



WFEO ENGINEERS FOR A SUSTAINABLE POST 2015

World Federation of Engineering Organizations (WFEO) -UN Relations Committee (WURC)

ABSTRACT

WURC, as the representative of World Federation of Engineering Organizations (WFEO) to the UN Scientific and Technological Communities Major Group, is committed to the journey to achieve the UN Sustainable Development Goals through true transdisciplinary approach to our professional work and collaboration with other UN Major Groups, which taken together represent global society. Engineering is a key to translate the Goals into effective policies and functional realities. WFEO works globally across all of the engineering disciplines and proposes to contribute on the Post-2015 collaborative process to build and implement a true transdisciplinary partnership for sustainable development. The World Federation of Engineering Organizations (WFEO) represents the global engineering and technological communities in the United Nations Forum and promotes engineering for a sustainable world. This paper discusses the contribution WFEO will make to achieve the Goals.

Introduction

ENGINEERS FOR A SUSTAINABLE POST 2015 - achieving the Post 2015 Sustainable Development Goals will only be accomplished with a strong engineering involvement with the Goals, strong engineering leadership and collegial interaction with our partners, ICSU, ISSC and the other Civil Society Major Groups. WFEO provides strong engineering leadership to marshal the global engineering community to achieve the Goals in concert with others and is committed to translating the Goals into functional activities compatible with society and the environment.

Turning the words that define the 17 SDGs into actions that achieve them will require engineering expertise to plan and implement cost-effective, feasible solutions in collaboration with scientists, policy and decision-makers as well as international and national financial institutions. Engineering translates the findings of science and develops and applies technology to the benefit of, and service to the whole of society. It has to be emphasized that Engineering solutions are based on full observance of the Laws of Nature, on up-to-date knowledge of properties of materials, on the state of the art of technological development and on consideration of technical, economic and environmental feasibility.

The World Federation of Engineering Organizations and its network of national and international organizations in more than 90 countries representing 20 million engineers across all disciplines is prepared to do its part to contribute an enormous resource of expertise and perspective towards achieving SDGs and their targets. Engineers must be at the policy table with scientists, civic and government leaders and officials, to provide the combined expertise of knowledge and its application to develop evidence-based policies and frameworks that are technically and practically feasible to implement within the constraints of fiscal and human and natural resources. Science, engineering and technology (SET) offers a defensible, practical and substantial resource to UN agencies coordinating efforts towards achieving the SDGs. WFEO, ICSU and ISSC, the Science and Technology UN Major Group, must work with all the UN Major Groups.



Sustainability

Despite the lack of a universally accepted definition of sustainability, maintaining and fortifying the human foundations of wellbeing is an everyday challenge and an opportunity for the engineer to serve. Sustainability is the capacity to thrive. For humans, sustainability is the long-term maintenance of responsibility, which has environmental, economic, and social dimensions, and encompasses the concept of stewardship: the responsible management of resources.

Healthy ecosystems and environments, and the earth's crust ecosystem services and natural resources provide vital ecosystem resources. Human sustainability interfaces with economics through the voluntary trade consequences of economic activity. Moving towards sustainability is a social challenge that entails, among other factors, international and national law, urban planning and transport, local, individual lifestyles, ethical consumerism and increasing levels of inter- and intra-generational equity. Ways of living more sustainably can take many forms from controlling living conditions (e.g., eco-villages, eco-municipalities and sustainable cities), to reappraising work practices (e.g., using permaculture, green building, sustainable agriculture), or developing new technologies that reduce the consumption of resources.

The foundations of human wellbeing are shelter, water, safe food, health, electricity generation, transport, energy production, medical supplies and equipment, freedom, safety, privacy, self-determination, individual intimacy, a social community, entertainment, knowledge and opportunity to prosper, opportunity to use one's talents, and many other elements and sufficient social inclusion. All these foundations are linked to the culture of a community, a tribe or government to meet human needs, support economic activity and provide quality of life in many countries and regions of the world. These foundations depend on sustainability of sources of food, water, materials, and energy which are dependent on the environment. Expanding and enhancing these services will not only meet a number of the SDGs but also provide the foundation to achieving other cross-cutting goals such as poverty reduction and reduced inequality.

The profession of engineering has evolved with the evolution of technology and underlies many if not most of the necessities and conveniences of life from clean water to smart phones, Codes of ethics that began in the early 20th century with an emphasis on duty to the client and the profession have expanded to include the profession's broad responsibility towards society.

Engineering societies have members globally and the societies themselves collaborate nationally and internationally to address issues like sustainable development that cut across engineering disciplines. An engineer in a single discipline or engineers in multiple disciplines working in concert are necessary to translate sustainable concepts into feasible, functional and adequate technology. The World Federation of Engineering Organizations (WFEO) represents the global engineering community in the United Nations Forum and promotes engineering for a sustainable world.

WFEO Model Code of Practice for Sustainable Development and Environmental Stewardship



The World Federation of Engineering Organizations (WFEO) has developed a Model Code of Practice for Sustainable Development and Environmental Stewardship (Appendix I). Sustainable Development is a challenging concept. Many professional groups, including engineering organizations, have developed specific though often discipline - centric definitions for their area of practice. These codes are enforceable but some do little to distinguish between what are our discretionary wants versus what are our essential needs, as determined by society; however many now do include a requirement for sustainability.

The Brundtland Commission considered the issue of 'needs', in particular the essential needs of the world's poor, to which overriding priority should be given. It also considered the idea of 'limitations' imposed by the state of technology and social organization on the environment's ability to meet present and future needs. In 1987 it published what is perhaps the broadest, best known and most widely accepted definition of sustainable development.

Environmental Stewardship is a more difficult concept to define. Few organizations have developed organizational - centric definitions for environmental stewardship in their own area of interest. Stewardship means to take care of something even if it does not belong to you. It has often been addressed implicitly to meet a narrower objective such as protecting an endangered species or preserving a threatened ecosystem. The Model Code defines Environmental Stewardship as:

The wisest use of the finite resources in nature to produce the greatest benefit while maintaining a healthy environment for the foreseeable future.

Engineering Practice

Globally about 2 million engineers graduate each year from educational institutions, adding to the 20 million practicing engineers represented by WFEO. These professionals are committed and engaged to make our cities, communities, rural areas and environment sustainable through the application of technology in the production, delivery, reuse, and recycling of goods and services. Centerpieces of engineering as a profession are codes of ethics. Sustainable development and sustainability are prominent in many of the codes. These codes drive the practice of professionals such as engineers and inform and influence product, regulatory and safety codes. Sustainable Development is prominent in the WFEO Code of Ethics. WFEO has a Code of Practice for Sustainable Development and Environmental Stewardship. The Code provides a framework to drive engineering practice to achieve the post 2015 UN Sustainable Development Goals.

Engineering and the Post 2015 Sustainable Development Goals

Engineering is a requirement to achieve the 17 goals. Consider that from waking in the morning to the end of the day engineering and technology provides water, safe food, produces fuel, provides energy generation, brings electricity to the user, provides transport on roads, on rails and in the air, communications, internet, and is involved in production of pharmaceuticals and design and production of medical equipment. Everything a person touches and uses have involved engineers of all disciplines. CAETs, the International Council for Academies of Engineering and Technology has defined as one of its objectives to "promote sustainable economic growth and social welfare throughout the world". The U.S. National Academy of



Engineering (NAE) Grand Challenges overlap several of the draft goals and provide some insight into how engineering could contribute.

Science and engineering make possible the improvement of our quality of life bringing enormous well being. At-times negative social and environmental impacts occur. Engineers have a duty to enhance the good associated with technology while minimizing the harm. Challenges arise when costs and benefits transcend user groups (geographically and generationally).

Climate change provides an important window into the challenges the engineering profession faces. The combustion of fossil fuel has undoubtedly facilitated enormous economic gains, enhanced quality of life and much greater mobility. These benefits have not been without consequences. Sustainability requires the overall benefits always outweigh costs – and that society and ecosystems must be able to accommodate the costs.

TABLE 1 UN Sustainable Development Goals and WFEO Engineering Contributions

Goal	UN Descriptor	Engineering Contribution	WFEO Activities
1	End poverty in all its forms everywhere	<ul style="list-style-type: none"> • Provision of basic services • Applied technology and provision of urban systems that make growth (wealth creation) possible 	<ul style="list-style-type: none"> • WFEO Engineering Education Committee • WFEO Capacity Building Committee • WFEO Engineering and Environment Task Force on Sustainability on Mining • WFEO Energy Committee
2	End hunger, achieve food security and improved nutrition and promote sustainable agriculture	<ul style="list-style-type: none"> • Manage the nitrogen cycle • Sustainable irrigation • Sustainable transportation • Adjudicate genetically modified organisms 	<ul style="list-style-type: none"> • WFEO Committee on Engineering and the Environment • WFEO Committee on Information and Communications • WFEO Engineering and Environment Task Force on Sustainability on Mining
3	Ensure healthy lives and promote well-being for all at all ages	<ul style="list-style-type: none"> • Engineer better medicines • Advance health 	<ul style="list-style-type: none"> • WFEO Committee on Engineering Innovation



		<p>informatics</p> <ul style="list-style-type: none"> • Clean air, clean water, safe food production • Develop bio-engineering and nanotechnology life improvement devices and materials 	<ul style="list-style-type: none"> • Life expectancy increases through basic service provision
4	Ensure inclusive and equitable quality education and promote lifelong learning opportunities for all	<ul style="list-style-type: none"> • Advance personalized learning • Quality engineering education in all countries to ensure local workforce 	<ul style="list-style-type: none"> • WFEO Committee on Education • WFEO Committee on Information and Communications • WFEO Committee on Women and Engineering • WFEO Committee Younger Engineers/Future Leaders
5	Achieve gender equality and empower all women and girls	<ul style="list-style-type: none"> • Increase participation of women in all engineering fields 	<ul style="list-style-type: none"> • WFEO Committee on Women and Engineering • WFEO Committee on Younger Engineers/Future Leaders
6	Ensure availability and sustainable management of water and sanitation for all	<ul style="list-style-type: none"> • Provide clean water for all 	<ul style="list-style-type: none"> • WFEO Committee on Engineering and the Environment • WFEO Energy Committee
7	Ensure access to affordable, reliable, sustainable and modern energy for all	<ul style="list-style-type: none"> • Make Solar Energy Economical • Ensure safe nuclear power • Provide energy from renewables • Increase efficient use of energy 	<ul style="list-style-type: none"> • WFEO Statement on Energy for All • WFEO Energy Committee
8	Promote sustained, inclusive and sustainable economic growth, full and productive employment and decent work for all	<ul style="list-style-type: none"> • Restore and improve urban infrastructure • Continue to provide the underpinning of wealth generation, e.g urban 	<ul style="list-style-type: none"> • WFEO Committee on Women and Engineering • WFEO Anti-Corruption



		<p>systems, mobility, communication, data</p> <ul style="list-style-type: none"> • Safe and inclusive work environment for professionals and participants 	<p>Committee</p> <ul style="list-style-type: none"> • WFEO Committee on Younger Engineers/Future Leaders
9	Build resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation	<ul style="list-style-type: none"> • Sustainable and resilient infrastructure • Sustainable manufacturing 	<ul style="list-style-type: none"> • WFEO Committee on Disaster Risk Management • WFEO Committee on Innovative Technology
10	Reduce inequality within and among countries	<ul style="list-style-type: none"> • Provide global example within profession • Highlight the negative consequences of inequality on engineering systems, e.g. 'NIMBY', inequitable sharing of technological 'costs' 	<ul style="list-style-type: none"> • WFEO Engineering Education Committee Task Force on Engineering Mobility • WFEO Committee on Women and Engineering • WFEO Committee on Younger Engineers/Future Leaders
11	Make cities and human settlements inclusive, safe, resilient and sustainable	<ul style="list-style-type: none"> • Restore and improve urban infrastructure • Development of technologies and processes globally to ensure safety and security across engineered systems - cyber security for mass transit 	<ul style="list-style-type: none"> • WFEO Committee on Disaster Risk Management • WFEO Committee on Engineering and the Environment • WFEO Energy Committee
12	Ensure sustainable consumption and production patterns	<ul style="list-style-type: none"> • Circular economy (material flows) - cradle to cradle, minimize waste in the manufacture of product • Enhanced resource efficiencies, industrial ecology and demineralization 	<ul style="list-style-type: none"> • WFEO Committee on Engineering and the Environment • WFEO Task Force on Sustainability in Mining • WFEO Committee on Innovative Technology



<p>13</p>	<p>Take urgent action to combat climate change and its impacts*</p>	<ul style="list-style-type: none"> • Develop carbon sequestration methods • Monitor, research and provide professional input on the role of geoengineering • Sustainable Energy for All • Make the built environment adaptable and resilient to uncertain climate and weather extremes • Substantially reduce greenhouse gas emissions from the built environment • Ensure safe nuclear power 	<ul style="list-style-type: none"> • WFEO Committee on Engineering and the Environment • WFEO Energy Committee • Climate Change Adaptation Task Force • Climate Change Mitigation Task Force. • WFEO Committee on Information and Communications
<p>14</p>	<p>Conserve and sustainably use the oceans, seas and marine resources for sustainable development</p>	<ul style="list-style-type: none"> • Improved monitoring • Better provision of independent data 	<ul style="list-style-type: none"> • WFEO Committee on Engineering and the Environment • WFEO Task Force on Sustainability on Mining
<p>15</p>	<p>Protect, restore and promote sustainable use of terrestrial ecosystems, sustainably manage forests, combat desertification, and halt and reverse land degradation and halt biodiversity loss</p>	<ul style="list-style-type: none"> • Restore organic matter to degraded soils • Better integrate biofuels 	<ul style="list-style-type: none"> • WFEO Committee on Engineering and the Environment • WFEO Committee on Information and Communications • WFEO Energy Committee
<p>16</p>	<p>Promote peaceful and inclusive societies for sustainable development, provide access to justice for all and build effective, accountable and inclusive institutions at all levels</p>	<ul style="list-style-type: none"> • Prevent nuclear terror • Secure Cyberspace • Provide credible monitoring and measures of success 	<ul style="list-style-type: none"> • WFEO Committee on Information and Communications • WFEO Anti-Corruption Committee
<p>17</p>	<p>Strengthen the means of implementation and revitalize the global partnership for sustainable development</p>	<ul style="list-style-type: none"> • Play a more active role in the global partnership as practitioners of sustainable development 	<ul style="list-style-type: none"> • WFEO Committee Engineering for Sustainable Technology • WFEO Committee on Information and Communications



Notes:

- **Bolded entries** are US National Academy of Engineering (NAE) Grand Challenges
- See www.WFEO.org for WFEO Committee Activities

Assessing Progress

Engineering practice focuses on processes and projects. For example, with respect to Goal 9, practice for assessing the sustainability of infrastructure has developed rapidly over the last ten years or so and will continue to evolve. Examples of rating systems which can be used to assess individual projects include the ISI Institute for Sustainable Infrastructure's Envision Rating System and CEEQUAL. Policies and incentives must be developed and implemented to ensure that major infrastructure projects meet minimum sustainability levels.

Metrics

Attainment of some goals could be in quantum jumps and some in progressive steps. Metrics must be adopted and developed to assess progress. These metrics must include the effect on society and must be based on what is scientifically and economically feasible and sound. Some metrics exist.

The WFEO is committed to infusing sustainability into the practice of engineering and engineering education worldwide. Developing the Code of Practice was the first step. The next step is acceptance and implementation of the Code by WFEO members. By 2020, the goal is for 90 percent of the WFEO members to commit to the Code. This will be supported with WFEO continuing education resources for practitioners and education resources for engineering students and future engineers.

The WFEO is also working with the International Engineering Alliance (IEA) to strengthen the education and practice of engineering in developing countries. The IEA Graduate Attributes and Professional Competencies model includes a high expectation for sustainability. The WFEO initiative to infuse the Code into engineering practice globally will be synergistic to raising the sustainability knowledge and practice in engineering.

Summary

Achievement of the post 2015 sustainable development goals will only be accomplished with a strong engineering involvement and with some goals: strong engineering leadership. The engineering profession through WFEO is committed to and looks forward to working collaboratively with the full spectrum of interests to achieve the post 2015 Sustainable Development Goals.