Lecture Notes On Environmental And Natural Resources Economics

This book, based on lectures on natural and environmental resource economics, offers a nontechnical exposition of the modern theory of sustainability in the presence of resource scarcity. It applies an alternative take on environmental economics, focusing on the economics of the natural environment, including development, computation, and potential empirical importance of the concept of option value, as opposed to the standard treatment of the economics of pollution control. The approach throughout is primarily conceptual and theoretical, though empirical estimation and results are sometimes noted. Mathematics, ranging from elementary calculus to more formal dynamic optimization, is used, especially in the early chapters on the optimal management of exhaustible and renewable resources, but results are always given an economic interpretation. Diagrams and numerical examples are also used extensively. The first chapter introduces the classical economists as the first resource economists, in their discussion of the implications of a limited natural resource base (agricultural land) for the evolution of the wider economy. A later chapter returns to the same concerns, along with others stimulated by the energy and environmental “crises” of the 1970s and beyond. One section considers alternative measures of resource scarcity and empirical findings on their behavior over time. Another introduces the modern concept of sustainability with an intuitive development of the analytics. A chapter on the dynamics of environmental management motivates the concept of option value, shows how to compute it, then demonstrates its importance in an illustrative empirical example. The closing chapter, on climate change, first projects future changes and potential catastrophic impacts, then discusses the policy relevance of both option value and discounting for the very long run. This book is intended for resource and environmental economists and can be read by interested graduate and advanced undergraduate students in the field as well.

This book presents selected papers introducing readers to the key research topics and latest development trends in the theory and application of MMESE. The advanced integrated research topic man-machine-environment system engineering (MMESE) was first established in China by Professor Shengzhao Long in 1981, with direct support from one of the greatest modern Chinese scientists, Xuesen Qian. In a letter to Shengzhao Long from October 22nd, 1993, Xuesen Qian wrote: “You have created a very important modern science and technology in China!” MMESE primarily focuses on the relationship between man, machine and environment, studying the optimum combination of man-machine-environment systems, where “man” refers to people in the workplace (e.g., operators, decision-makers), “machine” is the general name for any object controlled by man (including tools, machinery, computers, systems and technologies), and “environment” describes the specific working conditions under which man and machine interact (e.g., temperature, noise, vibration and hazardous gases). The three goals of optimizing such systems are ensuring safety, efficiency and economy. Presenting interdisciplinary studies on the concepts and methods in physiology, psychology, system engineering, computer science, environmental science, management, education and other related disciplines, this book is a valuable resource for all researchers and professionals whose work involves MMESE subjects.

Providing up-to-date numerical data across a range of topics related to renewable energy technologies, Renewable Energies and CO2 offers a one-stop source of key information to engineers, economists and all other professionals working in the energy and climate change sectors. The most relevant up-to-date numerical data are exposed in 201 tables and graphs, integrated in terms of units and methodology, and covering topics such as energy system capacities and lifetimes, production costs, energy payback ratios, carbon emissions, external costs, patents and literature statistics. The data are first presented and then analyzed to project potential future grid, heat and fuel parity scenarios, as well as future technology tendencies in different energy technological areas. Innovative highlights and descriptions of preproduction energy systems and components from the past four years have been gathered from selected journals and international energy departments from G20 countries. As the field develops, readers are invited and encouraged to contact the authors for feedback and comments. The ongoing data collection and analysis will be used – after proper acknowledgment of contributors - to develop new editions. In this way, it is ensured that Renewable Energies and CO2 will remain an up-to-date resource for all those working with or involved in renewable energy, climate change, energy storage, carbon capture and smart grids.

The book focuses on the different aspects of sensing technology, i.e. high reliability, adaptability, recalibration, information processing, data fusion, validation and integration of novel and high performance sensors specifically aims to monitor agricultural and environmental parameters. This book is dedicated to Sensing systems for Agricultural and Environmental Monitoring offers to variety of users, namely, Master and PhD degree students, researchers, practitioners, especially Agriculture and Environmental engineers. The book will provide an opportunity of a dedicated and a deep approach in order to improve their knowledge in this specific field.

This book offers a set of case studies exemplifying the broad range of statis tical science used in environmental studies and application. The case studies can be used for graduate courses in environmental statistics, as a resource for courses in statistics using genuine examples to illustrate statistical methodol ogy and theory, and for courses in environmental science. Not only are these studies valuable for teaching about an essential cross-disciplinary activity but they can also be used to spur new research along directions exposed in these examples. The studies reported here resulted from a program of research carried on by the National Institute of Statistical Sciences (NISS) during the years 1992- 1996. NISS was created in 1991 as an initiative of the national statistics or ganizations, with the mission to renew and focus efforts of statistical science on important cross-disciplinary problems. One of NISS' first projects was a cooperative research effort with the U.S. Environmental Protection Agency (EPA) on problems of great interest to environmental science and regulation, surely one of today's most important cross-disciplinary activities. With the support and encouragement of Gary Foley, Director of the (then) U.S. EPA Atmospheric Research and Exposure Assessment Laboratory, a project and a research team were assembled by NISS that pursued a program which produced a set of results and products from which this book was drawn.

Sediments are increasingly recognized as both a carrier and a possible source of contaminants in aquatic systems, and they may also affect groundwater quality and agricultural products when disposed on land. Four aspects are covered reflecting the development of knowledge in particle-associated pollutants during the past twenty-five years: - the

identification, surveillance, monitoring and control of sources and distribution of pollutants, - the evaluation of solid/solution relations of contaminants in surface waters, - the study of in-situ processes and mechanisms of pollutant transfer in various compartments of the aquatic ecosystems, - the assessment of the environmental impact of particle-bound contaminants, i.e. the development of sediment quality criteria. A final chapter focusses on practical aspects concerning contaminated sediments.

Numerical simulation models have become indispensable in hydro- and environmental sciences and engineering. This monograph presents a general introduction to numerical simulation in environment water, based on the solution of the equations for groundwater flow and transport processes, for multiphase and multicomponent flow and transport processes in the subsurface as well as for flow and transport processes in surface waters. It displays in detail the state of the art of discretization and stabilization methods (e.g. finite-difference, finite-element, and finite-volume methods), parallel methods, and adaptive methods as well as fast solvers, with particular focus on explaining the interactions of the different methods. The book gives a brief overview of various information-processing techniques and demonstrates the interactions of the numerical methods with the information-processing techniques, in order to achieve efficient numerical simulations for a wide range of applications in environment water.