

Mapping UNSW Impact Global Development

Primary SDG	7: AFFORDABLE AND CLEAN ENERGY
Broad theme	Geothermal electricity
Research	Investigating the building of a geothermal plant and training up local university staff and researchers
Impact region	Fiji
Faculty	Engineering
School/Institute	Petroleum Engineering
Academic	Professor Klaus Regenauer-Lieb
Project partners	Fijian Government, Fiji National University, University of South Pacific, Monash University, RMIT, UWA
	UNSW Institute for Global Development – seed funding of \$63,000
Related SDGs	11: Sustainable Cities and Communities
	13: Climate Action

Elevator pitch

Having identified geothermal potential in Fiji, Klaus is now working to build local academic capacity in geothermal power so locals can benefit from cheaper and cleaner electricity. He is also looking to extend the life of a gold mine for workers by applying a ground-breaking harvesting process he invented.

The Challenge: No electricity making it hard to preserve food and limit wood burning

Most Fijians in rural communities live without electricity. Those without electricity burn wood to cook food and dry copra, the meat of the coconut used to make coconut oil and to feed livestock. Copra farming is the main income of local farmers and is usually dried for two days using conventional wood fired kilns. This burning reduces the number of trees in the area and releases carbon dioxide emissions. Without electricity, people can only store and eat limited kinds of food. Food they do store in the warm climate may pose health threats and offer declining nutritional value. Fiji, does however, have thermal springs dotted around the island. The potential of these springs remains untapped.

UNSW's solution: Investigate geothermal plant, train up local experts

A colleague of Klaus' at USP asked him to investigate geothermal potential in Fiji in 2015. Together they discovered over 40 hot springs that have been sampled and proven to have strong potential to be used to create electricity. The World Bank and Fiji are now working together to run Fiji entirely on geothermal power from two big springs in Savusavu and Waiqele on the second largest Fijian island (Vanua Levu). Klaus, having instigated this development, is proposing the construction of a 4 Megawatt plant at Savusavu that will power

the diesel generator used to run the Savusavu mini-grid. If the World Bank approves the Savusavu plant, drilling will commence in 2019. The geothermal plant will take around five years to build.

Klaus is aiming to influence the building of Savusavu plant in a way that sees heat run-off used in multiple ways. Using the heat run off means the plant can not only provide electricity, it can be used to dry food (copra), drive refrigerators, and power cooling systems at the local morgue and fish farms. This ground-breaking use of heat in multiple ways, as seen in Iceland, equates to huge savings in electricity. Klaus has patented the technology for this and is looking to take on PhD students to further the adoption of it. In January 2019, Klaus will visit Fiji to screen local Fijian PhD students who will be trained at FNU and USP under his supervision to research geothermal power development at large scale and local livelihood levels.

Klaus is also working on off-grid heat driven technologies for food refrigeration, a morgue and a local fish farm for 5,000 nearby residents in a remote village near Savusavu. He is also performing a pilot study for geothermal energy use on the main island (Viti Levu). He is also collaborating with FNU and USP on an invention that could secure another lease of life for the Vatukoula Gold Mine, securing employment for more than 1,000 Fijian workers and turning the mine into an environmentally friendly operation. Klaus's patented technology can harvest minerals from the geothermal water beneath the mine by distillation, producing electricity rather than consuming it. If successful, the project could radically change the way mining is done in the future and save 2-4% of the world's energy that is spent crushing rocks and using harmful chemicals to extract valuable minerals. Klaus is currently working on a MOU for this intervention between USP, FNU and RMIT.

The Impact: Improve food preservation, minimise disease and electricity costs

The geothermal plant will provide electricity while the waste heat from the plant can be used for local refrigeration, the local morgue and local fish farmers looking to store food. This means more food can be preserved for longer, improving the nutrition of the food preserved and minimising disease transfer. The plant will also save locals from spending time and money buying and burning wood, improving air equality in the area and reducing carbon emissions. It will also save the fisherman and the morgue money they would otherwise spend on cooling machines, increasing their bottom line profit and the wealth in their immediate communities. There is scope to replicate this plant across the island for other villages and extend these benefits to them. Klaus has also identified potential for a therapeutic hot springs business in one of the locations.

The mining technique Klaus is proposing for the Vatukoula mine has the potential to extend the life of that mine and secure work for over 1,000 locals. The technology will also save the mine operators electricity costs, improving their bottom line. Should the technology work, it has the potential to replace industry standard rock crushing in the mining process that makes up 2-4% of the world's energy use.

Researcher

Professor Klaus Regenauer-Lieb is Research Committee Chair of the School of Minerals and Energy Resources Engineering at UNSW. He obtained a PhD from the Geothermal Institute in Auckland (NZ) and a second PhD in geophysics and geodynamics from the Universities of Mainz. He has worked for the Supercomputer Institute at the University of Minnesota, Swiss ETH Zurich, CSIRO, and he was Professor and Chair of Geophysics and Geodynamics in Mainz. He was a "Premier's Fellow" at the University of Western Australia in 2006, and CSIRO and Director of the Western Australian Geothermal Centre of Excellence. Klaus wants to clean up the mining industry in the developing world to ensure mistakes from the past are not repeated.

Ben Falkenmire 30.07.18