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# ENVIRONMENTAL SCIENCE AND SUSTAINABILITY

Baltimore, USA, November 7-9, 2009

- ❁ Proceedings of the 2nd WSEAS International Conference on NATURAL HAZARDS (NAHA '09)
- ❁ Proceedings of the 2nd WSEAS International Conference on CLIMATE CHANGES, GLOBAL WARMING, BIOLOGICAL PROBLEMS (CGB '09)
- ❁ Proceedings of the 2nd WSEAS International Conference on URBAN REHABILITATION AND SUSTAINABILITY (URES '09)

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**Preface**

This year the 2nd WSEAS International Conference on NATURAL HAZARDS (NAHA '09), the 2nd WSEAS International Conference on CLIMATE CHANGES, GLOBAL WARMING, BIOLOGICAL PROBLEMS (CGB '09) and the 2nd WSEAS International Conference on URBAN REHABILITATION AND SUSTAINABILITY (URES '09) were held in the Morgan State University, Baltimore, USA, November 7-9, 2009. The conferences remain faithful to their original idea of providing a platform to discuss crops & drought, climate change factors, human influences on climate change, pre-human climate variations, dynamics and stability of ecosystems, natural hazards, environmental disasters, environmental management, land use and management, biodiversity, sustainability development studies, solar energy systems, agriculture, urbanization, rehabilitation and international law, radioactive waste etc. with participants from all over the world, both from academia and from industry.

Their success is reflected in the papers received, with participants coming from several countries, allowing a real multinational multicultural exchange of experiences and ideas.

The accepted papers of these conferences are published in this Book that will be indexed by ISI. Please, check it: [www.worldses.org/indexes](http://www.worldses.org/indexes) as well as in the CD-ROM Proceedings. They will be also available in the E-Library of the WSEAS. The best papers will be also promoted in many Journals for further evaluation.

Conferences such as these can only succeed as a team effort, so the Editors want to thank the International Scientific Committee and the Reviewers for their excellent work in reviewing the papers as well as their invaluable input and advice.

The Editors





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## Plenary Lecture 1

### Climate Change Curricula and the Challenge for Educators



**Associate Professor Richard Snow**  
Embry-Riddle Aeronautical University  
Daytona Beach, Florida, USA  
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**Abstract:** The reality of climate change is unfolding at a rapid rate. Global warming is among the most serious environmental problems the world community faces today. The eight warmest years on record have all occurred since 1998, and the 14 warmest years on record have all occurred since 1990. The global mean surface temperature for 2005 was the warmest since temperature observations began, the years 2007 and 1998 are tied for Earth's second warmest year in a century, the warmest year on record in the United States was 2006, and the world has not been as warm as it is now for at least a millennium. Atmospheric concentration of carbon dioxide has increased from a pre-industrial value of 280 parts per million (ppm) to current levels of 385 ppm. This is the highest level in 650,000 years and is expected to double pre-industrial levels during this century, which could raise global temperatures 2 to 5 Celsius degrees over the next hundred years. The impacts of climate change are readily apparent around the planet. Retreating glaciers and extreme precipitation events cause flooding in some areas while elsewhere water bodies are evaporating. Tropical diseases are spreading as hurricanes become stronger and more destructive. If global warming continues locations from the equator toward the poles will begin to experience higher temperatures, which ultimately could lead to more severe droughts, rainstorms, heat waves, and floods. Locations in the Arctic and temperate latitudes are likely to experience warmer and stormier winters. Summers will be hotter with less precipitation, and summer rains will be the result of thunderstorms rather than showers. Such change will put the most stress on those systems already affected by pollution, thus increasing resource demands and unsustainable management practices. Global warming and climate change are among the most serious environmental problems the world community faces today. Each individual is involved and needs to be properly informed. This information should include the evidence, the impacts, and actions that can be taken to minimize the negative effects of altering Earth's climate system. A comprehensive approach to climate change education is necessary to address numerous environmental issues. For example, we must learn to overcome the dichotomy that exists between accepting the importance of nature while devaluing the environment through our chosen lifestyles. Also, we should supply sufficient and satisfactory methods for developing and implementing guiding ecological principles rather than relying solely on the rule of law. And, we need to formulate an all-inclusive philosophy of nature that will facilitate valuation. The college-level curriculum for such an all-encompassing ecological pedagogy is multifaceted providing an overview of the science behind major global environmental issues within the context of the physical environment of Earth including global climate change, resource extraction, water and air quality, urbanization, geohazards, and pollution. The main goal of the curricula is to engage students in rigorous analyses of data that can be compared with global trends. This research discusses the development of an upper-level college course on Climate Change created as part of an interdisciplinary Honors Seminar Series. The course makes use of multimedia instructional techniques to examine the physical, economic, and political dynamics of climate change. The curriculum includes an appraisal of assorted global warming websites, computer-based simulations and analysis of relevant climate data, as well as a review of the literature and other media including documentaries. The topic of climate change is extremely complex and the challenge for educators is to enlighten students through ways and means that are truthful, understandable, and comprehensive.

#### **Brief Biography of the Speaker:**

Dr. Richard Snow teaches Meteorology I, Meteorology II, Applied Climatology, Climate Change, Introduction to Geographic Information Systems (GIS), Advanced GIS, and Research Methods and Statistics in the Department of Applied Aviation Sciences at Embry-Riddle Aeronautical University. He earned a Ph.D. in Physical Geography with a specialty in Life Sciences from Indiana State University as well as a Master of Science degree in Geoscience and a Bachelor of Science degree in Geography with a Philosophy minor from Western Kentucky University. Before coming to Embry-Riddle, Dr. Snow was a Geographic Information Systems Specialist with the Department of Growth and Resource Management, Volusia County, Florida. He taught Environmental Science at Keiser College, World/Regional Geography and Cultural Geography at Indiana State University, Human Geography at Western Kentucky University, and Physical Geography for Indiana University/Purdue University at Indianapolis (IUPUI). Other professional

experience includes the Kentucky State Climate Center, the College Heights Weather Station (NWS), and the Center for Cave and Karst Studies at Western Kentucky University.

Dr. Snow has presented his research to numerous professional organizations, such as the American Meteorological Society, the National Weather Association, the National Council for Geographic Education, the Association of American Geographers, the Indiana Academy of Science, the Kentucky Academy of Science, and the University Aviation Association. He has presented at international conferences in Greece, Germany, France, the Netherlands, England, Cancun, the Bahamas, and Hawaii. His diverse research topics include microburst avoidance for pilots, temperature range variability, the effect of El Nino on heating degree days, global climatic change, applied climatic indices, seasonal thermal lags and thermal lag regimes, renewable energy, and Geographic Information Systems (GIS) applications in meteorology and climatology.

He has co-authored articles with Dr. Mary Snow that are published in the Collegiate Aviation Review, the Journal of Aviation/Aerospace Education & Research, and the Journal of Air Transportation. Together they have produced a dozen refereed journal articles, published numerous papers in peer-reviewed proceedings, and made many presentations from the local level to international conferences. The pair also co-authored a textbook for Prentice-Hall entitled Exercises in Climatology and are revising the 3rd edition of Climatology: An Atmospheric Science. Additionally, Dr. Snow is the co-author of the companion web site for Understanding Weather and Climate, 3rd, 4th, and 5th editions, published by Prentice-Hall, and he recently contributed an article on Continentality and Continental Climate, which is included in the Encyclopedia of World Climates.

Besides teaching, presentations, and publications, Dr. Snow has served on the Embry-Riddle College of Aviation Curriculum Committee as well as the University Honors Advisory Committee, Research Committee, Scholarship and Awards Committee, and the Senate Nominating Committee at Embry-Riddle. He is a member of Omicron Delta Kappa, Phi Eta Sigma, Phi Kappa Phi, Gamma Theta Upsilon, Sigma Xi, the National Weather Association, the American Meteorological Society, the University Aviation Association, Florida Academy of Science, Golden Key National Honor Society, the American Geophysical Union, and the American Institute of Physics. Rich is the Faculty Advisor for Chi Epsilon Pi, the Riddle Riders, the Lacrosse Club, the Divng Eagles SCUBA Club and is a certified PADI Open Water Diver. He also was voted College of Aviation Faculty Member of the Year by the graduating classes of 2006 and 2007 and is a fellow of the Oxford Round Table.

## Plenary Lecture 2

### Use of Uncertainty in Decision-Making



#### **Professor Shinya Kikuchi**

Charles E. Via Jr. Professor of Civil and Environmental Engineering  
Virginia Tech  
USA

**Abstract:** Uncertainty has become an increasingly popular subject of analysis in all fields of natural and human sciences today. Traditionally, uncertainty has been considered as something of a nuisance. The prevailing thinking has been that uncertainty is something to be removed by assumptions, and that the problem environment should be made to a well-defined situation first. Uncertainty, however, is part of our living environment, and it allows us to explore possibilities and challenges our potentials. This presentation looks at two general views about uncertainty, ambiguity and vagueness, and organizes the available theories first. It then presents a decision-making situation, in which each stakeholder presents the desire graphically, and the decision is made to maximize the least-satisfied stakeholder's desire, an egalitarian approach to decision. In this process, the uncertainty of the desire of the stakeholders is represented graphically, and the graphs become the means of communication among them. This approach turned out to be a bottom-up decision process, which preserves and uses the uncertainty of the expression of desires as much as possible in the process. This may be a useful approach in today's complex environment of decision-making.

#### **Brief Biography of the Speaker:**

Dr. Kikuchi is the Charles E. Via Jr. Professor in the Via Department of Civil and Environmental Engineering of Virginia Tech. Dr. Kikuchi came to Virginia Tech in 2005 from the University of Delaware, where he was a professor of transportation engineering/planning for 23 years. He was also employed by Transportation Development Associates and General Motors Corporation prior to his academic career. He received his BS and MS degrees from Hokkaido University, Japan, and a Ph.D. in Civil and Urban Engineering from the University of Pennsylvania. Dr. Kikuchi's primary areas of interest are urban transportation planning, urban public transportation systems, highway geometric design and operations, transportation data handling, and logistics. For the past 15 years, he has focused his interest in incorporating treatment of uncertainty in the analysis of transportation planning and design. Many of his research projects deal with incomplete data, approximate reasoning, and multi-objective optimization under incomplete causal knowledge. He is the director of the Civil and Environmental Engineering Program of Virginia Tech in the National Capital Region. He is the chair of TRB's Artificial Intelligence and Advanced Computation Applications Committee. He is also the co-founder of Annual Helsinki Summer School of Transportation.