

## Peace Engineering (PENG) for a Sustainable Planet by 2030

### The Why, What, and How

As one of America's governors has said, "We are the first generation to feel the impact of climate change and the last generation that can do something about it." So today, I'm here personally, as the leader of the world's largest economy and its second largest emitter, to say that we have begun to do something about it. - President Barak Obama quoting Governor of the State of Washington, Jay Inslee

United Nations Headquarters, New York, New York The White House, Office of the Press Secretary – September 23, 2014, 1:03pm EDT https://obamawhitehouse.archives.gov/the-press-office/2014/09/23/remarks-president-un-climate-change-summit

### The WHY: Peace Engineering: A call to action 2020-2030

There are urgent calls to action by the NAE<sup>1</sup>, the Nobel Prize Summit<sup>2</sup>, the UN<sup>3</sup> and global scientists<sup>4</sup> to address and solve, *in this decade (2020 – 2030)*, crucial and widely recognized global challenges before they become more complex and more environmentally, financially, and socially costly; before we reach the point of no return.

The National Academy of Engineering<sup>5</sup>, the institution that the US government leans on for investigating matters of science or technology, states that "A world divided by wealth and poverty, health and sickness, food, and hunger, cannot long remain a stable [and peaceful] place for civilization to thrive". The recent Nobel Prize Summit – "Our Planet, Our Future"<sup>6</sup> presses all citizens of the world to act on the immediate challenge: "What can be achieved in this decade to put the world on a path to a more sustainable, more prosperous future for all of humanity?"

With both quotes and the United Nations Sustainable Development Goals<sup>7</sup> in mind, the engineering profession must partner with social sciences and other disciplines to embrace a new mission statement for the twenty-first century: to contribute to building a more sustainable, stable, equitable and peaceful world; and to actively cultivate a culture of peace. This new mission statement requires that engineers be well-rounded global thinkers and doers, cognizant of: (i) their professional and personal ethical responsibilities; (ii) their role in society as citizen engineers; and (iii) the intended and unintended consequences of their decisions on the design, planning, management, and operation of projects in different socioeconomic, cultural and political situations. Peace engineering is defined not only by its sociotechnical application, but by its ethos and aims with an agenda formulated in service to social justice. Endorsing the new mission statement through Peace Engineering

<sup>&</sup>lt;sup>1</sup> <u>https://www.nationalacademies.org/news/2021/04/nobel-prize-laureates-and-other-experts-issue-urgent-call-for-action-after-our-planet-our-future-summit</u>

<sup>&</sup>lt;sup>2</sup> <u>https://www.nobelprize.org/events/nobel-prize-summit/2021/</u>

<sup>&</sup>lt;sup>3</sup> <u>https://www.ipcc.ch/report/ar6/wg1/</u>

<sup>&</sup>lt;sup>4</sup> https://www.cnet.com/news/climate-change-cop26-is-the-biggest-conference-in-the-world-heres-why-it-matters/

<sup>&</sup>lt;sup>5</sup> NAE (National Academy of Engineering) (2018) *NAE Grand Challenges for Engineering*. Available online: <u>www.engineeringchallenges.org</u>. Accessed 20 Sept 2018.

<sup>&</sup>lt;sup>6</sup> https://www.nobelprize.org/events/nobel-prize-summit/2021

<sup>&</sup>lt;sup>7</sup> https://sdgs.un.org/goals

represents a unique opportunity for the engineering profession to demonstrate how beneficial peace engineering solutions are to the world and, as a result, promote engineering to younger generations.

Peace Engineering is the outcome of the 2018 World Engineering Education Forum - Global Engineering Deans Council Conference (WEEF-GEDC 2018), the first conference of its kind. Held in Albuquerque, NM, WEEF-GEDC 2018 was among the world's largest gatherings of stakeholders and leaders in engineering education and pedagogy, bringing together scientists, educators, and innovators from several sectors including engineering, policy, urban development, healthcare, water, and energy from around the globe.

At the core of Peace Engineering is a mindfulness of the planet's sustainable future, calling leaders to act in unison from a systems thinking mindset<sup>8</sup> that involves identifying and avoiding unintended consequences from the outset. Peace Engineering strives to accelerate the deployment of products and services in order to impact policy and investing. The roadmap has been set by Industry 4.0 (Circular Economy)<sup>9</sup>, the 14 National Academy of Engineering Grand Challenges<sup>10</sup> and the 17 United Nations Sustainable Development Goals (SDGs)<sup>11</sup>.

It is urgent to act now to educate the next generation of professionals to innovate, design and produce NEW and thoughtful solutions. The COVID-19 pandemic and climate related crises have brought this to the forefront. New processes, technologies, social paradigms and financial models are needed to address failures and future needs whether they are in healthcare, climate change, transportation or energy, to name a few. These are great opportunities for development and deployment of innovative integrated solutions.

# <u>The WHAT</u>

The International Federation of Educational Engineering Societies (IFEES)<sup>12</sup> considers Peace Engineering as "the application of science, technology and engineering principles to promote and support peace." It recognizes the important contribution that engineering, the social sciences and other disciplines can make toward a world where prosperity, sustainability, social equity, entrepreneurship, transparency, community voice and engagement, and a culture of quality thrive.

Engineers are generally taught and generally work toward the most cost effective, most efficient solution to a technical problem. In Peace Engineering, engineers are taught and work towards the same goals but in the context of ecological, cultural and economic sustainability and resilience, inclusivity, social equity, partnerships and peace. Peace Engineering works in concert with other sustainable development programs to collectively tackle the problems we face as a global community.

Peace Engineering implies revisiting traditional engineering education and practice. It is about:

• Transforming Engineering Education

<sup>&</sup>lt;sup>8</sup> Systems Thinking: analyzing the way that a system's components interrelate and how systems work over time and within the context of larger systems. Systems thinking is particularly useful in addressing complex or wicked problems. <u>https://learningforsustainability.net/systems-thinking/</u> <u>https://searchcio.techtarget.com/definition/systems-thinking</u>

<sup>&</sup>lt;sup>9</sup> What is Industry 4.0? Here's Everything You Need to Know (pdsol.com)

<sup>&</sup>lt;sup>10</sup> Grand Challenges - Grand Challenges for Engineering (engineeringchallenges.org)

<sup>&</sup>lt;sup>11</sup> THE 17 GOALS | Sustainable Development (un.org)

<sup>&</sup>lt;sup>12</sup> See <u>www.ifees.net/peace-engineering-i</u> and <u>www.weef-gedc2018.org</u>.

- a. Educate future engineers to have breadth in other disciplines (arts, sciences, diplomacy, health, business, etc.) as well as the technical depth required for their engineering discipline
- b. Enrich the engineering talent pipeline by attracting diverse students interested in creating change and having impact
- c. Implement vision developed at the first global Peace Engineering conference (WEEF-GEDC 2018)
- Integrating multiple technical and scientific disciplines to address big challenge problems that face our planet today and will likely to be here for the foreseeable future (e.g., climate change, rapid urbanization, population growth and migration, global health, etc.)
- Integrating within and across partner institutions (Academia, R&D Labs, Industry, Government)
- Embracing Community, Culture, and Individuals to deploy NEW enduring solutions that are context and scale specific
  - a. Partner with Social Sciences such as Psychology, Anthropology, etc.
  - b. Work with Finance and Business Communities on comprehensive models for risk and return
  - c. Connect with Project ECHO to reach underserved communities globally, fostering sustainable and resilient community-driven and community-led solutions. Project ECHO (Extension for Community Healthcare Outcomes) is a guided-practice model that aims to increase workforce capacity by sharing knowledge<sup>13</sup>. The program was developed at UNM and is active in 180 countries (>47K organizations) with nearly 600,000 unique learners.
- Promoting the role of engineers and scientists in diplomacy and policymaking.

## The HOW

#### PENG for a Sustainable Planet Workshop - October 28<sup>th</sup>, 2021

- October 28<sup>th</sup> the University of New Mexico, the National Labs and the Peace Engineering Biome are hosting a kickoff event focusing on the following high priority areas: 1) Climate Change; 2) Life Sustainable Infrastructures; 3) Materials & Sustainability; 4) Complex Systems Modeling and 5) Diplomacy & Policy. Following the kickoff, we will host five bi-weekly working group sessions, each zeroing in on one of themes above, with the goal of identifying significant, achievable, immediate and sustainable actions that we can take now.
- Review of existing curricula and practices
- Propose a baseline body of knowledge for Peace Engineering education and practice
  - Transformative content, curricula, service learning, certificates, internships, continuing education
  - Emphasize context awareness (social, environmental, intended and unintended consequences)
  - Partnered research and education
  - o Identify/emphasize attributes that make PENG degrees highly desirable to employers
  - Work with ABET (and other organizations) to accredit PENG program(s)
  - Provide entry points and ongoing education to professionals at every level (including retirees)
- Identify R&D and entrepreneurship opportunities

<sup>&</sup>lt;sup>13</sup> <u>https://hsc.unm.edu/echo/</u>

- Peace Tech
- Foundations, NGOs, multilateral projects
- Global soft landings
- Themes and Case
  - Climate Change Impacts and Mitigation
  - Life Sustainable Infrastructures
  - Materials and Sustainability
  - Complex Systems Modeling
  - Other
  - Contribute to diplomacy and policy making
    - S,T&E literacy for policy makers
    - Diplomacy and policy literacy for S,T&E
- Develop outreach activities
  - Community partnerships and projects
  - o Marketing (recruitment, promotion, awareness, audience specific)
- Identify and secure sponsors
  - Develop short, medium and long-term strategies to become sustainable
  - Review opportunities
    - Short, medium, long-term
    - Local and global
  - o Identify key partnerships
  - o Get letters of support from congressional delegations
- Support diplomacy and policy making activities
  - S,T&E literacy for policy makers
  - Diplomacy and policy literacy for S,T&E

#### **CONCLUDING REMARKS**

A sustainable world must be a peaceful world, or it will not be. Engineers in the twenty-first century need to be more than providers of technical solutions; they also need to play an active role in peacebuilding efforts and contribute to diplomacy. Peace Engineering programs are needed to educate global engineers and leaders with the attitudes, hard and soft skills, and knowledge necessary to work in the complex and challenging context of human development in their lifetime. There is an urgent need to develop an international community of practice in Peace Engineering. And the time to start on this endeavor is NOW.