

## MEDIA RELEASE

### UP team wins second place in international climate solutions competition

A group of students from the University of Pretoria (UP) Plasma Research Unit has scored a second-place finish in an international competition aimed at finding multidisciplinary solutions to climate-related problems. UP's 'Team Tujenge' has since the beginning of 2022 been developing ideas for a small-scale, solar-powered water purification system using plasma technology.

Team Tujenge was named the second-place winner during the International Conference on Sustainable Development 2022, a special side-event of the UN General Assembly in New York City on 19 September 2022.

The "Universities for SDG 13 Award" competition is a joint venture between the [United Nations Sustainable Development Solutions Network \(SDSN\)](#) and [Siemens Gamesa](#). UP hosts [SDSN South Africa](#) through its [Albert Luthuli Leadership Institute](#). The United Nations' Sustainable Development Goal (SDG) 13 addresses "Climate Action" through multiple targets.

UP is one of five participating universities invited to the competition, the others being Arizona State University (United States), Göttingen University (Germany), Pontifical Catholic University of Rio de Janeiro (Brazil), and Tsinghua University (China). The team from Tsinghua University took first place, for their digital solution, "Byte Rainforest: A new pathway to realize the intangible value of tropical rainforest."

UP Team Tujenge – "Tujenge" means "Let's build" in Swahili – is made up of PhD students (chemical engineering) Samuel Babalola and Hilda Kyomuhimbo, along with master's student Victor Tshigo (project leader, also chemical engineering), and Amogelang Booyesen (MSc student in Environmental Management).

"We encouraged them to build a team where they can draw on each other's strengths or academic backgrounds," said [Dr Samuel Iwarere](#), Head of the UP Plasma Research Unit and Senior Researcher in UP's [Department of Chemical Engineering](#). Dr Iwarere was named a Royal Society Future Leader African Independent Research (FLAIR) Fellow in 2020, and the UK-based FLAIR funding allowed him to set up the Plasma Research Unit in 2021 with the support of [Prof. Michael Daramola](#) of the [UP Department of Chemical Engineering](#).

The UP team worked with the rural village of Tshikuwi in Limpopo to obtain water for testing and shoot the video for their submission. Only two of the six boreholes in the village can currently be used, with water from the others so contaminated that it's not fit for human consumption. Residents have to boil their drinking water if they want to ensure that it's drinkable – which is costly given current electricity prices.

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“Boiling water is not an energy-efficient method, and also does not remove all contaminants, such as manganese, as can be done through plasma technology,” Babalola said. Should they be able to secure further funding to develop and implement their solution, Team Tujenge hopes to assist the Tshikuwi community by supplying them with the first purification unit.

Dr Yolande Steenkamp, Network Manager of SDSN South Africa, said the team was touched by the hospitality they received from villagers during a visit to do field research and shoot [the video](#). She remembered the final words of village elder Marikhela Muthuphei Albert as they parted: “Please, you have to adopt this village as your child.”

### **Using plasma technology to purify water**

The winning project is one of a number of projects UP chemical engineers are working on aimed at developing easily operated, small-scale water purification systems that work without chemicals. To this end, and thanks to three years’ worth of further funding from the Water Research Commission of South Africa (WRC), Dr Iwarere and his team at the Plasma Research Unit are focused on combining plasma technology and renewable energy options to provide clean drinking water to rural, off-the-grid communities.

Plasma technology is already used in the likes of plasma televisions, plasma etchings, water purification systems, and high-temperature laser cutting. Plasma is one of the four fundamental states of ordinary matter (along with solids, gases, and liquids). It makes up 99% of the visible universe and is electrically conductive because it contains charged particles such as ions and/ or electrons. Plasma is generated and put in motion by sending a strong electromagnetic current through a neutral gas.

With regard to water purification, plasma technology is considered energy-saving compared to, for instance, the boiling of water. The unit used does, however, need a constant supply of power. “Energy provision is therefore an important concept when it comes to plasma technology,” Dr Iwarere said.

He is proud of how his postgraduate students have run with his ideas and have included the use of renewable solar-powered battery units into their design. Their lab-scale purification unit has already been successfully tested. It entails a plasma reactor in which water is cleaned to drinking standards thanks to electric currents being sent through at high voltage, with tanks storing untreated and clean water separately.

The team’s current laboratory prototype could provide 120 litres of clean water every four hours in off-grid situations. “This is enough to serve the purposes of at least eight households,” Babalola said.

“Many villages in South Africa and the rest of Africa do not have clean running water, nor do they have access to electricity. Therefore, the addition of a solar energy unit to the design is important,” added project leader Tshigo.

Dr Iwarere also has students working on the use of plasma technology to clean water that contains traces of antibiotics, antifungal medicines, and the like. One student is exploring how to deactivate antibiotic-resistant bacteria and their genes using non-thermal atmospheric plasma technology, while another is optimising the use of ozone as part of a point-to-use water purification process.

Dr Iwarere hopes that the research done in the unit will ultimately help people in many countries in sub-Saharan Africa who struggle to access clean, drinkable water. “Many lives are lost through water-related diseases. Our vision is to see a healthy and productive Africa, and to address some of the United Nations Sustainable Development Goals, and the African Union’s Agenda 2063.”

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### **Photo captions:**

First photo from left to right: *UP Team Tujenge members Hilda Kyomuhimbo, Samuel Babalola and Amogelang Booysen*

Second photo: *UP Team Tujenge project leader Victor Tshigo*

*UP Team Tujenge [the video](#).*

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## **ABOUT THE UNIVERSITY OF PRETORIA**

The University of Pretoria (UP) is one of the largest contact and residential universities in South Africa, with its administration offices located on the Hatfield Campus, Pretoria. This 114-year-old institution is also the largest producer of research in South Africa.

Spread over seven campuses, it has nine faculties and a business school, the Gordon Institute of Business Science (GIBS). It is the only University in the country with a Faculty of Veterinary Science, ranked top in Africa. Overall has 120 academic departments and 92 centres and institutes, accommodating more than 55 000 students and offering about 1 100 study programmes.

UP is one of the top five universities in South Africa, according to the 2019-2020 rankings by the Centre for World University Rankings. It is ranked among the top 100 universities worldwide in three fields of study (veterinary science, theology, and law) and the top 1% in eight fields of study (agricultural sciences, clinical medicine, engineering, environment/ecology, immunology, microbiology, plant and animal sciences and social sciences).

In May 2020, the annual UK Financial Times Executive Education Rankings again ranked GIBS as the top South African and African business school. The University also has an extensive community engagement programme with approximately 33 000 students involved in community upliftment. Furthermore, UP is building considerable capacities and strengths for the Fourth Industrial Revolution by preparing students for the world beyond University and offering work-readiness and entrepreneurship training.

For more information, go to [www.up.ac.za](http://www.up.ac.za)