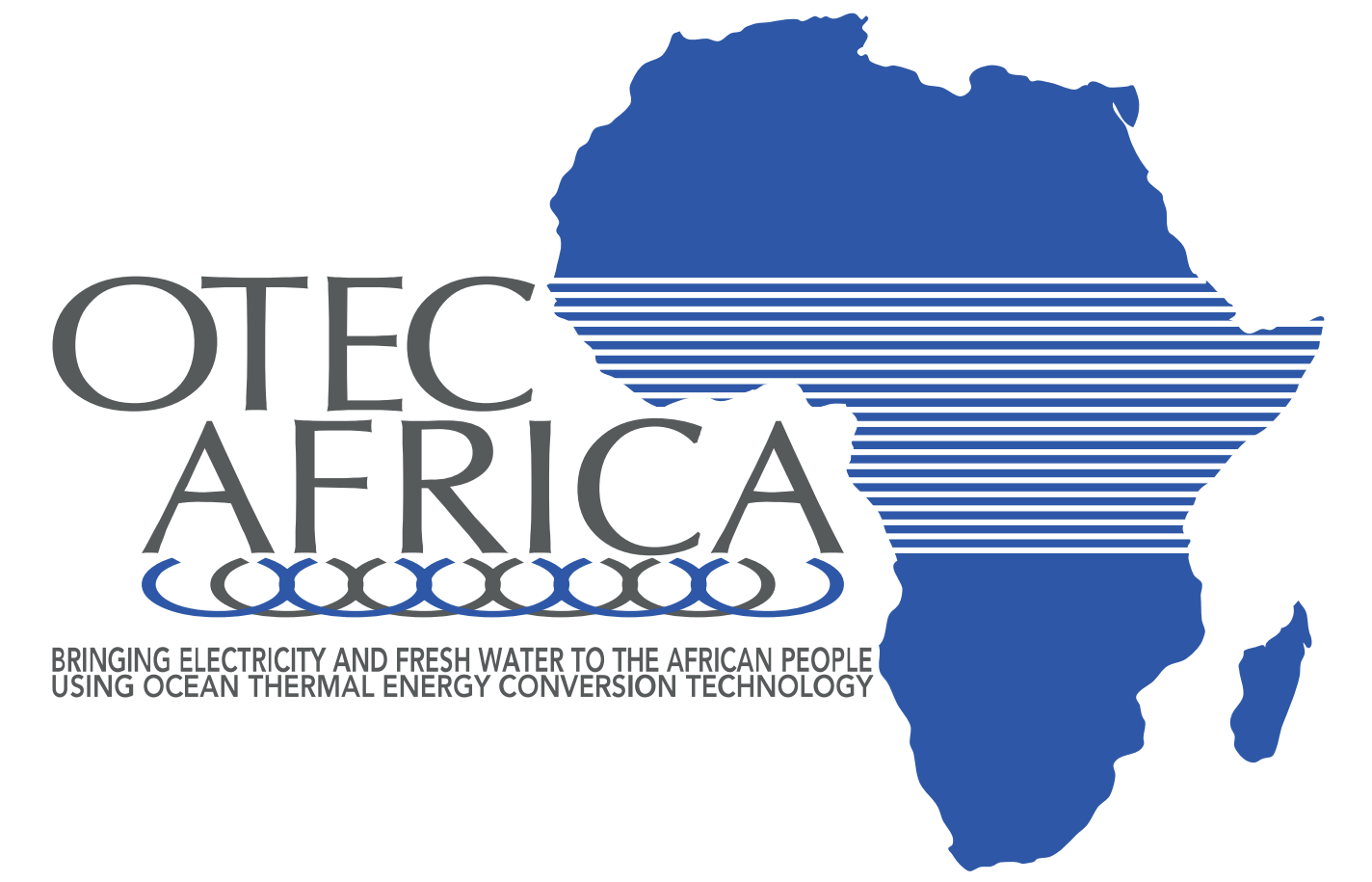




UNIVERSITY
OF BORÅS



Work with us on OTEC!

In the scientific community, and in business, it is rare that an individual can contribute greatly to solving the world's problems, but the OTEC field is still comparatively small, while its possible benefits are plentiful. OTEC can help feed the hungry, bring water to the thirsty, empower the poor, and stop climate change.

Together with an extensive network in OTEC academic research and industry, and based on a holistic and multi-disciplinary approach to OTEC's capabilities, the University of Borås hopes to establish a unique OTEC Research Center. We invite you to take part in this exciting journey, enabling sustainable growth and a better world for the people of both low- and high-income countries around the Globe.

OTEC benefits

Each day, a 100 MW OTEC plant can...

- ...serve a population of 100,000 people with base-load electricity.
- ...produce 120,000 cubic meters of drinking water, giving 1.2 million people 100 liters each.
- ...increase shellfish production with roughly 100 % (70 tons of shellfish meat) if nutritious deep ocean water (DOW) is pumped to the surface.
- ...be used to cool buildings (SWAC) such as hospitals, hotels, and buildings for storage of food.
- In the process, if the plant is a substitute for fossil fuel (which will often be the case in low-income countries), the plant saves 1.3 million barrels of oil and 700,000 tons of CO₂ emissions per year.

(Cost per 100 MW OTEC plant: about USD 750 Million)

Sources: Dr. Ted Johnson + Dr. Luis Vega

Problems related to Africa

OTEC technology can be used in close to a hundred countries/territories. It is particularly useful for African nations, as...

- ...Africa has now over 500 million people.
- ...the birthrate is the highest of any continent. By 2050, the population is expected to reach two billion.
- ...by the year 2030, water and energy needs in the world are estimated to increase about 50 %. African nations represent a large part of this increase.
- ...every eighth second, a child dies due to contaminated water.

Source: Dr. Ted Johnson, keynote speech, OTEC Africa Conference 2013

As this is the fastest growing region on the planet and the waters are very warm, it has great potential for OTEC. Because of the many problems Africa faces today and will face tomorrow, we owe it to the African people to investigate OTEC opportunities further.



The University of Borås. A progressive institution and a pioneer in sustainability research, close to Gothenburg, Sweden.

The Research Center

The University of Borås and the non-profit organization OTEC Africa have been involved in OTEC activities for several years, notably through the OTEC Africa Conference (2013) and the only journal dedicated to OTEC research, *OTEC Matters* (2015). We now hope to establish a multi-disciplinary OTEC Research Center. The aim of the center would be to start intercontinental research collaboration devoted to matters relating to OTEC, such as technology, commercialization, international aid, environmental studies, data visualization, and sustainable consumption.

Based on a systems theory perspective, the center would bring together researchers and industry experts, working truly multi-disciplinarily in joint collaboration projects. Together with these experts, we hope to help create a more sustainable world, for low- and high-income countries alike.

First planned project:

Redefining LCOE

Over the years OTEC research has mostly focused on technical aspects. Rather little research has been carried out on aspects such as how to lower the cost per kWh by taking OTEC's positive side benefits into account. These side benefits are mainly a result of OTECs demand for large quantities of water, and set OTEC apart from other sources of renewable energy.

In a recent IEA report (2015), OTEC compares well to such sources, and according to the OEE (2016) it is one of two marine energy technologies ready for commercialization. However, OTEC can be even more attractive to stakeholders and communities. Using a new economic model for calculating financial gain, the side benefits of OTEC can affect the LCOE (levelized cost of energy) very positively:

- The value of drinking water:** Today: Electrical power main product, drinking water by-product. Tomorrow: the other way around?
- Multi-energy platforms:** Storing electrical power is expensive for most renewable energy technologies. OTEC already solves this problem. To cut costs, ocean-based wind or wave power can thus connect to OTEC plants.
- Baseload is better:** Being a baseload technology, OTEC doesn't require diesel backup generators needed for communities relying on wind or wave power. This lowers the total price of a community's energy needs.

Some other ways to lower the LCOE

- Serial production:** The more plants built, the lower the cost per plant.
- New materials:** a) Heat exchangers make up for 40 % of the cost of a large OTEC plant. Coated with graphene, they would last much longer, drastically cutting the LCOE. b) The deep ocean pipes are mainly made of steel. A paper in *OTEC Matters* describes how using glass fiber cuts costs.
- Placement:** a) OTEC plants can be installed on ships. The LCOE of OTEC could be lowered significantly using retired vessels from the oil industry. b) It might be possible to use retired oil rigs when placing OTEC plants in – for example – the Mexican Gulf (having several thousand oil rigs to be retired over the course of the next twenty years).
- Alternatives to storing energy:** Using OTEC for production of hydrogen fuel may be more cost-effective than storing energy for electrical power.
- New innovations:** More refined technology by the fine companies and academic researchers in the OTEC community will undoubtedly result in lowered LCOE.

More research is needed to investigate these (and similar) ideas further.

Further contact

Please contact us to find out how we can work together!

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Fighting poverty, building sustainable cities, stopping climate change, ... As can be seen in the image, benefits of OTEC technology aligns exceptionally well with the UN's Sustainable Development Goals. At the University of Borås, research is carried out in all these areas.