8ICEG Keynote Lecture

Dr. Craig H. Benson

PhD, PE, FNAI, NAE

Keynote Lecture Title

Engineering for sustainability: new value proposition for differentiation in environmental geotechnics

【08:30 - 09:10 , Wednesday 31stOct. 2018】

Biography

Craig H. Benson is Dean of the School of Engineering at the University of Virginia as well as the Hamilton Endowed Chair in Engineering. Dr. Benson has a BS from Lehigh University and MSE and PhD degrees from the University of Texas at Austin. Prior to joining the University of Virginia, Dean Benson was appointed as a Distinguished Professor, Chair of Civil and Environmental Engineering, and Chair of Geological Engineering at the University of Wisconsin-Madison. He was also Director of Sustainability Research and Education for the University of Wisconsin-Madison, leading one of the three cross-campus strategic initiatives.

During Benson's time at UVA, the School of Engineering has developed a new strategic plan focused on interdisciplinary research and education that has developed linkages between traditional academic units within the School of Engineering and amongst the other schools and colleges at UVA. The research enterprise has grown more than 30% each year, and the School has received more than $60M in strategic investments. Enhancing diversity is a pillar of the strategic plan, which has included a $30M Clark Scholars endowment to provide scholarships for 80 diverse undergraduate students in Engineering. Amongst public universities, the School of Engineering has achieved the highest 4-yr graduation rate, the highest 4-yr graduation rate for African American students, and the highest percentage of women engineering undergraduates in the nation. The graduate student population in Engineering has grown substantially, including a 68% increase in PhD students, and is now the second largest at UVA next to the School of Medicine. The number of women and African American applicants to the PhD program has more than doubled, and graduate program rankings are on a steady upward trend.

Dr. Benson is an eminent engineering scholar and serves on the Environmental Engineering Committee of US Environmental Protection Agency's Science Advisory Board and ExxonMobil's Sustainability Advisory Committee. He is a fellow of the National Academy of Inventors (NAI) and the National Academy of Engineering

(NAE).

Abstract

The historical approach to engineering has focused on minimizing realized costs while achieving performance objectives for the engineered system. This approach ignores externalities (hidden costs) associated with irrecoverable resource consumption, disease related to pollution, and ecosystem deterioration. The traditional approach has led to large waste generation rates in developed societies due to one-pass material usage, contributing to significant environmental degradation. Poor management of these wastes led to the formation of environmental geotechnics and geoenvironmental engineering, which have focused primarily on protective waste containment systems and environmental remediation. A topic of considerable interest in these disciplines today is reuse and/or repurposing of wastes in new applications to promote sustainability -- that is, finding or creating value in materials previously considered useless in engineering applications where they have similar or superior performance as new materials for the betterment of society. Engineering predictions coupled with life cycle assessment (LCA) can be used to identify reuse and repurposing strategies that are cost-effective in terms of realized costs as well as externalities. Examples are provided illustrating how favorable sustainability metrics are achieved by extracting materials from the waste stream, processing if necessary, and repurposing in lieu of traditional materials used in geoengineering. The important role of LCA is illustrated using an example of waste repurposing that has unfavorable sustainability metrics. Recommendations are made that geoengineers can incorporate into their practice to reduce waste generation, increase utilization, and promote sustainability for society.