

Progress Report

Project: Paving the way towards a Warwick Humanitarian Engineering Centre

Authored by Dr Georgia Kremmyda, Dr Volkan Degirmenci

1. Outline of the project

This project aims at developing a network between the potential contributors of a future Warwick Humanitarian Engineering Centre (WHEC). Humanitarian engineering is by its nature an interdisciplinary field aiming to benefit the society with emphasis on poor, marginalised, or under-served communities, which often lack the means to address pressing problems. Education and Research on this topic are inclusive of people from different backgrounds, dealing with challenges internationally (Figure 1) such as:

- a. Global Poverty
- b. Disasters mitigation, relief and recovery
- c. Refugee crisis relief
- d. Energy and Sustainability
- e. Fast growing population cities
- f. Culture preservation
- g. Social justice

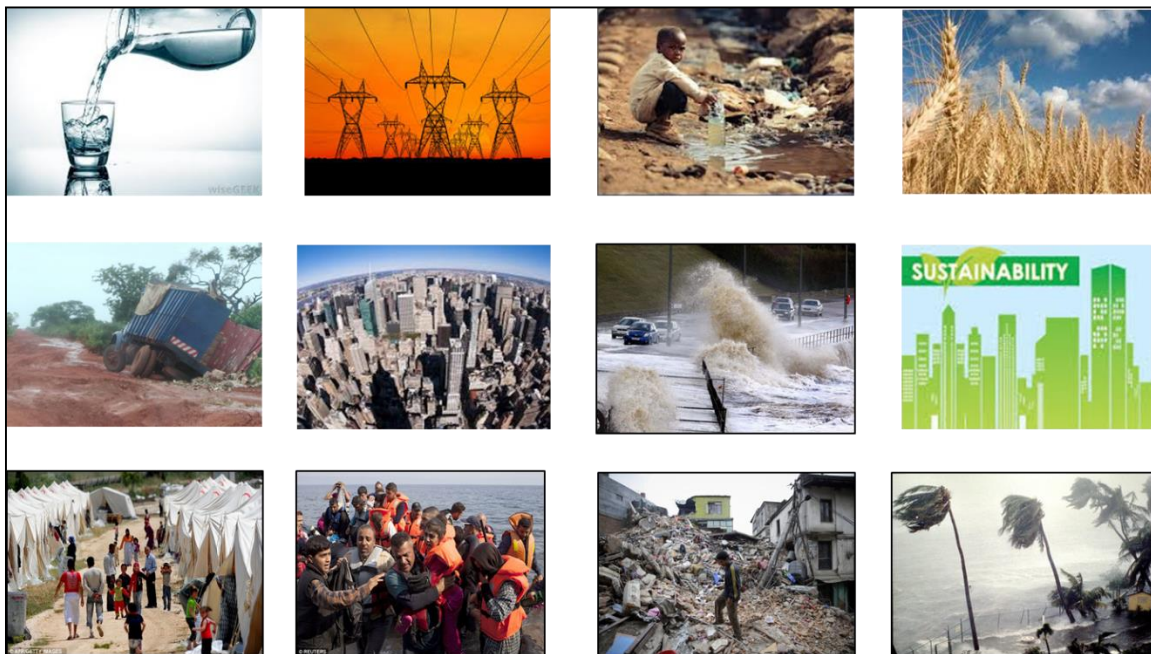


Figure 1. Humanitarian engineering as an emerging field

The aim of the present project is to initiate actions towards the development of a Warwick Humanitarian Engineering Centre which will encompass education and research in the field of Humanitarian Engineering. The teaching/learning approach will lead to highly trained

professionals to provide better designs and holistic solutions to humanitarian challenges while in parallel, the research approach will help build trust and ownership amongst the stakeholders and facilitate the implementation of new developments. The Centre's activities could be used from other innovators and communities to solve global humanitarian problems.

By the end of the project, a Warwick Humanitarian Engineering Society (WHES) will be established. WHES will encompass internal and external contributors such as students, scientists, engineers and practitioners from across academia, industry and non-governmental organisations that will share and promote knowledge in teaching and research across all aspects of engineering, from science to practical applications, which have a Global Humanitarian Impact.

An interdisciplinary module under the topic 'Introduction to Humanitarian engineering' will be developed to be offered by IATL to post-graduate students of several departments within the University i.e. Engineering (Civil; Chemical, Electrical/Electronic, Mechanical, Systems; Manufacturing); Natural sciences (Chemistry; Physics; Computer and Information Science; Materials); Health and Medical Sciences; Social Sciences (Economics; Law; Sociology; Politics and International Studies); Business (Management).

2. Timescale of the project

The project is having a total duration of six (6) months and it is structured in two Phases. The objectives of each phase are as follows:

Phase 1 (28 March 2016 to 31 July 2016)

- a. Identification of contributors from the University of Warwick, external specialists and professional bodies to participate in WHEC and WHES.
- b. Organising a Symposium on Humanitarian Engineering where potential contributors for the development of WHEC and WHES will come together to discuss, share and promote pedagogies, research and developments across all aspects of Humanitarian Engineering.
- c. Development of a strategic plan for Warwick Humanitarian Engineering Centre.

Phase 2 (1 August 2016 to 17 October 2016)

- a. Development of an interdisciplinary module to be offered by IATL to postgraduate students with the title '*Humanitarian Engineering: Theory and Practices*'.
- b. Dissemination of outcomes.

3. Progress to date

The project up to date has been running according to the timescale described previously with no delays or obstacles/challenges. Up to now the following progress has been made:

- a.** A working group has been established comprising of four (4) Warwick students (undergraduate and postgraduate) as below:
- Adam Dyson (1st year UG Engineering Student)
 - Chanelle Mistry (2nd year UG engineering Student)
 - Yung Lau (4th year UG Engineering Student)
 - Ryan Oozeerally (1st year PhD student)

The students contributed in the project by helping on the following tasks:

- Preparation and distribution of promotional material (flyer; booklet; banner)
- Organisation and participation in the delivery of the Symposium;
- Prepared the web page of the project;
- Prepared the web page of the Symposium;
- Publishing the Symposium on social media.

- b.** External specialists have been recruited and consulted

Mrs Katie Cresswell-Maynard

Mrs Katie Cresswell-Maynard is currently the Director of Education in Engineers Without Borders UK. She is responsible for the strategic leadership and oversight of EWB's activities and has a leading role in the learning and understanding of its members and the wider engineering sector. She is former Engineering Consultant in Arup's Cities, Energy and Climate Change team. Examples of experience include analysis of city wide programmes, production of strategies and collation of best practice case studies for the delivery of carbon reductions (in particular in the energy sector), climate change adaptation and most recently resilience in cities.

Katie has contributed to the project by preparing a list of humanitarian challenges based on real world problems faced by the communities with which EWB UK are working with. These problems span several disciplines including water and sanitation, renewable energy, the built environment, transport, waste management, Information Communications Technology and local industry, humanitarian law, cultural implications, social justice and heritage. Students who will undertake the interdisciplinary module will discuss the aforementioned projects and will be asked to reflect and provide solutions to them, with an emphasis on producing a design that is appropriate to the context in which it will be used, economically, socially and environmentally.

The report is already submitted and will be considered in Phase 2 during the development of the interdisciplinary module.

Dr Elizabeth Miles

Dr Elizabeth Miles is the Coordinator of UNESCO UNITWIN in Humanitarian Engineering. The UNESCO UNITWIN Network in Humanitarian Engineering and Computing aims to place cultural diversity and understanding at the heart of engineering and computing education. Dr Elizabeth Miles is also a Senior Lecturer in Project Management at Coventry University. She has led also the development of Coventry University's Humanitarian Engineering and Computing agenda for the past two years.

Elizabeth will contribute to the project by providing a report of approximately 8000 words covering the following topics:

- Beneficiaries of Humanitarian Engineering;
- Employers of Humanitarian Engineers; Industry/ Governmental and Non-Governmental Organisations
- Courses on Humanitarian Engineering offered by National/ International institutions;
- Best practices of Humanitarian Engineering curriculum;
- Backgrounds of students who enrol to the Humanitarian Engineering courses;
- Competencies that students develop;
- Experience of students on Humanitarian Engineering modules (what makes the modules popular; are students in favour of Humanitarian Engineering content in courses); Quantitative and qualitative data on the previous item, i.e. satisfaction rates, attendance of modules, etc will be provided.

The report requires critical gathering of information and is expected to be delivered by the end of August 2016.

- c. Identify potential contributors internally and externally to the University of Warwick for the support of WHES and WHEC

In this part of the project several potential contributors have been identified and contacted, and connections have been established between them and the project leads. A list of the affiliations of contributors who already agreed to be member of WHES and collaborate for the establishment of WHEC is as follows:

1. Internal Contributors
 - Global Research Priority on Sustainable Cities
 - School of Engineering
 - School of Law
 - Medical School
 - Centre for Interdisciplinary Methodologies
 - Warwick Business School
 - Institute for Advanced Teaching and Learning

Warwick Engineers Without Borders
Engineering Society

2. External Contributors

Engineers Without Borders UK
Women's Engineering Society
Manisha UK
RedR UK
Practical Action
Underground Professional Services (UnPS)
Institution of Chemical Engineers (IChemE)
Institution of Civil Engineers (ICE)
Royal Academy of Engineering
European Process Safety Centre

d. Symposium on Humanitarian Engineering

A Symposium on Humanitarian Engineering was organised on 4-5 July 2016. The Symposium was a two day event including twenty one (21) speakers from UK and abroad. There were five (5) international speakers coming from China, Indonesia, Bangladesh, France and Norway. The Symposium was attended by 92 participants.

The Symposium was funded by the project. It also received additional financial support from the Global Research Priority on Sustainable Cities. This financial support allowed to invite distinguished international speakers. This support covered accommodation and travelling expenses of the international speakers and a Symposium dinner.

The booklet of the Symposium is attached in Appendix A.

The Symposium successfully led to the development of a strong network between internal and external, national and international collaborators. This forms the basis for the development of WHEC. Fruitful discussions during the Symposium are expected to lead follow-up grant applications in the field of Humanitarian Engineering.

The Symposium was publicised on the web in the following link:

www.warwick.ac.uk/humanitarianengineering

e. The project is publicised on the web in the following link:

<http://www2.warwick.ac.uk/fac/sci/eng/research/grouplist/eerg/whec/>

f. Development of a strategic plan

A strategic plan for the development of WHEC was established and is included in a follow-up proposal successfully granted by IATL in the May 2016 round. The strategic plan includes as a next step the development of the first education element of WHEC on Humanitarian Engineering (Postgraduate Taught Masters Course) to be offered to students in 2018/19.

4. Next steps to the completion of the project

The second phase of the project is starting on 1st August 2016. Expected date for the completion of the project is 17th October 2016. During this phase an interdisciplinary module to be offered by IATL to post-graduate students with the title 'Humanitarian Engineering: Theory and Practices' will be developed and the outcomes of the project will be disseminated. The dissemination plan includes running activities to Schools around Warwickshire and Coventry to give an insight to students about humanitarian challenges from an early stage.

*31 July 2016
Dr Georgia Kremmyda & Dr Volkan Degirmenci*

Appendix A

Booklet of the Symposium on Humanitarian Engineering



WARWICK
THE UNIVERSITY OF WARWICK

Symposium on **Humanitarian Engineering**

4-5 JULY 2016

Welcome

This Symposium aims at **bringing together scientists, engineers and practitioners** from across academia, industry, and non-government organizations to **discuss, share and promote current research and recent developments across all aspects of engineering**, from science to practical applications, which have a global Humanitarian Engineering impact.

We aim to foster knowledge sharing, networking, and cooperation in Humanitarian Engineering field.

This is a two day Symposium organised in the framework of the project "Paving the Way Towards a Warwick Humanitarian Engineering Centre" generously funded by the Warwick Institute of Advanced Teaching and Learning (IATL). The Symposium is also sponsored by Warwick Sustainable Cities Global Research Priority (GRP).



Organisers

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Warwick Institute of
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Sponsored by

Warwick Sustainable
Cities GRP

Partners

United Nations Educational,
Scientific and Cultural Organization
UNITWIN Network in
Humanitarian Engineering

Day 1 (9:00 – 16:00) – Chair: Dr Volkan Degirmenci

- 09:00 – 09:30 Arrival; Registration
- 09:30 – 09:50 Welcome and Opening talk by Dr Georgia Kremmyda, University of Warwick
- 09:50 – 10:10 Dr Nicholas Monk, Institute of Advanced Teaching and Learning, University of Warwick
"Learning and Teaching in Cross-faculty Environments"
- 10:10 – 10:30 Professor Jon Coaffee, University of Warwick
"Designing for Risk, Crisis and Uncertainty: Humanitarian Engineering, Resilience and Sustainable Cities"
- 10:30 – 11:00 Professor Colin Eddie, University of Warwick & Underground Professional Services
"21st Century Infrastructure - New Thinking to Deliver a Sustainable Future"
- 11:00 – 11:30 Coffee Break
- 11:30 – 12:00 Dr Hongchuan Xin, Qingdao Institute of Bioenergy and Bioprocess Technology
"R&D of Renewable Energy in China: Impacts on Local Environment and Welfare"
- 12:00 – 12:30 Dr Anh Tran, Coventry University
"Empowering end-users of renewable energy using wireless sensor networks and education in the Philippines"
- 12:30 – 13:00 Dr Vagelis Plebris, Oslo and Akershus University College of Applied Sciences
"A Combined Particle Swarm - Ant Colony Optimization Framework for Emergency Post-earthquake Inspection Scheduling of Critical Infrastructures"
- 13:00 – 14:00 Lunch Break
- 14:00 – 14:30 Dr Sarah Peers, Women's Engineering Society
"Gender and Humanitarian Engineering"
- 14:30 – 15:00 Mr Brian Reed, University of Loughborough
"Global, Humanitarian, Sustainable, Appropriate, Development Engineering; What's behind the names?"
- 15:00 – 15:30 Dr Elizabeth Miles, UNESCO UNITWIN in Humanitarian Engineering
"Humanitarian Engineering, Humanitarian Education - A Case Study"
- 15:30 – 16:00 Mrs Katie Creswell - Maynard, Engineers Without Borders UK
"Inspiring and Educating the next generations of Globally Responsible Engineers"

Day 2 (9:00 – 16:00) – Chair: Dr Georgia Kremmyda

- 09:00 – 09:30 Arrival; Refreshments
- 09:30 – 10:00 Mr Nick Baveystock, Institution of Civil Engineers
"The challenges of post conflict reconstruction; A military practitioner's perspective"
- 10:00 – 10:30 Dr Ilan Kelman, University College London
"Disaster Diplomacy: Can humanitarianism in conflict zones create peace?"
- 10:30 – 11:00 Professor Andrew Williams, University of Warwick
"The impact of law on humanitarian operations"
- 11:00 – 11:30 Coffee Break
- 11:30 – 12:00 Professor Ian Guymer, University of Warwick
"CITYBLUES: A practical implementation of ecological and engineering principles in integrated stormwater management"
- 12:00 – 12:30 Dr Florent Chazarenc, École des Mines de Nantes
"Use of alternative wastewater treatment technologies under tropical climate in developing countries"
- 12:30 – 13:00 Professor Mohammad Shoeb, University of Dhaka
"Chemical contaminants in the environment and in the food chain in Bangladesh"
- 13:00 – 14:00 Lunch Break
- 14:00 – 14:30 Dr Oyinlola Oyebo, University of Warwick
"Slum Health: Challenges and Solutions"
- 14:30 – 15:00 Dr Ova Candra Dewi, Universitas Indonesia/NGO Bina Ekonomi Sosial Terpadu
"Community-based waste management approaches in Indonesia towards low carbon and eco-city"
- 15:00 – 15:30 Dr Colin Oram, University of Warwick
"Pico-Hydro Electricity in the Rwenzori Mountains of Uganda"
- 15:30 – 16:00 Closing talk by Dr Volkan Degirmenci, University of Warwick

Learning and Teaching in Cross-Faculty Environments

- Dr Nicholas Monk



Abstract

What is Interdisciplinarity in Learning and Teaching and Why Does it Matter at Warwick?

This presentation will consider, in relation to learning and teaching in higher education, the notions of disciplinarity: how disciplines organize their knowledge and set their parameters.

And multidisciplinarity: how disciplines share perspectives with those outside their individual fields.

Also, interdisciplinarity: what happens if these shared perspectives begin to challenge the pre-conceptions of partner disciplines and question their own, or discover hitherto overlooked synergies.

Finally, transdisciplinarity: a way to address an issue or problem that does not begin from a disciplinary stance but looks first at the nature of the problem or issue.



Biography

Dr Nicholas Monk is Associate Professor and Director of IATL. He is also adjunct Associate Professor in the Faculty of Arts at Monash University, Warwick's partner institution in Australia. He became an HEA National Teaching Fellow in 2013, and received Warwick's Butterworth Award for Teaching Excellence in 2008/9. He is responsible for IATL's suite of interdisciplinary modules, including 'Forms of Identity', which he co-teaches with Monash. He is lead author on *Open-space Learning: a Transdisciplinary Pedagogy* (Bloomsbury, 2011), and has published several journal articles on learning and teaching. He consulted in the discussions around the creation of the new engineering-based university in Herefordshire.

His other research interests include contemporary American fiction, and he has just completed a monograph on Cormac McCarthy for the University of New Mexico Press. He is also a contributor to the *Cambridge Companion to Cormac McCarthy* (2013). Before receiving his PhD from Warwick Nicholas studied at Rutgers University in the US where he received an MA in 2003. He has taught numerous modules in the Department of English at Warwick. He is Associate Director of Global Shakespeare. Nicholas runs workshops across the University faculties, and for the Learning and Development Centre. He is supervising PhDs on both American literature and Shakespeare.

Designing for Risk, Crisis and Uncertainty: Humanitarian Engineering, Resilience and Sustainable Cities

- Professor Jon Coaffee



Abstract

In this presentation I will showcase the ongoing work of the University of Warwick's Sustainable Cities Global Research Priority and illuminate how emerging work on risk, crisis and uncertainty are central to its mission to enhance the long-term sustainability and resilience of urban areas.

Overall this work brings together a range of interdisciplinary expertise and is brought into dialogue with international frameworks to improve disaster recovery, promote sustainable development and facilitate climate change adaptation. I will also reflect upon centrality of discourses of adaptation and resilience in the practices of international development which stresses the importance of attempts to enhance the adaptive capacity of the state to function and be more self-sufficient, stressing the importance of local capacities, vulnerabilities and agencies.

This emphasis on more adaptive resilience follows disillusionment with liberal internationalist understandings that Western or international actors could resolve problems of development through the export of liberal institutions and process of grand planning. With a focus placed upon adaptable local governance and bottom-up approaches, resilience is thus placed at the core of the international development agenda ushering in a more adaptive approach to fragility, where ambitions are downscaled and in which the importation of Western-like governance institutions are replaced by a focus on locally contextual, adaptable and appropriate solutions.

Biography

Jon Coaffee is Professor in Urban Geography based in the School of Politics and International Studies at the University of Warwick, UK. At Warwick Jon has established the Resilient Cities Laboratory, and directs the Warwick Institute for the Science of Cities. He is also co-lead of the Sustainable Cities Global Research Priority. His research focuses upon the interplay of physical and socio-political aspects of urban resilience and he has also published widely, especially on the impact of terrorism and other security concerns on the functioning of urban areas. During this research he has worked closely with a range of private and governmental stakeholders to ensure his research has real world impact.

This work has been published in multiple disciplinary areas such as political science, geography, town planning, sociology and civil engineering. Most notably he published *Terrorism Risk and the City* (2003), *The Everyday Resilience of the City* (2008), *Terrorism Risk and the Global City: Towards Urban Resilience* (2009), *Sustaining and Securing the Olympic City* (2011) and *Urban Resilience: Planning for Risk, Crisis and Uncertainty* (2016).

His work has been supported by a significant number of EU and UK Research Council grants. Jon is also an Exchange Professor at New York University's Center for Urban Science and Progress (CUSP).

21st Century Infrastructure - New Thinking To Deliver A Sustainable Future

- Colin M Eddie FREng BSc CEng FICE



Abstract

All experts agree that paradigm shifts in the way we live our lives are urgently required if we are to conserve the planet's resources and limit global warming.

Civil Engineers have long boasted that they have saved more lives than the Medical Profession through improved water supply and sanitation; albeit sadly largely in first world countries.

It is now time for Civil Engineers to make their next contribution by delivering smarter transportation and urban living solutions.

In this talk, Colin will draw upon his experience within the Tunnelling industry to propose solutions for some of the World's current Civil Engineering and Humanitarian challenges. He will look at the development of innovative materials and new applications for underground space.

Biography

Professor Colin Eddie is Managing Director of UnPS Limited (A Morgan Sindall Group Company).

With 35 years of experience in the tunnelling industry, he is passionate about the effective integration of design and construction to improve safety & sustainability.

He is responsible for a specialist design group that has delivered over £2bn of underground engineering and proud to have been associated with the introduction of many tunnelling innovations.

In 2005 he was honoured to have been invited to become a Fellow of the Royal Academy of Engineering. In recognition of his achievements in tunnelling, he was awarded the ICE John Mitchell Gold Medal in 2014. In 2015 the Royal Academy appointed him "Professor of Innovation and Tunnelling" at the University of Warwick.



R&D of Renewable Energy in China: Impacts on Local Environment and Welfare

- Dr Hongchuan Xin



Abstract

The Chinese Academy of Sciences' Qingdao Institute of Bioenergy and Bioprocess Technology (QIBEBT) is one of China's primary national research institutions for renewable energy, focusing mainly on R&D of bio-based energy and materials.

QIBEBT has made significant progress in: 1) biomass gasification for gasoline production, 2) biorefinery of agricultural biomass for production of gas/solid fuel and organic fertilizer, 3) catalytic conversion of waste oils to liquid transportation fuels, 4) cyanobacterial cell factories for photosynthetic carbon fixation and biochemicals production, 5) novel perovskite solar cells, etc. These R&D have contributed significantly to the improvement in local environment and welfare.

Biography

Hongchuan Xin is the deputy director of Science and Technology Department of Qingdao Institute of Bioenergy and Bioprocess Technology (QIBEBT), Chinese Academy of Sciences (CAS).

Hongchuan Xin received a B.S. and a M.S. degree in chemical engineering from the Dalian University of Technology (China), and a PhD in physical chemistry from the Dalian Institute of Chemical Physics, CAS.

He was a visiting scholar at the Eindhoven University of Technology (The Netherlands). He did his postdoctoral research at the Korea Advanced Institute of Science and Technology (Republic of Korea), before joining QIBEBT as an associate professor in 2011. He was appointed as the deputy director of Science and Technology Department of QIBEBT early 2015, and currently chairs the international collaboration office.

With 15 years experience in academic research, Hongchuan Xin has published over 35 peer-reviewed papers (with total citation of over 500 times and h-index of 15) and issued 2 patents.



Empowering End-Users Of Renewable Energy Using Wireless Sensor Networks And Education In The Philippines

- Dr Anh Tran



Abstract

In the Philippines, 16 million people lack access to electricity due to 1) the geographical spread of this archipelago nation composing of more than 7,500 islands and 2) politics, which prioritises large energy infrastructure projects on the main populous region of Luzon. 40% and 23% of 16 million people without access to electricity are in Mindanao and Visayas regions respectively.

Off-grid systems are an option to remote areas where the main grid is not feasible. In 1999, a private business installed a PV plant on Pangan-an Island to service a community of over 450 households. Seventeen years on, the community suffers energy challenges which relate to the technical design as well as from the poor management of the system. Lack of maintenance of the system and lack of energy awareness has resulted in constant black outs and restricted use of the system.

This research project aims to investigate how a wireless sensor network and energy awareness programmes can empower end-users of renewable energy systems to achieve their energy aspiration and produce meaningful social, environmental and economic benefits for the community.

Biography

Dr. Anh Tran is a Senior Lecturer in Humanitarian Engineering at the Faculty of Engineering, Environments and Computing at Coventry University, which she joined

in 2015. She is also spear-heading the research programme for the UNESCO UNITWIN Network of Humanitarian Engineering, in which Coventry University is the global lead institution.

She also has more than 9 years' experience in international development work. Her research interests are in the area of Appropriate and Humanitarian Technology. Her current research projects are in 1) the use of fluorescence spectroscopy to assess water quality in areas of poor sanitation and disaster relief, 2) floating biodigesters - a renewable energy, waste and sanitation solution for communities living on the water and the social enterprise models to bring this technology to market, 3) renewable energy and wireless sensor networks, 4) humanitarian drones for disaster relief - thermal imaging for search and rescue, 5) 3D scanning and printing for medical aid, 6) global competencies and intercultural awareness of engineers and 7) raising aspiration and widening participation in science, technology, engineering and mathematics (STEM) through Humanitarian Engineering outreach programs.

Anh was the co-founder of the Engineers Without Borders Challenge (EWB Challenge), an international design competition for first year university curriculum for engineering and non-engineering students to learn about design, sustainable development, team work and communication through real and inspiring sustainable development projects.

A Combined Particle Swarm - Ant Colony Optimization Framework for Emergency Post-earthquake Inspection Scheduling of Critical Infrastructures - Dr Vagelis Plevris



Abstract

Infrastructure networks are vital for the well-being of modern societies; national and local economies depend on efficient and reliable networks that provide added value to an area's social and economic growth.

Natural hazards such as earthquakes, floods or tornadoes can cause extensive failure of critical infrastructures including bridges, water and sewer systems, gas and electricity supply systems, communication systems and hospitals.

Following a natural hazard, the condition of structures and critical infrastructures needs to be assessed and damages have to be identified; inspections are therefore necessary, since failure to rapidly inspect and subsequently repair infrastructure elements can delay search and rescue operations and relief efforts.

The objective of this study is scheduling structure and infrastructure inspection crews following an earthquake in densely populated metropolitan areas. A model is proposed and a decision support system is designed to aid local authorities in optimally assigning inspectors to critical infrastructures. For this purpose, a combined Particle Swarm - Ant Colony Optimization based framework is developed which proves to be an instance of successful application of the philosophy

of bounded rationality and decentralized decision-making for solving global optimization problems.

Biography

Dr. Vagelis Plevris is an Associate Professor at the Department of Civil Engineering and Energy Technology of the Oslo and Akershus University College of Applied Sciences in Oslo, Norway. He holds a 5-year Bachelor's Degree in Civil Engineering from the National Technical University of Athens (NTUA) with specialization in Structural Engineering. He also holds an MSc from NTUA on "Structural Design and Analysis of Structures", a Master in Business Administration (MBA) from Athens University of Economics and Business (AUEB) and a PhD from the School of Civil Engineering of NTUA.

The title of his Doctoral Thesis was "Innovative Computational Techniques for the Optimum Structural Design Considering Uncertainties". His research interests include (i) Finite Element Method (FEM); (ii) Static and Dynamic Analysis of Structures with FEM; (iii) Earthquake Engineering; (iv) Optimum Design of Structures; (v) Reliability and Probabilistic Analysis of Structures; and (vi) Neural Networks and their Applications in Engineering.

His published work includes more than 60 articles published in peer-reviewed journals, conference proceedings and edited books.

Dr. Plevris is married and has a daughter and a son. He speaks English, German, Italian and Greek.

Gender and Humanitarian Engineering

- Dr Sarah Peers PhD PGCE MSc BSc MIET MIKE FWES FRSA



Abstract

It is women who are most affected by crisis. And it is engineers who do much to provide logistical and infrastructural support to recover from disasters and conflict. Across most of the developed world there are a minority of engineers who are women. This presentation explores the following questions:

Does it matter if there are no or few women engineers carrying out humanitarian works? Gender in humanitarian aid is a relatively new area of work, where only in the past decade or so have there been systematic attempts to consider gender in the analysis of fragile contexts. Practical attempts to mainstream gender equality are still sparse. What is the state of women in humanitarian engineering?

Can humanitarian engineering have a role in increasing gender diversity in engineering? In the UK and other western countries, the engineering sector struggles to make engineering attractive to a wider and more diverse population of potential recruits and talent. It is claimed that "big picture stories" that highlight the importance of engineering to solve real world problems are particularly effective in the promotion of engineering. Does humanitarian engineering provide yet another "story"?

The last, but possibly most important gender/humanitarian engineering intersection to be explored is that of the empowerment of women after crisis. Is there a role for women engineers to enable beneficiaries of humanitarian programmes to value women as agents for change?

Biography

Sarah is a trustee and Fellow of the Women's Engineering Society (WES), one of the oldest organisations inspiring women to be engineers, scientists and technical leaders; she is also a Fellow of the RSA, a member of the Institute of Innovation & Knowledge Exchange and of the Institution of Engineering & Technology. As Vice President of WES, Sarah is a champion of diversity in the engineering and technology sectors.

Her background is mathematics: a degree from University College London (UCL) followed by masters, and much more recently a PGCE in secondary maths. Her PhD is in mechanical engineering from UCL, where as a lecturer she engaged in international technology transfer. As part of major European projects, she led development of reliability- and AI-based decision support systems for planning maintenance of offshore structures. Sarah has over 15 years of teaching experience at higher and further education levels, and is currently a director at the STEM Foundation (until recently the New Engineering Foundation), overseeing programmes supporting FE colleges with vocational STEM (science, technology, engineering and maths) education.

Sarah is now engaged in a world first, an energy festival in Cumbria, EnergyUnearthed, aimed at increasing public understanding of energy and climate change, using STEAM (STEM+ the arts) to engage with the young and not-so-young, and highlighting Cumbria's unique global contribution to the energy sector.

Global, Humanitarian, Sustainable, Appropriate, Development Engineering; What's behind the names?

- Mr Brian Reed



Abstract

The need for civil engineering to have a more human approach has been identified by many commentators, including Prince Charles. Different approaches have been suggested, each with their own set of terminology and salient points. This presentation explores this poorly defined area and looks at the defining characteristics of each sub-set.

Biography

Brian is a lecturer in water and sanitation for low-income countries, teaching at undergraduate, postgraduate and professional development levels. He is particularly interested in holistic and multidisciplinary aspects of water and sanitation and this is reflected in the wide range of subjects he teaches, from making concrete to gender aspects of engineering projects, and the book he edited on 'Infrastructure for All'.

As a Chartered Environmentalist, Brian teaches modules on Environmental Assessment and Integrated Water Resource Management, as well as contributing to many other modules. In terms of research, areas of interest relate to the 'gaps and overlaps' between more traditional topics, such as management of water and sanitation facilities in emergencies, the institutional aspects of urban drainage or how engineers can contribute to development.

Research and teaching are brought together in his work on capacity building - looking at who needs the skills required for delivering sustainable services and how these skills can be developed. On a lighter note, Brian is collecting examples of water pots and latrine slabs from around the world which leads to interesting conversations at airports!



Humanitarian Engineering, Humanitarian Education - A Case Study

- Dr Elizabeth Miles



Abstract

Dr Miles will present and discuss the journey that Coventry University took to become the hosts of the UNESCO UNTWIN in Humanitarian Engineering from the perspective of the Faculty of Engineering Environment and Computing. She will review lessons learnt and plans in place to look at where Humanitarian Engineering with in the Faculty is to be directed in the future.

Biography

Network Coordinator of the UNESCO UNITWIN in Humanitarian Engineering, Senior Lecturer in Humanitarian Engineering, Policy Fellow at the Department for Education.

Lizzie studied Engineering at Leeds University from 1986 - 1994 when she gained her Ph.D. After a post-doctoral position at Cambridge University she was awarded a Royal Society Fellowship to study for 2 years in the National Research Institute for Metals in Tsukuba Science City, Japan. Upon her return she took a position in her family's heavy engineering company, becoming the third generation to join the business and remained with the company 3 years.

She began her teaching career as an academic at Coventry University teaching engineering management, entrepreneurship and business start-up eventually became the Business Development Manager for Entrepreneurship across the University as a whole.

In 2007 Lizzie joining the Royal Academy of Engineering initially as an Education Innovator but later as the Project Director for the HEI strand of the London Engineering Project, a government funded initiative designed to increase the number of people studying engineering at university. She returned to Coventry University as a Senior Lecturer in Project Management but discovered her passion for engineering had changed direction.

After being awarded a Vodafone World of Difference scholarship to work with the charity 'Engineers Without Borders UK' she began to investigate how engineering was used to support society across the globe. Taking the network that she made through this process she developed the UNESCO UNITWIN in Humanitarian Engineering, a global network of universities, NGO's and industries with likeminded initiatives that use engineering to support individuals or communities with problems that they need assistance with.

This has now grown to an award winning set of undergraduate modules, an MSc, an outreach programme supported by the Royal Academy of Engineering that is being rolled out across the globe and Lizzie now has a partial secondment to the Department for Education using her expertise to audit their outreach programmes for inclusivity and diversity.

Inspiring and educating the next generations of Globally Responsible Engineers

- Mrs Katie Cresswell-Maynard



Abstract

In 2016, the scale of the challenges facing the global community is enormous. Resource constraints, the effects of climate change, increasing urbanisation and a global population that is rapidly expanding are some of the big challenges that we must face and address.

In the global community we live in, all of us are affected, and all of us are responsible for taking action. Engineering is pivotal to catalysing the change the world needs to address these challenges and is therefore central to the responses.

For this to happen we need engineers to be able to navigate these complex social challenges and respond in a globally responsible way.

For Engineers Without Borders UK this goes beyond just focusing on those considered to be most vulnerable, this is a task for every engineer in every engineering project and so we seek to lead a movement that inspires, enables and influences global responsibility through engineering.

Biography

Katie Cresswell-Maynard is Head of Education at Engineers Without Borders UK overseeing the organisation's work to inspire generations of globally responsible engineers. This is delivered through engaging school children to discover the vital role of engineering in everyday life and how engineers make a difference, working with academics to deliver higher education curriculum allowing students to explore the ideas of being a globally responsible engineer and increasingly, partnering with organisations to share and collaborate on resources.

Previously she was a consultant in the energy, cities and climate change team at Arup informing policy makers about sustainable engineering interventions.



The challenges of post conflict reconstruction; A military practitioner's perspective

- Mr Nick Baveystock - Director General, Institution of Civil Engineers



Abstract

Conflict almost invariably results in disruption to social, economic and political infrastructure. But the real damage is most usually to society as fear, rumour, polarisation of opinion and lack of resource are exacerbated when families find they can no longer rely on even the most basic infrastructure. Local shortage leads to tension, fracture, and ultimately violence. Rapid repair and reconstitution of infrastructure to support the rule of law, economic growth and basic life support is critical. Delay provides a focus for dissent, factionalism and infighting.

Post conflict reconstruction needs continuity, long term strategic thinking, and, above all, a credible vision that is owned by local communities. Imposition of external values, solutions and processes is almost always a recipe for failure. Solutions require time, empathy and communication and engagement. Tactical commanders need to accept that the effect of their actions may not become apparent until long after they have left the country in which they have been operating.

In his talk Nick Baveystock will draw out the challenges faced by the military in identifying critical infrastructure needs, the effects that post conflict reconstruction projects need to deliver, the political and policy constraints, and the way the military can kick-start post conflict relief programmes. He will set out the methodology used in various campaigns to enable the creation of long term development programmes. And he will

look at the interfaces between military engineers, government, industry and humanitarian agencies and how they can best be managed.

Biography

After schooling in England and France, Nick joined the British Army's Royal Engineers. He commanded Royal Engineer units at all ranks up to Brigadier, and has wide experience of delivering engineering programmes; notably nearly 10 years leading international post conflict reconstruction and development in Southern Iraq and the Balkans.

After an early career in Germany, Northern Ireland and the Balkans, he spent time in the MOD's Directorate of Military Operations; as personal staff officer to both the Assistant Chief of the Defence Staff (Operations) in UK and to the Commander of NATO forces in Kosovo. He commanded a regiment in Kosovo, Bosnia, and in Southern Iraq. With 1 (UK) Armoured Division he deployed to Iraq again, as Chief of Staff Multinational Division (South East) and then as Chief Engineer.

As a Brigadier he commanded the Royal School of Military Engineering, leading the £3.2 Bn RSME Public Private Partnership. On the boards of Engineering UK, the Construction Industry Council, he is a NED for Women in Science and Engineering (WISE), Vice Chair of Thomas Telford Ltd and an alumnus of the Royal College of Defence Studies.

Disaster Diplomacy: Can humanitarianism in conflict zones create peace?

- Dr Ilan Kelman



Abstract

Disaster diplomacy examines how and why disaster-related activities do and do not create peace and reduce conflict. Disaster-related activities refer to actions before a disaster such as prevention and mitigation along with actions after a disaster such as emergency response, humanitarian relief, and reconstruction.

This presentation explores disaster diplomacy theory and practice, examining case studies from around the world to demonstrate the lack of evidence that humanitarianism is a prominent factor in conflict resolution. Instead, disaster-related activities often influence peace processes in the short-term - over weeks and months - provided that a non-disaster-related basis already existed for the reconciliation. This basis could be secret negotiations between the warring parties or strong trade or cultural links.

Over the long-term, disaster-related influences disappear, succumbing to factors such as leadership changes, the usual patterns of political enmity, or belief that an historical grievance should take precedence over disaster-related bonds.

The fundamental reason is that political priorities usually exist other than saving lives before or after disasters. Thus, a moral dilemma emerges that humanitarianism is fundamentally political, but to be most effective, it might be necessary to claim that it is apolitical.

Biography

Ilan Kelman www.ilankelman.org and Twitter @IlanKelman is a Reader in Risk, Resilience and Global Health at University College London, England and a fellow at the University of Agder, Norway. His overall research interest is linking disasters and health, including the integration of climate change into disaster research and health research. That covers three main areas: (i) disaster diplomacy and health diplomacy www.disasterdiplomacy.org ; (ii) island sustainability involving safe and healthy communities in isolated locations www.islandvulnerability.org ; and (iii) risk education for health and disasters www.riskred.org



The Impact of Law on Humanitarian Operations

- Professor Andrew Williams



Abstract

How does law affect humanitarian operations? From the protections offered humanitarian workers during military conflicts to the human rights of citizens in receipt of humanitarian relief, to responses to disasters, international and local laws have an impact on all humanitarian-inspired interventions. This talk will map out some of the legal issues involved.

Biography

Andrew Williams is a Professor of Law at the University of Warwick. He was previously a practicing solicitor, working in London and, for a time, in Malawi, and now directs the Centre for Human Rights in Practice. He is the author of the 2013 Orwell Prize winning book, *A Very British Killing*, which told the story of a murder committed during the UK's occupation of Iraq.



CITYBLUES: A practical implementation of ecological and engineering principles in integrated stormwater management

- Professor Ian Guymmer



Abstract

On behalf of Professor Jean O. Lacoursière (Kristianstad University), the talk will outline "CityBlues", an EU Human Resources Development (Asia-Link HRD) project.

The primary project objective was to strengthen the capacity of five partner higher-education institutions in delivering existing curricula requiring the full integration of engineering and ecological principles by 1) developing teaching compendia and multi-media support material directly addressing gaps identified among the Partners undergraduate and graduate programmes; 2) strengthening the teacher's own capacity to dynamically link theoretical and practical notions through hands-on participation in a multidisciplinary applied research project involving practitioners; and 3) by pro-actively supporting a problem-solving-based teaching through promoting linkages between faculty research and practitioners emerging needs.

The Development Objective in Urban stormwater management, implemented in a fully integrated approach to ensure the optimum balance between flood-protection and water quality enhancement at every phase - planning, design, operation and maintenance - to minimise negative impacts on receiving water bodies and to enhance the quality of life in urban environments.

Biography

Ian Guymmer graduated from Loughborough University of Technology, in 1981 in Civil Engineering. This was followed by a PhD, awarded from the University of Birmingham in 1985. His first academic appointment was at Heriot-Watt University, Edinburgh, followed by an appointment in 1990 to the lecturing staff within the Department of Civil and Structural Engineering at the University of Sheffield.

In January 2005, he accepted the position of Professor of Civil Engineering within the School of Engineering at the University of Warwick. He is a Chartered Engineer and a Member of the Chartered Institution of Water and Environmental Management. His research interests are centred around the transport and mixing of solutes and fine suspended sediments within civil engineering hydraulics and more recently, their effects on the receiving water environment. Research projects have been concerned with mixing processes in urban drainage systems, looking at specific components, such as manholes and combined sewer overflow structures, river systems, quantifying dispersion effects due to topographic variations, estuarine studies and coastal mixing processes.

In recent years, his research has been funded by EPSRC, NERC, Water companies, the Environment Agency and the Highways Agency (Highways England). In January 2016 he was appointed as the 1st Academic in Residence for the Institution of Civil Engineers under their Shaping the World initiative.

Use of alternative wastewater treatment technologies under tropical climate in developing countries

- Florent Chazarenc



Abstract

In 2008 half of the world population was living in rural area. The contribution of partially treated or untreated effluent from small collective and non-collective domestic sources has been widely recognize as a major contributor of nutrients release in the surrounding environment. This often lead to pathogens transmission, eutrophication of surface water and development of cyanobacteria / green algae which affect ecosystems and hamper recreation use and/ or fishing in many lakes (e.g. lake Champlain Canada/US) or coast and seaside resorts (e.g. Brittany coast in France).

In an international context of legislation evolution (on septic tank management, on phosphorus and nitrogen discards...) what are the best strategies to be implemented to significantly reduce these negative impacts over the forthcoming 10 years? This work, performed in the frame of French-Indian and European-African collaborations, aims at establishing the good practice and the best strategies to enable an efficient and sustainable technology transfer.

Centralized wastewater treatment systems can be efficient; however the costs of such systems are very high partly due to the construction of an extensive sewage collecting network. At the moment, there is a high demand in India and Africa for small treatment systems at different scales: house level (4-8 people), small settlements, condominium or hotel level (100-400 people) and small village or small agro-food industries (400-1,000 people). As a consequence, some Indian and African

industrial or engineering companies specialized in water or wastewater are seeking for such decentralized solutions for marketing. Constructed wetlands can be a very efficient and cheap solution for the treatment of domestic wastewater while SBR will be more adapted to the treatment of small agro-food industries. Furthermore, the re-use of treated water can be highly beneficial for the agricultural industry, provided that the treatment system achieves a sufficient water quality level for safe re-use.

Biography

Florent Chazarenc is a Ph.D in environmental engineering. He is an associated professor at Ecole des Mines de Nantes at the Department of Energy Systems and Environment. His research expertise is in wastewater treatment with an emphasis on the use of extensive process like constructed wetlands.

Over the last 10 years, he conducted researches on the use of intensifications to upgrade P and N removal in constructed wetlands for example by use of industrial by-products (mostly steel slag) as a reactive media in filter designed to treat phosphorus or by use of effluent recirculation for nitrogen removal. More recently he was involved in several international projects to apply constructed wetland systems for water treatment and re-use in development countries. He published more than 40 papers in peer review journals. He will be the Chair of the 14th Specialized Conference on Small Water and Wastewater Systems (Nantes 2017).

Chemical contaminants in the environment and in the food chain in Bangladesh

- Professor Mohammad Shoeb



Abstract

Food safety is an essential public health issue for all countries. Food borne diseases due to microbial pathogens, biotoxin, and chemical contaminants in food represent serious threat to the health of thousands of millions of people. It is a great challenge for developing countries to regulate food safety due to lack of proper legislation, infrastructure and management.

Bangladesh is an agro-based developing country. To consume the safe food, pesticide residue contents must be below the maximum residue limit (MRL) values. In order to monitor the level of pesticides such as 4,4-DDT, 2,4-DDT, DDE, DDD, chlorpyrifos, cypermethrin, diazinon, fenvalerate, carbaryl, carbofuran and imidachloprid different kinds of vegetable, rice, pulse and spice samples (n=120) were collected from cultivated fields and markets of Bangladesh following the WHO guidelines.

In addition to agricultural crops soil, water and fish samples were collected from different parts of Bangladesh and analyzed to determine the level of organochlorine pesticides, polychlorinated biphenyl and heavy metals. As human exposure to chemical contaminants are through food chain we also analyzed human blood samples (n=225) from different groups to monitor the level of exposure to organic contaminants. The methodologies for human blood analysis and all results will be discussed in the presentation. In this presentation method development and validation of chemical contaminants, and their presence in human blood

and environmental samples in Bangladesh will be discussed.

Biography

Dr. Mohammad Shoeb is Professor at the Department of Chemistry, University of Dhaka, Bangladesh. He persuaded his Ph.D in Natural Products Chemistry from The School of Pharmacy, The Robert Gordon University in collaboration with University of Aberdeen, UK in 2006.

He completed his Post-Doc on Marine Bio-diversity from University of Aberdeen as a Commonwealth Academic Fellow. He gained special training on Analytical and Environmental Chemistry from Stockholm University (Sweden), University of Helsinki (Finland), Eurofins Food & Agro (Sweden) and Delft University of Technology (The Netherlands).

Recently, he completed Postdoc fellowship from Linkoping University, Sweden on Environmental and Analytical Chemistry. His specialized working fields are Organic Chemistry, Natural Products Chemistry (Plants, Marine, Endophytic Fungi and Bacteria), Herbal and Traditional Medicine, Analytical Chemistry, Environmental Chemistry. Prof Shoeb leads a research group consisting of twenty five members including staffs, PhD, MPhil and MS students supported by International Science Programme (ISP), Uppsala, Sweden. His group is developing analytical methodologies to investigate organic pollutants in fish, vegetables, water and environmental samples, and established collaboration in national, regional and international levels.

Slum Health: Challenges and Solutions

- Oyinlola Oyeboode



Abstract

Global urbanisation is occurring on such a scale that many people born and arriving in today's cities are housed in informal settlements, also known as slums, where infrastructure is poor, access to safe water and sanitation is limited and overcrowding is rife.

Today's one billion slum dwellers are a vulnerable and marginalised group facing unique health issues.

This presentation will summarise two in-depth scholarly reviews examining, firstly, the determinants of health and resulting health challenges in contemporary slums; and secondly, interventions to improve the health of people who live in slums.

Biography

Oyinlola Oyeboode is an Associate Professor in Public Health at Warwick Medical School. She trained as a public health consultant in London, and worked for organisations including a local authority, the NHS, the Health Protection Agency and the National Institute of Health and Care Excellence. She took up a full time academic role at University of Warwick in August 2014. Her current research areas include non-communicable diseases and their risk-factors in low and middle-income countries (particularly salt-intake and hypertension) and in the UK (particularly obesity), and health in informal settlements or slums.



Community-based waste management approaches in Indonesia towards low carbon and eco-city

- Ova Candra Dewi



Abstract

KIPRAH: milestone for reducing emission through community-based composting program. Like in many of South East Asia's rapidly growing, densely populated areas, the lack of regular and safe disposal of solid waste in Indonesia, leads to wild dumping burning or disposal of solid waste which are hazards for public health and the environment. Spread of diseases such as dengue fever, typhoid cholera, respiratory diseases, contamination of water resources, air pollution, and increased risk of flooding are the some of the main challenges.

In order to tackle the issues linked to urban poor solid waste management, BORDA (Bremen Overseas Research and Development Association) and its Indonesian partners BEST (Institute for Integrated Economic and Social Development) and LPTP (Foundation for the Development of Rural Technologies) developed the multi stakeholder solid waste management program KIPRAH (Kita-Pro-Sampah = we pro waste) in 2006.

KIPRAH is a community-based solid waste management project, which serves densely populated urban areas by supporting Material Recovery Facilities (MRF), open facilities where waste is collected and separated; recyclables are sold, and organic waste is composted. KIPRAH is implemented by local NGOs (e.g. BEST, LPTP) with financial support from BORDA-IDRC and governments. KIPRAH aims to improve the living condition of poor and low-income communities through demand-responsive decentralized solid waste management, deploying the 3R-approach.

Biography

Ova Candra Dewi (Female, 36 years old) is a scholar, urban manager and environmental activist. She grabbed her Bachelor of Architecture from Engineering Faculty, Universitas Indonesia and graduated in 2003. When she was a bachelor student she was very active on urban related researches and became student assistants for Theory and methods for Environmental Design. After that she continued working in university as junior teaching staff.

In 2007 she continued her study on master program in Urban Management, Berlin University of Technology (2007-2009). There she found her main passion and interest on waste management. This moved her to continue further, a PhD on Bioconversion and Emission Control from waste sector in Hamburg University Technology (2009-2013).

Right after she came back to her home country, she started to work in the university again, but this time she also works and applies her knowledge to the community, by joining NGO and concentrates on community based-waste management. During her free time, she also taught the community on making compost from organic waste and doing the urban farming. Now she works as a lecturer in Department of Architecture Universitas Indonesia and responsible for Architecture and Sustainability Master Program, and also work at BEST (Institute for Integrated Economic and Social Development) as Waste Management and Climate Change Strategic Manager.

Pico-Hydro Electricity in the Rwenzori Mountains of Uganda?

- Dr Colin Oram



Abstract

Since 2009 Warwick Engineering students and one member of staff have installed and helped maintain three very small (~2kW) hydro-electric schemes in the foot hills of the Rwenzori Mountains in the west of Uganda. Two of the schemes use commercially obtained Chinese made low-cost turbines and the third was specially made by the member of staff in Uganda.

There has been much damage and repair of the equipment including alternator rewinding by a local artisan. The dams are of reinforced concrete or steel and timber and the distribution networks use steel fencing wire or scrap aluminium wire and locally made insulators, or coaxial aluminium cable. There is now approximately 7 km of overhead network in the three schemes. Termite damage to wooden posts has obliged the use of concrete 'godfathers'. Power is used in schools, a clinic, shops and domestic accommodation for lighting, computers and TVs and battery (especially mobile phone) charging. About 2000 people benefit from the schemes.

Funding has come from the member of staff, student bursaries and the Ugandan government. Ugandans have contributed labour. A manually collected tariff is paid (unreliably) by users. There has been significant theft and corruption in the committees and communities 'owning' and using these schemes and repeated sabotage of one installation. A great deal of effort i.e. many public and private meetings and election of committees etc. has gone into overcoming these 'logjams', not all of it successful. PTC load limiting devices have been made, but not yet installed.

Biography

Colin Oram has been a Teaching Fellow in Warwick School of Engineering since 1987. He teaches engineering design for developing countries in conjunction with Engineers Without Borders, renewable energy and sustainability and since 2007, our 15 Credit three week African Field Course module held in Uganda.

He obtained a first degree (BEng in Engineering Design and Appropriate Technology) from Warwick in 1983 and a PhD from Cranfield University in 1989 on the aerodynamics of vertical axis wind turbines. He has developing country experience as a VSO builder in Vanuatu in the 1970s, with the Development Technology Unit in Warwick working in East Africa and Nigeria, including a three year DFID funded donkey cart and harness programme in Kenya and Uganda, and since 2007 has spent much time in Uganda on hydro power and community development and the development of low-cost technology including motorcycle trailers, longtail irrigation pumps and longtail outboard motors for fishing boats.

He has further interest in low-cost building techniques especially stabilised soil. He is Chair of the Trustees of the Development Technology Workshop in Cambodia, a UK registered charity and limited company which developed the Tempest vegetation clearance machine used in humanitarian demining and continues to develop small equipment for the HD sector. Oram has written a large number of instruction manuals/ booklets for the construction of products for developing countries.



Dr Georgia Kremmyda

Dr Georgia Kremmyda is the Civil Engineering Degree Leader, responsible for the delivery and management of teaching at undergraduate and MSc levels in Civil Engineering within a unified School of Engineering, providing also leadership in curriculum development, administration, liaison with industry and other activities.



Dr Volkan Degirmenci

Dr Volkan Degirmenci is an Assistant Professor in Chemical Engineering in the School of Engineering. His teaching and research interests are in the field of Catalysis, bio-renewables and sustainable production of energy and chemicals.





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