

Characterizing the uncertainties in climate change impacts assessment for water resources

Overview

During the last two decades the results of many climate change impact assessments have been published by hydrologists. These assessments are based mostly on climate scenarios provided by General Circulation Models (GCMs). Water balance models have often been used to transform these climate scenarios into hydrological responses. The results of these analyses, however, depend strongly on the GCM used to generate the climate scenario. It is not surprising that the expected change of global mean temperature under the assumption of a doubling of the concentration of atmospheric CO₂ varies from 1.9°C to 5.8°C. If transient climate scenarios are used to specify the time scale of changes, another uncertainty results from the future socio-economic development that influences the emission of greenhouse gases in the future. However, GCMs represent the current knowledge of climatic dynamics, and there is no other way to make prognoses. To quantify the uncertainties of climate change scenarios, Monte-Carlo simulations are generally used. Numerous simulations have been done by a random sampling of uncertain parameters. The following uncertainties are considered:

(a) The uncertainty caused by differences of the regional results from different GCMs. Seven different GCMs, are used to specify this uncertainty.

(b) Uncertainties caused by different assumptions about the unknown climate sensitivity. Large differences between the results of climate scenarios under the assumption of a doubling of the concentration of atmospheric CO₂ are caused by different assessments of the assumed sensitivity of global climate. To characterize this uncertainty, a triangular distribution is used. The peak is located at the often used assumption of a global warming of 3°C under the conditions of a doubled CO₂ concentration.

(c) Uncertainties caused by unknown emissions of greenhouse gases in the future. Four emission scenarios are used that are based on different pathways of future economic and demographic development. Here the so-called SRES scenarios of the International Panel of Climate Change (IPCC) are used. Each scenario is characterized by the same probability. To consider the possible effects of emission-reducing strategies, an implementation of the Kyoto Protocol is also considered, with a probability for its implementation of 50%.

(d) Uncertainty caused by the natural variability of climate. Climate characteristics may be influenced by natural variability, which depends strongly on the time slice used to estimate them. This variability is assessed for temperature and precipitation by analyses of time periods of 30 years within a time series of 1400 years.

Modules	A: Understanding the Process of Climate Change, impacts and uncertainties involved : Feb. 22, 2016 B: Monte Carlo Simulations and their Applications : Feb. 23, 2016 C: Understanding and formulation of a water balance model to transmit the climate: Feb. 24-25, 2016 D: Assessment of Uncertainties : Feb. 26, 2016 Number of participants for the course will be limited to Thirty.
You Should Attend If...	<ol style="list-style-type: none"> 1. Faculty (working on research relating to climate change, uncertainties, and modeling environmental systems) 2. UG/PG/Research Students from Engineering
Fees	The participation fees for taking the course is as follows: Participants from abroad : US \$200 Industry/ Research Organizations: ` Rs. 4000 Academic Institutions: ` Rs. 2000 The above fee include all instructional materials, computer use for tutorials and assignments, laboratory equipment usage charges, 24 hr free internet facility. The participants will be provided with accommodation on payment basis.

The Faculty

Prof. Adeloye J. Adebayo is Professor at school of built environment, Heriot Watt University, Edinburgh, UK. Dr Adeloye won the prestigious and highly competitive Fellowship of the Royal Commission for the Exhibition of 1851, a post-doctoral fellowship tenable at the Imperial College of Science, Technology and Medicine, London. Dr. Adeloye joined Heriot-Watt University as a lecturer in 1992 and was promoted to a Senior Lecturer in 2004. He is the co-author of "Water Resources Yield", a postgraduate reference textbook first published in 2005 by Water Resources Publications, Colorado, USA. He is Member, Chartered Institution of Water & Environmental Management (MCIWEM), Chartered Water & Environmental Manager (CWEM), Chartered Engineer, UK; Fellow, UK Higher Education Academy (FHEA). He was Chair and organiser, UK-Indo Workshop on "Water Resources Management under Climate and Environmental Change", September 2009. Also he was Invited guest Editor, Special Issue of the Open Hydrology to be published in 2010, Invited participant, NERC sponsored Workshop on Changing Water Cycle, New Delhi, India, February 2010, Invited Written Contribution, ICE/CIWEM/Royal Academy of Engineering Enquiry on Global Water Security, Invited Member of expert research proposals review panel, King Fahd University of Petroleum and Minerals, Kingdom of Saudi Arabia, Invited Member, expert research proposals review panel, NERC-sponsored thematic programme on "Ecosystem Services for Poverty Alleviation", May/June, 2010, Invited Applicant, Prince Sultan Bin Abdulaziz International Prize for Water, Kingdom of Saudi Arabia, Invited article, Special Issue of ICE Journal of Urban Design and Planning, ICE, 2010, Invited External Reviewer, Degree programme in environmental engineering, Dammam University, Kingdom of Saudi Arabia for the purpose of approval by the Accreditation Board for Engineering & Technology (ABET), USA, Member, Editorial Advisory Board, the Open Hydrology Journal (www.bentham.org/open), Member, Editorial Advisory Board, Journal of Applied Sciences

Prof. CSP Ojha PhD (Imperial College, London) is a Professor in Civil Engineering, IIT Roorkee since 2004. He has more than 25 years of teaching and research experience in the area of water resources and environmental engineering. His current research interests are flow and contaminant transport, root water uptake by plants, irrigation scheduling, hydrologic processes, water resources management under climate change. He has co-authored about one hundred seventy five journal publications, twenty five book chapters and authored/edited about half a dozen books. He has supervised more than three dozen Ph.D. students. He has been recipient of Alexander von Humboldt Fellowship in 2001, Distinguished Visiting Fellowship of Royal Academy of Engineering, U.K. in 2008, STINT Fellowship in 2009, Visiting Fellowship of ASCE in 2010 and Senior JSPS Fellowship in 2010-11. He has received research paper awards from ASCE in 2001, 2009, 2010 and 2013, and half a dozen research paper awards from reputed Indian organizations. He was awarded BCEEM by American Academy of Environmental Engineering in 2011 and Curtis

Visiting Professorship by Purdue University in 2012-2013. He has been serving as Editor, Journal of Indian Water Resources Society, 2003-05, Associate Editor, ASCE Journal, Joint Guest Editor with A.J. Adedoye, for a Special Issue on Climate Change and its Implications for developing economies, The Open Journal of Hydrology, Bentham Science, Publishers, 2009-2010, Member, ASCE Task Committee on Green House Gas Emissions and Climate Change, since 2010, Member, Editorial Board for ASCE Book on Green House Emissions and Climate Change, since 2010. He has specific experience in modelling of Water Resources and Environmental Engineering Systems, Statistical downscaling and climate change; design and operation of on farm reservoir, crop water requirement and root water uptake.

Prof. Rajnish Shrivastava, a known academician, Ph.D in civil engineering (Environmental Engineering) from University of Roorkhee. He has been dean Academic at MANIT- Bhopal. He has been Advisor-I in All India Council of Technical Education, New Delhi wherein he served in Bureaus of Management & Technology, Academic, planning and coordination from 2006-2008. He has been Director, NIT- Jamshedpur from 2008-2011 and Director NIT-Hamirpur from 2011- till date. He has been recipient of AICTE Career award for Young Teachers (1997), Indira Gandhi Fellowship by Govt. of Madhya Pradesh (1999), Brijnandan Sharma award by Indian Water Works Association (2001), and ISTE-Rajarambapu Patil National Award for promising engineering teacher (2003). He is also a recipient of Technical Cooperation Training Fellowship at U.K. Prof. Shrivastava has 80 research publication in his name and supervised 41 M.Tech and 9 Ph.D thesis. He is a life fellow of Institution of engineers (India), Institution of Public Health Engineers (India) and life member of India Association of Environmental Management, Indian Water Works Association and India Society of Technical Education. He has been Secretary- cum-Treasurer of ISTE Madhya Pradesh & Chhattisgarh state, secretary IPHE Regional Centre Bhopal, Executive member IE MP state centre and Honorable Secretary IWWA, Bhopal Centre. Also recently nominated as Executive Council members of ISTE from state of Bihar and Jharkhand.

Dr. Vijay Shankar Dogra, is Associate Professor in the Department of Civil Engineering, National Institute of Technology, Hamirpur (HP), with a teaching experience of 19 years. His areas of interest include Water Resources Engineering, Unsaturated Zone Modelling, River Bank Filtration, Irrigation Scheduling, climate change and Water Resources Management. He has published over 20 papers in International and National Journals, and 41 papers in National and International Conferences. Mainly the research work is focused on irrigation scheduling and root water uptake. He has undertaken about a dozen Consultancy Projects, organized nearly 33 International and National Conferences, Training Programs/ Courses/ Workshops/ Expert-Lectures. He has numerous academic interactions, collaborations outside Institute/Organization/Country. He is part of MoES (GOI) – NERC (UK) funded international collaborative research project, titled “Mitigating climate change impacts on India agriculture through improved Irrigation water Management” under the changing water cycle UK-NERC/India MOES Initiative.

Course coordinators:

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