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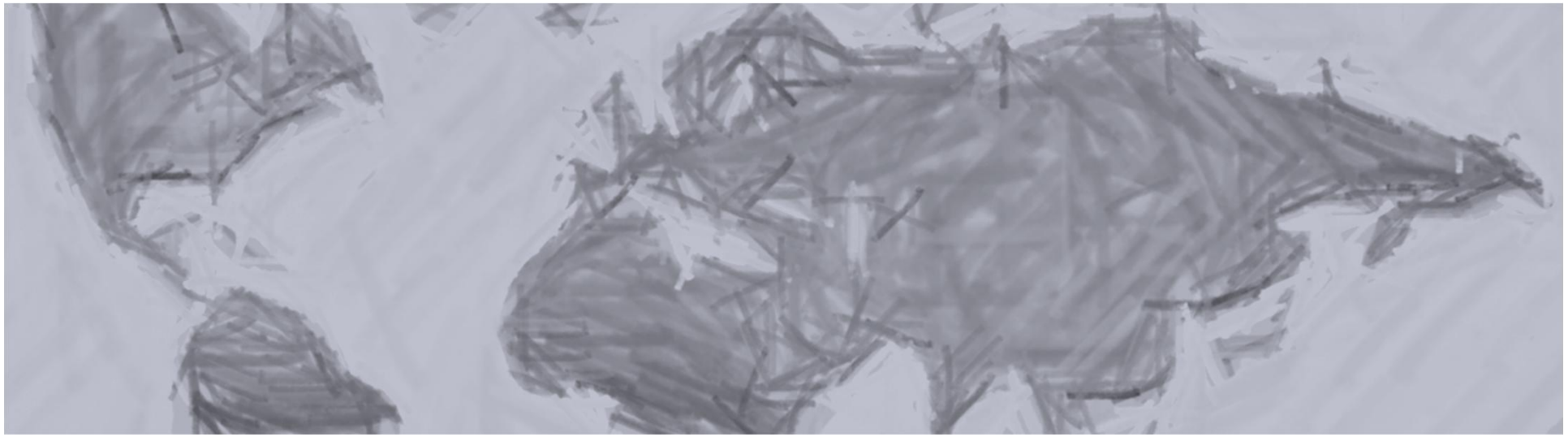
The IEA Graduate Attributes and Professional Competencies (V4)
The Reviewed Benchmark for engineers of the Future

Dr. Marlene Kanga AM FTSE Hon.FIEAust Hon.FIChemE
WFEO President 2017-19
National President Engineers Australia, 2013

5 November 2021



The World Federation of Engineering Organizations:

- The peak international body for professional engineering institutions
- Founded in 1968, Under the auspices of UNESCO
- 100+ national professional engineering institutions, 12 international and continental/regional professional engineering institutions, representing 30 million engineers
- Co-Chair - Major Science and Technology Group at UN
- Representation at major UN Organisations

Engineering for Sustainable Development

Algeria
Argentina
Australia
Bahrain
Bangladesh
Belize
Bolivia
Brazil
Bulgaria
Cameroon
Canada
Chile
China
Chinese Taipei
Colombia
Costa Rica
Croatia
Cuba
Cyprus
Czech Republic
Ecuador
Egypt
Ethiopia
Fiji
France
Germany
Ghana
Greece
Honduras
Hong Kong, China
Hungary
India
Iraq
Italy
Ivory Coast
Japan
Jordan
Kenya
Korea
Kuwait
Lebanon
Libya
Macedonia (FYROM)
Madagascar
Malawi
Malaysia
Malta
Mauritius
Mexico
Moldavia
Mongolia
Montenegro
Morocco
Nepal
New Zealand
Nigeria
Pakistan
Palestine
Peru
Poland
Portugal
Puerto Rico
Qatar
Romania
Russia
Rwanda
Saudi Arabia
Senegal
Serbia
Sierra Leone
Singapore
Slovakia
Slovenia
South Africa
Spain
Sri Lanka
Sudan
Switzerland
Syria
Tanzania
The Philippines
Tunisia
Turkey
Uganda
Ukraine
United Arab Emirates
United Kingdom
United States
Uruguay
Yemen
Zambia
Zimbabwe

- A key objective of the World Federation of Engineering Organizations, since 2018, is to advance the UN SDGs through engineering.
- WFEO is working with UNESCO and other international engineering organizations to advance the 2030 Agenda including the declaration of World Engineering Day for Sustainable Development in November 2019.
- The UNESCO Engineering Report – Engineering for the Sustainable Development Goals, aligns with this vision and shows the important work that needs to be done by engineers and "how engineering can make it happen".
- In addition the report shows that we need to build capacity for more engineers, with the right skills to advance sustainable development.

UNESCO was a key partner for the review of the engineering benchmarks for Graduate Attributes and Professional Competencies

The second UNESCO Engineering Report – "Engineering for the SDGs", released 4th march 2021, Chapter 1, author Dr Marlene Kanga recommends:

1. *"Government, engineering educators, industry and professional engineering institutions need to collaborate to increase the number and quality of engineers.*

2. *There is also a need to work in partnership to develop the necessary international engineering education benchmarks for sustainable development.*

3. *These need to be recognised across the world and form the basis of national engineering education systems for engineers with the right skills especially Asia, Africa and Latin America."*

EN http://on.unesco.org/Eng2021 , FR: http://on.unesco.org/Ing2021

ES http://on.unesco.org/Ingen21

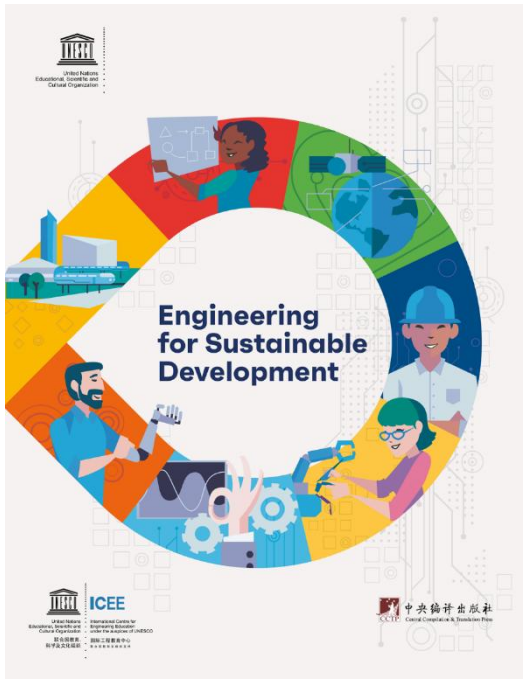
***Engineering* for Sustainable Development**

UNESCO is a key partner for the review of engineering benchmarks for Graduate Attributes and Professional Competencies

1. Recognised as a recommendation in the second UNESCO Engineering Report, released 4th march 2021, Chapter 1, author Dr Marlene Kanga :

- *"There is also a need to work in partnership to develop the necessary international engineering education benchmarks for sustainable development.*
- *These need to be recognised across the world and form the basis of national engineering education systems for engineers with the right skills especially Asia, Africa and Latin America."*

2. Recognition by UNESCO ensures that the IEA GAPC is the pre-eminent international benchmark for engineering education.



EN http://on.unesco.org/Eng2021

Message UN Secretary General Antonio Gutteres
to the WFEO Global Engineering Congress,
22-26 October 2018

"The United Nations will continue to count on your engagement and support as we strive to achieve the 17 Sustainable Development Goals – the world's blueprint for building a future of peace and prosperity for all on a healthy planet. ***Every one of the Goals requires solutions rooted in science, technology and engineering****."*

The UN Secretary General agrees, Twitter, 4 March 2021, World Engineering Day,

"As a trained engineer I am passionate about the potential of engineering to help solve the most pressing challenges facing our world"

WFEO – UNESCO
Declaration, signed on March 7, 2018

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

United Nations
Educational, Scientific and
Cultural Organization

WFEO / FMOI

Paris Declaration

Advancing the United Nations Sustainable Development Goals through Engineering

SUSTAINABLE DEVELOPMENT GOALS

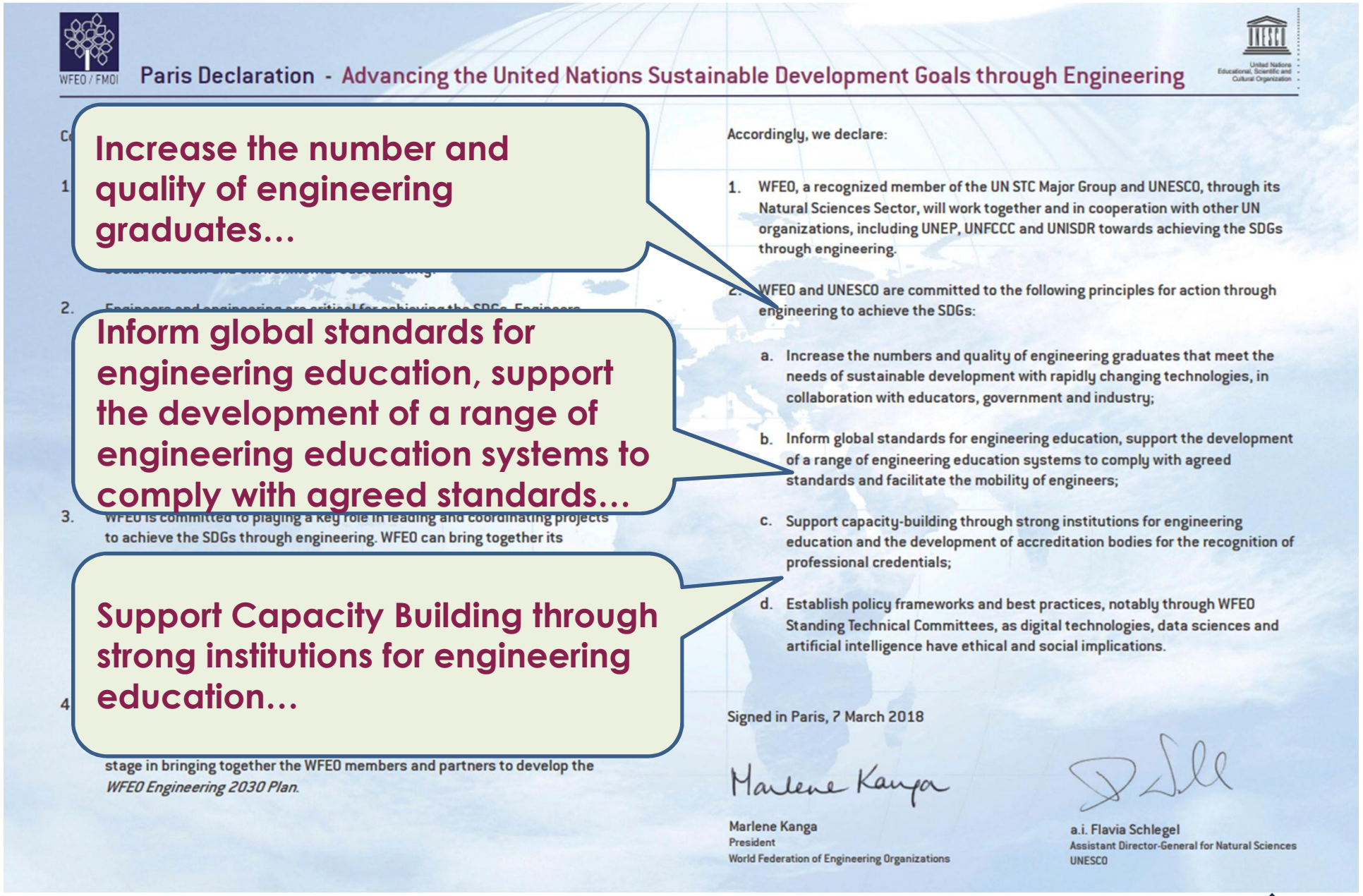
The World Federation of Engineering Organizations (WFEO) is the main body for engineering globally, representing nearly 100 nations and some 30 million engineers.

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.

CELEBRATING 50 YEARS OF INTERNATIONAL ENGINEERING LEADERSHIP

WFEO / FMOI
Maison de l'Unesco - 1 rue Miollis, 75015 Paris, France - Tel : +33 (0) 1 45 68 48 46
secretariat@wfeo.org - www.wfeo.org



Engineering 2030 – Principles for Action

1. **Encourage young people –** To consider engineering as a career
2. **Graduate Outcomes -** Agree with educators, government, industry
3. **Global standards -** for engineering education and professional development
4. **Partnerships –** with international standard setting organisations for consistent international framework

WORKING GROUP 1 - COMPLETE JUNE 2021

5. **Support –** development of national engineering education systems to comply with agreed standards
6. **Capacity Building –** for accreditation of engineering education and accreditation bodies
7. **Capacity Building –** for professional engineering institutions
8. **Develop professional competency pathways –** so graduates meet employer needs
9. **Support national and international registration –** for recognition of qualifications and experienced of practising engineers

WORKING GROUP 2

10. **Liaise with governments –** to establish consistent regulation policies for engineers
11. **Establish an international platform for engineering standards –** Education and professional development, under auspices of WFEO and UNESCO
12. **Report on progress -** to UNESCO and other international organisations

These projects:

1. Engineering education for the right skills - Goal 4
2. Develop institutional capacity – Goal 16 accreditation bodies and professional engineering institutions
3. Working in partnership – Goal 17

   UNESCO, WFEO members, International Engineering Alliance and signatories, international engineering organizations

UNESCO WFEO IEA Plenary on Engineering Education @ WEC2019 – Declaration committing to working together

1. **Recognise the Current IEA Graduate Attributes and Professional Competencies Framework as international engineering benchmark standards;**
2. **Support IEA review of the IEA Graduate Attributes and Professional Competencies to ensure that they meet the requirements for new technologies and engineering disciplines, new pedagogies and include contemporary values such as sustainable development, diversity and inclusion and ethics;**
3. **Extend the global reach of the IEA Agreements and Accords through capacity building efforts, such as mentoring and training, that support the development of engineering accreditation and professional competence/registration/licensure systems, appropriate to each jurisdiction;**
4. **Support the development of professional engineering institutions through capacity building efforts to ensure engineering quality and standards are maintained;**
5. **Support the development of national, regional and international registers and liaise with governments for the regulation of engineers to ensure their competence, performance, integrity and accountability throughout their careers, and**
6. **Facilitate the international mobility of engineers.**

UNESCO WFEO IEA Plenary on Engineering Education @ WEC2019 – Declaration committing to working together

Dr Peggy Oti-Boateng, Director, Capacity Building Section, Natural Sciences Sector UNESCO, speaks at Plenary, WEC2019, Melbourne

Signing of MoU between IEA and WFEO, WEC2019, Melbourne

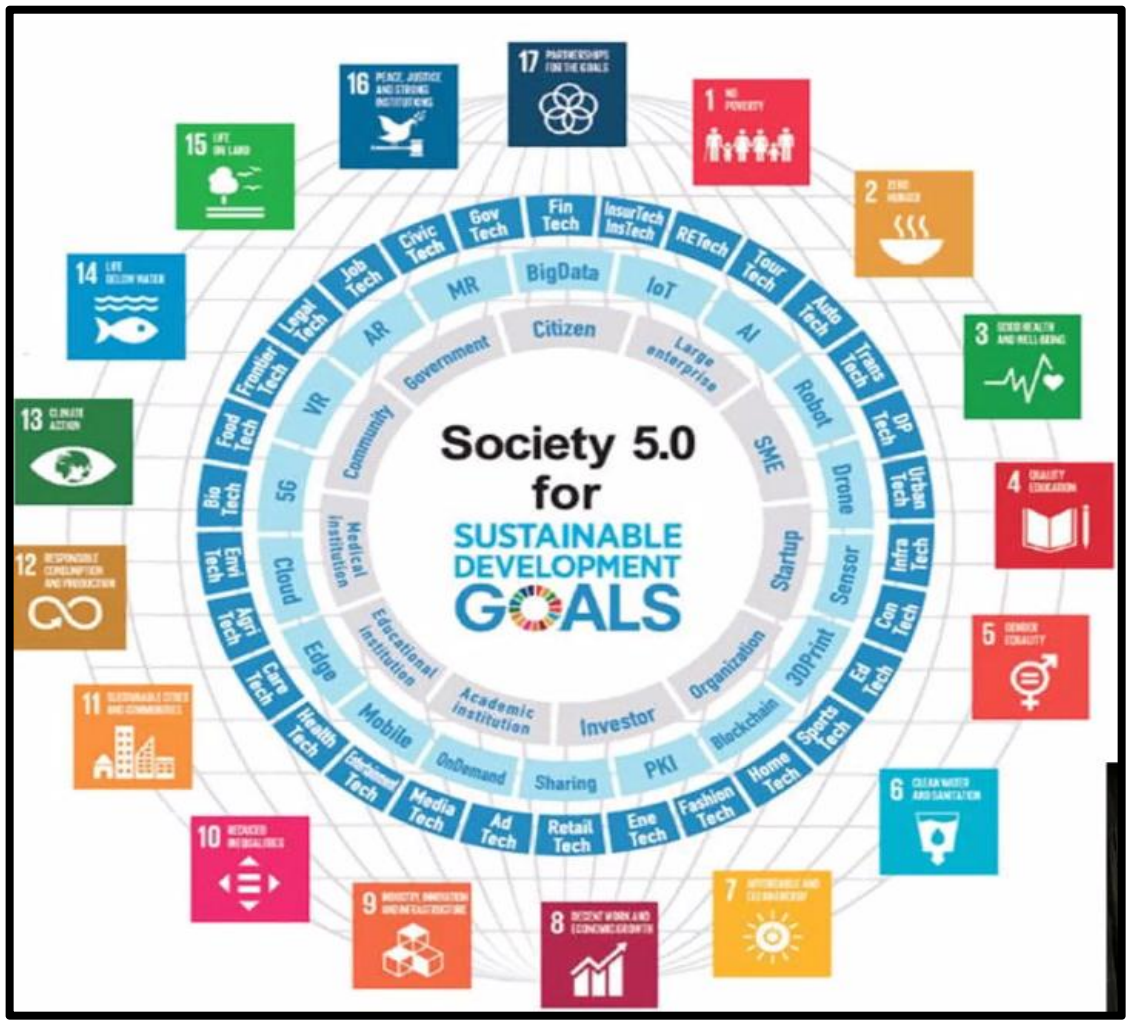
Emerging engineering disciplines and skills needed by engineers of the future

- **Core knowledge and skills,** analytic background, knowledge specific to discipline, basic transferable skills will continue to be needed.
- **IT skills, ability to write code**, rely on 3D printing, digital skills (information literacy, media literacy, and information and communication technologies) will be core.
- **Data driven analytics**, digital proficiency, digital learning platforms
- **New technologies:** Artificial Intelligence, Machine Learning, Automation will have rapid growth – commitment to **lifelong learning**
- `liberal arts training` become important, **multi-disciplinary issues** - social, legal, economic will need consideration in solutions
- The **complexity** (scale, diversity, globalism, disruptiveness) in engineering problems will increase - need for inclusive and sustainable solutions.
- Emphasis on `**entrepreneurial skills**`, `risk-taking`, and `critical thinking`
- **Communications skills**, ability to work collaboratively with diverse teams, in remote and virtual workplaces.
- incorporating the need to address the objectives of **the UN Sustainable Development Goals**
- A **broad ethical approach** and responsibility for the development of engineering solutions.
- And so on….

Recognition of the need for change

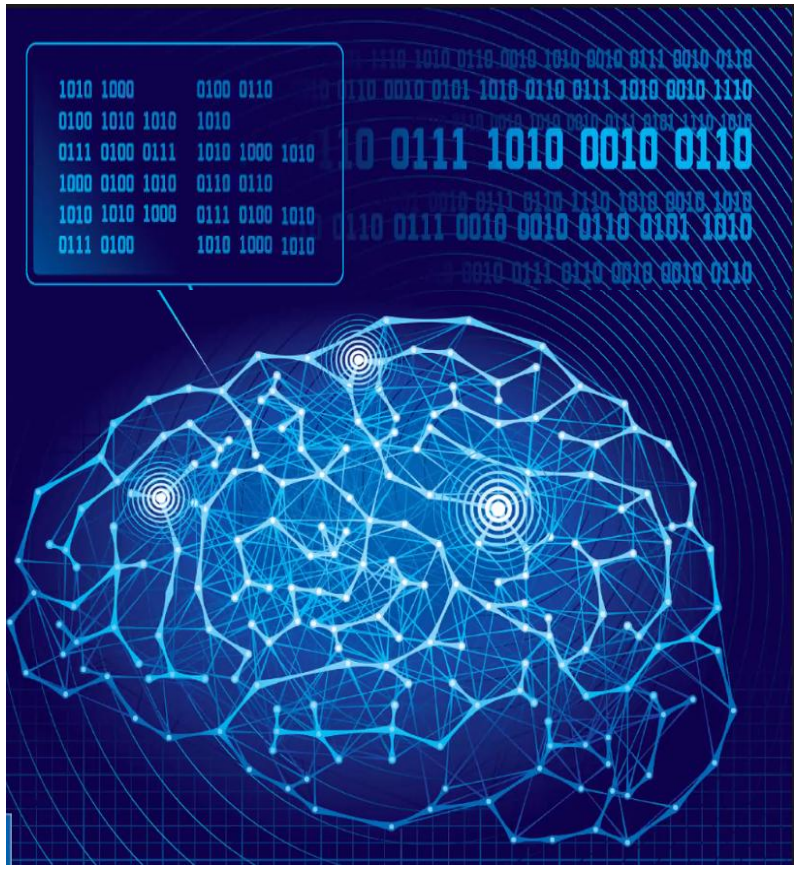
- **Global acceptance has been remarkably fast, demonstrating that the profession itself has recognised the need for urgent change to maintain the social license for relevant, contemporary engineering solutions.**

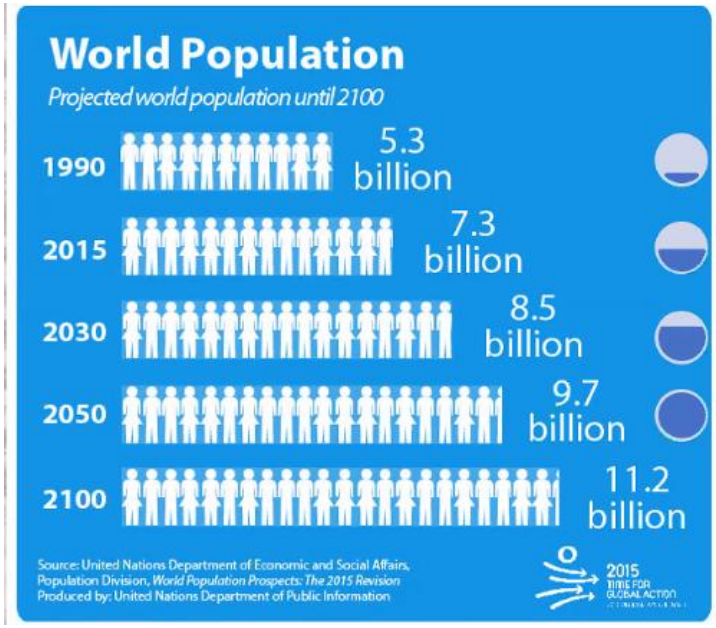
Emerging engineering disciplines and technologies and the UN Sustainable Development Goals



Source: https://www.researchgate.net/figure/Society-50-for-sustainable-development-goals-4_fig1_336567060

Increasing digitisation and information technologies is transforming our world





1990 GSM

2015 4G

2030 6G

2050 8G

Source: I. Opperman, Enabling our digital future, Feb. 2021

Example – civil engineering - skills needed by engineers of the future

- **It is estimated that 90% of the work of civil engineers is embedded in the excellent codes and standards that underpin much of civil engineering. These can be used to build automated systems that may take over routine design work and tasks that once took many months of effort will be processed by a computer in a matter of hours.**
- **Building Information Modelling (BIM), Simulation, optimization, and automation are transforming civil engineering and will be used for many tasks with little human intervention.**

Engineering needs more brain power not muscle power

***Engineering* for Sustainable Development**

Partnering with our international peers

- **This project has been progressed in partnership with our peer international organisations in engineering**
- **Together we are working on joint objectives in education, training and sustainable development**
- **Partnerships with:**
  - **International Engineering Alliance (IEA)**
  - **International Federation of Engineering Education Societies (IFEES)**
  - **Federation of International Consulting Engineers (FIDIC)**
  - **International Network for Women Engineers and Scientists (INWES)**
  - **International Centre for Engineering Education (ICEE, UNESCO Category II Centre) at Tsinghua University, China**
  - **International Science Technology and Innovation Centre for South-South Cooperation (ISTIC, Malaysia, UNESCO Category II Centre)**

The International Engineering Alliance (IEA) and the benchmark Framework for Graduate Attributes and Professional Competencies (GAPC)

- **IEA is an umbrella organisation that provides governance for the three Accords and four Agreements that provide international multilateral recognition of graduate attributes and professional competencies across 30 countries.**
- **For graduation after tertiary engineering education course*:**
  - **Washington Accord – Professional Engineer usually 4-5 years**
  - **Sydney Accord – Engineering Technologist usually – 3-4 years**
  - **Dublin Accord – Engineering Technician usually -2 years**
- **After graduation for professional registration, after a period of work experience:**
  - **Intl. Professional Engr. Agreement – Prof. Engineer**
  - **Intl. Technologist Engr. Agreement – Eng. Technologist**
  - **Intl. Associate Engr. Agreement – Eng. Technician**
  - **APEC Engineering Agreement – APEC Region- Prof. Engineer**

* Note: The duration of academic formation will normally be at least sixteen years (Washington Accord), fifteen years (Sydney Accord) and 13 years (Dublin Accord).

UNESCO WFEO IEA Working Group for review of Graduate Attributes and Professional Competencies (GAPC)

- **Chair**: IEA Nominated – Prof. Arif Bulent Ozguler MUDEK , Turkey
- **IEA Members (all signatories)**
  - Prof Mitsunori Makino and Ms Akiko Takahashi (JABEE), Japan
  - Prof Barry Clarke (Engineering Council UK) , UK
  - Ms Bernadette Foley (Engineers Australia), Australia
- **Co-Chair** – WFEO Nominated
- **WFEO Members** –
  - Dr Marlene Kanga – WFEO President 2017-2019, Australia
  - Mr WANG Sunyu (Vice Director General, ICEE Tsinghua University), China
  - Dr Charlie Than, (President, Myanmar Engg. Council) , Myanmar
  - Dr Michael Milligan (Chief Executive, ABET) – representing IFEES, USA
  - Others from ICEE China:
  - Mr KANG Jincheng, Strategic Specialist, ICEE
  - Mr QIAO Weifeng, Asst Professor Inst. Of Education Tsinghua University and ICEE
  - Mr XU Lihui, Research Associate, Inst. Of Education Tsinghua University and ICEE

- **Schedule:**
- Review current frameworks, draft discussion document, prepared by the Working Group, for consultation Nov-2019 - June 2020 (Available on the consultation web page)
- Consultation: July 2020 – March 2021
- Revise and Finalise IEA Annual meeting June 2021 and WFEO General Assembly 2021

The IEA GAPC Benchmark: Context

- **GAPC are stated generically** and are applicable to all engineering disciplines
- ***Graduate attributes*** form a set of individually assessable outcomes that are the components indicative of the graduate's potential to acquire competence to practice at the appropriate level. The attributes are clear, succinct statements of the expected capability.
- ***Professional competency profiles*** record the elements of competency necessary for competent performance that the professional is expected to be able to demonstrate in a holistic way at the stage of attaining registration.

- The graduate attributes identify the distinctive roles of ***engineers, technologists and technicians***
- The professional competency profiles are written for each of the three categories: ***engineer, engineering technologist and engineering technician*** at the point of registration

The IEA GAPC Benchmark: Principles and Approach

Recognize that GAPC Framework:

- **Is not an "international standard" but provides a benchmark to judge substantial equivalence**
- **Is not prescriptive - reflects the essential elements**
- **Does not specify performance indicators for assessment of equivalence**
- **Applicable to all engineering disciplines, i.e. discipline-independent.**

<u>Approach</u>:

- **Research current major reviews on engineering education globally**
- **Sought views from IEA signatories i.e Accreditation Agencies**
- **Focused on discipline-independent features**
- **Made sure that any modifications are "assessable" attributes/ competencies**
- **Maintained Framework structure, "no change" was as valid as a "change"**

Key areas for change

1. **Accommodate future needs** of engineering professionals and the profession – strengthen the required attributes on team work, communication, ethics, sustainability.
2. **Emerging technologies** – incorporate digital learning, active work experience, lifelong learning.
3. **Emerging and future engineering disciplines and practice areas** – while retaining discipline independent approach, enhance the skills on data sciences, other sciences, life-long learning.
4. **Incorporate UN Sustainable Goals** - in the development of solutions that consider diverse impacts – technical, environment, social, cultural, economic, financial and global responsibility **AND LEAVE NO ONE BEHIND**
5. **Diversity and Inclusion** – include these considerations within ways of working in teams, communication, compliance, environment, legal etc. systems.
6. **Intellectual agility, creativity and innovation** – emphasize critical thinking and innovative processes in design and development of solutions

Structure of GAPC Framework

The GAPC Comprises five tables:

1. **Table 1: Range of Problem Solving Capabilities** that distinguish the 4-5-year programs with engineer graduates from those that have a teaching duration of 3-4 years for technologists or 2 years for graduating technicians. Distinguishes between complex, broadly-defined and well-defined engineering problems.
2. **Table 2: Range of Engineering Activities** for an engineer, a technologist, and a technician, respectively.
3. **Table 3: Knowledge and Attitude Profile** of a graduate of an engineering program, i.e. the minimum requirements for the curriculum
4. **Table 4: Graduate Attribute Profiles the qualifications** (assimilated knowledge, skills, and attitudes) of an engineer/technologist/technician at the time of graduation.
5. **Table 5: Professional Competency Profiles** specifies the range of competency profiles for a qualified engineer/technologist/technician. These need to be attained, not only during school education but also, through lifelong learning and professional development to practice at an appropriate level.

Table 4 : Graduate Attribute and Professional Competency Profile

- **Table 4: Graduate Attribute Profile - the qualifications (assimilated knowledge, skills, and attitudes) of a professional engineer/technologist (3-4 year)/technician (2-3 year) are described.**
- **In this presentation - focus is on the professional engineer – usually 4-5 year degree.**
- **Attributes for technologists and technicians are described in the full in the Report by the UNESCO WFEO IEA Working Group which is available on the WFEO website https://bit.ly/3fg8Fdh**

GAPC Table 4: Graduate Attribute Profile (as approved 21 June 2021)

Graduate attributes cover:

RED FONT SHOWS CHANGES MADE

1. ~~Engineering knowledge~~
2. Problem analysis
3. Design and development of solutions
4. Investigation and research
5. Usage of appropriate tools

KNOWLEDGE

6. The engineer and ~~society~~ **the world**
7. ~~Human, social and environmental impacts~~
8. **7.**Ethics

ENGINEER & SOCIETY

9. **8 Individual** and collaborative team work
10. **9.** Communication
11. **10.** Project Management and Finance
12. **11.** Preparation for lifelong learning

WAYS TO WORK

GAPC Table 4: Graduate Attributes (1)

BASICS + COMPUTING SKILLS

LATEST THINKING, CONSIDER IMPACTS FOR SUSTAINABLE DEVELOPMENT – FOR A BETTER WORLD

Differentiating Characteristic	… for Washington Accord Graduate	
Engineering Knowledge: Breadth, depth and type of knowledge, both theoretical and practical	**WA1:** Apply knowledge of mathematics, natural science, computing and engineering fundamentals, and an engineering specialization as specified in WK1 to WK4 respectively to develop ~~the~~ solutions to ~~of~~ complex engineering problems	…o the …to …ence and
Problem Analysis Complexity of analysis	**WA2:** Identify, formulate, research literature and analyse *complex* engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences with holistic considerations for sustainable development* (WK1 to WK4)	The graduate is expe… to apply the latest thinking and holist…ally consider the implications for sustainable development
Design/development of solutions: Breadth and uniqueness of engineering problems not previously been identified or codified	**WA3:** Design creative solutions for *complex* engineering problems and design systems, components or processes that meet identified ~~specified~~ needs with appropriate consideration for public health and safety, whole-life cost, net zero carbon as well as resource, cultural, societal, and environmental considerations as required (WK5)	A graduate is expected to consider the whole of life cost and net zero carbon impacts of solutions from cradle to cradle.

DIFFERENT PERPECTIVES, CREATIVITY, INNOVATION, CRITICAL THINKING, SUSTAINABILITY, DIVERSITY

*Represented by the 17 UN Sustainable Development Goals (UN-SDG)

GAPC Table 4: Graduate Attributes (2)

Differentiating Characteristic	… for Washington Accord Graduate	Rationale for Change
Investigation and depth of i and experimen	igations of *complex* engineering problems hods including research-based knowledge, ~~h methods including~~ design of experiments, ~~ibosis of information~~	The graduate is expected be able to research latest technologies, trends and thinking and including data analysis, draw conclusions
~~**Modern**~~ **Tool Usage:** Level of understanding of the appropriateness of technologies and ~~the~~ tool	**WA5:** Create, select and apply, and recognize limitations of appropriate techniques, resources, and modern engineering and IT tools, including prediction and modelling, to *complex* engineering problems ~~with an understanding of the limitations~~ (WK2 and WK6)	The graduate is expected to use data, modelling and computational techniques to simulate possible solutions whil derstanding the limitations of the anal d implications of assumptions made, critical thinking.
The Engineer and the World: Level of knowledge and responsibility for sustainable development	**WA6:** When solving complex engineering problems, analyze and evaluate sustainable development impacts* to: society, the economy, sustainability, health and safety, legal frameworks, and the environment (WK1, WK5, and WK7)	The engineer must be able to consider broad outcomes for sustainable development – previous attribute that was more narrow has been replaced.

CONSIDER HUMAN SOCIAL ECONOMIC AND ENVIRONMENTAL IMPACTS FOR ALL

LATEST RESEARCH AND TRENDS, CRITICAL THINKING, DIVERSITY

USE OF DATA AND MODELLING AND COMPUTATIONAL TOOLS

CONSIDER BROAD OUTCOMES FOR SUSTAINABLE DEVELOPMENT

*Represented by the 17 UN Sustainable Development Goals (UN-SDG)

GAPC Table 4: Graduate Attributes (3)

Differentiating Characteristic	… for Washington Accord Graduate	Rationale for Change
Ethics: Understanding and level of practice	**WA7:** Apply ethical principles and commit to professional ethics ~~and responsibilities~~ and norms of engineering practice and adhere to rel… Demonstrate an … inclusion (WK9~~7~~)	Ethical responsibilities for compliance with national and international laws and for diversity and inclusion has been added – a strong enforcement of the engineers' ethical responsibility for being inclusive.
Individual and Collaborative Team work: Role in and diversity of team	**WA8:** Function effe… or leader in diverse ~~and inclusive~~ teams and in multi-disciplinary, face-to-face, remote and distributed settings (WK9)	The importance of working effectively in diverse teams by ethnicity, gender, age, location etc. has been added
Communication: Level of communication according to type of activities performed	… write effective reports and design documentation, make effective presentations, ~~and give and receive clear instructions~~ taking into account cultural, language and learning differences.	The importance of inclusive communication, written and verbal, taking account of cultural, language and other differences, has been added

ETHICS – BROADLY – TECHNOLOGY, DATA, HUMAN, COMPLY WITH LAWS, DIVERSITY AND INCLUSION

CONSIDER DIFFERENT PERSPECTIVES - INCLUSIVE COMMUNICATION – LANGUAGE, CULTURE, LEARNING DIFFERENCES

A VOICE FOR EVERYONE - WORKING COLLABORATIVELY IN DIVERSE TEAMS IN THE BROADEST SENSE

GAPC Table 4: Graduate Attributes (4)

Differentiating Characteristic	… for Washington Accord Graduate	Rationale for Change
Project Management and Finance: Level of management required for differing types of activity	**WA10:** ~~Demonstrate~~ Apply knowledge and understanding of engineering management principles and economic decision-making and apply these to one's own work, as a member and leader in a team, and to manage projects and in multidisciplinary environments.	The engineer must apply knowledge and understand economic and management issues as a team leader.
Lifelong learning: ~~Preparation for and depth of continuing learning.~~ Duration and manner	**WA11:** Recognize the … preparation and abil… independent and life-long learning ii) adaptability to new and emerging, technologies and iii) critical thinking in the broadest context of technological change (WK8)	The importance of creativity, adapting and learning about emerging technologies and technological change and critical thinking, has been added

INTELLECTUAL AGILITY, TECHNICAL, ECONOMIC, MANAGEMENT AND LEADERSHIP

CREATIVITY, INNOVATION, CRITICAL THINKING

ADAPT TO NEW AND EMERGING TECHNOLOGIES

GENDER NEUTRAL LANGUAGE THROUGHOUT THE FRAMEWORK

Consultation to March 2021 on Graduate Attributes and Professional Competencies (GAPC) Framework

- **4 webinars:**
- **Professional Engineering Institutions,**
- **Engineering Educators and Universities**
- **Women,**
- **Industry**
- **932 attending, 60 countries**

- **Survey – responses from every continent**

- **15 Detailed submissions, every continent**

Continent	No.	%
Africa	75	8%
Asia	665	71%
Americas	96	10%
Europe	54	6%
Middle East	29	3%
Oceania	13	1%
Total	932	100%

See: http://www.wfeo.org/consultation-with-wfeo-members-and-partners-on-proposed-updated-iea-benchmark-for-graduate-attributes-and-professional-competencies/

Consultation July 2020 - March 2021 on Graduate Attributes and Professional Competencies (GAPC) Framework

Webinars by WFEO – July 2020 - Feb. 2021:

1. **WFEO Members- Professional Engineering Inst. (Ozguler, Kang, Than, Milligan, Kanga)**
2. **Engineering Educators and Universities, IFEES (Kanga)**
3. **Women, INWES (Ozguler, Than Milligan, Kanga)**
4. **Industry, FIDIC (Than, Kanga)**

Webinars hosted by others:

1. **Peru, *6th ICACIT Symposium*, 7 November 2020, (Ozguler)**
2. **Philippines Technological Council, *ACE Accreditation Conference in Engineering*, 18 Nov 2020 (Kanga)**
3. **China, International Centre for Engineering Education (ICEE) *Engineering Education for Sustainable Development*, 4 December 2020 (Kanga)**
4. **Myanmar, Myanmar Engineering Council, *International Conference on Engineering Education Accreditation (ICEEA 2021)*, 14-16 January 2021 (Kanga)**
5. **Jakarta, UNESCO Jakarta AAESAP and PII (Indonesia) *Engineering Value Chain*, 4 March 2021 (Kanga)**
6. **3rd Deans Conference, Pakistan Engineering Council, 7 April 2021 (Ozguler, Than, Kanga)**
7. **APEC Meeting Taipei, *Regional Industry-Academia Collaboration, 7 May 2021 (Kanga)***

Review of GAPC - consultation with industry

Consultation with other international organisations in engineering – educators, industry and women - to provide feedback on proposed changes to GAPC benchmark.

See: http://www.wfeo.org/consultation-with-wfeo-members-and-partners-on-proposed-updated-iea-benchmark-for-graduate-attributes-and-professional-competencies/#Webinar-Diversity&Inclusion

Feedback to March 2021 has been overwhelmingly positive and constructive

1. George Mason University, VA USA
2. University of Western Australia
3. American Society of Civil Engineers, ASCE Body of Knowledge Version 3 (BOK3)
4. South African Institution of Civil Engineers (SAICE)
5. International Network for Women Engineers and Scientists (INWES)
6. University of Bath, UK
7. Civil Engineering Specialist Advisory Group, *CALOHEE project, Measuring and Comparing Achievements of Learning Outcomes in Higher Education in Europe*, funded with support from the European Commission, see https://www.calohee.eu
8. Germany: IPE e. V., Ingenieurpädagogische Wissenschaftsgesellschaft, ipw-edu.org, info@ipw-edu.org
9. Centre for Engineering Education (CEE), Universiti Teknologi Malaysia, http://tree.utm.my
10. Engineers Without Borders International and EWB Chapters in Australia, Brazil, India, Canada, Netherlands, Philippines, UK, USA

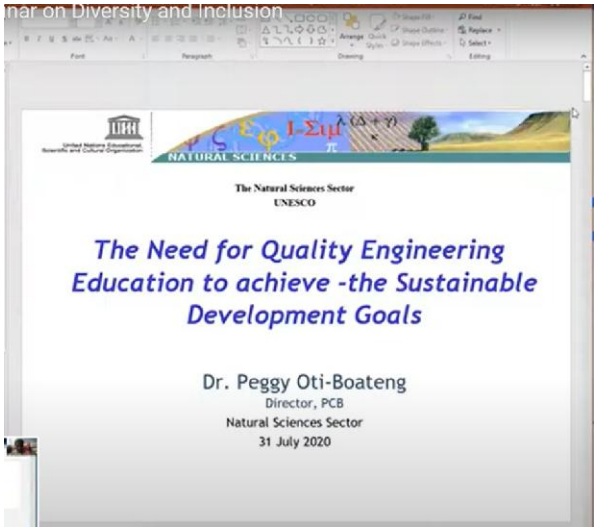
Feedback to June 2021 has been overwhelmingly positive and constructive

IEA Signatories

1. Engineering Council UK
2. Institution of Professional Engineers, Japan
3. Engineers Canada, WFEO member
4. Board of Engineers Malaysia
5. Philippines Technological Council, Provisional IEA signatory, WFEO Member
6. The Hong Kong Institution of Engineers (The HKIE), WFEO Member
7. Engineers Australia, WFEO Member
8. Engineers Canada, WFEO Member
9. ABET (Accreditation Board for Engineering and Technology), USA
10. Board of Professional Engineers of Bangladesh (BPERB), Institute of Engineers Bangladesh (IEB), Provisional IEA signatory, WFEO Member
11. Engineering New Zealand, WFEO Member
12. MUDEK (Turkey)
13. Myanmar Engineering Council, Myanmar, Provisional IEA signatory, WFEO Member
14. Institution of Engineers Singapore (IES), WFEO Member
15. JABEE (Japan)
16. Pakistan Engineers Council (PEC)
17. Chinese Institution of Engineers (CIE) Chinese Taipei
18. Acredita CI (Chile)
19. National Board of Accreditation (NBA) India

UNESCO Support

Dr Peggy Oti-Boateng, Director, Capacity Building Section, Natural Sciences Sector UNESCO, speaks at WG2 Meeting 26 Feb 2021 (left) and WFEO IEA Benchmark Webinar 31 July 2020 (right)



- **Review and endorse the Graduate Attribute-Professional Competency Framework**
- **Support the capacity building effort to enable funding to cover mainly travel costs for mentors**
- **Recognise this Project as a UNESCO Engineering Initiative for capacity building in engineering**

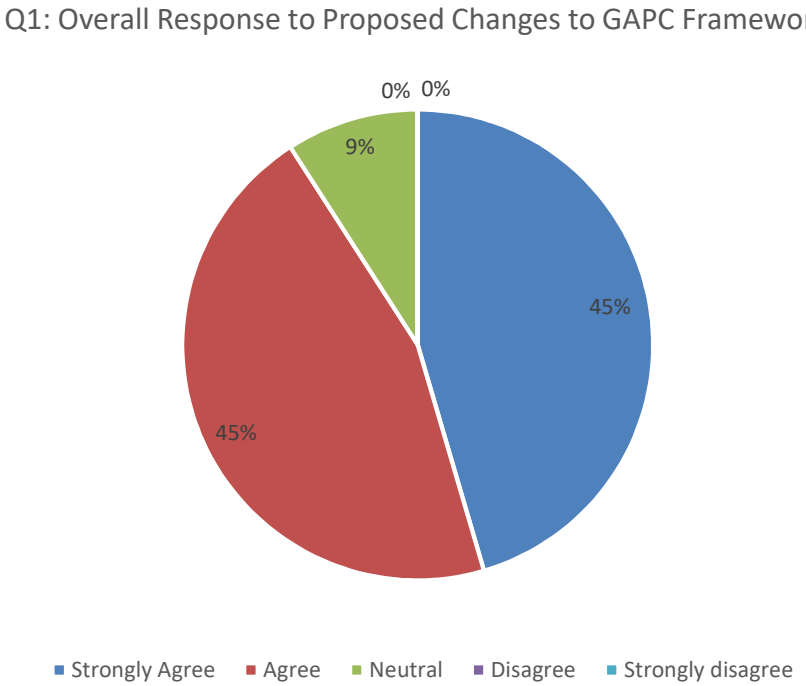
Feedback from external stakeholders has been overwhelmingly positive

"**The GAPC framework is truly transformative in outlook for engineering education, and of major importance.**"

Professor Tim Ibell FREng
Professor of Structural Engineering
Associate Dean of the Faculty of Engineering and Design
BRE Centre for Innovative Construction Materials
Department of Architecture and Civil Engineering
University of Bath
Bath
BA2 7AY
United Kingdom

Feedback Received - Survey

Q1: What was your first reaction to the Proposed Revised Graduate Attributes and Professional Competencies (GAPC) Framework?



A total of **90% of respondents were positive** about the proposed changes and either "Strongly Agreed" or "Agreed" with the proposed changes. 9% were neutral. There were no negative responses.

Full details of survey and responses at: **WFEO: https://bit.ly/3fg8Fdh**

Addressing Feedback

1. All feedback was reviewed thoroughly by the working group with clear reasons for acceptance or not
2. At all times, the WG noted that the GAPC will be used in the field by many educational accreditation and professional registering organizations. Thus the WG questioned, at every step, the reason for each change, how the changes can be implemented in an engineering curriculum, how a program can demonstrate attainment, and how an engineer can list the attributes in a CV.
3. The GAPC recognises and addresses the changes that are needed to address technology, learning and practice modes in engineering. However the GAPC does not prescribe how attainment is demonstrated. This is the work of the accreditation bodies in each jurisdiction. Guidelines may be developed in future, but essentially, these bodies should develop these for their jurisdiction, reflecting local culture, practices and systems. This will ensure that the GAPC is relevant in every context around the world.

IEAM Approval 21 June 2021 Publication September 2021

More information on the review of the Graduate Attribute and Professional Competency (GAPC) Framework

- **The entire table "A Proposal to Update the GAPC Tables.docx" is available at :**

- **WFEO: https://bit.ly/3fg8Fdh**

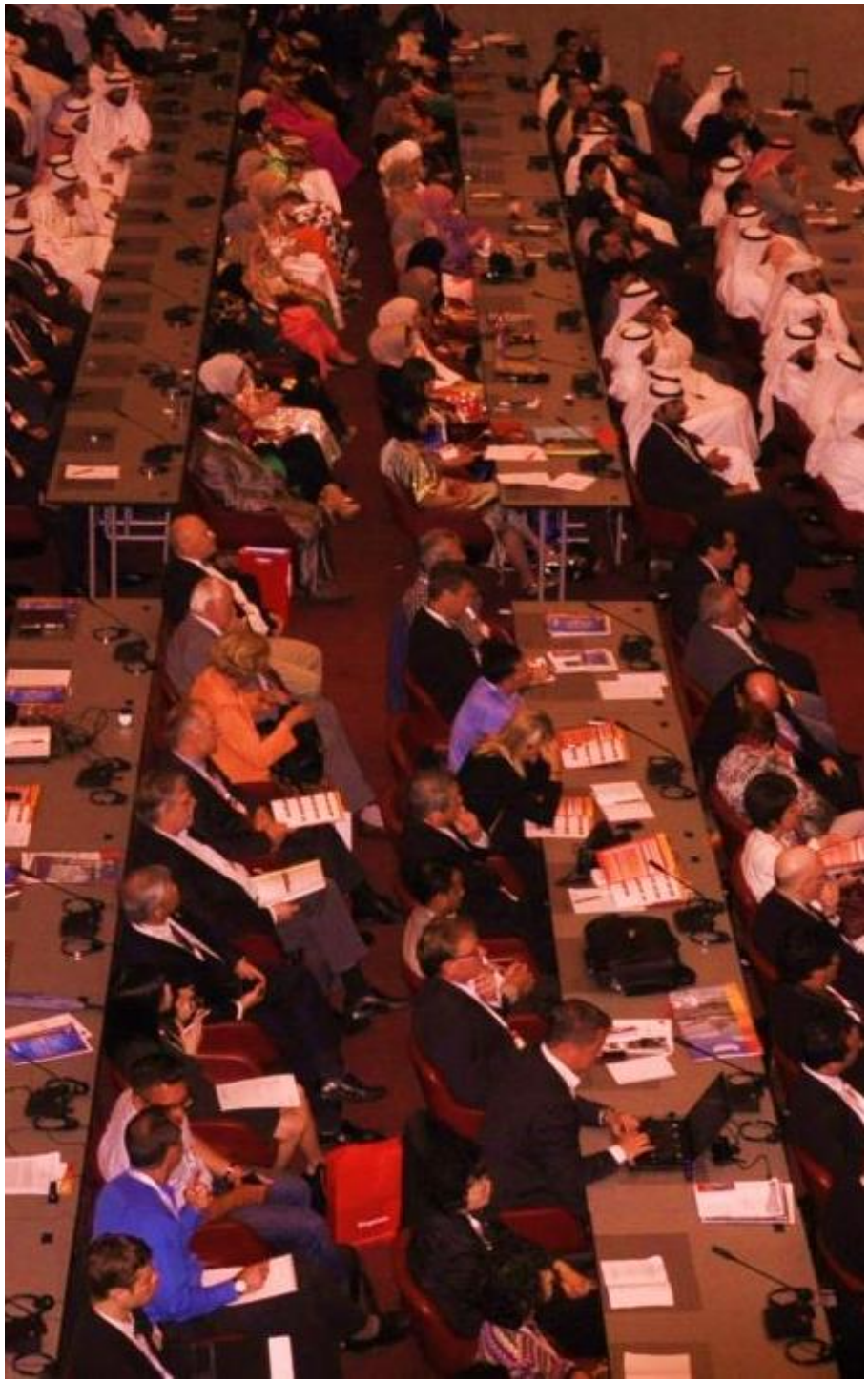
- **IEA: https://www.ieagreements.org/about-us/iea-unesco-and-wfeo-collaboration**

- **The document contains the five tables relating to graduate attributes and professional competencies for the professional engineer, the technologist and technicians with changes (deletions and additions) on the present GAPC Framework.**

Celebrating the impact of Engineering

- **World Engineering Day for Sustainable Development - 4th March every year, inaugural celebration 4th March 2020**
- **An opportunity to celebrate the impact and outcomes of engineering for a better, sustainable world**
- **Encourage young people, boys and girls, to consider engineering as a career for positive change for a better sustainable world**
- **A role for accreditation bodies and engineering educators to promote engineering**
- **A Hackathon for engineering students, support achievement of GAPC attributes**
- **Visit: www.worldengineeringday.net**

WORLD ENGINEERING DAY FOR SUSTAINABLE DEVELOPMENT



Engineering for Sustainable Development

- Participation
- Influence
- Representation

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

WFEO / FMOI

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

www.wfeo.org
@wfeo
info@wfeo.org