2013 Lawrence K. Cecil Award Lecture:
Protecting the Environment, Lessons from a Personal Journey

Heriberto Cabezas¹

U.S. Environmental Protection Agency
Office of Research and Development
Cincinnati, Ohio, USA
&
University of Pannonia
Department of Computer Science and Systems Technology
Veszprem, Hungary

Abstract

The lecture was given at the 2013 Annual Meeting of the American Institute of Chemical Engineers in San Francisco, California in November 2013. The lecture summarizes some of the most important developments from the lecturer’s work at the EPA over the last 19 years. It discusses the Waste Reduction Algorithm for pollution prevention and its application to chemical process design. This is followed by a general discussion of the concept of sustainability and sustainability metrics, including Fisher information and the Sustainable Regimes Hypothesis, ecological footprint, emergy, and green net product. These concepts are the applied to regional sustainability assessment and the stability of nation states. The last major topic is the application of sustainability concepts to the design of energy supply chains. The lecture ends with some general comments on sustainability and complexity and a summary.

¹ On detail to the Embassy Science Fellow Program, U.S. Embassy, Zagreb, Croatia
Heriberto Cabezas
Brief Curriculum Vitae

Heriberto Cabezas is the Senior Science Advisor to the Sustainable Technology Division in the U.S. EPA’s Office of Research and Development. He also holds an academic appointment as Associate Professor in the Department of Computer Science and Systems Technology at the University of Pannonia in Hungary. At the U.S. EPA he is responsible for the scientific oversight of the research teams under the guidance of the division director. He is a former Acting Director (2008-2010) of the Division consisting of approximately 50 scientists, engineers, and support staff – some thirty five at the doctoral level. Dr. Cabezas organized and led as Chief (2000-2008) the Sustainable Environments Branch, a multidisciplinary research group of some seventeen scientists and engineers. At the University of Pannonia he is responsible for conducting research on sustainability science and Graph Theory (P-Graph specifically) for network design including manufacturing processes, supply chains, and product and services distribution. Dr. Cabezas has served as Chair of the Environmental Division of the American Institute of Chemical Engineers (AIChE) for 2006. He was a recipient of the 1998 U.S. EPA Science Achievement Award in Engineering, the 2007 Distinguished Alumni Achievement Award from the New Jersey Institute of Technology, the 2011 Research Excellence Award in Sustainable Engineering from the AIChE, the ORD Sustainability Award (team) at the U.S. EPA, and has been selected for the 2013 Lawrence K. Cecil Award in Environmental Chemical Engineering from the AIChE. Dr. Cabezas holds a Ph.D. from the University of Florida (1985) in thermodynamics and statistical mechanics, a M.S. from the University of Florida (1981), and a B.S. (magna cum laude) from the New Jersey Institute of Technology (1980) all in chemical engineering. His publications include over sixty peer-reviewed articles. His published areas of expertise include: (1) complex fluid property theory and experiment, (2) purification of biological molecules, (3) computer-aided chemical process design for the environment, (4) computer aided solvent replacement for the environment, (5) sustainability metrics for geographic regions, and (6) the design of sustainable supply chains. He is a Fellow of the American Association for the Advancement of Science, and a Board Certified Member of the American Academy of Environmental Engineers and Scientists. Dr. Cabezas is a decorated U.S. Navy veteran of the Vietnam Conflict.