

World Federation of Engineering Organizations
Fédération Mondiale des Organisations d'Ingénieurs
50th anniversary

WFE0 Engineering 2030

A Plan to advance the achievement of the UN
Sustainable Development Goals through engineering



Progress Report No. 1 - October 2018

A collaborative project with



Sustainable
Development
Goals



United Nations
Educational, Scientific and
Cultural Organization

Division of Science Policy and Capacity Building
Natural Sciences Sector

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The project information provided in this report was presented at the World Federation of Engineering Organizations, 50th Anniversary Symposium, Paris, 7 March 2018.

Foreword from Dr. Flavia Schlegel, ADG Natural Science Division UNESCO



It is well recognised that the implementation of solutions to achieve the UN Sustainable Development Goals requires engineers and engineering.

I am very pleased that the World Federation of Engineering Organizations has developed the **WFEO Engineering 2030 Plan** that brings together the projects of its standing technical committees, members and partners to demonstrate the work of engineers and the impact that it has on sustainable development.

The Report not only deals with the partnerships that have been established but how work has commenced on the important task of establishing appropriate standards for engineering education and building capacity in engineering in countries most in need, in Asia and Africa.

More engineers are needed, to advance sustainable development, and these engineers need to have the right standard of engineering education to develop and implement the solutions that are so important for nation building.

It is also pleasing to see projects that address the need to attract more girls to engineering, essential for innovation.

Many of the projects that have commenced address basic issues such as sustainable infrastructure and the need for clean sources of water. Other are highly innovative and use advanced technologies including satellite technologies, to address the extreme risks of natural disaster like earthquake and floods. These projects demonstrate the very wide scope of engineering and the range of technologies that engineers use to advance sustainable development.

I congratulate all the project sponsors and look forward to progress being reported in future by more partners, members and committees. This is an essential part of not only advancing sustainable development in many different areas but also demonstrating the action that is being taken for the information and inspiration of the world.

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

Foreword from Dr. Marlene Kanga, WFEO President

I am delighted to introduce the first report of the **WFEO Engineering 2030 Plan**.

The Plan activates the WFEO Strategic Objectives that were agreed by the WFEO General Assembly in December 2015 and demonstrates the commitment by WFEO, its members and partners, to advance the UN Sustainable Development Goals through engineering.



The UN Sustainable Development Goals take an integrated approach for future development, combining progress in economic prosperity, social inclusion and environmental sustainability. Each one of these goals requires engineers and engineering. The Paris Declaration signed by UNESCO and WFEO in March 2018 stated the commitment of the world's engineers to sustainable development.

This document provides an overview of the projects that are being undertaken by WFEO Standing Technical Committees, national and international members, associates and partners. These projects were first presented at the WFEO 50th Anniversary Symposium held in Paris on 7th March 2018 and are ongoing. Further progress reports will be provided annually.

I am delighted with the diversity of the projects which represent every region of the world, and the collaborative approach taken to tackle some of the most pressing problems in engineering. A constant theme is the need for quality education in engineering and to build capacity for engineers around the world. Initiatives that address the culture and practice of engineering including the need for diversity and ethical engineering practices are also important and will ensure that the best intellects around the world are engaged in addressing the world's most pressing problems. These are the areas where the international network of WFEO can have the greatest impact.

WFEO will continue to work on advancing Sustainable Development Goals through its committees, members and partners and report on progress through various forums in the coming years. It is a necessary role of WFEO leadership of the engineering profession for a better sustainable world.

A handwritten signature in dark ink that reads "Marlene Kanga".

*Dr. Marlene Kanga AM FTSE Hon.FIEAust Hon.FICChemE
WFEO President.*

1. Background

In September 2015, the world came together to declare the new UN 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 World Federation of Engineering Organizations.

The World Federation of Engineering Organizations is the peak body for engineering, representing nearly 100 nations and 30 million engineers. It is the voice of engineering at an international level and promotes the important role of engineers in key issues that the world is now facing: sustainable development, the growth of our cities, climate change and strategies for energy production to meet the needs of the growing population around the world.

In this work, the World Federation of Engineering Organizations is recognised by governments, intergovernmental organizations, international NGOs and the public in general as a respected and reliable source of advice and guidance on strategies and policies that use engineering and technology for the benefit of human development and wellbeing and sustainable outcomes.

The Mission of WFEO includes:

- To represent the engineering profession internationally, providing the collective wisdom and leadership of the profession to help national agencies choose appropriate policy options that address the most critical issues affecting countries of the world.
- To enhance the practice of engineering.
- To foster socio-economic security and sustainable development and poverty alleviation among all countries of the world, through the proper application of technology.

WFEO therefore has a key role in leading and co-ordinating the various projects for developing engineering capacity for maximum long term impact to achieve the UN Sustainable Development Goals. WFEO is able to bring together educational institutions, governments and industry to facilitate projects that address the need for engineering capacity in various regions of the world. The national and international members of WFEO, that are leading professional engineering institutions, will play a key role in this endeavour and in developing country and region specific responses.

The celebration of WFEO 50th anniversary in 2018 is a catalyst to develop a framework for an action plan for the engineering capacity that is required to achieve the UN Sustainable Development Goals. The first step was the signing of the Declaration between UNESCO and WFEO on the commitment to advance the UN Sustainable Development Goals through engineering, see Appendix 1.

2. The Need for Engineers in the Context of Sustainable Development and Achieving the UN Sustainable Development Goals

Engineers and engineering are critical for achieving the UN Sustainable Development Goals. Engineers have a key role in supporting the growth and development of essential infrastructure such as roads, railways bridges, dams, communication, waste management, water supply and sanitation, energy and digital infrastructure which facilitate communications. They enable a country's economy to grow and develop and this in turn can lead to better economic and social outcomes including improved life expectancy, higher literacy rates and better quality of life.

There is an important link between a country's engineering capacity and its economic development. Engineers are responsible for the modern world – from the houses we live in, the food we eat, the transport we use and all the comforts derived from electricity and clean water supplies. However, with half the world living in poverty and millions of people without sufficient food or sanitation, engineering is needed to support the progress of sustainable development across the world.

The World Bank reports¹ the significant positive effect of infrastructure on output, productivity and growth and the ability of economies to be innovative. Other research shows that there is a significant positive impact on the GDP of countries that have a sufficient number of engineers². However, it is not just about the quantity but also the quality of engineers which affects the outcomes of engineering projects and their contribution to the economy. This makes it essential for a country to have its own human capital resource of engineers who can design build and maintain vital infrastructure to international standards to deliver maximum benefit to the economy.

As the pace of technological innovation and development accelerates, there is an increasing need for engineers. Some of the factors are discussed below.

Engineers and the 4th Industrial Revolution

From the time of the first Industrial Revolution, engineering has underpinned the growth of the industrial economy. The invention of steam and electricity led to a transformation of economies, from agriculture to manufacturing, resulting in increased incomes and prosperity for developed countries especially in Europe and North America.

¹ Engineering Growth: Innovative Capacity and Development in the Americas, William F. Maloney, Felipe Valencia Caicedo, March 9, 2016, World Bank Research publication, <http://pubdocs.worldbank.org/en/422491458852358129/Engineers-County7A.pdf>, accessed August 2018.

² See Engineering UK, The Contribution of Engineering to the UK Economy – the multiplier impacts, January 2015, <https://www.engineeringuk.com/media/1323/jan-2015-cebr-the-contribution-of-engineering-to-the-uk-economy-the-multiplier-impacts.pdf>, accessed August 2018.

We are now at the start of the 4th industrial Revolution where data and the interconnectedness of machinery and the Internet of Things is driving new efficiencies and innovation. Engineering continues to be at the heart of the latest revolution. Engineers have an important role in these innovations, developing new ideas and scientific breakthroughs into new inventions and products that can help many countries accelerate their economic development.

Green Infrastructure and Smart Cities with increasing Urbanisation

With increasing urbanisation and growing cities, engineers are expected to develop new innovations for green infrastructure for smart cities and develop low CO2 energy sources. Engineers have a vital role in solving the problems of climate change and to implement sustainable solutions for the use of depleting resources especially the use of water.

The Demand for Engineering in Asia, Africa and Latin America

There is expanding demand for engineers and engineering services in Asia, Africa and Latin America, as the world's fastest-growing economies urbanise and develop their infrastructure.

2. WFEO Engineering 2030 – A Plan to develop engineering capacity to achieve the UN Sustainable Development Goals

As the peak body for professional engineering institutions, the World Federation of Engineering Organisations has a key role to lead the development of engineering capacity of appropriate recognised standards for sustainable development.

The WFEO Strategic Plan 2015-2019

The WFEO Engineering 2030 Plan activates the WFEO Strategic Plan that was approved by the WFEO General assembly in Kyoto in December 2015. The elements of the WFEO Strategic Plan 2015-2019 are:

A. External Objectives

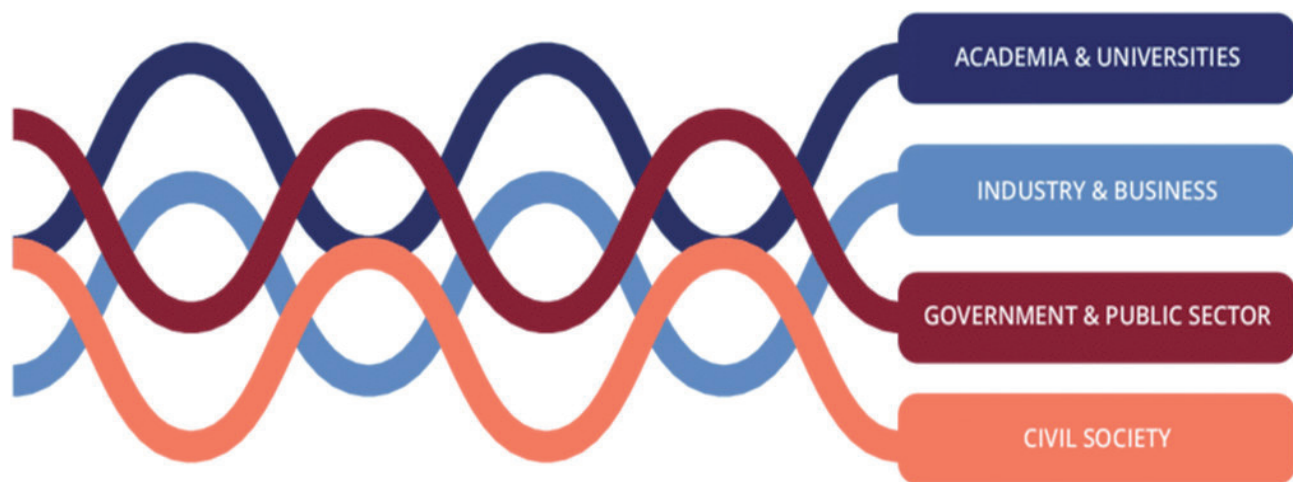
1. Be recognised as the respected source of advice and guidance on engineering and technology related issues for human well-being and natural environment management
2. Be at the forefront of international efforts in making the engineering profession contribute that is scientifically and technologically achievable
3. Apply engineering and technology for promoting sustainable development, climate change adaptation, disaster risk mitigation, public health and poverty alleviation
4. Facilitate mobility of engineering professionals globally
5. Establish and maintain a global code of ethics for the professional practice of engineering
6. Promote diversity and inclusion in the engineering profession

B. *Internal objectives*

1. Improve the financial visibility, presence and stature of WFEO
2. Expand the membership and the support of national and international members
3. Continuously improve the work of the Standing Technical Committees and the quality of their outputs

Partnerships to Achieve the Strategic Plan

The Plan is based on a quadruple interaction of governments, academia, industry and professional engineering institutions which is best described in the Quadruple Helix Model between the professional engineering institutions that are the members of WFEO, academia and universities, industry and business, and governments.



The partnership Model to Achieve the WFEO Engineering 2030 Plan

Each group will have an important role:

- **The Professional Engineering Institutions:** WFEO already has long standing established relationships with professional engineering institutions around the world with more than 100 national and international members. WFEO will work with its members, through specific projects, to achieve the goals of the WFEO Engineering 2030 Plan. In particular, the WFEO Standing Technical Committees, that are hosted by WFEO national members, have access to specialised expertise and capacity to deliver specific activities and outcomes which advance the UN Sustainable Development Goals.
- **Engineering Educators – Universities, technical Institutions and Associations:** WFEO will work with universities and other educational institutions, accreditation bodies and international organisations involved in engineering education to bring together the relevant parties with the expertise and experience in engineering education from around the world to support the development of the best standards for engineering education and the development of engineering capacity in countries in greatest need of engineers.

- **Industry Associations and large companies:** WFEO will work with industry and industry associations in the engineering sector to mobilise the resources with the expertise and experience to engage with industry and employers to:
 - o inform desired graduate outcomes from engineering education, especially with rapidly changing needs as a result of technological advancements;
 - o determine desired professional development requirements so that engineers are competent in their disciplines throughout their careers.

Principles for Action

The Principles for action to activate the WFEO Strategic Plan through the WFEO Engineering 2030 Plan are:

1. **Address the need for more engineers** - and encourage young people, boys and girls, to consider engineering as a career.
2. **Ensure appropriate standards in engineering education** - which address current and future needs of industry and society including teaching approaches (pedagogy), the use of technology and graduate outcomes.
3. **Ensure appropriate pathways for professional development** - so graduates and engineering practitioners meet employer needs and community expectations.
4. **Build capacity** - for the development of national engineering education systems to comply with agreed standards.
5. **Build capacity** - for the development of systems for the accreditation and regulation of engineering education and professional credentials, including training and governance for professional engineering institutions.
6. **Support multilateral mutual recognition** - of national and international accords and agreements – for recognition of qualifications and professional credentials of experienced engineers and to facilitate their mobility to move to locations where there is a demand for engineers.
7. **Develop strong relationships with government and policy makers** - to address policies relating to engineers and engineering.
8. **Liaise with governments** - to establish consistent regulation policies for engineers.
9. **Establish international projects to advance sustainable development for engineers and engineering** - led by the WFEO Standing Technical Committees.
10. **Report on progress** - to UNESCO and other international organisations.

Current and Future Projects

WFEO will establish joint projects, as well as facilitate projects currently in progress, to meet the objectives of the **WFEO Engineering 2030 Plan** including:

- Development of policy frameworks and metrics in science and engineering to advance the UN Sustainable Development Goals with the **International Science Council** and engagement with the United Nations;
- Support and facilitate the work of the WFEO national and international members in assisting education institutions achieving the required standards in engineering education and professional development, to develop the capacity for engineers, for example, the work of **FEIAP – Federation of Engineering Institutions in Asia and the Pacific**, an international member of WFEO and the work of **International Federation of Engineering Education Societies (IFEES) and the Global Engineering Deans Council (GEDC)**, both partners of WFEO;
- Extend the reach of multilateral recognition of engineering education and professional development of engineers through partnership with the **International Engineering Alliance (IEA)**;
- Support and facilitate professional training to support engineers throughout their careers, e.g. **FIDIC – Federation of International Consulting Organisations**;
- Develop international frameworks and strategies to address diversity in engineering through joint projects with WFEO Standing Technical Committee on Women in Engineering, national members and the partnership with the **International Network of Women Engineers and Scientists (INWES)**;
- Capacity Building projects in professional engineering institutions in Sub-Saharan Africa by WFEO members and international partners;
- Facilitate the work being done to encourage girls to consider STEM careers by WFEO associate member, **WomEng, South Africa**;
- Address anti-corruption in engineering, through the WFEO Standing Technical Committee on Anti-Corruption and collaboration with the **OECD, Global Infrastructure Anti-Corruption Centre, UK and the World Justice Project**;
- Capacity development activities by the Category II UNESCO body – **International Scientific Technology and Innovation Centre (ISTIC)**, based in Malaysia and by other bodies in Africa and the Americas;
- Engineering education programs development by UNESCO Category II **Centre the International centre for Engineering Education (ICEE)**, based in Tsinghua University, Beijing, including the use of technology to support engineering education.

Work in Progress and Achievements of the WFEO Engineering 2030 Plan.

Work in progress and achievements will be reported annually.

This report presents the projects that have been established by WFEO, its national and international members and its international partners to advance sustainable development during 2017-18 and presented at the WFEO Symposium on Advancing the UN Sustainable Goals Through Engineering, held in Paris on 7 March 2018. They demonstrate the diversity of projects geographically, technologically and in addressing a wide range of the UN Sustainable goals. They represent the power of the WFEO network and its partnerships and show case projects from WFEO:

- WFEO Standing Technical Committees including: Disaster Risk Management and Engineering and Innovative Technologies.
- WFEO National members – Spain, Portugal, Bahrain and Fiji.
- WFEO International members – the Federation of Engineering Institutions of Asia and the Pacific (FEIAP), the Federation of Arab Engineers (FAE) and the World Council of Civil Engineers (WCCE).
- WFEO International Partners in addressing engineering education standards and capacity building including the International Engineering Alliance (IEA), the International Federation of Engineering Societies (IFEES) and the International Federation of Consulting Engineers (FIDIC).
- WFEO Associate members including WomEng, South Africa.

Many other projects are in progress and include:

1. WFEO Committee on Disaster Risk Management – capacity building for earthquake and water related natural disasters and on-line database of engineering information to mitigating these risks.
2. WFEO Committee on Engineering Education – biennial conferences on engineering education and publication of IDEAS journal.
3. WFEO Committee on Information and Communication – international seminars on implementation in technologies for Smart Cities and the Internet of Things and publication of monographs on the implementation of information technology in health care and Industry 4.0 technologies.
4. WFEO Committee on Energy – international World Energy Forum and publication on solar energy to facilitate the implementation of new technologies in energy.
5. WFEO Committee on Engineering Capacity Building – facilitation of capacity building in engineering including Africa Engineering Week, held annually and focussing on developing engineering capacity in Africa.

6. WFEO Committee on Engineering and the Environment – Codes of Practice for Sustainable Development and Environmental Stewardship for Engineers and Principles of Climate Change Adaptation for Engineers and participation in the UN Conference of Parties (COP) events on engineering approaches to climate change mitigation and adaptation.
7. WFEO Committee on Engineering for Innovative Technologies – international conferences and seminars on artificial intelligence, use of innovative technologies, robotics and cloud computing.

Engineering practice for sustainable development has been addressed by the work of:

8. WFEO Committee on Women in Engineering – survey on the status of women engineers in Africa and work on improving sanitation for women in Africa.
9. WFEO Committee on Anti-Corruption – contribution to the ISO 37001 Anti Bribery Standard, ongoing participation in the ISO technical committee and development of training materials.
10. WFEO Young Engineers/Future Leaders Committee in supporting young engineers in their roles to advance sustainable development including the inaugural Young Engineers Competition held in 2018.

Detailed reports on committee activities on advancing the UN Sustainable Development Goals will be presented as part of the WFEO Biennial Report for the WFEO General Assembly in November 2019.

Project: Reviewing and Developing Standards for Engineering Education to meet current and future needs of industry and society



The objective of this project is to review current standards for engineering education for graduate engineers, technologists and technicians and to consider enhancement to meet the needs of industry and society.

This is a partnership project led by WFEO and with the participation of WFEO partners and national members including:

- The International Federation of Engineering Education Societies (IFEES) which has the world's engineering education societies as its members;
- The Global Engineering Deans Council (GEDC) which includes the leaders of engineering institutions around the world;
- The international peak body for consulting engineering associations (FIDIC);
- The International Network for Women Engineers and Scientists (INWES) which represents the associations of women in engineering and science;
- The UNESCO category II centre, the International centre for Engineering Education, at Tsinghua University.

The first meeting of the working group will be held in London on 21 October 2018 and thereafter by Skype. Face to face meetings are planned at the same time as the WFEO meetings in Ljubljana, Slovenia, in April 2019 and in Melbourne in November 2019.

It is expected that the working group will develop a plan of work with an outcome of proposed standards for agreement and recognition by countries around the world.

Participating organisations:



Project: Capacity Building for Engineering Education Systems, accreditation and registration to meet the needs for engineers around the world



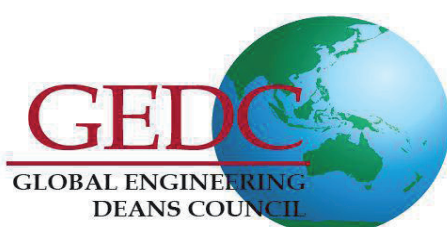
The objective of this project is to mentor and support countries to develop their engineering education accreditation systems so that education systems are meeting the standards for graduate outcomes that are recognised around the world.

This is a partnership project led by WFEO and with the participation of WFEO partners and national members including:

- International Engineering Alliance (IEA) that is responsible for the three multilateral accords that provide mutual recognition for engineering education outcomes;
- The International Federation of Engineering Education Societies (IFEES) which has the world's engineering education societies as its members;
- The Global Engineering Deans Council (GEDC) which includes the leaders of engineering institutions around the world;
- The international peak body for consulting engineering associations (FIDIC);
- The International Network for Women Engineers and Scientists (INWES) which represents the associations of women in engineering and science;
- The UNESCO category II centre, the International Centre for Engineering Education (ICEE), at Tsinghua University

The first workshop will be held as part of the Africa Engineering Week on Tuesday 18th September in Mombasa, Kenya. The second workshop will be held on Tuesday 23 October 2018 during the Global Engineering Congress 2018 in London. Further to face meetings are planned at the same time as the WFEO meetings in Ljubljana, Slovenia in April 2019 and in Melbourne in November 2019. Workshop participants will be invited to submit proposals for support and information on the specific requirements of their country in terms of the education system and structure. A plan of work will be developed for each country to be supported.

Participating organisations:



Project: Capacity Building for Engineering Education



The Federation of Engineering Institutions in Asia and the Pacific (FEIAP) is an international member of WFEO and has been developing projects to mentor and support professional engineering institutions to improve national engineering education standards to internationally recognised levels.

Thus degrees recognised by an accreditation agency of an economy which is recognised by FEIAP will be considered to have fulfilled the required standards for basic engineering qualifications according to the APEC Engineer Agreement.

The FEIAP Engineering Guideline takes into account that different economies in Asia and the Pacific region are at different stages of development. This references graduate outcomes against the exemplar standards set by the Washington Accord and/or EUR-ACE systems.

It allows for two levels of recognition based on the level of maturity of the applicant agency's accreditation system and processes, as well as the degree of compliance with the criteria that is set out under the FEIAP framework. The *first level* of compliance is appropriate to the '*nation-building*' phase of the economy and is very much an indication of the *potential* to achieve the educational requirements of the APEC Engineers.

The *second level* of recognition is an acknowledgement of the standard of accredited programs within the applicant agency's jurisdiction as meeting the base level education requirements for recognition under the APEC Engineer registration system. Thus by improving the quality of engineering education, from national standard to an international standard, more developing economies will be able to achieve the standard that is required for the global mobility of engineers.

Contribution by: Ir Prof Academician Dato' Dr Chuah Hean Teik, Chair Education Committee, FEIAP, an international member of WFEO



**Federation of Engineering Institutions
of Asia and the Pacific (FEIAP)**

Project: WomEng: 1 Million Girls in STEM



WomEng is an Associate member of WFEO and was established in 2006 with the objective of encouraging girls to consider STEM as a career by creating STEM awareness for girls and developing, mentoring and supporting them through their engineering journey.

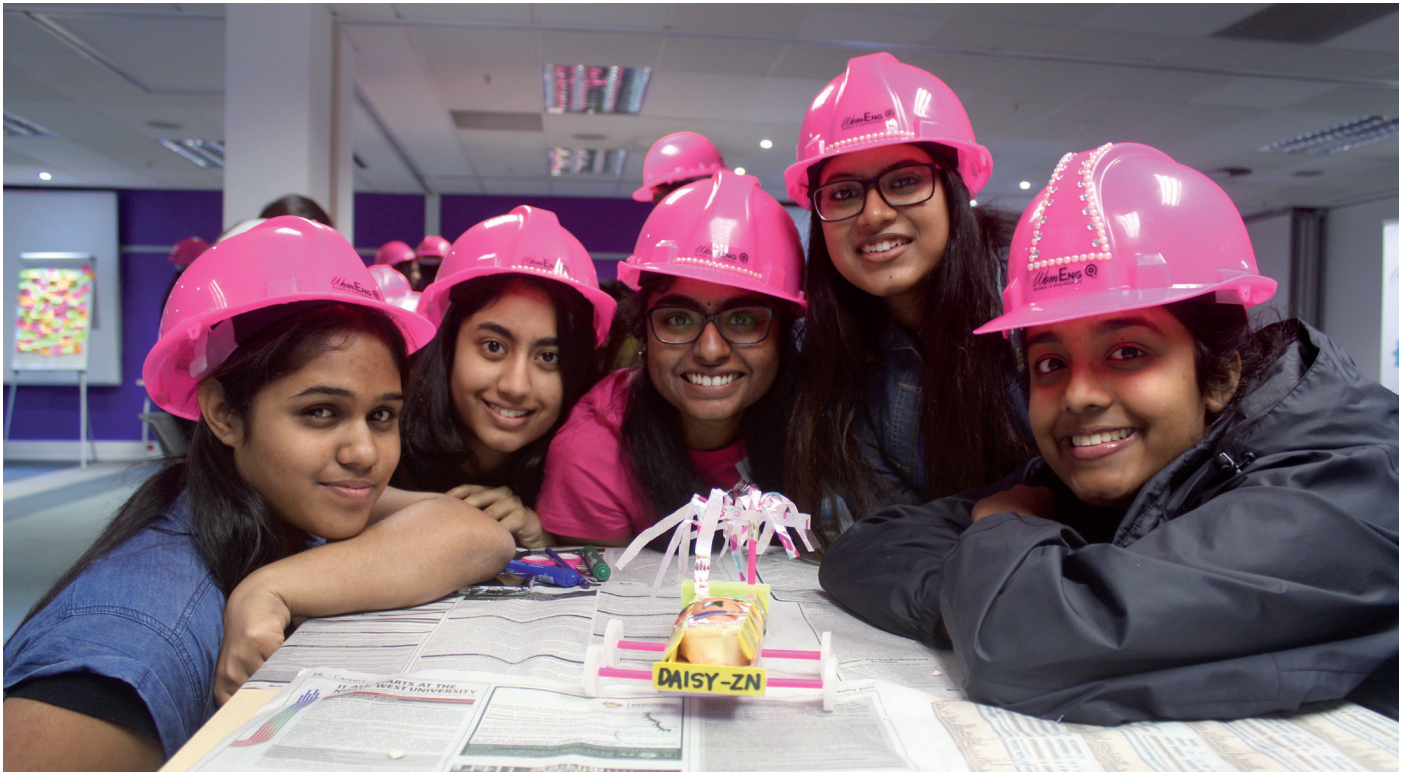
The symbol of the campaign is WomEng's trademark pink hard hat. The ambition of the campaign is to challenge the age-old perceptions and stereotypes that exist in the engineering industry and instill a sense of belief and ambition to pursue engineering careers in girl children around the world.

The model for extending the reach of STEM awareness to 1 million girls is based on an exponential train-the-trainer scaling model, working with individuals and/or organisations passionate about STEM, such as WFEO member organisations, who can sign up for a #1MillionGirlsInSTEM toolkit to become an official WomEng Activator. The reach is tracked on a live Google Map showcasing the number of countries, cities and girls reached.

The #1MillionGirlsInSTEM campaign is a key component of WomEng's efforts to meet the Sustainable Development Goals. By investing in girls' education and creating gender equity for the entire engineering sector.

Contribution by: Hema Vallabh, co-founder,
WomEng, an Associate member of WFEO.





Source for Images: WomEng

Project: World Council of Civil Engineers: Water Monographies



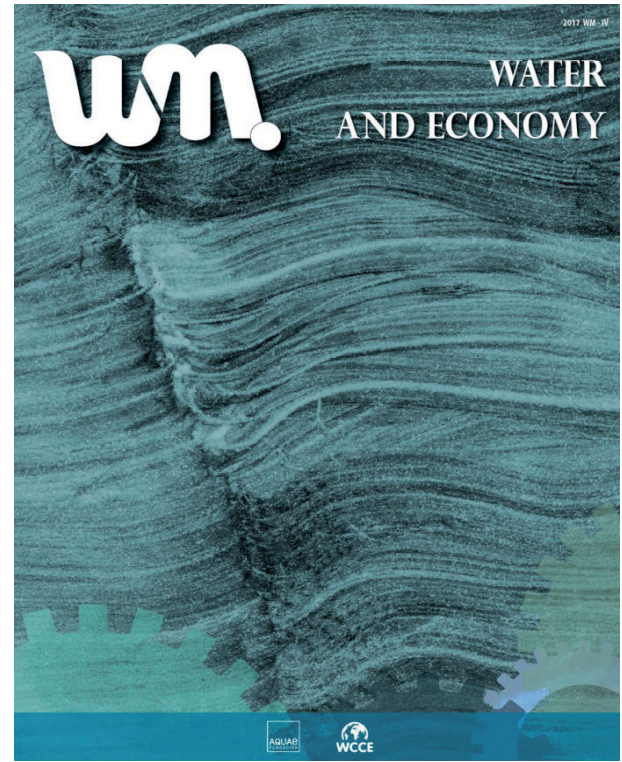
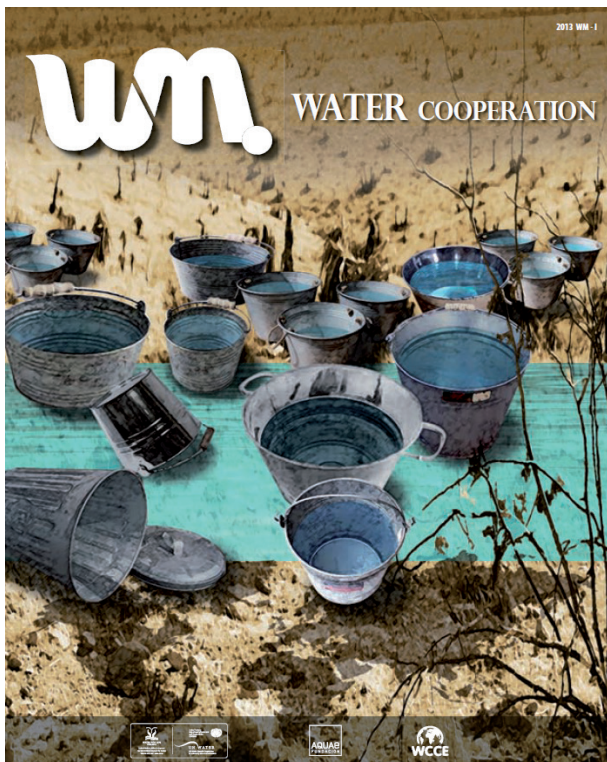
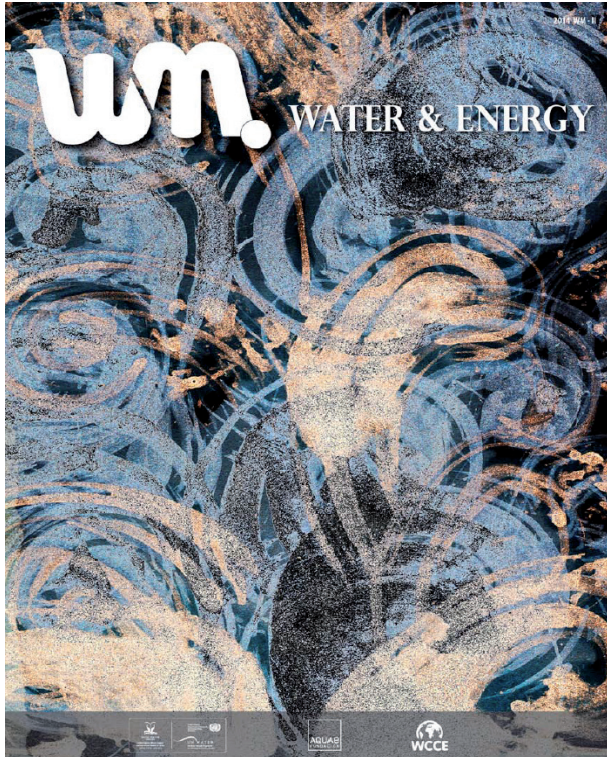
The *Water Monographies* initiative was carried out by the World Council of Civil Engineers (WCCE), the United Nations Office in Spain and Aquae Foundation under the aegis 2005 - 2015 International Water Decade. All signatories agreed to publish a series of monographs under the topics chosen annually to commemorate the «International Year of Water» declared by the UN in the 2013-2015 triennium, which was later extended until 2017.

The initiative has been welcomed by several stakeholders including UN agencies which have presented their views on water related topics. Views expressed were non unanimous and even opposite, but have enriched the reader expressing pros and cons of each approach, being respectful with the other.

The second series is also supported by the UNESCO International Hydrological Programme and provides approaches to sustainable development for water through a range of engineering solutions.

Contribution by: Eng. Alfonso Gonzalez Fernandez, President World Council of Civil Engineers, International member of WFEO.





Project: Spain and Portugal: Partnerships for Water



The Institution of Engineers Spain (IIE), the Order of Engineers Portugal (OdE) and the World Council of Civil Engineers (WCCE) have combined to develop strategies and programmes to address the severe drought in the Iberian Peninsula and to develop sustainable solutions to integrated water management. Projects and activities have included:

- Conference on river basin management plans (2015), Conferences on sustainability dams and reservoirs, Conference on water, 2017;
- Best Water Practices, *M. Lorenzo Pardo Award*;
- ***Declaration of Madrid, Water the Future We Want***, March 1, 2018, signed by ECCE - European Council of Civil Engineers, CICPC-CECPC - Council of Civil Engineering Associations from Portuguese and Spanish Speaking Countries, FEANI - European Federation of Engineering Organizations, WFEO - World Federation of Engineering Organizations;
- ***Declaration of 2018 – the Year of the Climate Change*** in Portugal;
- Participation in the 8th World Water Forum, Brasilia, March 2018;
- Conference on new Special Plans for Droughts in Spain, April 2018 with Ministry of Environment, Spain;
- Contribution to the WCCE Water Monographies Project.

Contribution by: Mr. Tomas Sancho, Past President World Council of Civil Engineers, Institution of Engineers Spain National Member Representative and member of WFEO Executive Council.



ORDEM
DOS
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Project: The Global Cyber School



The project involves Collaborative effort from all over the world to create an online global interactive remote teaching K-12 learning platform using modern ICT tools and technologies for the benefit of developing nations, especially in sub-Saharan Africa and Southern Asia.

The globalized Cyber-School utilises the unlimited potential of the internet, satellite, and wireless communication technologies to allow learners from developing countries to have interactive classrooms delivered by teachers from participant countries who should be visible and accessible via real time teaching sessions. In addition to this interactive real-time teaching, the platform will provide learners with open access extensive educational resources and services to reinforce their educational experience.

The platform is a multi-language cloud-based Interactive Learning Management System (ILMS) that covers the basic education curriculums taught in school from grades kindergarten through twelve (K-12). The curricula of each stage is presented in many languages, and by many teachers who are spread all over the globe, with different schedules.

Participating teachers will be empowered in ICT to effectively take care of classroom management and to be able to create and deliver interactive on-line classes that are comprehensive, easy to use, and enjoyable in order to attract students' interest, presence and concentration.

The implementation of the project has serious challenges to overcome, among them is the one related to the access of the internet and wireless communication technology infrastructure and facilities in rural and remote areas. Other challenges are related to the implementation and execution methodology of a user-friendly structured platform. In addition, flexibility of access is crucial as the platform is to be available to geographically dispersed learners in multiple languages.

Engineering and ICT professional's skills are essential to the implementation of the proposed Cyber-School platform. They will be responsible for developing the infrastructure in order to improve the delivery of quality education for all.

Contribution by: Dr. Raida Al-Alawi, Aseel Al-Dallal, member, Bahrain Society of Engineers, national member of WFEO, ICT Committee member of the Federation of Arab Engineers, International Member of WFEO



Project: Innovative Technologies Assisting Disaster Risk Reduction - the International Meridian Circle Project



Earthquake is a major natural disaster risk that threatens human life and property. Improving the capacity of earthquake prediction is urgently needed for sustainable development and is in turn requires international collaboration and technical innovation.

The International Meridian Circle Project (IMCP) will establish a global network of earthquake monitoring based not only on the earth but also in space, by utilizing satellite on the orbit of International Meridian Circle (IMC), a circular orbit combining the 120°E meridian with 60°W meridian. Furthermore, this global monitoring system could integrate the sensing data on the earth and from space, combining the given earthquake monitoring technology with innovative technologies, such as satellite remote sensing, Internet of Things (IoT) and Big Data, to acquire unprecedented ability to the monitoring of earthquake on a global scale.

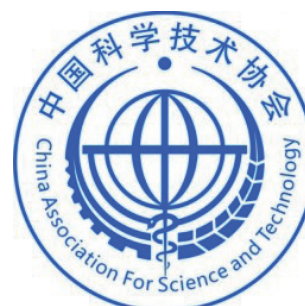
The project is initiated and lead by the Committee on Engineering for Innovative Technologies (CEIT) of WFEO. WFEO as the international platform addressing issues of concerns to the public and the profession with engineering and technologies, and can unite engineers, scientists, research institutes etc. from its members all over the world.

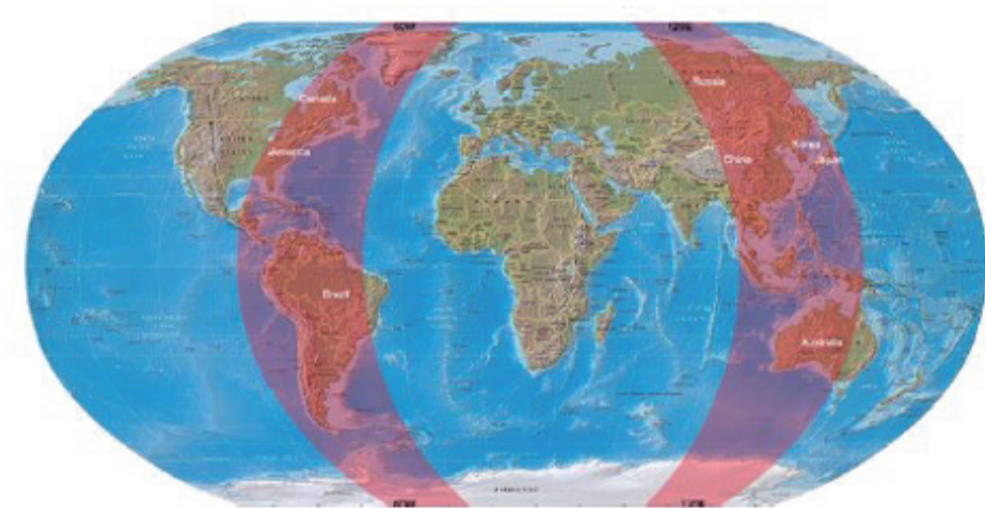
Moreover, other Standing Technical Committees of WFEO such as Committee on Disaster Risk Management (CDRM), Committee on Information and Communication (CIC), Committee on Engineering and the Environment (CEE) are closely associated with the issues addressed by the project and innovative technologies utilized in the project.

Partners of the project include WFEO members and committees with support from the Chinese Institute of Electronics, Brazilian National Institute for Space Research (INPE), Russian Academy of Sciences-Irkutsk Institute of Physics and Astronomy, Yakutsk Institute of Physic and Upper Atmosphere, the Institute of Crustal Dynamics in China.

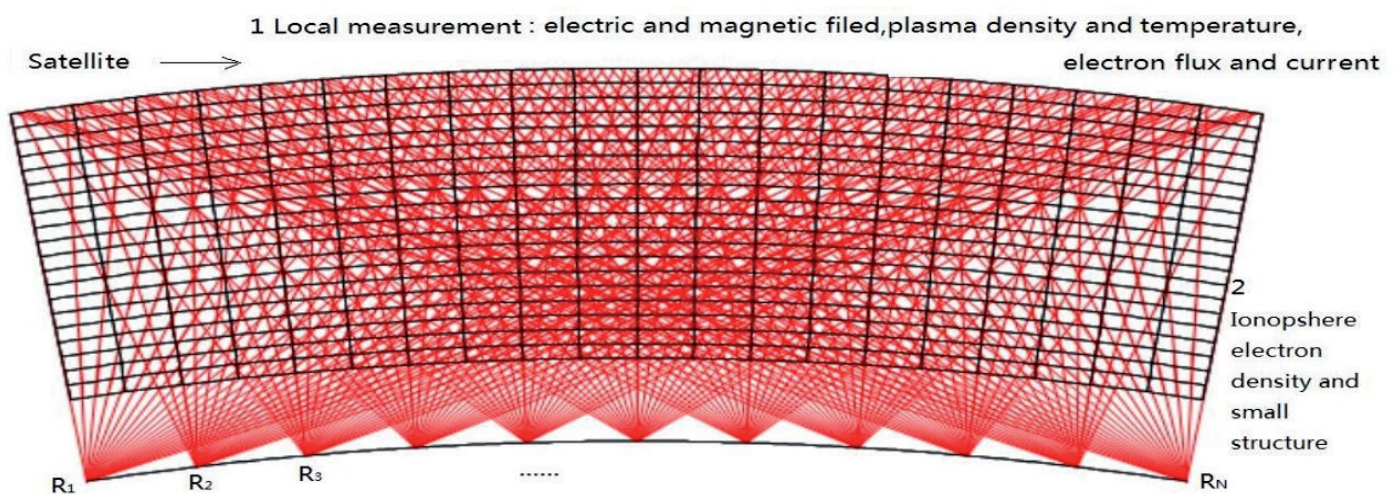
Teams engaged in space weather forecasting, earthquake prediction, geophysics, space physics, and radio propagation, etc. are welcome to join. WFEO members will greatly improve their capacity of earthquake prediction. and enhance the collaboration among the members and committees.

Contribution by: Prof. Gong Ke, Chair WFEO Committee for Engineering and Innovative Technologies 2017-2018, hosted by China Association of Science and Technology, President Elect WFEO.





Map Showing the Coverage of IMC



Innovative Ionospheric Precursory Monitoring System

Photograph Sources: WFEO CEIT IMC Project

Project: Sustainable Infrastructure and Resilience to Natural Disasters in Small Island Developing States



The South Pacific and the Small Island Developing States (SIDS) are low in human population, widely spread out and geographically remote from the rest of the world. In the global context, normally it is easily forgotten and left out. Nonetheless, the impact of Climate Change and frequent natural disasters such as tropical cyclones and floods produce serious financial and social setbacks on the SIDS fragile economy. Therefore, building sustainable infrastructure and resilience to natural disasters is essential for sustainable development.

Over the years the engineering leadership in Fiji has identified the key partners in order to progress the relevant SDG's. It has built a strong relationship and identity with the national governments, academia, infrastructure owners and asset managers, national disaster management office, private sector; particularly the business community and the development partners. It has engaged on "pro bono" basis with the Government of Fiji immediately after February 2016 Tropical Cyclone Winston with technical assistance, damage assessments and cost estimates to rebuild critical infrastructure and over 2,000 buildings, including schools.

The quality of the work produced by the engineers convinced the Hon. Prime Minister to publicly announce the "Adopt a School" Programme. Some development partners and business corporates took advantage of the Programme.

The excellent outcome resulted in a panel of assessors, approved by the Asian Development Bank for rapid damage assessment after a natural disaster event and to assist with the recovery process.

Engineers in the region are also driving the quality and benchmarking of engineering education at tertiary institutions in Fiji. In April of 2016, the regional university, The University of the South Pacific obtained its accreditation to the International Engineering Alliance standard for professional engineers (Washington Accord) for its Bachelor of Engineering, Electrical and Mechanical programmes. Such projects will ensure the number and quality of engineers educated in Fiji and which will serve the needs of the nation for sustainable development.

Contribution by: Eng Pratarp Singh, Past President, The Fiji Institution of Engineers, a national member of WFEO, Immediate Past President, South Pacific Engineers Association.





Damaged Telecommunications Tower after Tropical Cyclone Winston (Source: Pratarp Singh)



Damage after Tropical Cyclone Winston, Feb 2016, source: www.abc.net.au

Project: Piura River, Peru, Early Warning System – Resilience Against Natural Disasters



The WFEO Committee on Disaster Risk Management, hosted by the Peruvian Association of Professional Engineers will lead this project that has the objective of providing early warning to flood event following extreme rainfall to people living in the city of Piura, Peru. It addresses the impacts of climate change and uses engineering to build resilience against natural disasters.

The project involves collaboration of engineers across Peru and will include the development of hydrological models comprising historical precipitation data from satellites and stream flow data. A high resolution meteorological model will be developed to forecast climate conditions up to 10 days in advance. This provides time to organise response and protect the population.

The community will be encouraged to develop specific response plans.

The project draws on international experience for responses to river flooding including the Mississippi and the outcomes will be used to address river flooding in other area including the Rimac river basin in Peru.

Contribution by: Prof. Jorge Alva Hurtado,
Chair WFEO Committee for Disaster Risk
Management, hosted by the Peruvian Institution
of Engineers.

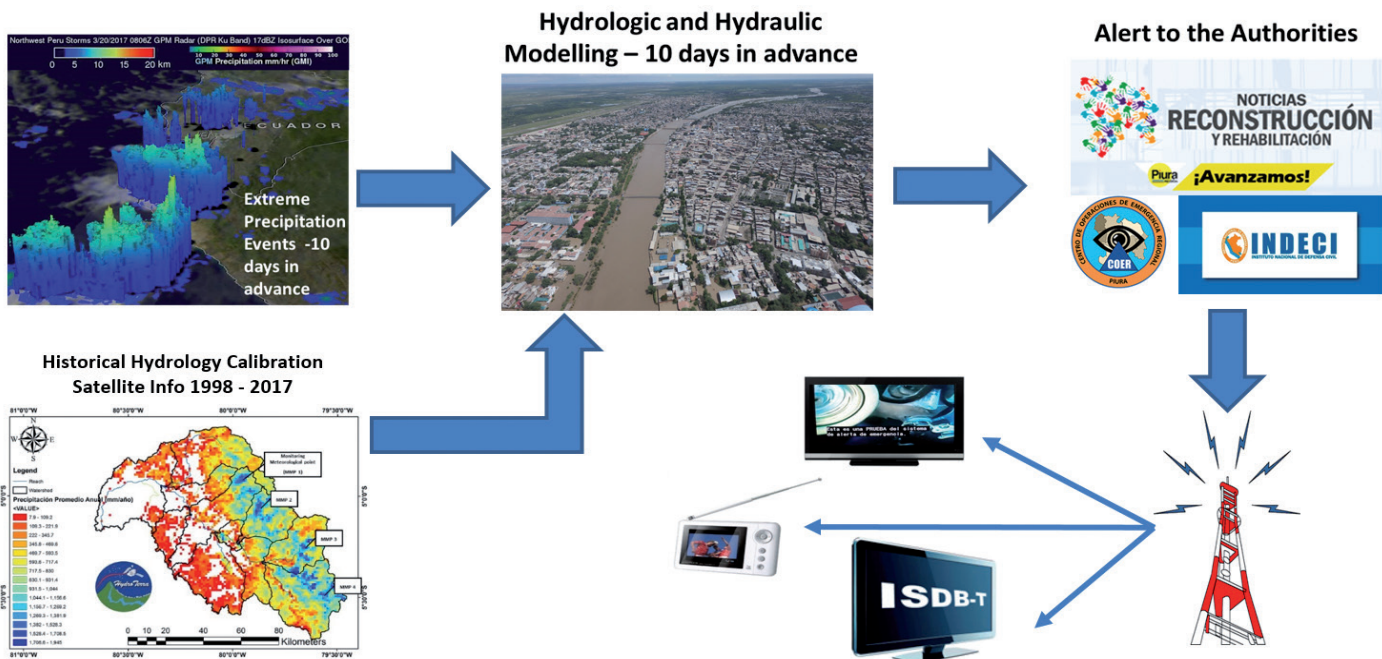




Piura River in Flood, Source Prof. J.A. Hurtado



PIURA RIVER'S EARLY WARNING SYSTEM



Proposed Piura River Early Warning System

Project: Partnerships for Governance, Anti-Corruption and Strong Institutions



The WFEO Committee on Anti-Corruption vision is to promote zero tolerance to corruption. This will reduce corruption in engineering projects and practice through the enforcement of sound management systems and ethical professional practice.

The Committee seeks to execute thematic, results-oriented programs that raises ethics and corruption prevention awareness and increases the understanding of the global, regional, engineering and policy issues and solutions for the combating of corruption to induce transparency in infrastructure and other vital services.

The Committee conducted a baseline infrastructure anti-corruption survey in Zambia and Zimbabwe during 2017 with the aim to create future periodic anti-corruption index reports as well give anti-corruption recommendations to Governments, Corporates, Civil Society and Professional Engineering Institutions. This project was conducted in partnership with the Global Infrastructure Anti-corruption Centre (UK), Engineers Against Poverty and the Engineering Council of Zimbabwe, a national member of WFEO and host of the Committee.

The Committee is working to develop training programmes in ethics and anti-corruption to be delivered by WFEO partners and members including the Federation of International Consulting Engineers (FIDIC). The Committee participated in the 2018 OECD Integrity Forum on integrity in public infrastructure and will continue to work with OECD in this area.

The Committee collaborates with the World Justice Project and the Global Infrastructure Anti-Corruption centre on issues relating to ethics and anti-corruption in engineering. It is planning to develop a course on engineering ethics to be recognised by international engineering education partners and a procurement code for WFEO members.

Contribution by: Eng. Martin Manuwha, Chair
WFEO Committee for Anti-Corruption, hosted by
the Engineering Council of Zimbabwe



Project: World Engineering Day for Climate Change Action and Sustainability



WFEO and its members and partners are coming together to propose the Declaration of 4th March as ***World Engineering Day for Climate Change Action and Sustainability***. **This is an example of partnerships in the engineering community in action, working towards a common goal.**

The Declaration of the Day of the Engineer will be an important recognition of the importance of engineering to modern life and the significant impact of engineering on the well-being, social and economic development of the people of the world.

It will be an opportunity to celebrate and inform government and society on the importance of engineering in achieving the UN Sustainable Development Goals.

WFEO is seeking formal letters of support from its national and international members for the Declaration of the Day which demonstrate their commitment to celebrate the Day and the likely impact of such celebrations. Women engineering networks in particular have provided letters of support on the positive impact such a Day would have on encouraging women and girls to consider careers in engineering. Young people are also enthusiastic about the declaration of the Day as it will provide an opportunity to encourage boys and girls to consider careers in engineering.

Letters of support received by WFEO indicate the impact of the declaration of the World Engineering Day would exceed 2 billion people.

The application process will commence in 2018 and it I hoped that an announcement can be made at the Word Engineers Convention in Melbourne in November 2019.

Annex 1: The Paris Declaration: Advancing the UN Sustainable Development Goals through Engineering, 7 March 2018

The World Federation of Engineering Organizations (WFEO) is the main body for engineering globally, representing nearly 100 nations and some 30 million engineers. The members of WFEO are the national and regional professional engineering institutions of the world. WFEO is a member of the United Nations Scientific and Technological Community (UN STC) Major Group and has an official Associate status with UNESCO.

UNESCO, as the United Nations agency for education, science and culture, supports engineering through its Natural Sciences Sector, and acknowledges engineering as a powerful means to achieve sustainable development, capacity-building in engineering education and gender equality in developing countries, as well as the safeguarding of world heritage.

Considering that:

1. In September 2015, the United Nations General Assembly adopted its Resolution 70/1 announcing the 2030 Agenda for Sustainable Development and its 17 Sustainable Development Goals (SDGs), which take an integrated approach to future development, combining progress in economic prosperity, social inclusion and environmental sustainability.
2. Engineers and engineering are critical for achieving the SDGs. Engineers have a key role in supporting the growth and development of essential infrastructures such as: roads, railways, bridges, dams, waste management, water supply and sanitation, energy and digital networks. They are responsible for developing and implementing technologies and systems that contribute towards achieving the SDGs as they relate to water, energy, environment, sustainable cities, natural disaster resilience and other areas, which will benefit people and the planet for greater prosperity and better quality of life.
3. WFEO is committed to playing a key role in leading and coordinating projects to achieve the SDGs through engineering. WFEO can bring together its members, educational institutions, government and industry to address the need for engineering capacity and the quality of engineers around the world and develop strategic frameworks and best practices for the implementation of engineering solutions for sustainable development. The national and regional members of WFEO, that are leading professional engineering institutions, will develop country and region-specific responses.
4. The celebration of WFEO's 50th anniversary in 2018 is a catalyst to develop a framework for an action plan for the engineering capacity that is required to achieve the SDGs. The Symposium held today, on 7th March 2018, is the first stage in bringing together the WFEO members and partners to develop the WFEO Engineering 2030 Plan.

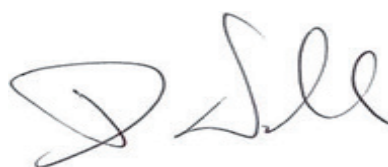
Accordingly, we declare:

1. WFEO, a recognized member of the UN STC Major Group and UNESCO, through its Natural Sciences Sector, will work together and in cooperation with other UN organizations, including UNEP, UNFCCC and UNISDR towards achieving the SDGs through engineering.
2. WFEO and UNESCO are committed to the following principles for action through engineering to achieve the SDGs:
 - a. Increase the numbers and quality of engineering graduates that meet the needs of sustainable development with rapidly changing technologies, in collaboration with educators, government and industry;
 - b. Inform global standards for engineering education, support the development of a range of engineering education systems to comply with agreed standards and facilitate the mobility of engineers;
 - c. Support capacity-building through strong institutions for engineering education and the development of accreditation bodies for the recognition of professional credentials;
 - d. Establish policy frameworks and best practices, notably through WFEO Standing Technical Committees, as digital technologies, data sciences and artificial intelligence have ethical and social implications.

Signed in Paris, 7 March 2018



Dr. Marlene Kanga AM
WFEO President



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

The world's engineers united in
rising to
the world's challenges.
For a better, sustainable world



WFEF / FMOI

SUSTAINABLE
DEVELOPMENT
GOALS