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(Editors)

Multiple Criteria Decision Making for Sustainable Energy and Transportation Systems

Lecture Notes in Economics and Mathematical Systems

634

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Multiple Criteria Decision Making for Sustainable Energy and Transportation Systems

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Preface

In the twenty-first century the world has entered an age of exponentially increasing demand for energy and transportation services in a globalised economy. The evidence for climate change as a consequence of human activity and a growing realization of limited resources has put the sustainability of energy and transportation systems on the top of the political agenda in many countries around the world. Economic and technological growth as well as the development of infrastructure must consider the sustainability of such activity for the future and governments are establishing policies towards a sustainable, low emissions energy future.

The environmental impacts of human economic activity necessitate the consideration of conflicting goals in decision-making processes to develop sustainable systems. Any sustainable development has to reconcile conflicting economic and environmental objectives and criteria. The science of Multiple Criteria Decision-Making (MCDM) has a lot to offer in addressing this need. Decision-making with multiple (conflicting) criteria is the topic of research that is at the heart of the International Society of Multiple Criteria Decision-Making. To provide a forum for the discussion of current research the Society organised the 19th International Conference under the theme “MCDM for Sustainable Energy and Transportation Systems”.

This book is based on selected papers presented at the conference, held at The University of Auckland, New Zealand, from 7th to 12th January, 2008. The conference was attended by 137 people from 39 countries on six continents.

125 papers were presented in 39 scientific sessions, including two plenary addresses by Prof. Anna Nagurney, University of Massachusetts, on “Multicriteria Decision-Making for the Environment: Sustainability and Vulnerability Analysis of Critical Infrastructure Systems from Transportation Networks to Electric Power Supply Chains” and Prof. Jim Petrie, University of Sydney and University of Cape Town, on “Multi Criteria Decision-Making within Energy Networks for Electricity Production in Emerging Markets”.

The International Society on Multiple Criteria Decision-Making awards prizes to outstanding researchers in the field. The winners in 2008 were:

- MCDM Gold Medal: Prof. Theodor J. Stewart, University of Cape Town
- Edgeworth-Pareto Award: Prof. Kalyanmoy Deb, Indian Institute of Technology Kanpur
- Georg Cantor Award: Prof. Valerie Belton, University of Strathclyde.



Fig. 1 The participants of the 19th International Conference on Multiple Criteria Decision-Making

A total of 58 papers were submitted for publication in this book, 32 of which have been accepted following a thorough peer review process. Eight of the accepted papers were included in a special track on evolutionary multi-objective optimization organized by Boris Naujoks. These papers by Srivastava et al., Woehrle et al., Mikhailov and Knowles, Klinkenberg et al., Bader et al., Hernandez-Diaz et al., Preuss et al. and Tantar et al. were submitted and peer reviewed ahead of the conference. This volume organized in four parts:

1. Multiple Criteria Decision-Making, Transportation, Energy Systems, and the Environment
2. Applications of Multiple Criteria Decision-Making in Other Areas
3. Theory and Methodology of Multiple Criteria Decision-Making
4. Multiple Objective Optimization.

Part I contains ten papers applying MCDM methods to problems in energy and transportation systems and environmental contexts. The applications range from city electric transport to natural resource management, railway transport, and environmental synergies in supply chain integration. An even wider variety of applications is covered in the ten papers in Part II. Many different MCDM methods are applied in risk assessment, banking, manpower planning, wireless sensor networks, and others. Parts III and IV have a theoretical and methodological focus. The five papers in part III address the analytic hierarchy process, a bibliometric analysis of MCDM and multiattribute utility theory, conjoint measurement, model predictive control,

and classification. Part IV includes seven papers on multiple objective optimization. These papers present a variety of algorithms for discrete and continuous multiobjective optimization problems, including five of the eight papers presented in the special track on evolutionary multiple objective optimization of the conference.

Acknowledgements As editors, we wish to thank all the people who made the conference and this book possible. First of all, our thanks go to the local organizing committee of Matthias Ehrgott (chair), Ivan Kojadinovic, Richard Lusby, Michael OSullivan, Andrea Raith, Paul Rouse, Lizhen Shao, Cameron Walker, Judith Wang, Hamish Waterer, and Oliver Weide. Secondly, we acknowledge the contributions of the Executive Committee of the International Society on Multiple Criteria Decision-Making.

The book, of course depends on the hard work of the authors who have submitted papers and the referees whose dedication in reviewing papers ensure the quality of this book. We wish to thank the following individuals who acted as referees:

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