United Nations Educational, Scientific and Cultural Organization

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SUSTAINABLE DEVELOPMENT GOALS

AEESEAP

PERSATUAN INSINYUR INDONESIA PII

WORLD ENGINEERING DAY FOR SUSTAINABLE DEVELOPMENT

2021

4 MARCH

ONLINE COMMEMORATION
IN ASIA AND THE PACIFIC

UNESCO Office Jakarta

Background

Engineering is essential for economic advancement and the implementation of new technologies and the application of science, including basic needs of food, health, housing, roads and transport, water, energy and management of the planet's resources. The Engineer is a vital profession in addressing basic human needs, alleviating poverty, promoting secured and sustainable development, responding to emergencies, reconstructing infrastructure, bridging the knowledge divide, and promoting intercultural cooperation.

Engineers have played a pivotal role in shaping human civilisation along with the history of humankind. They remain the key driver in solving global issues and achieving common global goals as stipulated in SDG 2030.

For these reasons, and with the support of over 40 Member States and more than 80 engineering organisations, the General Conference of UNESCO, at its 40th session (2019), proclaimed the 4th of March World Engineering Day for Sustainable Development. UNESCO seeks to convey that engineering is one of the keys to sustainable development.

UNESCO Jakarta as Regional Science Bureau for Asia and the Pacific, in collaboration with Association for Engineering Education in Southeast Asia and the Pacific (AEESEAP) and Institution of Engineers Indonesia (PII) will organise an online event to celebrating the World Engineering Day for Sustainable Development in the Asia Pacific region on 4 March 2021.

The event is a follow-up to the meeting held on 3 November 2020 exploring possible collaborations between the three institutions to strengthen engineering value chain in Asia and the Pacific, and the 2020 AEESEAP Workshop "Enhancing Engineer Value Chain" in October 2020 on how the engineering education and professional competence development can further improve global engineer collaboration to support a more sustainable and inclusive economic advancement.

The online event will be the occasion to strengthen the network or relevant partners to trigger further improvements and collaborations in engineering education and professional competence in Asia and the Pacific. The event will also launch:

1. A UNESCO-AEESEAP-PII joint publication, including the proceedings of the 2020 AEESEAP workshop, to identify the regional trends, understanding the state of the engineer value chain (education, professional competence development);
2. Proposal on co-developing a digital platform for Global Collaboration of Engineers in Asia and the Pacific: compiling all multilateral agreements (MRA) among associations/institutions in regions to enhance the engineering visibility and trigger further collaboration (including APEC ER, ACPE).

Co-Organisers

UNESCO Jakarta is organising this online celebration in collaboration with AEESEAP and PII.

Objectives

It is important to build partnerships between different regional stakeholders in identifying the engineering value chain system and trends, promote engineering education and professional competence across the value chain to support a more sustainable and inclusive economic advancement through global collaboration and open engineering in Asia and the Pacific.

The online event for Asia and the Pacific will be the first regional celebration of the World Engineering Day for Sustainable Development. It will provide a platform to raise awareness of the engineering value chain, increase the engineering sector's visibility and regional collaborations for an accelerated transition to a knowledge-based society or economy and sustainable growth in the Asia-Pacific region.

The specific objectives of this online regional celebration are to:

- bring together the experts, policymakers, and main stakeholders across the Engineering Value Chain in Asia and the Pacific;
- share common understandings of the current engineering education and professional competence development landscape in Asia and the Pacific;
- advance the discussion from Asia and the Pacific perspective on the needs, challenges, and priorities of the engineering value chain to respond to the changing environments, such as the COVID-19 crisis, to achieve SDGs by 2030;
- identify key actions for international collaboration and networking to advance the Global Collaboration of Engineers on a digital platform.

This online event is envisaged to bring together some hundred multi-stakeholder participants. It will be held in English on the Zoom platform based on the draft structure and agenda below.

Expected Outcome

The stakeholders in Asia and the Pacific will recognise the regional engineering education landscape, take cognisance of the key challenges and needs in professional competence development for sustainable development with recommendations to overcome them, and future steps for international collaboration and networking to advance the global platform of engineers. The online event will add to the visibility of the joint publication and the digital platform.

Agenda

Time	Topic
11.00 - 11.05	**Opening** • Prof Shahbaz Khan, UNESCO Director and Representative of UNES • Dr. Ir. Heru Dewanto, President of AEESEAP and PII
11.05 - 11.10	**UNESCO/AEESEAP/PII Joint-activities' presentation** by Dr Heru Dewanto • Joint Publication "Enhancing Engineers Value Chain for Global Collaboration in achieving SDGs" • Proposal and invitation for a Global Digital Platform
11.10 - 11.50	**Panel Discussion** moderated by Dr Ai Sugiura (engineering value chain for SDGs/ STEAM and engineering communication/Open Engineering/) • "UNESCO global and regional effort in promoting Engineering services to society for the SDGs", *Prof Shahbaz Khan, UNESCO Director and Representative* • "Review of International Engineering Benchmarks for Graduate Attributes and Professional Competencies for engineers to successfully advance the UN Sustainable Development Goals", *Dr Marlene Kanga, WFEO President, Women's Leadership Institute Australia, Australia* • "Mobility for Engineers: Challenges and Opportunities", *Prof. Dr. Chuah Hean Teik, President of AAET, FEIAP former President* • "Open Engineering platform", *Dr Chang Liu, Secretary General of IKCEST, China*

Time	Topic
11.10 - 11.50	**Panel Discussion** (cont.) • "Developing Engineering Accreditation System in Indonesia", *Dr. Leni Sophia Heliani, UGM, Indonesia* • "Engineering Education data in AEESEAP countries", *Prof. Dr. -Ing. Ir. Misri Gozan, IPU, Chair of Indonesian Accreditation Board for Engineering Education (IABEE PII)* • "Engineering Education for SDGs", *Dr Malik Adnan, UNESCO Chair on Environmental Management and Infrastructure Development Engineering, Japan* • "STEAM", *Prof. Manolo Mena, Director, National Graduate School of Engineering of the University of the Philippines*
11.50 - 12.20	**Round Table Discussion** • As UNESCO and AEESEAP proposed, we would like to establish a regional or even global network for certified Engineers to collaborate. What are the opportunities in the regional collaboration for Engineers? What kind of regional support do we need for collaborations? • Engineering is playing a decisive role in supporting member states reaching SDGs. What kind of regional strategies do we need in order to achieve SDG through Engineering, especially SDG 9 and 17?
12.20 - 12.30	**Conclusion and way forward for AP region** • Dr. Ir. Heru Dewanto, President of AEESEAP and PII • Prof Shahbaz Khan, UNESCO Director and Representative

Speaker

Prof. Shahbaz Khan

Professor Shahbaz Khan UNESCO Director of Regional Science Bureau for Asia and the Pacific and the Representative for Brunei Darussalam, Indonesia, Malaysia, the Philippines, and Timor-Leste. He is a Fellow, Chartered Engineer and Engineering Executive of Engineers Australia, Hon Fellow of Institution of Engineers, Malaysia, Fellow of the ASEAN Academy of Engineers, Hon Fellow of the Myanmar Engineering Society, Founding Fellow of the Academy of Engineering and Technology of the Developing World and Fellow of the Modelling and Simulation Society of Australia and New Zealand. Shahbaz is currently Adjunct Professor at the University of Canberra and Western Sydney University, Australia, Adjunct Professor at the Lincoln University, New Zealand, Distinguished Professor at the National University of Science and Technology, Pakistan and Distinguished Professor at the Capital Normal University, China.

Prof Khan has worked in Australia, France, Indonesia and Pakistan in various research, consultancy and policy positions. Before joining UNESCO, Shahbaz was Professor and Director at the Charles Sturt University, Research Director Irrigation Systems at CSIRO and Programme Leader, System Harmonisation for Regional Irrigation Business Partnerships at the Cooperative Research Centre for Irrigation Futures, Australia. His work has been widely recognised e.g. 2019 China Friendship Award, Great Wall Friendship Award China 2017, FEIAP Engineer of the Year Award 2016, UNESCO Team Award for Managing Hydro Hazards 2009, Land and Water Australia's Eureka Prize 2007, CSIRO Medal 2007, Biennial Medal of the Modelling and Simulation Society of Australia and New Zealand. He has widely published in the area of water, environment and sustainable development and received several outstanding publications awards.

UNESCO Global and Regional Effort in Promoting Engineering Services to Society for the SDGs

Shahbaz Khan

UNESCO Regional Science Bureau for Asia and the Pacific, Jakarta, Indonesia

Through dedicated international efforts and program structures, the Regional Science Bureau for Asia and the Pacific – in partnership with science professionals from across the region – is providing policy-relevant and timely expertise in diverse fields such as freshwater, biodiversity and ecosystems, disaster risk reduction, climate change, and science, engineering, technology and innovation to support 2030 Agenda in the region. In particular, the Regional Science Bureau works at raising awareness on engineers and engineering services to society for the SDGs. At the global level, UNESCO has been raising multi-level awareness of the role of engineering for SDGs among stakeholders (from decision makers to civil society) with the celebration of World Engineering Day for Sustainable Development proclaimed by UNESCO in 2019 by the 40th Session of UNESCO General Conference along with more than 80 engineering organisations. UNESCO has also been promoting Engineering role and services to society through its global series of UNESCO reports. Two specific volume, first published in 2010 on "Engineering: issues, challenges and opportunities for development" and in 2021 "Engineering for Sustainable Development" have been published. They give state of the art, inclusive and objective review through case studies and best practices from UNESCO Member states in assessing current actors, global and national efforts and depicting furtherly needed global partnership and collaboration in engineering to deliver the SDGs. At the regional level, UNESCO has been partnering its network of UNESCO Category 2 centres and UNESCO chairs and local partner organisations to promote further "South-South Cooperation for Strengthening Engineering Standards and Mobility of Professionals". UNESCO is now reviving its partnership with AEESEAP to further advance regional outreach of engineering and engineers through strengthen engineering education and capacity building for SDGs.

Keywords: SDG, World Engineering Day, regional partnership

Speaker

Dr. Ir. Heru Dewanto, ST., M.Sc.(Eng.), IPU., ASEAN Eng

HHeru Dewanto obtained Bachelor of Civil Engineering from Yogyakarta's Universitas Gajahmada and Engineer from ITB Bandung. He continued his Post-Graduate Study in Railways and Public Transport in Universitat Innsbruck (Austria) then acquire his Master Degree in Transport Planning and Engineering from Great Britain's Leeds University. He earned his Doctoral degree from the University of Indonesia (UI) in investment performance of Indonesia's electrical utility industry.

He currently the President of the Institution of Engineers Indonesia (PII), President of AEESEAP (Association of Engineering Education in Southeast, East Asia and the Pacific) 2018-2020 and Vice President of AAET (ASEAN Academy of Engineering and Technology) 2016-2020, and Council Member of FEIAP. Before entering academic area, he had over 2 decades of experience in leading national and multi-national Infrastructure corporations.

Enhancing Engineer Value Chains for Global Collaboration in Achieving Sustainable Development Goals (SDGs)

Heru Dewanto1,2
1President of The Institution of Engineers Indonesia (PII)
2President of the Association of Engineering Education in Southeast East Asia and the Pacific, (AEESEAP) 2018-2020

Engineering has played a pivotal role in the course of civilisation, along with history. Through the pace of innovations, humankind has shifted from hunters and gatherers age to agriculture to industrial and information era and today's pervasive technology revolution. Engineering in a particular relationship with science, technology, math, and arguably arts, will remain the main driver in solving current and future global issues, such as poverty, hunger, clean energy and water, and climate change. Global engineer collaboration is key to ensuring the world's blueprint for a healthy planet as stipulated in SDG 2030. Such collaboration requires at least common standards and platform. The engineer value chain can be formulated as a directable and measurable process from academic engineering education, professional education, professional competence development, and international recognition. Each chain needs clear design specification to ensure the quality standard of the outcome, which becomes the input to the following chain. While Washington, Sydney and Dublin Accords advance global standards for engineering education, the multilateral agreements for mutual recognition of professional competence are governed by ACPE, APEC ER, APEA, IETA and AIET. The international standard engineers' value chain outcomes shall be facilitated with a platform for global collaboration. Registration of professional engineers (PE) in the respective economy should provide a database consist of a detailed recording of each PE's logbook that can further be developed into engineer Big-data as a digital platform for multiple purposes. Each multilateral agreements can as well develop such a digital platform for its registered PEs. It may take a mutual collaboration among them to create a joint digital platform for global engineer collaboration to achieve 17 SDGs.

Keywords: engineer value chain, engineering education, professional competence, recognition agreement, digital platform, global engineer collaboration

Speaker

Dr Marlene Kanga AM FTSE Hon.FIE (Aust) Hon. FIChemE

Dr. Marlene Kanga is the Immediate Past President of the World Federation of Engineering Organisations (WFEO), the peak body for engineering institutions internationally representing some 100 engineering institutions and approximately 30 million engineers. A chemical engineer, she was the 2013 National President of Engineers Australia. She is a a Fellow of the Academy of Technology Science
and Engineering, Australia. She is a Member of the Order of Australia, a national
honor, in recognition of her leadership of the engineering profession.

During her term as WFEO President, Marlene led the initiative for the member states at UNESCO to declare 4th March, the founding Day of WFEO, as World Engineering Day. The inaugural World Engineering Day was held on 4th March 2020. Marlene is a board member and non-executive director of some of the largest organizations in Australia in the utilities, transport and innovation sectors. She is an Honorary Fellow of the Institution of Engineers Australia, an Honorary Fellow of the Institution of Chemical Engineers (UK), and a Foreign Fellow of the ASEAN Academy of Engineering and Technology. She has been listed among the 100 engineers making a contribution to Australia in the last 100 years as part of Engineers Australia Centenary celebrations in 2019, among the Top 100 Women of Influence and one of the Top 10 women engineers in Australia.

Review of International Engineering Benchmarks for Graduate Attributes and Professional Competencies for engineers to successfully advance the UN Sustainable Development Goals

Dr. Marlene Kanga AM Hon. FIEAust HonFIChemE FTSE

President (2017-2019), The World Federation of Engineering Organisations (WFEO)

UNESCO, the World Federation of Engineering Organisations (WFEO) and the International Engineering Alliance (IEA) came together in November 2019 to review the IEA Graduate Attributes and Professional Competencies Framework (GAPC) to ensure that they reflect contemporary values and employer needs as well as equip engineers, technologists and technicians of the future to incorporate the practices that advance the UN Sustainable Goals. Dr Marlene Kanga has been leading the WFEO members of the Working Group on this important transformative project. She has been deeply involved and can provide valuable insights into the proposed changes. Widespread consultation has taken place and the proposed changes are expected to be approved by the signatories of the IEA during 2021.

Speaker

Prof. Dr. Chuah Hean Teik

Dr. Chuah Hean Teik graduated with a BEng (First Class Honours), MEngSc and PhD in electrical engineering, all from University of Malaya, Malaysia. He was President of Universiti Tunku Abdul Rahman (UTAR) in Malaysia from 2008-2019, where he is now an Emeritus Professor and a member of UTAR Council. He is a member of the Board of Trustees of TARUC Education Foundation. He is also a Consultant Professor to Northwestern Polytechnical University, Xian, China.

His research interests include microwave remote sensing and applied electromagnetics. He has authored/co-authored more than 280 papers in international journals and conferences. Dr. Chuah has received many awards locally and internationally. Dr. Chuah is an eminent technical leader. He is currently the President of ASEAN Academy of Engineering and Technology (AAET), Past President of the Federation of Engineering Institutions of Asia and the Pacific (FEIAP) from 2011-2015, and current Chairman of FEIAP Standing Committee on Engineering Education. Dr. Chuah was the President of IEM (2009-2011). He is a Senior Fellow of the Academy of Sciences, Malaysia (ASM); a Founding Fellow of the AAET and The Academy of Engineering and Technology of the Developing World; Fellow of the Institution of Engineering and Technology, UK; the Institute of Electrical and Electronics Engineers, USA; and the Electromagnetics Academy, USA. He is currently a member of the Disciplinary Committee Panel under the Advocates and Solicitors' Disciplinary Board, Malaysia, the Malaysian Engineering Accreditation Council (EAC) and the Civil Aviation Authority of Malaysia. He also serves in Technical Committee or Advisory Committee of a few regional and international conferences and symposia.

In recognition of his valuable services and contributions, he was conferred an Order of Chivalry, Darjah Setia Pangkuan Negeri, which carries the title "Dato", by the Governor of Penang in July 2005, and conferred the Panglima Setia Mahkota Award, which carries the title "Tan Sri", by the King of Malaysia, the Yang Di Pertuan Agung, in September 2019.

Mobility for Engineers: Challenges and Opportunities

Prof. Dr. Chuah Hean Teik
President, ASEAN Academy of Engineering and Technology (AAET)
President (2011-2015), the Federation of Engineering Institutions of Asia and the Pacific (FEIAP)

In this presentation, the author looks into the main issues of international mobility of engineers: the trust and confidence on quality of engineering education and competency of professional engineers; the keen competition with engineers from abroad; many signatories of international mobility forums are learned societies and not professional regulatory authories and thus the challenges of convincing the governments in changing the rules and regulations for free flow of engineers; and the cultural differences of different economies. The author suggests preference be given to professional engineers with IntPE and APEC Engineers status while awarding contracts particularly those financially supported by international agencies such as the World Bank; partnership with local professional engineers, and also real transfer of technology in every stage of the Project so that real international collaboration is achieved and trust built between foreign and local partners.

Speaker

Dr Chang Liu

With doctor's degree in applied linguistics, she served as an associate professor in the Department of Foreign Languages of Huazhong University of Sciences and Technology (HUST), China, for over ten years. She then worked with the Chinese Academy of Engineering (CAE), with her main job responsibilities lying with the management of a category-2 centre under UNESCO, namely, the International Knowledge Centre for Engineering Sciences and Technology under the Auspices of UNESCO (IKCEST). She is newly appointed the Secretary General of IKCEST. Her publications include two books and a number of journal articles.

An Open Platform for Global Engineering Initiatives: International Knowledge Centre for Engineering Sciences and Technology under the Auspices of UNESCO

Zuoning CHEN1,3, Chang LIU1,3, Yingchen MA2,3, Ye ZHANG2,3, Ying FANG2,3

1. Chinese Academy of Engineering, Beijing, 100088;
2. Centre for Strategic Studies, Chinese Academy of Engineering, Beijing, 100088;
3. International Knowledge Centre for Engineering Sciences and Technology under the Auspices of UNESCO (IKCEST), Beijing, 100088.

The International Knowledge Centre for Engineering Sciences and Technology (IKCEST), a category II centre under the auspices of UNESCO based in Beijing, aims at providing knowledge-based services at a global scale for policy-makers and engineering science and technology professionals in the world, with particular reference to the developing countries. IKCEST has established a platform with data resources and knowledge services at the core. This operational service system includes one general platform and several sub-platforms in its prioritized areas such as disaster risk reduction, intelligent city, engineering education. Since the platform was put into operation, it has launched 51 knowledge applications (APPs), serving 2+ million users from 220 countries and regions worldwide, and offered training for 13,000 persons from developing countries. In face of the pandemic, IKCEST set up a COVID-19 column which received positive feedback from users across the globe, the introductory video of which was publicized on the UNESCO official website. As a knowledge hub supporting global sustainable development and an open platform for global engineering initiatives, IKCEST will spare no efforts to make greater contributions in providing more tailored and valuable knowledge-based services for global users.

Key Words: UNESCO, engineering sciences and technology, knowledge service, knowledge platform

Speaker

Dr. Leni Sophia Heliani

Dr. Leni Sophia Heliani is a Lecturer at Department of Geodetic-Geometics Engineering and Head of Centre for Marine Resources and Technology Studies, Universitas Gadjah mada (UGM) Yogyakarta, Indonesia. Her specialisation is physical geodesy and hydrographic. She is Evaluation Accreditation Committee, Coordinator for training and development, and Head of Internal Quality Assurance section of Indonesian Accreditation Board for Engineering Education (IABEE-PII). She gained her PhD and Master degree from Graduate School of Science, Kyoto University, Kyoto, Japan.

Outcome-based Engineering Accreditation: Concept, Implementation and Impact

Leni S. Heliani1,2, and Misri Gozan1,3*

*1,*Indonesian Accreditation Board for Engineering Education (IABEE-PII)*
2Department of Geodetic Engineering, Universitas Gadjah Mada, Indonesia
3Department of Chemical Engineering, Faculty of Engineering, Universitas Indonesia

In the current industrial era, industry and engineering education are two parties that need each other. The industries require competent human resources produced by engineering education, while engineering education requires the industries to employ its graduates. Therefore, the industry should contribute to the development of engineering education, and engineering education has to ensure that its outcomes fulfil the industry's needs. Outcome-based engineering accreditation plays an essential role in bridging the industry's needs and engineering education gap. The accreditation process ensures that the study program fulfils its engineering education outcome and use the evaluation results for improvement as a part of a continuous quality improvement (CQI) system. This system is expected to improve the quality of student learning experience to contribute to the industry. To ensure international compliance and mobility, the engineering accreditation bodies signed the Washington Accord (WA) in 1989 as a multilateral agreement that recognises the accredited programs' substantial equivalency among its members. The bodies define similar outcome criteria following the International Engineering Alliance's graduate attribute. This paper aims to discuss the concept and implementation of outcome-based engineering accreditation and its impact on engineering education and industry. Three accreditation bodies, namely ABET, JABEE and IABEE, will be used as case studies, especially in implementing accreditation. These three accreditation bodies represent accreditation bodies that have become world barometers, have been recognised for a long time and are in the process of applying for signatory member, respectively.

Keywords: Outcome-based education, accreditation, industrial needs, substantial equivalency, International Engineering Alliance, graduate attribute.

Speaker

Prof. Dr. -Ing. Ir. Misri Gozan, M.Tech., IPU

Dr. Misri Gozan is a Professor of Industrial Waste Treatment Engineering at Universitas Indonesia (UI). Since 2018, he is the Chairman of the Indonesian Accreditation Board for Engineering Education (IABEE-PII).

He graduates from the Faculty of Geo-, Forestry- and Hydroscience, TU Dresden, Germany (2001-2004) and had a post Doctoral work, King Saud University, Riyadh, Saudi Arabia (2009-2010). He finished his Master of Technology from the Process and Environmental Engineering, Massey University, Palmerston North, New Zealand in 1998.

Summary of Workshop A: Accreditation for Academic Degree

Misri Gozan *1,2*

1.Indonesian Accreditation Board for Engineering Education (IABEE-PII)
2.Department of Chemical Engineering, Faculty of Engineering, Universitas Indonesia

This workshop has met the aim to present lessons learned from many accreditation bodies representatives to the engineering society's benefit. The importance of closing the gap between engineers and education was discussed in Indonesia's lesson in developing the international accreditation system. Prof. Ir. Misri Gozan (Chairman of the Indonesian Accreditation Board for Engineering Education/IABEE-PII), gave the background of challenges in engineering education faced by Indonesia as the country with more than 5,106 engineering programs which have 1,024,321 engineering students in this archipelago. The accreditation in engineering education should be seen as part of engineer duties, i.e. in continuous improvement and shaping the industrial revolution, especially in the education field as the upstream of the engineering value chain. The Law (12/2012) redesigned the program's accreditation to be carried out by the autonomous accreditation body formed by society. The Institution of Engineers Indonesia (PII) prepared IABEE in 2013 and announced its establishment in 2015 as a permanent body inside the PII. Since then, professional engineers (PEs) in engineering education have never been the same. Dr Yasuyuki Aoshima, as the former CEO of the Japan Accreditation Board of Engineering Education (JABEE) and the advisor to the JABEE International Affairs Division, has many experiences in connecting the discussion in this workshop on the importance of accreditation system in engineering education. He reminded me that Engineering is the most advanced field in quality assurance in professional education. In Western countries, historically, professional societies such as an institution of professional engineers or a council of engineers have been conducting the accreditation of education to ensure that the younger generation has acquired the required ability and knowledge to graduate from the engineering study program. In those countries, only graduates from accredited programs are eligible to be professional engineers.

Michael K. J. Milligan (the Executive Director and Chief Executive Officer of ABET) accentuates accreditation as the means to develop excellence in engineering education. Accreditation demonstrates the institutions and their programs are committed to improving the students' educational experience. Through several mechanisms during the accreditation process, the collegiate programs meet threshold standards to produce graduates ready to enter "the engineering profession". The accreditation process provides confidence to all the stakeholders involved in the education system, including the students, institutions, faculty, global industry, and the public. The workshop concludes that the critical points of healthy accreditation in engineering education should uphold several pillars. The accreditation system should involve both academic and professional engineers as the bridge between education and the industry. The program involvement in the accreditation should be voluntary as part of the continual improvement. A healthy engineering education accreditation process is guaranteed to contribute to these pillars' strong engineering value chain.

Keywords: accreditation criteria, voluntary, outcome-based education, graduate attribute.

Speaker

Dr Adnan Anwar Malik

Adnan Anwar Malik is an Assistant Professor at the Department of Civil and Environmental Engineering of Saitama University Japan, where he conducts research in the field of Geotechnical Engineering and also supports Foreign Student Office since 2018. He completed his doctorate and master degrees from Saitama University in Environmental Science and Civil Engineering in 2015 and 2011. Before starting his academic career, he worked for over five years as a professional geotechnical engineer at Ammico Contracting Company – Qatar, National Engineering Services Pakistan – Pakistan, and National Development Consultants – Pakistan. His research focuses on the performance enhancement of eco-friendly pilling techniques.

The role of engineering education in fostering sustainable development of infrastructure in developing countries

A. A. Malik1*, **C. S. Goit**1, **and Y. Matsumoto**1

*1,*UNESCO Chair on Environmental Management and Infrastructure Development Engineering, Department of Civil and Environmental Engineering, Graduate School of Science and Engineering, Saitama University, 255 Shimo-Okubo, Sakura-ku, Saitama-shi, Japan*

The world is progressing towards sustainable development to overcome the economic, social, and environmental challenges that have resulted due to rapid infrastructure development. These challenges not only affect the quality of life in developed countries but also severely affect the quality of life in developing countries, where available resources to counter such challenges are often scarce. Engineering education can play a vital role to overcome such pressing challenges through active learning-based curriculum, targeted research, and connection with industry and funding agencies in attaining the sustainable development goals. The UNESCO Chair on Environmental Management and Infrastructure Development Engineering at Saitama University offers postgraduate program in the field of civil and environmental engineering to support students from developing countries in terms of education, research, and training. This paper details the past and ongoing actions and outcomes of the International Graduate Program on Civil and Environmental Engineering at Saitama University towards attaining various Sustainable Development Goals (SDGs) through engineering education. The integrated curriculum and research activities of this program strike a good balance between theoretical and practical knowledge in line with the essence of SDGs to support students from developing countries. Over 550 graduates from more than 30 countries have graduated from the program since its inception in 1992 and these graduates are actively contributing to the sustainable development goals of their respective home countries in a wide range of capacity. A strong connection that the program has maintained with the alumni over the years has been proved to be vital in terms of international collaboration, exchange activities, and state-of-the-art knowledge and technology transfer in building resilient infrastructure, developing sustainable industrialization, and fostering innovation in developing countries. Moving forward, an automated approach on the collaboration between academic institutions and industries is the need of the hour for realizing sustainable development goals.

Speaker

Prof. Manolo Mena

Dr. Mena is a Professor Emeritus and the Director, National Graduate School of Engineering of the University of the Philippines, Diliman, Quezon City. His field of specialization includes thermodynamics and kinetics of metals and materials, extractive metallurgy, electrometallurgy and corrosion, as well as semiconductor electronic materials and packaging.

Dr. Mena graduated with a doctor of philosophy in Metallurgy from the University of Utah, USA. He obtained his Masters in Metallurgical Engineering and Bachelor of Science in Metallurgical Engineering from the University of the Philippines. He was more that 40 years experience in the academe and 25 years in semiconductor packaging.

STEAM Education in South East Asia and the Pacific

Professor Emeritus Manolo G. Mena, Ph. D.
Director, National Graduate School of Engineering University of the Philippines

The AEESEAP Executive Committee created a sub-committee during its 29th meeting in Tohoku University, Japan to conduct exploratory work on the use of STEaM (Science, Technology, Engineering, arts, and Mathematics) among its membership institutions. Japan, Malaysia and the Philippines volunteered to participate, with the Philippines taking the lead.

Results of the survey conducted among the three countries showed that general education or liberal arts courses are required as part of their engineering programs. Common topics include Philosophy, Social Science, Ethics, Sociology and Humanities. These courses appear to have been added on, instead of being completely integrated into the curriculum to develop competency on critical thinking, systematic problem solving, creativity and collaboration.

Noteworthy, however are the efforts of special program at Tohoku University, the Faculty Courses at the University of Malaya, and the University of the Philippines STS 100 course. In the special Tohoku program developed by Prof. Webeck, the ability to contextualize, think through issues considering many perspectives, to think in a group, to network, to critically analyze, to communicate well, to understand perspectives, to problem solve, to develop confidence are cultivated and encouraged, leading to leadership, and superior thinking skills are enhanced.

At the University of Malaya, faculty courses such as Thinking and Communication Skills, Project Management and Law and Ethics are utilized to develop well-rounded students who could merge their engineering knowledge in a societal, legal, economic, and environmental context, with a capacity for lifelong learning.

STS 100 involves “an exploration of the past, present and future of science and technology in society and the social, cultural, political, economic and environmental factors affecting their development, with special focus on the Philippines.”

Summary of the Event

UNESCO Jakarta, as the Regional Science Bureau for Asia and the Pacific organized an online celebration of World Engineering Day in Asia and the Pacific, on 4 March 2021, in collaboration with AEESEAP (Association for Engineering Education in Southeast Asia and the Pacific) and the Institution of Engineers Indonesia (PII). The online event was the regional celebration of the World Engineering Day for Sustainable Development in Asia and the Pacific since its declaration in 2019. Eight international experts discussed and exchanged their perspectives on raising awareness and promoting services of engineering to society. The event also provided an occasion and a platform to raise awareness of the engineering value chain, to increase the engineering sector's visibility and regional collaborations for an accelerated transition to a knowledge-based society through the delivery of Agenda 2030 in the Asia Pacific region. More than 330 participants joined the online session via Zoom and UNESCO Jakarta Facebook live stream.

The Director of UNESCO Jakarta, Dr Shahbaz Khan, and the President of AEESEAP and PII, Dr Heru Dewanto, delivered their remarks to welcome the panellists and the participants. Dr Dewanto then presented the UNESCO-AEESEAP-PII Joint Publication "Enhancing Engineers Value Chain for Global Collaboration in achieving SDGs" and a proposal and invitation to develop a Global Digital Platform.

The eminent experts delivered their views and insights on the importance of engineering value chain, engineering education, open engineering and STEAM in delivering UN SDGs by 2030, moderated by Dr Ai Sugiura, Programme Specialist for Science and Capacity Building of UNESCO Jakarta. The panelists were:

- Dr Shahbaz Khan, Director of UNESCO Regional Science Bureau for Asia and the Pacific, revisited the UNESCO global and regional initiatives in promoting Engineering services to the society and stressed the importance to raise awareness on engineers and engineering we need for the SDGs (see UNESCO Engineering Report 2021).

- Dr Marlene Kanga, immediate past President of World Federation of Engineering Organizations, introduced the review of International Engineering Benchmarks for Graduate Attributes and Professional Competencies for Engineers, and highlighted incorporating SDGs, diversity and inclusion among six key areas for transforming engineering education and profession.
- Prof. Chuah Hean Teik, President of ASEAN Academy of Engineering and Technology (AAET), identified the main issues of international mobility of engineers, and suggested more financial support by international agencies, partnership with local engineers, and technology transfer in line with SDGs to achieve international collaborations and build trust between partners.
- Dr Liu Chang, Secretary General of International Knowledge Centre for Engineering Sciences and Technology (IKCEST) introduced their Open Engineering Platform and IKCEST solutions to SDGs. She emphasised on providing engineering solutions and decision-making references, promoting information exchange within the engineering community, and supporting the implementation of the UN SDGs.
- Dr Leni Sophia Heliani, Head of Internal Quality Assurance Section of Indonesian Accreditation Board for Engineering Education (IABEE-PII), stated the importance of outcome-based engineering accreditation in developing engineering accreditation system in Indonesia and the SDGs.
- Prof. Misri Gozan, Chair of Indonesian Accreditation Board for Engineering Education (IABEE PII) shared the engineering education data in AEESEAP member states, exposed the unequal distribution of engineers among the countries, and emphasised the need of detailed and periodic data collection, more program and mobility, as well as quality.
- Dr Adnan Anwar Malik from the UNESCO Chair on Environmental Management and Infrastructure Development Engineering presented international engineering education programmes and international collaboration projects initiated by the UNESCO chair to illustrate the role of engineering education in fostering sustainable development of infrastructure in developing countries.

- Prof. Manolo Mena, Director of National Graduate School of Engineering University of the Philippines, reviewed the exploratory work on the use of STEAM (Science, Technology, Engineering, Arts, and Mathematics) conducted by AEESEAP member institutions, and called for more integration rather than additional curriculum in STEAM approach.

In the round table discussion on regional strategies, Dr Marlene Kanga specified how the engineers working was transformed, therefore new benchmarks are needed in an inclusive manner, which is not only for women but for all through sound and inclusive communication strategy. Prof. Chuah reiterated the importance of respecting different cultures, building trust and confidence at the local level when there are exchanges and collaboration for the mobility of engineers. Dr Chang Liu stated that open engineering is a future trend in the region, and the challenges in developing the platform, such as unidentified user needs, unintegrated data standards, and establishing a collaborative mechanism. Prof. Misri Gozan emphasised engineering education being an important part of Engineering Value Chain, and reiterated it is not only the numbers of engineers but also the quality of engineers we need.

In the concluding remarks, Dr Heru Dewanto encouraged the contribution to the global and regional collaboration initiative, and emphasised the cooperation is needed more than competition in global challenges. Dr Shahbaz Khan concluded the meeting with three main recommendations as the way forward: raising awareness about Engineering, the transformation of Engineering profession for SDGs, and “No one left behind” and Engineering equal opportunities for all.

The online event is contributing to the Sustainable Development Goals, especially on Goal 9 Building resilient infrastructure, promote inclusive and sustainable industrialization and foster innovation (target 9.5, 9.b and 9.c), and Goal 17 Strengthen the means of implementation and revitalize the global partnership for sustainable development (target 17.6, 17.7, 17.8, 17.9, and 17.14).

Recommendations and Next Steps

	Recommendations	Next Steps
RAISING AWARENESS ABOUT ENGINEERING	• World Engineering Day Celebration encouraging the participation of youth in a gender inclusive way • UNESCO Engineering Report • UNESCO Chair and UNESCO Category 2 Centres • Detailed and periodic data collection on engineers and engineering education in the region (Prof. Gozan)	• Continue promoting the role to wider public, stakeholders and policy makers the role of engineering and engineers especially to deliver agenda 2030 and the 17SDGs • Promote the sharing of data and foster further efficiency of existing programmes
TRANSFORMATION OF ENGINEERING PROFESSION FOR SDGS	• Review of IEA Graduate Attributes and Professional Competencies Framework (Dr Marlene Kanga) • Engineering Value Chains for Global Collaborations for the SDGs (Dr Heru Dewanto) • Outcome-based Engineering Accreditation bridging industry needs and engineering education gap (Dr Leni) • STEaM: Enhance efforts to integrate the liberal arts courses to engineering curriculum (Prof Manolo)	• Continue 1) incorporation of SDGs in the development of solutions and global responsability, 2) inclusion and diversity through enhanced communication • Support the links between the chains through a digital platform

Recommendations and Next Steps

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"NO ONE LEFT BEHIND" AND ENGINEERING EQUAL OPPORTUNITIES FOR ALL	• Mobility of Engineers enhanced through trusted partnership especially within IntPE and APEC Engineers (Prof Chuah) • Open Platform for Global Engineering Initiatives addressed to policy makers, SETI professionals in developing countries (Dr Liu) • UNESCO Chair based post-graduate programme in the field of civil and environmental engineering supporting students from developing countries education, research and training (Dr Malik)	• Provide opportunities for registered engineers to get practical experience in international context which in turn encourage engineers to register • Promoting Open Engineering through regional Open Science Movement • Develop mechanism for creating active collaboration and knowledge sharing among institutions and individual engineers •

Organisers

UNESCO Office Jakarta

Prof. Shahbaz Khan	Director and Representative
Dr. Ai Sugiura	Programme Specialist, SC/PCB
Ms. Jiaying Lin	China Scholarship Council (CSC) sponsored Trainee, SC/PCB
Ms. Fitrie A. Nurritasari	Project Assistant, SC/PCB

AEESEAP and PII

Dr. Ir. Heru Dewanto, ST., M.Sc. (Eng.), IPU., ASEAN Eng	President of AEESEAP and PII
Prof. Dr. -Ing. Ir. Misri Gozan, IPU	Chair of Indonesian Accreditation Board for Engineering Education (IABEE PII)

Contact

UNESCO Office, Jakarta
Jl. Galuh (II) No. 5, Jakarta 12110, Indonesia
Tel: +62 21 7399818 | Fax: +62 21 72796489
Email: Jakarta@unesco.org
Website: https://en.unesco.org/fieldoffice/jakarta

UNESCO Jakarta

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@unescojakarta

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