individuals when they are connected to skilled networks of experts and organizations who are similarly focused on the critically-important challenges of climate change, resource scarcity, and food security.

According to the UN Refugee Agency (UNHCR), extreme weather events are causing more than 20 million people to leave their homes and move to other areas in their country each year. The efforts of the SAM Project directly increase the resilience and climate adaptation of a very small percentage of these potential casualties of a warming planet. Moreover, our collaboration with other agencies means that our methods and innovations, particularly in the diversification of water sources and technologies to increase water efficiency, will be shared amongst a much greater number of communities.

Once again, we extend our greatest respect and immense gratitude to our volunteers and donors who make this important work possible.

Colin Eves, for the Board of Directors



SAM's 2022 at a glance:

Capacity-strengthening

- **13** Zambian interns trained in the rural groundwater development project cycle through **3** field school visits
- **13** community mechanics trained in protected dug well installation and hand pump maintenance
- **2** sanitation community champions trained in zero-subsidy latrine promotion

Infrastructure

- **1** piped borehole water source installed, supporting a clinic and mothers shelter with a **24,000** person catchment
- **5** decentralized protected dug wells installed, bringing clean water closer to **520** people
- **4** locally-led centralized waterpoint repairs supported, restoring clean water for **2550** people
- **2** school latrines constructed

Research

- **3** novel geophysics approaches tested in Southern Province
- **6** schools and **2** clinics with geophysics-identified groundwater targets
- Protected dug well design refined
- EMAS low-cost pump trialled



Who We Are

The Sustainability through Agriculture and Microenterprise (SAM) Project, is a volunteer-run Canadian-registered charity working in the dry lands of rural Zambia. We're a handful of Canadians and Americans who have partnered with a growing network of professionals and communities in Zambia.

What We Do

We work alongside Zambians in a community-driven approach towards a dignified and sustainable livelihood. Our collaborative programs focus on three fundamental needs: access to clean water, drought-resilient agriculture, and income diversification.

How We Do It

SAM utilizes a holistic approach to take on the social, economic, and environmental challenges facing rural Zambians. We concentrate our limited resources on building a variety of programs in one community, rather than diluting our impact over a larger area. Applying extensive research and creative problem-solving, while leaning on proven methods and technologies from other jurisdictions, provides a much bigger "bang for the buck".

Updates on some SAM Legacy Projects



Siandwazi Dam and Irrigation Scheme

Funded by: Individual donors; **Implemented:** 2016-18

The Siandwazi community has independently expanded the gardens that have substantially increased income and drought resilience. Many are practicing soil conservation practices taught by the late Teddy Ncube, and ongoing Rotary nutrition projects confirm that under-5 child weights in the community have stabilized. **The success of the dam has inspired 2 other Rotary-funded irrigation schemes in the area!**



Market Shop Micro-loan

Funded by: Individual donors;

Implemented: 2017

Bornface was provided a small loan to stock his empty shop. **His wife Margaret continues to operate the thriving business today, and they've even opened a second shop!**



Goat Breed Marketing and Improvement

Funded by: SAAP; Rotary International; **Implemented:** 2014-17

After participating in a facilitated sale to Lusaka markets, **twice Margaret has organized her neighbors to join forces, hire transport, and sell goats for 3x profits at the Congo Border.**



Hand pump Maintenance Capacity Building Program

Funded by: Individual donors; Rotary International; **Implemented:** 2015-18

The Zimba District spare parts shop constructed and stocked by SAM has supported over 100 waterpoint repairs! The 36 trained committees continue performing independent repairs and are maintaining a high pump functionality rate (>90%). Some committees have started gardening at their waterpoints to improve food and income security.



A note on objectivity and transparency:

While we are proud of our successes, it is important that we seek out and learn from our failures.

Therefore, we are currently working on a systematic, project-wide assessment of our projects' outputs, beneficiaries, and shortfalls, so that donors can have a complete picture of our impact to date.



SAM's Primary Focus in 2022



38% of people in Zimba District walk over a kilometer to access a hand pump, and 27% don't have a waterpoint to collect from at all, instead relying on unprotected surface water

Water crisis in difficult well drilling environments - how can we support the Zambia water sector to better serve these areas?

In Zambia, the primary method of rural clean water provision, borehole drilling, produces very low success rates in areas like Zimba District, where groundwater resources are scarce and isolated. Communities in these areas have been "left behind" across Africa, presenting a severe barrier to achieving the UN Goal of "Water and Sanitation for All" by 2030.

SAM uses a 2-pronged approach to overcome this challenge:

1. Improve well drilling success rates

How? Through novel geophysical surveying approaches

Program: "Kujana" (see pg. 5)

2. Fill in the water supply gaps between wells

How? By identifying, piloting, and scaling up alternative water supply technologies

Program: "DiWaSSAA" (see pg. 7)



PAUL BAUMAN GEOPHYSICS



AARHUS UNIVERSITY



Kujana ("to find"):

Improving well drilling success rates in poorly weathered bedrock terrains

Why is the groundwater so hard to find?

In Zimba District, like much of Africa, the rock below the surface is "poorly weathered" (solid) so groundwater can only be stored in isolated fractures and and weathered pockets.

These zones are extremely difficult to locate prior to well drilling due to their small size and low-density distribution.



Figure by: British Geological Survey.

Lessons learned from Kujana will be disseminated to help Government and other NGOs improve their well drilling success rates

Project Goals:

1. Identify and promote suitable geophysical methods for areas with difficult well drilling conditions
2. Provide a field school opportunity to Zambian students and equip them with employable skills in the rural water development sector
3. Improve access to clean water through the installation and repair of borehole wells at schools and clinics experiencing the worst water scarcity in Zimba District

How do you find (Kujana) it?

Through the use of geophysics, it is possible to gain an understanding of sub-surface qualities through physical and electromagnetic measurements at the surface. The application of geophysics has been around for decades, however the common methods have failed to produce meaningful improvements to well-drilling success rates in southern Zambia.

The Kujana project brought together world-renowned geophysicists to use multiple tested and experimental geophysical methods to locate groundwater in Zambia's most challenging drilling environments. The methods applied include remote sensing; resistivity (1D and 2D), Electromagnetics (EM34 and WalkTEM), and Nuclear Magnetic Resonance (NMR).



2022 Kujana Highlights



Kujana started as every program should - by listening to the community. Communities were asked where they thought groundwater could be found, resulting in incredibly insightful maps of groundwater indicators, such as water-indicating trees.



A group of 13 **Zambian undergraduate engineering, geology, and human development students were involved in every step of the way.** Three field schools were hosted, introducing the students to the entire rural groundwater development project cycle. Topics included community engagement, geological mapping, geophysical surveying, drilling, contractor management, and well quantity assessment.,



Photos by: Paul Bauman

Intensive geophysical groundwater surveying was conducted at 7 schools/clinics where the nearest tap is, on average, 2.6km away. 19 well drilling targets were identified, with at least one at every school/clinic.



A successful well was established at the pilot site - it will supply piped water to a clinic serving over 24,000 people!



Along the way, Kujana supported 4 communities to repair their own waterpoints, restoring water to 2540 people!



DiWaSSAA: Diversifying Water Supply in Semi-Arid Africa

Funded by:



Project Goals:

1. Identify and promote water technologies suitable for areas with difficult well conditions
2. In the process, achieve high-standard water and sanitation coverage in the pilot catchment

Project Catchment:

Masanzya, Zimba District, characteristic of areas "left behind" in Africa due to its:

1. Extremely difficult well drilling conditions (<10% success rate)
2. Remote location (5hrs from nearest town)
3. Low-density settlement pattern

Filling in the gaps between centralized borehole wells using under-utilized technologies and water sources

2019: Assessed technologies' suitability for local environmental conditions and community priorities

2020-21: Piloted promising technologies

2022-23: Scaling and refining most successful technology



Protected dug wells



PDWs



PDWs



Sand dams



SDs



Sub-surface dams



SSDs



Roofwater harvesting



Check dams



Biosand filters

Protected dug wells with Tara hand pumps take advantage of under-utilized low permeability aquifers at a sixth of the cost of a borehole well



2022 DiWaSSAA Highlights



The Masanzya waterpoint committee was trained in how to maintain Tara pumps, and they've already successfully performed their first repair!



The sanitation component of DiWaSSAA was initiated. Community sanitation facilitators were trained and the community was "triggered" to initiate zero-subsidy latrine construction.

13 Zimba District community members were trained in protected dug well construction, including 2 women who will lead additional waterpoint construction under DiWaSSAA.

150 households and 200 individuals were surveyed to capture community perspectives, water use priorities, project risks, and the state of WASH practices.



An "EMAS" pump made of 100% locally available materials was trialed, which will halve the current protected well installation costs, bringing the technology within the financial reach of rural communities



Our Ambitions for 2023

1. Complete the Kujana and DiWaSSAA Projects

- **Kujana:** Drill borehole wells at remaining 6 schools and clinics and train waterpoint committees at all handpumps installed/repaired
- **DiWaSSAA:** Implement water quality monitoring program and improve existing protected dug wells through well deepening and catchment protection measures
- Disseminate lessons learned from both projects to other water developers in Zambia and Southern Africa

2. Waterpoint mapping and monitoring in Zimba District

- The surveyed data-set will form the foundation of a water development plan to assist organizations, including the national government, to reach under-served areas and maximize benefit per dollar invested

3. Establish a Water-focused Social Enterprise

- local SAM staff will start offering pump testing and borehole siting services to other organizations, helping them become more effective while generating income for our own community water programs

4. Support irrigation development and nutrition education

- SAM will guide Rotary and ADRA food security programs being implemented in areas where SAM has established a secure water supply

5. Enter the realm of "Self Supply"

- SAM has identified technologies affordable enough to be funded by communities themselves, rather than relying on external assistance. SAM will support communities to access the knowledge and skills required to install such waterpoints.

We're a small organization, and we could sure use your help!

Being a small organization has many advantages: a direct connection to communities, an absence of bureaucratic bottlenecks, and an ability to pivot and adapt to changing needs. The disadvantage of being small is that, due to financial constraints, we constantly have to turn down communities looking to partner.

In 2023, we are funding-limited in the following areas:

Initiative	Benefit	Cost
Waterpoint mapping and monitoring in Zimba District	Better informed water development, ensuring the resources of government and other NGOs make it to those who need them most	\$6,000
Additional protected well installations and pump repairs / committee trainings	Directly improved access to water	\$1,000 / waterpoint

Every donation, no matter how small, helps us bolster and expand our partnerships with Zambians.

[**Click Here to Donate**](#)

All donations over \$20 are eligible for tax receipts.

As always, we ensure that your money will be spent responsibly, effectively, and efficiently.

The SAM Project would like to thank a few key individuals for their contributions this year



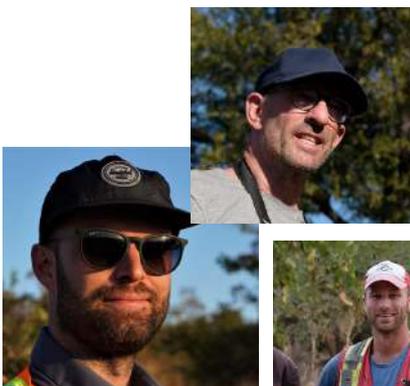
Henry Lungu became the new **Zambian Director of The SAM Project** in 2022! Henry is a passionate Water Engineer who has worked with SAM since 2015 in various water initiatives. We are very grateful to have him step into a management position and guide our projects for years to come.

Kate Chadwick led Kujana's design and implementation. She volunteered 5 busy months of field work and countless hours of grant-writing, preparation, and reporting. SAM is extremely grateful for Kate's talents in geology and community development, which have led Kujana to be on schedule, under budget, and on pace to meet its objectives.



Rebecca Tembo (TR), Mainza Chivwanga (TL), Maambo Lilando (BR), and Josephine Chiila are outstanding civil servants who supported SAM throughout 2022. We look forward to expanding our partnership moving forwards.

Taylor Josephy has supported SAM's operations since 2014, volunteering over 3 1/2 years in Zambia in the process. Moving forward, Taylor will continue to advise SAM's water projects remotely.



Photos by:
Paul Bauman

Paul Bauman, Max Layton, William Hoppe, Maddy Hughes from BGC Engineering, along with Denys Grombacher and Matt Griffiths from Aarhus University all made substantial in-kind contributions to the Kujana program. The program could not have been possible without their geophysical expertise, incredible work ethic throughout long, hot days surveying, and care for the plight of Zambians.



Dan Blankenau volunteered his time and drilling expertise towards Kujana. Thanks to his guidance (and donating all dry-hole costs!), Kujana installed it's first well!



SUSTAINABILITY THROUGH
AGRICULTURE AND
MICRO-ENTERPRISES

**We would also like to thank the following organizations
for their financial support, in-kind contributions, and
implementation collaboration:**



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And last but not least:

**From all of us here at SAM,
on behalf of the communities
and individuals we partner
with, thank you for your
interest and support.**

Twalumba Kapati!