Editorial: Special issue on OR Applications in Natural Resources Management

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The use of operations research (OR) in natural resources management (NRM) is an evolving research field with many application areas. Decision makers in NRM are often not aware of the possibilities that OR techniques offer them to solve their daily challenges. This special issue contributes to close this gap by showing how OR can be useful in different application areas of NRM. The presented papers are (co-)authored by internationally well-known researchers and went through a rigorous peer review process. All papers contribute to a better understanding of existing decision problems in NRM and provide useful state-of-the-art methods or profound ideas to solve them efficiently.

This special issue covers the following applied topics: forestry management, green transportation, fishery management, transportation in pig breeding, and green computing.

The first paper is about EcoForest, an educational tool that can be used to educate forestry and natural resources specialists. The authors present an Integer Linear Programming (ILP) model that captures forest core areas and forest edges with indicator variables and aims at designing a forest pattern attractive to wildlife. They compare the obtained results with manually drawn solutions from students and show therefore the usefulness of their optimization tool as well as the high relevance of OR techniques in this application area.

The next paper presents a case study from the Spanish Pyrenees. It focuses on the two main environmental impacts associated with road transportation, i.e., noise and air pollution. The authors want to examine the willingness to pay of the local population in order to reduce these externalities. They use probability models that were estimated based on contingent valuation. The outcome of this study gives interesting insights into the economic behavior of residents that are faced with externalities from transportation.

The third paper presents a nonlinear optimization model for obtaining a total allowable catch quota for jack mackerel fishery in Chile. The decision variables represent the annual capture quota for a multi-period planning horizon. Decisions in each period are made considering the age structure of the population and its exploitation zones. Based on real life data the authors show in their study how to ensure sustainability in fishery management.

The subsequent paper introduces a Mixed Integer Linear Programming (MIP) model that optimizes the delivery of fattened pigs to the abattoir. Pork is the most produced and consumed meat in the world, which leads to pig farms that are becoming more and more specialized, while the size of their facilities is increasing. The model analyzes the deliveries of pigs depending on growth, body composition, truck capacity, and penalties on the selling price. The authors confirm the findings of past studies but also discuss the benefits of fattening pigs with homogeneous weights and the importance of individual measures to avoid extra costs derived from grouped animals.

The last paper is about OR and its use in Green Internet Computing. Internet services are becoming more and more popular among users worldwide, leading to an increase in the number and size of data centers offering them. This development implies a sharp annual increase in energy consumption. The authors present ideas for energy-efficient solutions that can address environmental issues related to current and future cloud computing. These result in multi-objective optimization problems that offer an attractive challenge for the OR community.

Finally, the guest editors want to thank the authors for their valuable contributions. Moreover, they are grateful to the reviewers, since their contribution was decisive to guarantee the quality of this special issue.

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