MHRD | Government of India
Ministry of Human Resource Development

ENVIRONMENTAL AND WATER RESOURCES DECISION MAKING USING INFORMATION THEORY UNDER CLIMATE AND ANTHROPOGENIC CHANGES

Overview

The process of decision making can be traced to the beginning of human civilization. However, the nature of problems requiring decisions, the type of decisions, and the decision making tools have undergone dramatic changes over time. People's intuitive judgment and cognitive ability; the availability of data; environmental and ecological considerations; and social, political and economic constraints influence decision making and decisions. Most day-to-day decisions involve a certain amount of risk which is factored, either knowingly or unknowingly, in the decision making process.

Planning, design, operation, and management of environmental and water resources systems are greatly affected by the vagaries of nature or the uncertainty of natural events as well as human-induced errors or factors. Nature has immense variability and the information available to quantify this variability is usually limited. Nevertheless, decisions have to be made and implemented. The decision theory attempts to provide a systematic approach to making rational decisions. The decision making philosophy entails the benefit-cost theory, the decision theory, and the sustainability theory. However, occupying the central stage in this philosophy is risk and reliability analysis. The relative importance of each element changes with social evolution and the development stage of the society. These days most societies attach utmost importance to sustainability and equity, and decision making therefore is becoming participatory.

Central to rational decision making and risk assessment is uncertainty. It can be argued that the necessity of decision making results totally from uncertainty. In other words, if the uncertainty did not exist, there would be no need for decision making or decision making would be relatively simple and straightforward. One of the main causes of uncertainty in environmental and water resources systems is the unpredictability of the system behavior. For example, flow in a river varies in time and experiences highs and lows each year. If one were to consider the lowest flow in each year for a number of years, a series of low flows will be the result. The prediction of these flows cannot be made with certainty. The same would apply to the highest yearly flows. Another example is the unpredictability of rainfall or for that matter forecasting of climate.

A risky decision exposes the decision-maker to the possibility of some type of loss but there are many situations when such a decision has to be made. For example, a decision to build a water resources project may be risky because a large flood might occur and endanger the structure with the resulting loss of life and property. Second, a decision may be risky because the natural phenomena are not clearly understood. Sometimes a risky choice has to be made if the cost of an alternative that can control the risk is more than the ability or willingness to pay for it. The ultimate goal is to reduce uncertainty and thereby risk.

Risk is an inherent part of any decision making process. Risk and uncertainty are unavoidable in the design, construction, and management of environmental and water resources systems. However, until recently, common way to account for risk and uncertainty in engineering design was through a factor of safety. However, this does not provide any idea of the risk in a particular situation and most decision makers these days want to explicitly know the risk involved while making a decision as well as the risk of operating an existing system and the consequences of a management action. Answers to these questions require an understanding of the behavior of inputs to the system under study as well as the consequences of a management action. Therefore, this course presents fundamental concepts of decision making regarding environmental and water resources systems under anthropogenic and climate changes which will help participants be better equipped to deal with uncertainty and make better decision.

Objectives

The primary objectives of the course are as follows:

i) Exposing participants to the fundamentals of decision making under uncertainty,
ii) Providing essentials of uncertainty and risk,
iii) Providing techniques for analyzing uncertainty,
iv) Presenting a unified framework for uncertainty analysis using information theory,
v) Presenting application of information theory to environmental and water resources systems, and
vi) Providing hands-on experience for use of information theory in environmental and water resources decision making

Internationally faculty **Prof Vijay P Singh** an academician, researcher and practitioner with proven knowledge, experience and demonstrable ability in teaching, consultancy, research and training will deliver lectures and discuss case studies in the course. The course will be planned and offered as per the norms set by the GIAN programme.

Course participants will learn these topics through lectures and hands-on tutorials. Case studies and assignments will also be shared among all to stimulate research motivation of participants.

Course	**ENVIRONMENTAL AND WATER RESOURCES DECISION MAKING USING INFORMATION THEORY UNDER CLIMATE AND ANTHROPOGENIC CHANGES** **November20–24, 2023** No of participants for the course will be limited to fifty.
You Should Attend If…	Participants from Industry, Research Organisations, Faculty and Students from all over the world who are interested in the course are welcome to register for the course.
Fees	The participation fees for attending the course are as follows: **Participants from abroad:** : US $100 **Industry / Faculty or Scientists of Institutions:** Rs. 2,000/- **Academic /Research Institutions-Students:** Rs. 1,000/- The above participation fee includes soft copy of all instructional materials, computer use for tutorials and internet facility. **Participants will be provided with shared double occupancy accommodation at the university guest house and Indian Vegetarian food on payment of charges as per university rules.** Hotel accommodation will be arranged on **payment basis** at nearby places, if requested. For more details please visit ***http://www.gbpuat.ac.in/gian/index.html***

The Faculty

Prof. Vijay P. Singh is a Distinguished Professor, a Regents Professor, and Caroline & William N. Lehrer Distinguished Chair in Water Engineering, Department of Biological and Agricultural Engineering and Zachary Department of Civil & Environmental Engineering, Texas A & M University, College Station, Texas, USA.

His research interests include Surface-water Hydrology, Groundwater Hydrology, Hydraulics, Irrigation Engineering, Environmental Quality and Water Resources engineering, entropy theory, copula theory, mathematical modeling, and Hydrologic Impacts of Climate Change.

His professional heights include **1535 papers** published in refereed journals, 333 conference papers, 40 books, 92 edited books, 135 book chapters and 72 technical reports and 15 special issues of journals. He is the editor of many Journals. He has been awarded *2012 Texas A& M University Bush Excellence Award for Faculty in International Research; University Distinguished Professor Award 2013, Texas A & M University, 2013; and Lifetime Achievement Award, Environmental and Water Resources Institute, American Society of Civil Engineers, among more than 110 awards*., honorary doctorates: 4; 2 Normal medals; crystal drop award; Chow Award; Hancor Award; four Lifetime achievement awards, among others. His Google citationsaremore than 98,250, I-index is 1160, and H-index is 128. https://vijaypsinghtamu.wixsite.com/vsingh; https://scholar.google.com/citations?user=xfA8dwcAAAAJ&hl=en; Google Scholar

Dr Mrs. Jyothi Prasad is a Professor in the Department of Civil Engineering, College of Technology, G B Pant University of Agriculture and Technology, Pantnagar, Uttarakhand State. Her area of interest is *Hydrology* with specialisation in Water Shed Management, Irrigation Water Management, Water Resources Mgmt.

She got more than thirty five years of teaching and industrial experience at different institutions/universities. She has more than Eighty Five (85nos) publications of National and International Journals / Conferences to her credit. She has organised more than Twenty (20) training / workshop programmes for the faculty of engineering colleges, field engineers funded by MHRD-GIAN, SERB, DST, AICTE-ISTE, TEQIP WORLD BANK project etc and attended more than Fifty (50) training programmes organised by UNESCO, DFID, SDC, DST, DOE, AICTE, ISTE, NAAC, ICH, NORAD, IGSH etc. She is PI of **SPARC,**MHRD, GOI sponsored project in association with WSU, Sydney, Australia & Co PI of NMHS, MOEF & CC, GOI project in association with Kumaun University.

Course Coordinator

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Registration visit
http://www.gian.iitkgp.ac.in/GREGN

Updates:
https://sites.google.com/site/pantnagar2018/

Information visit:
http://www.gbpuat.ac.in/gian/index.html