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Panel on Environmental Engineers Solving Problems of Planetary Health

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Panel on Environmental Engineers Solving Problems of Planetary Health

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Abstract

Planetary health is defined as, "… a solutions-oriented, transdisciplinary field and social movement focused on analyzing and addressing the impacts of human disruptions to Earth's natural systems on human health and all life on Earth," (Planetary Health Alliance). In September 2023, the United States Bureau of Labor Statistics updated the formal definition of job code 17-2081 Environmental Engineers. The prior definition noted that, environmental engineering was defined as, "research, design, plan, or perform engineering duties in the prevention, control, and remediation of environmental hazards using various engineering disciplines." The current definition now includes that, "environmental engineers use engineering disciplines in developing solutions to problems of planetary health." The purpose of this panel presentation is to discuss the meaning of planetary health, and how environmental engineers solve the problems of planetary health by addressing two important questions. The first question is, "what technologies are needed to support human existence without exceeding (or while continuing to exceed) planetary boundaries?" And second question is, "what improved social contracts may be supported by technologies?"

Introduction

The Anthropocene, a now rejected scientific proposal to rename the current geological epoch, is still used informally to describe the current period when human activity is recognized as a dominant force for change on planet earth [1][2]. From approximately 1950 until today (2025), the Earth has experienced what is known as the, "Great Acceleration," [3]. This includes a period of technological innovation, which has supported an exponential growth in the human population, as well as an exponential growth in the human consumption of raw and processed materials. As postulated by Thomas Malthus in 1798 in, "An Essay on the Principle of Population," the growth in both population and consumption may eventually exceed the ability to produce, which suggests a need to make substantial change(s) to the nature of human activity [4].

As an exercise in systems thinking, planetary boundaries have been described to measure the consumption of raw materials - such as water, nutrients, and atmosphere – as well as biodiversity, which are under threat from depletion [5]. While there are those who hold to an alternative view of resource abundance through technological innovation [6], on noted measures of planetary scale phenomena the consumption of resources exceeds the ability of natural regeneration by the planet. In other words, many believe that ecosystems are failing, and the planet is slowly dying.

Engineers have an obligation to hold paramount the health, safety, and welfare of the public. Historically this included engineers questioning if individual design efforts would create a product or a process that could potentially harm humans. Often the litmus of harm focused at the local level. The unspoken assumption was that the planet was so large that activities beyond the local level could be ignored. It has become increasingly obvious that the phrase, "think global,

act local," requires engineers to reconsider how to hold paramount the health, safety and welfare of the entire planet, and to even consider "engineering" on a global scale (i.e., "climate engineering") [7] . Some might argue that the planet is the ultimate expression of public. From an ecosystems perspective, the public includes humans, non-human life, and abiotic materials that make up ecosystems upon which all life depends. Put another way the question is, "is it time to decenter humans in our discussion of sustainable development?" [8].

In response to the realities faced by the planet, engineers have begun to rethink their role in planetary health research, education, practice, and policy [9][10][11][12]. In particular, the profession of environmental engineering has been a leader in the planetary health movement [13][14][15]. Historically, environmental engineering arose from a focus on solving the problems of dense human settlements. This included the conveyance of waste and the provision of clean drinking water. Over time, environmental engineering also included the treatment of contaminated soils and air at a regional scale. Today, environmental engineers must scale-up approaches to address planetary threats; in other words acting locally while thinking globally about the health of the entire planet upon which all human life currently depends [16].

Environmental engineering is a caring profession [13]. As such this means there are activities within environmental engineering which receive financial renumeration, as well as activities within environmental engineering, which are not recognized with financial renumeration. These unrecognized activities are known as "caring". Caring is well recognized in other professions, such as nursing and elementary education. Caring professionals can be recognized as those who do work that is not financially renumeration. To begin to capture these caring traits as we train up future engineers, the profession of environmental engineering has been encouraged to adopt life cycle approaches [14], and even the definition of environmental engineering has been modified. Unlike most definitions of engineering, which are characterized by phrases emphasizing designing and building certain "widgets", the definition of environmental engineering now focuses on solving problems of planetary health [15].

As described online, "Planetary Health is a solutions-oriented, transdisciplinary field and social movement focused on analyzing and addressing the impacts of human disruptions to Earth's natural systems on human health and all life on Earth," (see: https://planetaryhealthalliance.org/what-is-planetary-health/). The adoption of solving problems of planetary health for environmental engineering is significant for two important reasons. The first reason is that the motivation (i.e., the "why") for environmental engineering is now clearly stated at the level of "planetary health". Second, the approach (i.e., the "how") for environmental engineering is now clarified as "problem solving". In contrast, the prior definition may be characterized as focused on process (i.e., the "what" that is done by environmental engineers". Migrating from a definition focused on "what" to a definition that clarifies "how" and answers the question "why" is consistent with the "Changing the Conversation" campaign of the National Academy of Engineering and the proposed effort to diversify engineering through the use of more inclusive language. For example, "engineers make a world of difference" is more similar to the new definition as compared to the prior definition of environmental engineering [17][18].

Given some of the major documents available to the environmental engineering education community – such as the Environmental Engineering Body of Knowledge (2009) [19], the National Academy of Engineering Environmental Grand Challenges report (2019) [20], and the Engineering for One Planet Framework (2022) [20] – the purpose of this panel is to share examples of where engineering educators are leveraging the "planetary health lens" as they work with students to "learn by doing", specifically in "solving problems".

Conclusion

This session will include a moderated discussion of faculty leaders who share their views on common questions and their perspectives of classroom experiences will provide exemplars for the audience to consider as part of open discussion to incorporate the new definition of environmental engineering into classrooms, laboratories, and experiential learning environments nationally.

Please contact the author for a summary of any additional information that is shared as part of the session.

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