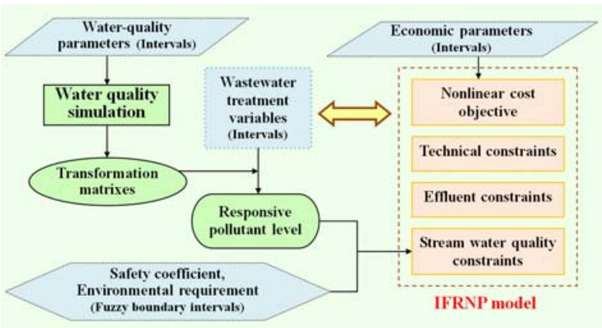
Water Resources & Environmental Systems Planning

Exponentially growing population and industrial expansion have created water resources and environmental problems, that require scientific understanding to provide bases for sound planning and management. A series of inexact optimization methods, e.g. interval-fuzzy programming and stochastic fractional programming approaches, have been developed for water resources and environmental management under uncertainty. These methods can effectively deal with a variety of system complexities and associated with the decision making process.

Stream Water Quality Management

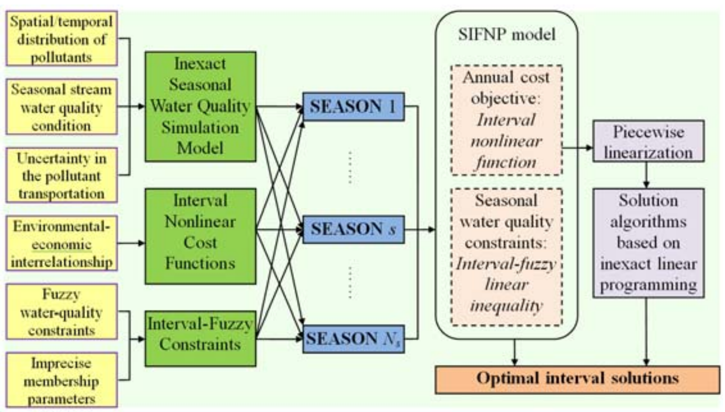


Flowchart of IFRNP formulation

Stream water quality management refers to the determination of pollution mitigation levels at a set of contamination sources to ensure that an acceptable level of water quality is maintained throughout the stream. An interval-parameter fuzzy robust nonlinear programming (IFRNP) model has been developed and applied to a case study in the Guo River of China.

Seasonal Planning for Water Quality Management

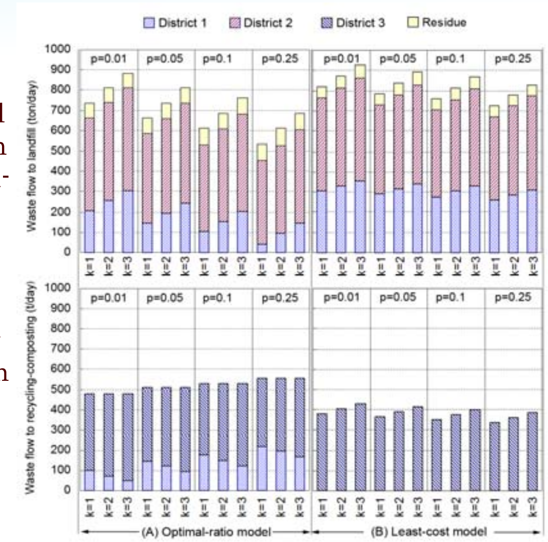
A simulation-based interval-fuzzy non-linear programming (SIFNP) approach has been developed. It can communicate dual uncertainties into the optimization process and help decision makers identify cost-effective management schemes within a multi-season context.



Framework of the SIFNP method

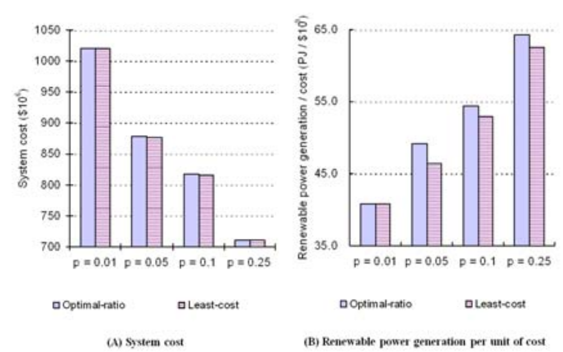
Waste Management

A stochastic linear fractional programming (SLFP) approach has been developed for sustainable waste management, where maximum net diverted wastes per unit of system cost are desired. Compare with stochastic linear programming (SLP), SLFP has advantages in dealing with objectives of two aspects, reflecting system efficiency, and solving ratio optimization problems.



Comparison between SLFP and SLP results

Energy Management



Results of optimal-ratio and least-cost models

A dynamic stochastic fractional programming (DSFP) approach has been developed for capacity-expansion planning of energy systems. Different from using least-cost models, optimal-ratio models based on DSFP can provide more sustainable expansion schemes through maximizing the ratio between renewable energy generation and system cost.

University of Regina

For any questions about this poster, please contact

Hua Zhu, Institute for Energy, Environment and Sustainable Communities

Telephone: **+1-306-3373298** Email: **zhu.marie@gmail.com**