

State of Engineering for Global Development



Australia and New Zealand

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TABLE OF CONTENTS

- Summary** | pg 1
- Definitions** | pg 2
- Summary Table** | pg 3
- Program Descriptions** | pg 4
- Research and Innovation Centres** | pg 7
- Conferences** | pg 8
- Research** | pg 9

Disclaimer

To E4C's knowledge, this is the first report of this kind to attempt to list out all the programs and faculty who work in Engineering for Global Development. We recognize that there will likely be missing information in this first edition. If you identify any programs or professors that you believe should also be included in this report, please email us at info@engineeringforchange.org.

Motivation & Aim

Engineering for Global Development (EGD) is a growing field in which technology and design are utilized to support communities around the world and improve quality of life. More commonly known as Humanitarian Engineering in Australia and New Zealand, this sector has been rapidly evolving over the last five years. Specifically in this region, Humanitarian Engineering encompasses short and long-term activities including disaster response and relief, resilience, development, humanitarian aid, and refers to both domestic and international operations. This report attempts to comprehensively highlight the university programs, non-government organisation partnerships, research and innovation centres, conferences, and academics and professors dedicated to this work in Australia and New Zealand. The intended audience is primarily students interested in pursuing EGD or Humanitarian Engineering opportunities within Australia and New Zealand, as well as institutions and academics wanting to understand the sector, connect and collaborate.

Method

The universities, programs and organisations listed in this document have been procured by Rhys Keogh, a final-year undergraduate engineering student, and 2019 Engineering For Change (E4C) Fellow. Lists were generated and reviewed via interviews with various Humanitarian Engineering professors and practitioners in Australia and New Zealand.

Institutions that host Engineers Without Borders (EWB) Chapters and coursework as their only EGD-related program are not included in this list. However, it should be noted that 27 universities across Australia and New Zealand offer an introductory humanitarian design course in partnership with Engineers Without Borders (EWB) Australia. In many cases, universities deliver this course in a compulsory first-year subject for all engineering disciplines. The EWB Challenge, launched in 2007, now reaches over 9,000 students each year, and was a key catalyst in increasing student engagement with EGD over the last decade. Additionally, there are numerous [Australia-based](#) and [New Zealand-based](#) EWB Chapters in this region, which are not included in this report.

Overview

Results from our exploration show that 11 institutions in Australia and New Zealand offer Humanitarian Engineering courses ranging from bespoke subjects, experiential opportunities, undergraduate minors and majors, and diploma-level programs. At the time of this first release (October 2019), no Masters-level courses have been developed. From these 11 institutions, the following EGD-related programs are available:

- Diploma: 1 institution
- Bachelor major degree: 1 institution
- Bachelor minors degree: 3 institutions
- Courses & experiential opportunities: 11 institutions

Finally, there are a growing number of ways students can become involved in EGD co-curricular activities, events and workshops, as well as further research opportunities. Engagement with NGOs, either through an academic institution or directly contribute to a large number of these new opportunities.

Definitions

Engineering for Global Development (EGD) - EGD is an interdisciplinary practice that aims to improve the quality of life of underserved communities worldwide through the design and delivery of technology-based solutions combined with local capacity-building. To do this effectively, practitioners must integrate their technical training with an understanding of economics, entrepreneurship, social science and politics to benefit people living in poverty. Engineering education programs that support this definition are found at many institutions throughout Australia and New Zealand. Program-specific aims and goals may be broader or further specialized than the definition presented here. Likewise, terminologies and titles sometimes vary, with "humanitarian engineering" being the predominant term used in this region. This report includes those programs that E4C has identified as supporting our overarching definition of "EGD."

Humanitarian Engineering (HumEng) - For the purposes of this report, HumEng and EGD can be used interchangeably. HumEng was coined in 2011 by EWB-Australia in their declared '*Year of Humanitarian Engineering*'. It has since been adopted in the region to refer to EGD-related work.

Diploma - These programs are sometimes referred to as Undergraduate Diploma and classified as Level 5 on the Australian Qualifications Framework (a Bachelor degree is higher at level 7). They are often studied in parallel with a Bachelor Degree.

Major - A curricular program offered at institutions of higher education that students select as their main course of study.

Minor - A curricular program offered at many institutions of higher education that allows students to a second academic discipline, in addition to their main course of study (major).

Courses - Curricular units of teaching that typically last one academic term. In this report, we include both graduate and undergraduate level coursework under this definition.

Experiential Opportunities - Experiential opportunities take place outside of a traditional classroom setting including fieldwork, internships, immersions, and study abroad.

Research - In this report, research is defined as practices that systematically investigate EGD-related topics, which lead to new conclusions and developments.

Engineers Without Borders (EWB) - The Australian and New Zealand chapters of EWB are distinct from other EWB groups globally, despite sharing common goals. EWB Australia has been pivotal in the adoption of humanitarian engineering in the Australasian region through their cross-institutional programs.

Non-Government Organisations - NGOs referred to in this paper are usually not-for-profit independent organisations whose work has a social or humanitarian purpose.

Summary Table of EGD Programs in Australia & New Zealand

Institutions & Location	Program Name	Diploma*	Major	Minor	Courses	Research	Experiential Opportunities
New South Wales							
Southern Cross University, Lismore, NSW	Humanitarian Engineering Project				X		X
University of New South Wales, Sydney, NSW	Humanitarian Engineering				X		X
University of Sydney, Sydney, NSW	Humanitarian Engineering Major		X		X	X	X
University of Technology Sydney, Sydney, NSW	Summer Design Studio				X	X	X
University of Wollongong, Wollongong, NSW	Humanitarian Engineering				X		X
Victoria							
Swinburne University of Technology, Hawthorn, VIC	Engineering Practice Academy			X	X	X	X
University of Melbourne, Melbourne, VIC	Humanitarian Design Internship				X		X
Royal Melbourne Institute of Technology, Melbourne, VIC	Humanitarian Experiential Learning Project				X	X	X
Australian Capital Territory							
Australian National University, Canberra, ACT	Humanitarian Engineering Minor			X	X	X	X
South Australia							
University of Adelaide, Adelaide, SA	Humanitarian Minor			X	X	X	X
New Zealand							
University of Canterbury, Christchurch, NZ	Diploma in Global Humanitarian Engineering	X			X		X

*Equivalent to an undergraduate degree

EGD Program Descriptions

Diploma in Global Humanitarian Engineering, University of Canterbury, Christchurch, NZ

Description: A diploma program that focuses on humanitarian response, particularly establishing shelter, water and food security, and building communication skills.

Structure: The diploma consists of eight semester-long subjects, divided into three parts: (1) three engineering design subjects, (2) three subjects from a humanities list, and (3) two Capstone options, including a choice of further coursework, project-based learning with an NGO, a global experiential learning program, and a research project.

Experiential opportunity: Replicating a disaster scenario, the students deploy a clean water system.

External Collaborators: Student-led Emergency Response Team (UCERT) and EWB-New Zealand.

Engineering Practice Academy, Swinburne University of Technology, Hawthorn, VIC, AUS

Description: The Engineering Practice Academy is a practice-based program co-created with industry, where students work on real-world projects from a range of clients.

Structure: This program is embedded in the four-year Bachelor of Engineering Practice (Honours) degree, and is made of 6-week projects structured as sprints throughout the program. Students engage with a wide range of partners, such as NGOs, local councils, and social impact organisations.

External Collaborators: EWB-Australia, City of Melbourne, RSPCA, Dulux any many more industry partners.

EWB Challenge Program, Engineers Without Borders Australia, Australia-wide

Description: The EWB Challenge is a platform for first-year engineering students to develop professional skills such as teamwork and communication, whilst learning about design for sustainable development. It provides students with “real-world” project briefs alongside a library of resources for students to deep dive into a community and appropriate and creative technologies and solutions.

Structure: The EWB Challenge is embedded in a first-year engineering subject delivered over one semester.

External Collaborators: WaterAid Timor Leste (2019), Cambodian Rural Development Team (2018) and 29 universities across Australia, New Zealand and Malaysia.

EWB Humanitarian Design Summit, Engineers Without Borders Australia, Asia-Pacific

Description: The EWB Humanitarian Design Summit is an immersive learning experience for students to develop an understanding of human-centred design in a developing community. It aims at developing cross-cultural communication skills, leadership and teamwork.

Structure: The Humanitarian Design Summit is a two-week immersive program targeting second to fourth-year students that is delivered in the summer and winter holidays.

External Collaborators: Cambodian Rural Development Team, Three Sisters Nepal and Empowering Women Nepal.

EWB Student Research Project, Engineers Without Borders Australia, Australia-wide

Description: The EWB Student Research Report engages final-year students through project-based learning and research. It targets students who are passionate about developing technologies for underserved community both locally and internationally.

Structure: The Student Research Project is a year-long collaboration with a partner of EWB, undertaken in the student’s final year as their capstone or honours project.

Humanitarian Design Internship, University of Melbourne, Melbourne, VIC, AUS

Description: The Humanitarian Design Internship is an experiential program where students travel to India for two weeks to partake in a collaborative design process where local design knowledge is incorporated into student projects.

Structure: This program runs for two weeks in the Summer Break, and is open to students with elective availability. This program is supported by New Colombo Plan Scholarship mobility funding.

Humanitarian Engineering, University of New South Wales, Sydney, NSW, AUS

Description: Humanitarian Engineering courses cover topics from disaster response to resilience and sustainable community development. Areas of particular focus include sustainable infrastructure, emergency shelters, energy, water and sanitation, appropriate technologies, biomedical engineering, and community partnership and engagement.

Structure: Two dedicated Humanitarian Engineering courses are offered across the Faculty of Engineering; the first provides an introduction to the concepts of humanitarian engineering and the second is a project based course where students research and develop solutions for real world humanitarian engineering projects. Other elective courses are available within individual schools in the Faculty of Engineering that may also be of interest to students wishing to study Humanitarian Engineering.

Humanitarian Engineering Management, University of Wollongong, Wollongong, NSW, AUS

Description: This program is an experiential learning program with content delivered related to disaster recovery, project management and design. Students spend time in Rwanda delivering water and shelter projects for a partner community.

Humanitarian Engineering Major, University of Sydney, Sydney, NSW, AUS

Description: This major challenges students to apply their engineering skills to development, international aid and disaster response and recovery and First Nations communities through a combination of theoretical and experiential opportunities.

Structure: Students first engage with this four-subject major from their third year, where they would undertake an introductory course, a deeper dive into development theory, a global engineering field work module, and a choice from a series of humanities electives.

External Collaborators: Global Mobility partners: Authentica Travel India, NGO partners in India, Samoa and Myanmar. Main research partners: Ifakara Health Institute, Tanzania, Fiji National University, Fiji, Ateneo de Manila University, Philippines.

Humanitarian Engineering Minor, Australian National University, Canberra, ACT, AUS

Description: The minor aims to bridge the gap between engineering and development, exploring how engineering and technology can address underserved or marginalised communities domestically and internationally.

Structure: The four-subject minor includes an introduction to engineering in a humanitarian context, and humanities introductory course, a humanitarian and development context course, and a multidisciplinary course.

External Collaborators: Abundant Water, Enable Development, Okra and EWB Australia. Students can engage in research projects, study tours and internships.

Humanitarian Engineering Project, Southern Cross University, Lismore, NSW, AUS

Description: Students undertake a group project focusing on engineering technology applications to humanitarian contexts.

Structure: This is a compulsory first-year course that runs throughout either semester.

External Collaborators: EWB Australia (particularly the Design Summits).

Humanitarian Experiential Learning Project, Royal Melbourne Institute of Technology, Melbourne, VIC, AUS

Description: This program embeds an experiential learning opportunity within an introduction to development course. Topics explored include humanitarian engineering, community development and cross-cultural communication.

Structure: Students attend several pre-departure workshops where they prepare for the experiential learning component, which is then conducted over the Summer or Winter break with partner NGOs. Students will engage in reflective learning throughout the experience and upon return.

External Collaborators: EWB Australia, Unbound.

Humanitarian Minor, University of Adelaide, Adelaide, SA, AUS

Description: This minor focuses on developing students skills in responding to disasters, shelter construction, developing sustainable energy and clean drinking water.

Structure: Students undertake this four-subject minor in conjunction with one of six engineering bachelor degrees. This includes an introduction to development course, and a GIS course.

Summer Design Studio, University of Technology Sydney, Sydney, NSW, AUS

Description: The Humanitarian Engineering Studio was run in 2018, where students were tasked with developing a feasibility report for a Nepalese-based NGO.

Structure: Students use an elective subject to partake in the studio class, which is delivered over 6 weeks in Summer break.

External Collaborators: From the Ground Up, EWB Australia, Supply Chain Sustainability School, The Humanitarian Institute, Arup.

EGD Research and Innovation Centres

The research and innovation centres included below undertake projects from short higher-education workshops to extensive and deep research portfolios. Included in the definition of researchers conducting EGD work are engineers, computer scientists, architects, and urban planners. **We recognize that this list may not be comprehensive and will naturally change overtime, please contact us at info@engineeringforchange.org if you know of a faculty member who is missing from this list.**

Research and Innovation Centres		
Institution	Location	Sectors
Centre for Appropriate Technology	Alice Springs, NT, AUS	Water, energy, shelter, ICT, telecommunications
Centre for Sustainable Infrastructure	Swinburne Institute of Technology, Hawthorn, VIC, AUS	Shelter, civil infrastructure, transport, water, geotechnical
China-Australia Centre for Sustainable Development	University of South Australia, Adelaide, SA, AUS	Air pollution, water, transport, health, shelter, environmental
Development Policy Centre	Australian National University, Canberra, ACT, Australia	Knowledge-based, education, development
Energy Storage Test Facility	University of Adelaide, Adelaide, SA, Australia	Sustainable power, micro grids, battery systems, off-grid energy production
Engineer's Australia Humanitarian Engineering Community of Practice	Engineers Australia, Canberra, ACT, Australia	Humanitarian engineering
Humanitarian Engineering Education Network of Australasia (HEENA)	Australian National University, Canberra, ACT, Australia	Higher-education, humanitarian engineering, development
Institute for Global Development	University of New South Wales, Sydney, NSW, AUS	Knowledge-based, research, education
Institute for Sustainable Futures	University of Technology Sydney, Sydney, NSW, AUS	Cities and buildings, climate change and adaptation, energy futures, food systems, international development, resource futures, transport, water futures
Natural Hazard Research Centre	University of Canterbury, Christchurch, NZ	Disaster relief, research, natural disasters, earthquake resilience, seismology
QuakeCore	University of Canterbury, Christchurch, NZ	Disaster response, disaster relief, earthquake resilience
Sustainable Development Institute	Monash University, Melbourne, VIC, AUS	Research, knowledge-based, education
Risk Frontiers	Macquarie University, Macquarie Park, NSW, AUS	Disaster relief, earthquake resilience, protection, tropical cyclones
Research for Development Impact (RDI) Network	Deakin, ACT, AUS	Knowledge-based, education, research, Partnerships, NGOs, research, development, policy, DFAT funded

The Warren Centre	University of Sydney, Sydney, NSW, AUS	Student engagement through cross-institutional hackathons and design challenges.
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The State of EGD Conferences

The conferences included below range from student-led conferences through to peak-body conferences. Included in the definition of researchers conducting EGD work are engineers, computer scientists, architects, and urban planners. **We recognize that this list may not be comprehensive and will naturally change overtime, please contact us at info@engineeringforchange.org if you know of a faculty member who is missing from this list.**

EGD Conferences		
Conference	Location	Sectors
Australasian Association for Engineering Education	Brisbane (2019), QLD, Australia	Higher education, engineering education, humanitarian engineering education
Humanitarian Engineering Conference	Hazelbrook (2019), NSW, Australia	Student-led, humanitarian engineering, higher-education, water, shelter, health
EWB NZ Humanitarian Engineering Conference	Auckland, New Zealand	Humanitarian engineering, water, shelter, sanitation, energy, agriculture, community development
Humanitarian Innovation Hackathon	Sydney, NSW, Australia	Higher-education, humanitarian engineering, disaster response, mass displacement, refugee camps, development
EWBUTS Design Corner	University of Technology Sydney, Sydney, Australia	Student-led, design, humanitarian engineering, appropriate technology, higher-education
Engineering World Health	University of New South Wales, Sydney, NSW, AUS	Health, education, capacity building, development
WhyDev	Monash University, Melbourne, VIC, AUS	Peer network, development, research
Leadership for Inclusive Development (#L4ID)	La Trobe University (2019), Melbourne, VIC, Australia	Leadership, research, education, social impact, knowledge-based

The State of EGD Research

Faculty included in this section conduct current, graduate-level, EGD-related research at higher-educational institutions in Australia and New Zealand. Included in the definition of researchers conducting EGD work are engineers, computer scientists, architects, and urban planners. **We recognize that this list may not be comprehensive and will naturally change overtime, please contact us at info@engineeringforchange.org if you know of a faculty member who is missing from this list.**

Key EGD Researchers					
Faculty	Institution	Sectors	Faculty	Institution	Sectors
Bello-Mendoza, Ricardo	Univ. of Canterbury, Christchurch, NZ	Water	Johnson, Fiona	Univ. of New South Wales, Sydney NSW	Water
Birzer, Cris	Univ. of Adelaide, Adelaide, SA	Energy	Opdyke, Aaron	Univ. of Sydney, Sydney, NSW	Habitat
Brown, Nick	Royal Melbourne Institute of Technology, Melbourne, VIC	Education, Agriculture	O'Shea, Julian	Unbound	Education
Cheng, Eva	Univ. of Technology Sydney, Sydney, NSW	Education, ICT	Perkins, Sam	EWB Australia	Habitat, Energy, Water
Dansie, Andrew	Univ. of New South Wales, Sydney NSW	Water, Health	Prpic, Juliana	Univ. of Melbourne, Melbourne, VIC	Education
Drain, Andrew	EWB Australia	Agriculture	Smith, Jeremy	Australian National Univ., Canberra, ACT	Education, ICT
Garnock, Ben	Southern Cross Univ., Lismore, NSW	Education	Thomas, Jacqueline	Univ. of Sydney, Sydney, NSW	Water, WASH
Hadgraft, Roger	Univ. of Technology Sydney, Sydney, NSW	Education, Water			

For an analysis of humanitarian engineering programs in this region read the research carried out by E4C Fellow, Rys Keogh in partnership with UTS titled [Humanitarian Engineering in Australia & New Zealand: Past, present and a Way Forward](#).