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

INTERNATIONAL ENGINEERING ALLIANCE

UNESCO Member Information Update

Advancing Capabilities in Engineering Education for Sustainable Development From Vision to Actions with Impact

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WFEO President 2017-2019

Engineers and engineering are critical for achieving the UN Sustainable Development Goals (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.

The World Federation of Engineering Organizations (WFEO) is committed to advancing the UN Sustainable Development Goals through Engineering. WFEO is leading and coordinating projects to achieve the SDGs through engineering. WFEO is working with the International Engineering Alliance (IEA) that provides governance over multi-lateral mutual recognition of engineering education qualifications in 29 countries to provide expert support to advise and mentor nations that wish to raise the standards of their engineering education systems and become signatories of the IEA Accords.

This work is the outcome of the commitment made at the celebration of WFEO's 50th anniversary in March 2018 which was a catalyst to develop a framework for an action plan for the engineering capacity that is required to achieve the SDGs. The event resulted in a joint Declaration between WFEO and UNESCO (**Figure 1**) on a commitment to advance the UN SDGs through engineering.

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Paris Declaration - Advancing the United Nations Sustainable Development Goals through Engineering

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

Marlene Kanga
President
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Assistant Director-General for Natural Sciences
UNESCO

Figure 1: The UNESCO WFEO Paris Declaration, 7 March 2018

In their joint Declaration, WFEO and UNESCO committed to the following objectives 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."*

The work of the WFEO Committee of Education in Engineering advances the first three of these objectives.

WFEO is progressing the work from vision to actions with impact in partnership with our peer international organisations in engineering. Together we are working on joint objectives in education, training and sustainable development. WFEO has formal partnerships with:

- International Engineering Alliance (IEA), representing 29 signatories and 41 jurisdictions through the engineering education Accords and professional competency Agreements;
- International Federation of Engineering Education Societies (IFEES), representing the engineering educators around the world;
- International Federation of Consulting Engineers (FIDIC), representing the consulting engineering companies and engineers around the world;
- International Network for Women Engineers and Scientists (INWES), representing the women in engineering and science around the world;
- International Centre for Engineering Education (ICEE, UNESCO Category II Centre) at Tsinghua University, China, representing UNESCO Category II centres in engineering education.

A significant achievement has been the review of the IEA Graduate Attributes and Professional Competencies (GAPC) benchmark, the pre-eminent global standard for engineering education, in in partnership with the IEA and WFEO partners for a consistent and contemporary Framework. The priorities for the review was to reflect changes in societal needs and contemporary values including consideration of the impact of engineering work on the UN SDGS, diversity and inclusion in engineering teams, emerging technologies and disciplines in engineering, rapidly changing technology environment and learning systems, ethics, a commitment to lifelong learning and skills for critical thinking and innovation.

The review was supported and endorsed by the UNESCO Assistant Director General, Natural Sciences Sector. ***Recognition by UNESCO Natural Sciences Section and the UNESCO Assistant Director General, ensures that the IEA GAPC is the pre-eminent international benchmark for engineering education.***

This work is a milestone in transforming the WFEO vision to action with impact. The work was completed in record time between November 2019 and March 2021, following global consultation across 60 countries and extensive feedback from WFEO members and IEA signatories. The Working Group consulted with engineering educators, industry, women and young people, the first time that such

extensive consultation had occurred. The updated GAPC Framework (**Figure 2**) and has been translated into the six UNESCO official languages, in addition to English, French, Spanish, Russian, Chinese and Arabic.

Figure 2: The approved IEA Graduate Attributes and Professional Competencies Framework

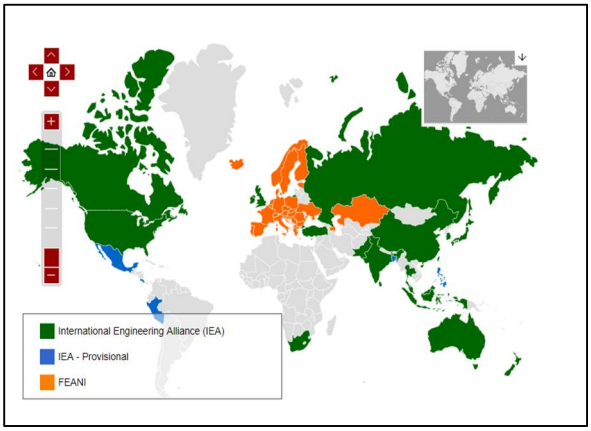

Figure 3: Map showing the gap in mutual recognition systems around the world

A **second working group with members from IEA, WFEO and its partners** is addressing the gap in engineering capability in Africa, Middle East, Asia and Latin America as shown in the map (**Figure 3)**. The grey areas are the countries that need to be supported to achieve the international standards and shows the great deal of work to be done in these regions.

WFEO has established working groups to mentor and support accreditation bodies to achieve signatory status at the International Engineering Alliance. I am proud to be leading this work on behalf of WFEO. There are three working groups currently supporting the accreditation bodies of Kenya, Mauritius and Ghana. Monthly mentoring meetings have been held virtually (**Figure 4)** and significant progress has been made. The mentors have developed structured systematic work plans for provisional signatory status applications.

Figure 4: Online mentoring for Institution of Engineers Mauritius (IEM) Engineering Accreditation Board by National Board of Accreditation (NBA, India) & Engineering Council of South Africa (ECSA), with Myanmar Engineering Council being the Chair and Secretariat.

Figure 5: Site Visit to University of Mauritius to observe accreditation by the Institution of Engineers Mauritius (IEM) Engineering Accreditation Board, June 2021.

A third working group established in partnership with IEA, IFEES and WFEO members and provides access to training in engineering education at no cost at www.wfeoacademy.com. Webinars by experts in engineering education from around the world provide structured training for accreditation

bodies, professional engineering institutions, engineering educators and also to provide engineers, technologists and technicians – non-discipline specific training to support their career development.

The website is based on UNESCO Open Science Principles and innovation and advanced technology to make content available inclusively to all. The website is presented in nearly 100 languages and scripts, it can be accessed by all, men and women wherever they are, and ensures that no one is left behind. Future work will establish recognition of training through national and international registers to facilitate the mobility for engineers, technologists and technicians.

Figure 6: WFEO Academy home page

UNESCO Natural Sciences Sector Capacity Building Division, is a key supporter of this project. This project uses innovation and technology to transfer much needed skills to developing countries in Asia, Africa and Latin America.

Figure 7: Welcome message from Dr Shamila Nair-Bedouelle on the WFEO Academy website

WFEO is working hard through its Committee on Education in Engineering for more engineers in countries where engineers are needed most – Africa, Asia and Latin America. WFEO is working with its partners to realize this vision and translate it into action with the endorsement of the UNESCO Natural Sciences Sector Capacity Building Division.

This work is being done through the generosity of experts in engineering education from WFEO members and partners on a volunteer basis and with a very limited budget. However, the benefits of this project transformational and global and will continue to have far reaching impacts and will advance the vision of WFEO for more engineers with the right skills for sustainable development and for our sustainable future.

For further information, please contact:

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