



World Federation of Engineering Organizations
Fédération Mondiale des Organisations d'Ingénieurs



YOUNG ENGINEERS CAN CREATE

**THE
WORLD
WE WANT**

2018 Young Engineers Competition

Celebrating the Achievements of
Young Engineers in Advancing the UN
Sustainable Development Goals



**SUSTAINABLE
DEVELOPMENT**

GOALS

All project information and photographs have been
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Young Engineers Competition 2018



The UN Sustainable Development Goals (SDGs) integrate social, economic and environmental commitments—from reducing hunger and poverty, and improving health and work, to protecting the planet—in an inclusive and transformative way. Young engineers are critical to this process, both as active stakeholders in achieving the SDGs, and as future leaders to carry them forward.

The World Federation of Engineering Organizations' Young Engineers Competition is an outstanding opportunity for young leaders in the field to prove the value of their work in communities. This competition shows what happens when bright minds are challenged to come up with innovative solutions for people, to promote sustainable living and peace locally and beyond.

This competition highlights innovations in engineering to address agriculture, fishing, water and sanitation issues, facilitated by community partnerships. These innovations are reported to have positive effects, from children now accessing clean water in their school in Myanmar, to a Nepalese farmer who now uses sustainable and cost-effective energy to pump water. Thanks to competitors, a hospital in Uganda has a hygienic, eco-friendly sanitation system, and Ghanaian villagers have their first standpipe delivering water.

My congratulations to every young engineer that participated from around the world, in particular the competition winner and those 'highly commended' for their work. This competition, and the innovations it stimulates, shows that young engineers know how to come up with solutions for sustainable development, which should leave no one behind.

Dr. Flavia Schlegel, Assistant Director-General Natural Sciences Division, UNESCO



I am delighted to introduce the results of the inaugural WFEO Young Engineers' Competition which celebrates the achievements of our young engineering leaders and their achievements in advancing sustainable development. The UN Sustainable Development Goals take an integrated approach for future development, combining progress in economic prosperity, social inclusion and environmental sustainability. Each of these goals requires engineers and engineering.

Young engineers have a particularly important role in sustainable development, they are our future, as leaders, designers and implementers of the solutions that the world needs. This project showcases the best of their achievements from around the world from water and sanitation projects in Myanmar and Uganda, the implementation of renewable energy projects in China to projects that address food scarcity in the Philippines, Nepal and Peru.

I am delighted with the diversity of the submissions, geographically and by gender and the wide range of technologies and advanced concepts that were applied, including in rural and low income settings. The leadership by young engineers shows that the world is well placed to achieve its aspiration for sustainable development, especially through engineering.

Dr. Marlene Kanga AM FTSE Hon.FIEAust Hon.FIChemE WFEO President

We are very pleased to bring you the winner and commended participants of the keenly contested 2018 WFEO Young Engineers Competition for the best ideas and projects from young engineers around the world, who are advancing the UN Sustainable Development Goals through engineering. The Competition is a challenge aimed at bringing recognition and visibility to young engineers' ideas or projects while showcasing WFEO's commitment to the UN 2030 Agenda.

On behalf of the WFEO Young Engineers/ Future Leaders committee, I would like to congratulate Sim Siang Tze Victor, who has been invited and fully sponsored by the Kuwait Society of Engineers to share his ideas/project with GEC 2018 conference in London.

Ms. Zainab Al Garashi, Chair, WFEO Young Engineers / Future Leaders Committee, Vice President, WFEO.



The WFEO Young Engineers Competition – Celebrating the Achievements of Young Engineers Around the World in Advancing the UN Sustainable Development Goals

The World Federation of Engineering Organizations (WFEO) Executive Board and the WFEO Young Engineers/Future Leaders Committee is proud to host a competition for the best ideas and projects from young engineers around the world, who are advancing the UN Sustainable Development Goals through engineering.

Young engineers, below 35 years on 31 May 2018, were invited to submit an article or poster on their ideas or projects that they are currently working on and which advance sustainable development.

Young engineering leaders were invited to present their ideas and perspectives on one of the 17 Sustainable Development Goals. These goals take an integrated approach for future development, combining progress in economic prosperity, social inclusion and environmental sustainability. The implementation of these goals is a key objective of the Federation.

Approximately 150 submissions were received from 30 countries around the world, 11 percent of these were from women. The submissions were judged on the following criteria:

1. Impact of the project on achieving one or more of the targets underlying the United Nations Sustainable Development Goals
2. The engineering background of the author, and role in the project from an engineering perspective.
3. The level of innovation in addressing the underlying problem and how a solution has been developed
4. The quality of the presentation and the communication of the important and relevant issues of the project in terms of language, illustrations and photographs

The judging panel included WFEO President Dr. Marlene Kanga, WFEO President-Elect Prof. Gong Ke and Ms. Zainab Al-Garashi, Chair of the WFEO Young Engineers Future Leaders Committee.

The best submissions are published in this booklet with the permission of the authors and released during the Global Engineering Congress (GEC2018) in London on 22 October 2018. WFEO is co-hosting this Congress with the Institution of Civil Engineers (ICE, UK) as part of its 50th anniversary celebrations and the ICE 200 year celebrations.

The author of the best submission is invited to present their ideas during the GEC2018 conference in UK London on 22 October 2018.

Our thanks to the China Association for Science and Technology for the design of the booklet and Kuwait Society of Engineers, for sponsoring the publication of this booklet and the travel costs of the winner, both national members of WFEO.

WINNER: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Clean Water Access for Don Bosco School and Hlaing Thar Yar community, Myanmar.

Author: Dr Victor Sim Siang Tze

This is a philanthropic project through the Lien Environmental Fellowship (LEF) program to provide safe water to an underserved community in Hlaing Thar Yar. The LEF program is funded by the Lien Foundation and administered by Nanyang Environment & Water Research Institute (NEWRI), NTU Singapore. The project seeks to provide clean water access and sanitation to the community. Through the adoption of the Don Bosco School as a community partner, it seeks to support achievement of SDG Goal 4:



Quality Education and Goal 17: Partnership for the Goals. As the community has only polluted saline ground water available, a reverse osmosis (RO) treatment system has been developed to produce 5-10 cu.m. of drinking water daily.

NEWRI Community Development team worked with community leaders to generate nominal revenues from water sales. A smart sensor network, solar power and remote optimization analytics is used to optimize operating costs. Completion is expected in October 2018. The project provides free clean water to children of St John Bosco Kindergarten and a subsidized supply of potable water to the Hlaing Thar Yar community. Village residents have an affordable source of potable water. Close collaboration with community influencers such as the village head, Don Bosco School and local partners were also important in this project, bringing positive change in the community's overall well-being.

Project Author Biography: Dr Victor Sim is a Principal Engineer in Surbana Jurong, one of Asia's largest consulting firms. He was responsible for the leadership of NEWRIComm as its Deputy Director. A Chartered Engineer (Singapore) in Environmental and Water Engineering, he is also a member of the Institution of Engineers Singapore, (WFEO National member) Council (Young Engineers) for the term 2018-2020.

Acknowledgements: Project team members: Engineers: Mr Jason Yong (Mech.), Mr Lee Han Wee (Elec.), Mr Kong Jian Kai (Civil) Ms Josephine Chow (Project Manager), Mr Win Naing (Local Project Coordinator) Nanyang Environment & Water Research Institute, Nanyang Technological University, Singapore, Myanmar Chemical & Machinery Co, Centennial Construction & Management Co.

A philanthropic project to provide safe water to community in Hlaing Thar Yar, Yangon, Myanmar which benefits over 1,500 village residents.



System Installation



Children playing on the streets of Hlaing Thar Yar Village Myanmar

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Targeted Poverty Alleviation Supported by Geo-Spatial Information, People's Republic of China

Author: Shiqi Liu

The project is based on the current situation and needs of targeted poverty alleviation in Guizhou Province, China. Poverty reduction remains a daunting task given the 4.93 million of population living with low incomes in a complex geographical environment.

The project uses geo-spatial Information to analyze areas of poverty and supervise poverty alleviation projects and analyze their effectiveness.

A data collection and management platform collected poverty object data, basic geographic data, resettlement data and land remediation project data. A Precision Poverty Alleviation Management System was developed which included provincial, municipal, and county information.

Project results have been deployed to “Guizhou-Cloud Big Data”, and is used by the Poverty Relief Office, the Department of Land and Resources, the Public Security Bureau, the Immigration Bureau, provincial departments and the government of 10 cities in Guizhou province.

The project supported 20 billion RMB costs to relocate 500,000 people. The results have been widely reported in China’s mainstream media and other provincial departments have come to Guizhou to study the project.

Project Author Biography: Mr. Liu Shiqi is a GIS engineer who works in the Third Surveying and Mapping Institute of Guizhou Province. He has many years of experience in building geo-spatial framework of digital cities.

Acknowledgements: I would like to express my gratitude to all participants in the project and all those who have contributed to poverty alleviation.



Geographic Information System(GIS) mapping to provide accurate poverty alleviation services in Guizhou Province, China.



Heat map of settlements by levels of income



Poverty alleviation impacts August 2016(left) and August 2018(right)

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Solar Power for Rural Irrigation, Nepal

Author: Avishek Malla

Nepal has a predominantly agriculture-based economy with 67% of the total population dependent on agriculture. Over 50% of the agricultural land in Nepal does not have access to irrigation and rely solely on rainwater which is subjected to climatic vulnerabilities.

The project objective was to establish a renewable energy based, scalable, replicable and sustainable irrigation solution in the rural communities of Nepal through solar powered water pumps with an innovative financial model. Modern irrigation systems in rural areas generally rely on electricity or diesel which are high cost. Solar water pumps are an option but lack of familiarity with the technology and high upfront cost have been issues.



SunFarmer Nepal developed the BOOST model to provide irrigation services for Nepalese farmers. SunFarmer Nepal Builds, Owns, Operates the solar irrigation system and Strengthens the farmer's capacity through relevant training and facilitation. At the end of the agreement period, SunFarmer Transfers the ownership of the system to the farmer(s). Throughout the agreement period, the farmer makes agreed payments. SunFarmer provides long-term maintenance and guarantees system performance.

The project has been implemented in the districts of Chitwan, Makwanpur, Saptari and Dhading, in partnership with the Nepal government. It has de-risked farmer investments and irrigated 600,000 sq. meters of land. Total project value is US\$400,000 benefitting over 1000 people. 50% of the farmers are female with a repayment rate of above 98%. The project has produced over 1.7 million liters of water per day, increased crop yields, reduced labor, improved water use efficiency and doubled farmers' revenue. Diesel consumption for irrigation has reduced by 75%. Families have better food security and nutrition, education and health.

Project Author Biography: Avishek Malla is social entrepreneur with 10 years' experience in Renewable Energy. He started SunFarmer Nepal in 2014 and was awarded for best innovative business model for delivering solar energy services. He holds BE. Mechanical, Dip. Management from Kathmandu University, MSc. from Murdoch University, Australia.

Acknowledgements: The author wishes to acknowledge ICIMOD, APEC, Winrock International, Sana Kisan Cooperative and Practical Action for technical and financial collaboration.

Solar powered irrigation system available through innovative BOOST business model has benefitted over 1000 people in rural Nepal.



Solar Pump installed in a farm in Nepal



Nepalese Farmer with the solar power irrigation pump

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Aquaponic systems to ensure global food security, Peru

Author: Netty Dalma Malca Perez

AcuaponiCax is a social entrepreneurship project to address the challenges of global warming and to ensure food security in vulnerable communities through the implementation of aquaponic systems. The first system is being installed in the rural area of Cajamarca, Peru and will be operational in October 2018.

Aquaponics is the combination of aquaculture (raising fish) and hydroponics (the soil-less growing

of plants) that grows fish and plants together in one integrated system. The fish waste provides an organic food source for the plants, and the plants naturally filter the water for the fish.

Aquaponics enables food to grow at six times more per square foot than traditional farming while using 90% less water than traditional methods. Since water is recycled, food can grow in droughts and areas with little water and in any season. Plants twice as fast due to the naturally fortified water from the fish. For the commercial farmer, aquaponics produces two streams of income: fish and vegetables. Aquaponics does NOT require farmland with fertile soil, or even land with soil. Aquaponics can be done just as successfully on sand, gravel, or rocky surfaces, which could never be used as conventional farmland.

The system is expected to produce 5 tons per year of trout and 38,000 heads of leaf lettuce per year. It will be a source of revenues as well as a sustainable source of food for the community.

Project Author Biography: Netty Dalma Malca Perez is an Industrial and System Engineer and leads the AquaponiCax project that is supported by the Agriculture Ministry from Peru. She is Chief of the Department for Development of Productive and Enterprising Area at Los Andes de Cajamarca association.

Acknowledgements: Heartfelt gratitude to Violeta Vigo, Raul Benavides, Beiker Malca, Paola Cuellar, John Schrock, Fredy Becerra, Brian Pajares and Gala Korniyenko



Aquaponics as the future way to ensure sustainable global food security being tested in rural Peru.



Aquaponics Farming in Virginia USA



Aquaponix farm in Cajamarca, Peru, operations commence October 2018

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Solar energy for Venezuela's public hospitals, Venezuela

Author: Luis Alfredo Cabrera Andrade

In Venezuela there is a shortage of electricity supply. The installation of solar energy in Venezuela's hospitals. Using solar energy will improve health as blackouts occur daily for up to 8 hours, either by equipment failure or electrical cuts. From January to March of 2018 there were 2300 blackouts, according to the Venezuelan Association of Electrical Engineering, Mechanics and Related Careers (AVIEM) associated to the Venezuela's Engineers College, due to deficiencies in operations and maintenance of electricity generating systems.



There are a total of 300 public hospitals, therefore providing solar energy is the most feasible, efficient and effective solution. This will improve services for a newborn in his incubator, surgeons performing operations, laboratory analysis, storage of medicines, among other critical activities.

This justifies the investment of solar energy for public hospitals, guaranteeing the continuity of the electricity supply and thus ensuring the lives of thousands of patients.

The latitude of Venezuela and its climatological conditions allow better energy exploitation than in a lot of other countries such as Spain or Germany.

Solar energy has been implemented in hospitals in many countries. The implementation of solar energy in critical areas of hospitals will have a positive impact on the health outcomes of the citizens of Venezuela.

Project Author Biography: The Project Author is an engineer, young entrepreneur leader and a skilled person and with humanistic potential. He is committed to research, innovation, leadership and teamwork. He is President-Founder of the foundation of young engineers of Venezuela-Zulia.

Acknowledgements: I thank God first, my parents, the University of Zulia, the center of Engineers of Zulia and the young CIV foundation Zulia.

Improve health outcomes through the implementation of solar energy in Venezuela's public hospitals



Solar panels on Hospital Universitario de Mirebalais, Haiti 2013



San Cristobal's Central Hospital, Venezuela March 2018

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: An ecological sanitation project towards the well-being of the patients and the sustainability of the Kumi Hospital in Uganda with Engineers for Overseas Development (EfOD)

Author: Irene Serrano Gonzalez

The project was run by Engineers for Overseas Development (EfOD) and provides opportunities for UK based young engineers to contribute towards the development of sustainable humanitarian engineering work.

Kumi Hospital is a Private Not for Profit Facility General Hospital in Uganda. with an increasing demand for use. Volunteer engineers assessed the sanitation facility and developed plans to build seven blocks of eco-sanitation facilities including rainwater harvesting for hand washing and cleansing.

The concept of the eco-san system relies upon the separation of urine and excreta for separate forms of treatment and use. Beneath each eco-san cubicle, there is a double vault to store excreta. After a period of dehydration, of around eight months, the excreta can be removed and used as fertilizer. The urine is collected separately and diluted before being used as fertilizer. This process “closes the loop” recovering and recycling nutrients from excreta and urine which are then used in agriculture, providing a sustainable and innovative approach in the hospital for the treatment and use of these types of waste.

Local residents received information and training on rainwater harvesting and recycling of waste and maintenance of the latrines. A rainwater harvesting system for hand washing and cleansing was also installed. 25 patients will use each cubicle per day based on the hospital’s current requirements. The expected benefits include improved health benefits for patients and hospital staff.

Project Author Biography: Irene Serrano Gonzalez is a civil engineer and a graduate member of the Institution of Civil Engineers (UK), a national member of WFEO. She is a sustainability consultant in the Strategic Consultancy team in AECOM London and vice-chair of the EfOD London branch.

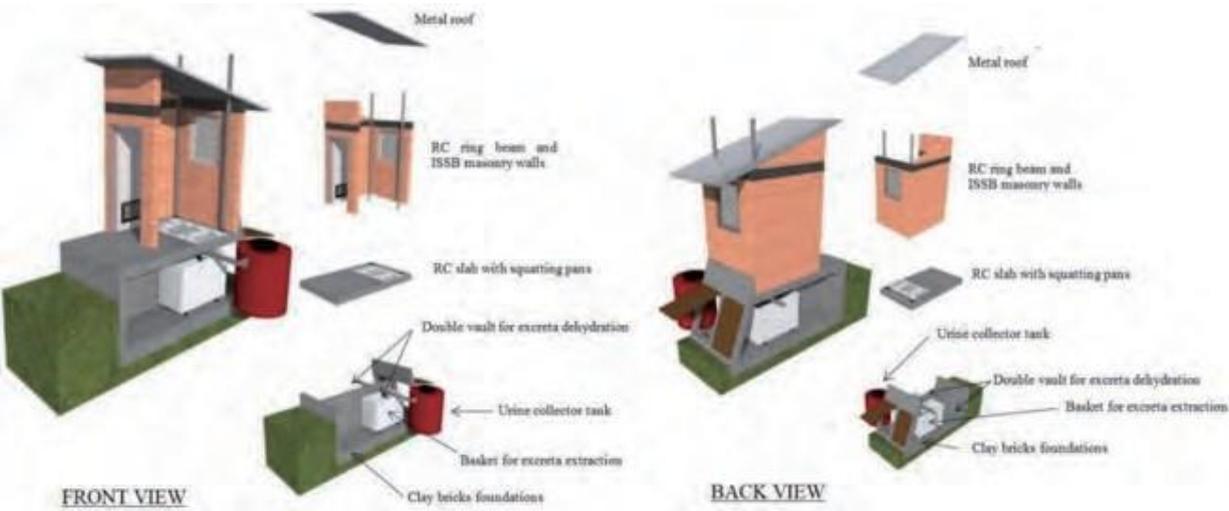
Acknowledgements: The author would like to express her gratitude to EfOD Konstantinos N. Kalfas, and to the rest of the members of this project. Special thanks to Positive + Architects for their kind contribution to the 3D sketch design.



Design of sustainable eco-sanitation facilities with improved health outcomes for hospital patients in Uganda.



Project team in Uganda



Schematics of eco-sanitation system for Kumi Hospital, Uganda

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: An IoT-based Water Quality Monitoring and Potability Prediction System for Rural Communities in the Philippines

Author: Melchizedek I. Alipio

The project is located in Barangay Tagapo, Sta. Rosa, one of the rural areas in the province of Laguna, Philippines. The project aims to provide immediate dissemination of information on water quality and potability in rural and underserved areas with poor or no mobile 3G and 4G/LTE coverage and thus, limited or no Internet connectivity.

The Hydra system uses sensor nodes to collect water parameters such as temperature, turbidity,

total dissolved solids and PH. The data is to a base station where data analytics predicts water quality. The predictive model is based on 500-sensor datasets from various rural areas randomly selected from CALABARZON region in the Philippines. The predicted water potability level is sent via SMS and the mobile communication network to each household in the region. The local government also uses the data for real-time water quality monitoring via a cloud server. Other government agencies, particularly health and sanitation officers, as well as non-government agencies can remotely access the data. The model achieved 93% accuracy of prediction and 98.96% reliability in terms of data delivery.

This project promotes access to safe and sustainable drinking water to rural and underserved areas by providing real-time notification to household families on water quality and potability. Also, the local government's health and sanitary officers can use the dataset obtained by the project as a reference for health-related programs in the community. It increases awareness of the community about the effect of water sources to water quality. It is a low-cost and time-efficient option to collect information and analyze water quality from different sources in rural communities.

Project Author Biography: Melchizedek Alipio is a licensed Electronics Engineer and currently an Associate Professor at Malayan Colleges Laguna, Electronics Engineering department. He is a member of Institute of Electronics Engineers of the Philippines (IECEP), Institute of Electrical and Electronics Engineers (IEEE), Internet Society (ISOC) and Pacific Telecommunications Council – ICT4D Research Group.

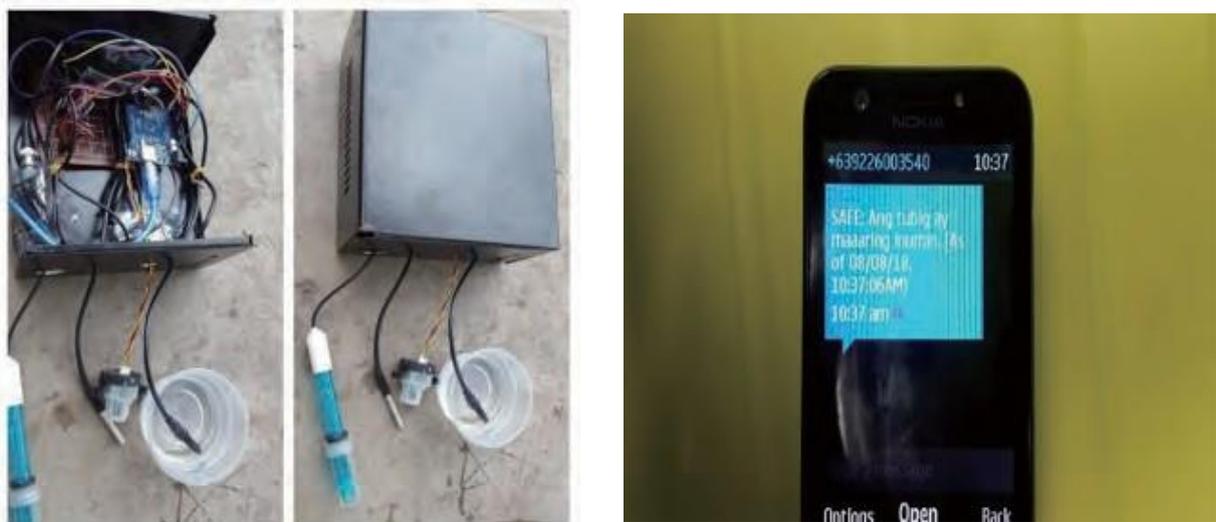
Acknowledgements: This project acknowledges the support of the Electronics Engineering Department of Malayan Colleges Laguna, Pulo Diezmo Cabuyao City Laguna Philippines.



Hydra system using water sensors and data analytics to provide real-time information and awareness on drinking water quality in rural communities



Rural water sources



Sensor nodes and SMS messages

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Solar Energy Submersible Pump, China

Author: Ling Zhou

This project was accomplished at Nation Research Center of Pumps, Jiangsu University, China. The aim is to provide an affordable water supply solution for arid areas, especially for developing countries. The continuously growing global water scarcity and the evidences for climatic changes require a refocus on reliable water supplies, especially in arid and semi-arid regions. Submersible Pumps are the core equipment of groundwater extraction.



The low-cost and high-performance solar energy submersible pump was designed after years of research and experimentation. Besides using solar energy, there are three main innovations in the pump: maximum head design, three-dimensional surface return diffuser design and double thrust bearing pair design.

According to the test data, the efficiency of new design is 5%~8% higher than similar products and the manufacturing cost are 25%~33% lower, making them more affordable for the rural communities, especially in developing countries. The new design has the advantages of low energy consumption, compact structure, lightweight, high reliability and good maneuverability.

A range of 18 submersible pumps have been designed, all of them are energy-saving and low-cost. This innovation was awarded the Silver Medal at the China International Industry Fair, and the Gold Prize of Innovation Patents in Jiangsu Province, China. The new design of solar energy submersible pump has been widely used in arid area of western China, such as Yunnan, Guizhou and Gansu province. The affordable price and high performance helps about 1.5 million people to get clean drinking water at low cost.

Project Author Biography: Ling Zhou is an Associate Professor at National Research Center of Pumps, Jiangsu University, China. Her research interests are in the area of hydraulic design and optimization of multistage centrifugal pumps. she has published over 30 peer-reviewed journal papers, co-edited four books in Chinese, and one in English.

Acknowledgements: This work was supported by National Natural Science Foundation of China, and Royal Academy of Engineering-(UK) Leaders in Innovation Fellowship.

New design of Solar Energy Submersible Pump with low-cost and high-performance features for affordable and reliable water supply for arid regions.



Submersible Pump design comparison – new design at right

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Greater Accra Metropolitan area (GAMA) Water Project (Batch 1), Ghana

Author: Ing. Emmanuel Adams

The Government of Ghana with support from the World Bank is implementing a series of water and sanitation projects, through the Ministry of Local Government and Rural Development and Ghana Water Company Limited (GWCL). The total cost of the project is US\$ 150 million. The Greater Accra Metropolitan Area (GAMA) water project is one of the flagship projects being undertaken to respond to the decline in access to clean water and sanitation.



The project is being executed in low-income communities in Accra-Ghana in the Accra Metropolitan Assembly (AMA), Ledzokuku Krowor Municipal Assembly (LEKMA) and Adentan Municipal Assembly (ADENTAN).

GWCL engaged ABP Consult Ltd to supervise the construction of the GAMA Water Project (Batch 1). The project, commenced in September 2016 for a duration of 18 months with a cost of US\$ 4.5 million. ABP Consult Ltd led the project management and planning. Ensuring compliance with the conditions of contract, quality assurance, time and cost control. The Contractors were ZIGMA Engineering, Ghana, Blessed field Ltd, Ghana and CHICO, China.

The project outcomes include a water 70 km distribution network, increased hydraulic capacity of the water distribution systems, which has boosted water supply, construction of 64 new public standpipes and 3000 new domestic water connections. The project has improved water service delivery to about 140,000 people within the priority low-income communities. Low cost service connections at US\$ 42 have been provided, compared to the usual cost of US\$300+. Residents who were displaced or economically affected during the construction phase were compensated through the Resettlement Action Plan (RAP).

Project Author Biography: Emmanuel Adams is a Civil Engineer and a member of Ghana Institution of Engineers (GhIE), a national member of WFEO. He was the Project Coordinator/Resident Engineer for GAMA Water Project. He worked with ABP for 9 years and is currently a management trainee with GWCL. Project. He worked with ABP for 9 years and is currently a management trainee with GWCL

Acknowledgements: Ing. Albert Ogyiri (ABP), Ing. Somuah Tenkorang, (GWCL), Ing. Solomon Oguah (ABP) and Ing Boachie-Agyeman (ABP) and the GAMA Team.

The Project is a significant intervention in addressing water supply challenges in pro-poor arid areas in metropolitan Accra.



Inspection and Handing Over of Double Tap Public Stand-pipe

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Supplying Affordable and Clean Energy through Multiple Energy Systems Integration, China

Author: Ning Zhang

China has the highest wind and photovoltaic (PV) generation capacity in the world but there is also significant wind and solar energy curtailment. A reduction of 1% percent of curtailment of renewable energy would save \$22.7 Million. Multiple energy systems (MES) integration addresses this issue and has been implemented in Technology Innovation park in Shanxi, Tongli new energy town in Suzhou and Beijing's subsidiary administrative center.



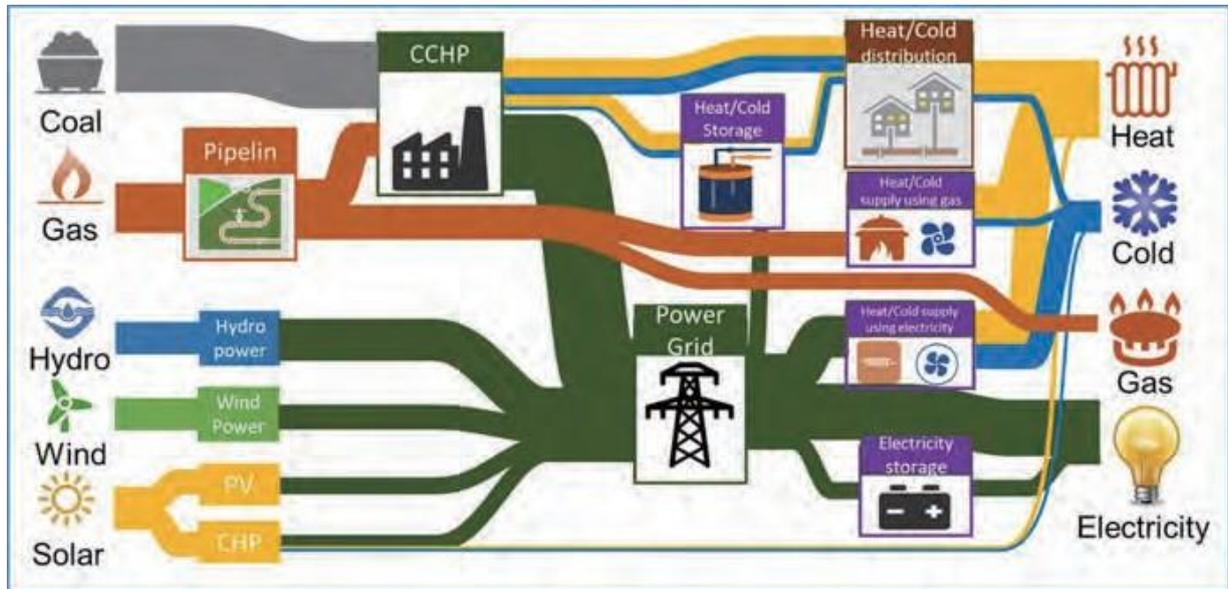
The objective of the research is to integrate the generation, transmission, storage and consumption of electricity, heat, cooling and gas subsystems in modern energy systems using information and communication technologies to optimize energy management. Since renewable energy such as wind power and PV is highly intermittent, different energy systems need to be closely coupled. Energy sources (input) and loads (output) are modelled using graph theory, where the characteristics of energy converters/storage and their topology are expressed in matrix form.

The advantage of the methodology is the ability to convert energy data into matrix form that can be analyzed by computers and the use of linear modelling for complex nonlinear systems. The approach allows the design of multiple energy systems without prior assumptions of the topology and capacity of the energy facility as well as energy flow configuration. The software has been used for planning multiple energy systems in China. It provides a basic blueprint for building an efficient urban energy system in China. The end use efficiency of the overall energy system has been improved by 30%, cost reduced 20% and use of renewable energy by 50%.

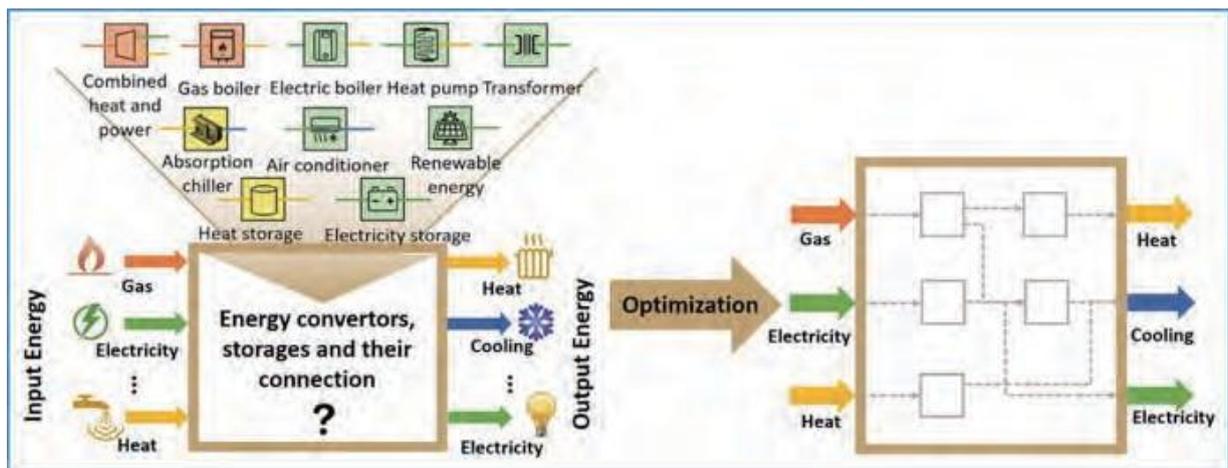
Project Author Biography: Ning Zhang is an Associate professor at Tsinghua University, who has received both B.S. and Ph.D. in 2007 and 2012 at Tsinghua University. His research interests include multiple energy systems integration, renewable energy, and power system planning.

Acknowledgements: The project is jointly supported by Major International (Regional) Joint Research Project of National Natural Science Foundation of China, the Major Smart Grid Joint Project of National Natural Science Foundation of China and State Grid and General project of National Natural Science Foundation of China. The research team includes Prof. Chongqing Kang and Mr. Yi Wang, Wujing Huang, Jingwei Yang, Yaohua Cheng and Zhenyu Zhuo from Tsinghua University, China and, Prof. Daniel Kirschen from University of Washington, USA.

Modelling approach for integrated planning of multiple energy systems to accommodate renewable energy sources in a highly efficient way.



Schematic diagram of energy flow in multiple energy systems



Example of multiple energy systems planning

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: The Capacity Assessment Tool for Infrastructure

Author: Geoffrey Morgan

The objective of the UNOPS Capacity Assessment Tool for infrastructure (CAT-I) is to help countries develop sustainable, resilient, human-centered, and inclusive infrastructure at all levels (national, regional, and municipal).

The tool creates a common language and framework for infrastructure identification, planning, and implementation in development.

CAT-I is an interdisciplinary multi-stage sub-indicator that provides an examination of build capacity.

CAT-I was piloted in collaboration with local government partners in Serbia, Nepal, and Mato Grosso State, Brazil. The pilots received positive feedback from the participating governments and discussions to implement CAT-I are progressing in Grenada, Uganda, Kenya, St Lucia, Haiti, Pakistan, Myanmar, Panama, and Laos.

Project Author Biography: Geoffrey Morgan is an Infrastructure Sustainability and Resilience Specialist at the United Nations Office for Project Services (UNOPS). He is a member of the Institution of Civil Engineers UK, a National member of WFEO and has worked on sustainability projects in sub-Saharan Africa, East Asia, Middle East, and Latin America.

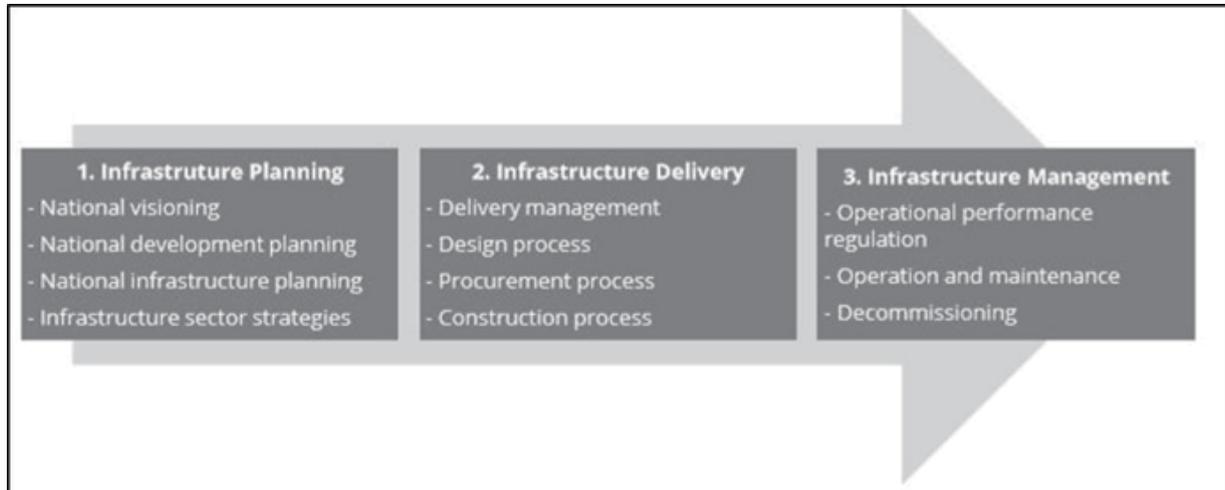
Acknowledgements: The author would like to thank everyone within UNOPS and our government partners who provided support to CAT-I's development.



government efficiency and effectiveness to understand impact.

Recognizing the importance and value of infrastructure, the CAT-I framework, the main indicator, is divided into 11 indicators and 91 sub-indicators. The CAT-I platform also provides guidance on implementation exercises. The CAT-I platform also provides support knowledge transfer and

The central aim of CAT-I is to help countries develop sustainable, resilient, human-centered, and inclusive infrastructure



The CAT-1 Assessment Tool



Graphical Representation of Infrastructure Capacity

COMMENDED: YOUNG ENGINEERS ADVANCING THE UN SDGs

Project: Geographical and Varietal Origin Determination and Mapping of Philippine Fishery Products for Traceability and Biodiversity Assessment using Stable Isotope Probing, Philippines

Author: Adonis P. Adornado

This research covers the entirety of the Philippine waters and has the objective to determine, map, and assess the geographical and varietal origin of various species of fishes and fishery products for traceability through stable isotope probing.

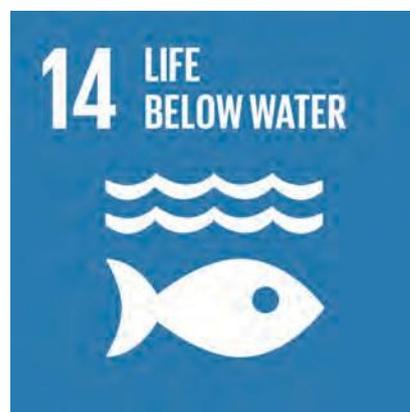
This project will use stable single- and/or multi-isotopes for probing / profiling (isotopic finger printing and analysis) fish species instead of DNA barcoding.

Isotope Analysis is the identification of isotopic signature to understand the flow of energy through a food web, to reconstruct past environmental and climatic conditions, to investigate human and animal diets in the past, for food authentication, and a variety of other physical, geological, paleontological and chemical processes. An Isotopic Signature is a ratio of non-radiogenic stable isotopes, stable radiogenic isotopes, or unstable radioactive isotopes of particular elements in an investigated material. The ratios of isotopes in a sample material are measured by isotope-ratio mass spectrometry against an isotopic reference material.

The research aims to establish a metagenomic library of isotope ratios for a variety of Philippine fish species. These efforts can be used for responsible consumption and production of fish, traceability and biodiversity assessment, analysis of impacts of climate change, and address illegal, unreported, and unregulated fishing.

Project Author Biography: Engr. Adonis P. Adornado, M.Sc. (cand.) is a licensed chemical engineer, graduating from Mapúa University in 2013. He is actively engaged in environmental research and has published several scientific papers.

Acknowledgements: Acd. Mudjekeewis D. Santos of Department of Agriculture - National Fisheries Research and Development Institute (DA-NFRDI) and National Academy of Science and Technology - Philippines (NAST-PHL), and Dr. Allan N. Soriano of Mapúa University for their continuous support and Engr. Federico "Fred" A. Monsada, President of Philippines Technological Council (PTC), WFEO National member.



Isotope signatures applied on fish species in Philippines water for marine creature conservation



REPUBLIC OF THE PHILIPPINES
DEPARTMENT OF AGRICULTURE
NATIONAL FISHERIES RESEARCH AND DEVELOPMENT INSTITUTE



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GEOGRAPHICAL AND VARIETAL ORIGIN DETERMINATION AND MAPPING OF PHILIPPINE FISHERY PRODUCTS FOR TRACEABILITY AND BIODIVERSITY ASSESSMENT USING STABLE ISOTOPE PROBING

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Considering the importance of fish trade in the globalization era especially in the Philippines, traceability and biodiversity assessment of fishery products through geographical and varietal origin determination and mapping is now the most in demand research perspective in the global food safety, marine conservation, and in illegal, unreported, and unregulated (IUU) fishing community.

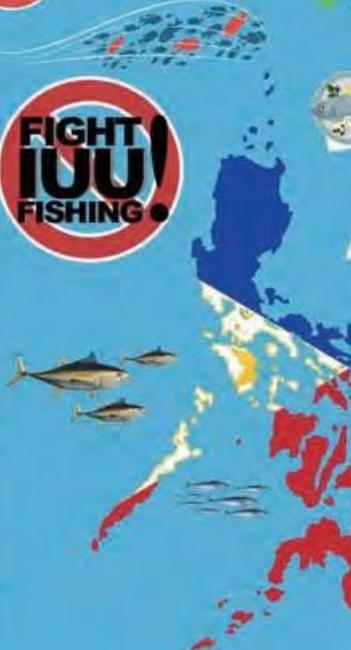
100% GUARANTEE



FOOD SAFETY

MARINE CONSERVATION

FIGHT IUU FISHING!



NO SUSTAINABILITY WITH OUT TRACEABILITY

SUSTAINABLE DEVELOPMENT GOALS

2 **ZERO HUNGER**



12 **RESPONSIBLE CONSUMPTION AND PRODUCTION**



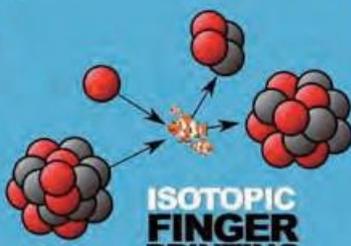
13 **CLIMATE ACTION**



14 **LIFE BELOW WATER**



ISOTOPIC FINGERPRINTING & ANALYSIS



Since it is very difficult and costly for DNA (barcoding) to track geographical and varietal origin of fishes (traceability), stable single- and/or multi-isotope profiling is more appropriate method to use. And establishing a metagenomic libraries of isotope ratios for variety of Philippine fish species will be a breakthrough in Science.

ISOTOPE ANALYSIS is the identification of isotopic signature. It can be used to understand the flow of energy through a food web, to reconstruct past environmental and climatic conditions, to investigate human and animal diets in the past, for food authentication, and a variety of other physical, geological, paleontological and chemical processes.

An **ISOTOPIC SIGNATURE** (also isotopic fingerprint) is a ratio of non radiogenic stable isotopes, stable radiogenic isotopes, or unstable radioactive isotopes of particular elements in an investigated material. The ratios of isotopes in a sample material are measured by isotope-ratio mass spectrometry against an isotopic reference material.



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Project: Vínculo comunitario (Community Link Project), Mexico

Author: **González Velázquez Rodrigo Israel & Gómez Guerrero Fernando**

Vínculo Comunitario is an interdisciplinary partnership project led by students of civil engineering and supported by various faculties that through infrastructure projects seeks the restructuring of the social fabric fulfilling the objectives of sustainable development.

The project is located in communities around the municipality of Celaya (Los Galvanes, La Trinidad,

Los Mezquites, Los Capulines and Los Arenales) and Salvatierra (Palo Blanco), in the state of Guanajuato, México.

The objectives were to mitigate the levels of marginalization and inequality in Mexico and provide housing and basic services and better education, raise awareness among young people and government authorities of social and environmental problems and develop solutions to community problems.

Infrastructure projects are identified to cover the basic needs of people while proving an opportunity to train the community in sustainable development practices. Projects completed to date include a pedestrian bridge, soccer field, ecotourism park, two potable water and sewage networks, rainwater collection systems, multiple use space and design of a school. The projects are delivered to the corresponding government entities for execution, at no cost.

Information workshops provide training and awareness of strategies that can support development in areas such as health and education. Communities are encouraged to grow their own food for economic and health benefits. Other courses promote greater awareness and care for the environment and natural resources. through cleaning campaigns, animal treatment, water care and the development of added value to cultivated products, and trade skills. These generate sustainable living, better social cohesion and reduced family violence.

Project Author Biography: We are two young Mexican civil engineers that believe that everything is possible. We fight against every obstacle or hard situation, and we try to demonstrate that if you work hard, with innovation, strategy, wisdom and with love, we can achieve all our dreams. This is just the beginning.

Acknowledgements: ANEIC, ALEIC, WCCE, FECIC, people of the communities and student participants. This is possible because you believe in us.



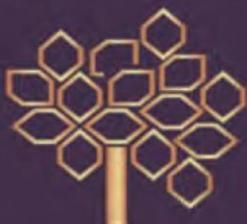
Sustainable living action community project and partnerships in Mexico



Vínculo comunitario (Community Link) and community partners



SUSTAINABLE DEVELOPMENT GOALS



World Federation of Engineering Organizations
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