

## The RCO/DN Approach to Planning of Urban Growth Boundaries

**Vladimir A. Masch**

President, Risk Evaluation and Management, Inc. Warren NJ, the USA; Tel: (908) 561-7820;  
Email: vladimir@rcosoftware.com

**ABSTRACT.** Cities are faced with serious issues resulting from urban sprawl, and one way to manage this is through the implementation of urban growth boundaries (UGB). The complexity of cities makes long-term planning extremely difficult. The high level of uncertainty, currently inherent in any complex and long-term problem, makes this task even more formidable.

Decision Network (DN) methodology has been developed to deal with complexity and Risk-Constrained Optimization® (RCO) is a system for long-term planning and risk management under radical uncertainty. This study integrated the two systems in the form of RCO/DN, resulting in the creation of a powerful tool to deal with the problems of urban planning. RCO/DN is meant to enhance the effectiveness of planning by taking into consideration both its intended goals and undesirable unintended consequences. As a second function, RCO/DN prevents the overextension of urban resources, physical, technological, financial, and human.

RCO/DN presents the uncertainty associated with future events using multiple scenarios provided by city planners and simulations. Scenarios differ with regard to values of their parameters, such as annual land use or inflated costs of land within UGBs. Unfortunately, under radical uncertainty it is impossible to predict plan outcomes or reliably convert diverse outcomes into a single metric to allow a comparison of strategies. Finally, under such conditions there exists neither a “best solution”, nor a “best method” to select a solution.

The only option is to develop a number of reasonably good and safe strategies. These strategies can then be presented to decision-makers for final selection, which they make according to their preferences and their attitudes toward various forms of risk.

This approach seeks to identify good tradeoffs between various forms of risk, such as environmental, human safety-related, or financial. RCO/DN accomplishes this task by using an ensemble of novel techniques that includes enhanced stochastic multiscenario mathematical programming models, designed to reveal hidden dangers within unfavorable scenarios.

With regard to the planning of UGBs, RCO/DN is a risk management system that allows the combination of time-driven and event-driven approaches to reduce costs by shortening the planning horizon.

Simplified RCO/DN models can be standardized for small towns, while more complex models



can be developed for large cities, in which UGBs are connected to multiple interrelated factors. This approach is particularly valuable in planning disaster mitigation actions as well as in dealing with economic crises. The more complex planning difficulties are, the greater the benefits of RCO/DN in realistic planning, risk management, and cost savings.

**KEYWORDS.** *Sustainability, risk management, urban planning, urban growth boundaries, decision-making under radical uncertainty, stochastic multiscenario models, complexity*