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Multiple criteria analysis for sustainability assessment of urban
infrastructure development

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According to the United Nations Population Division, in July 2005, the world gained 6.5 billion inhabitants; and half of them are living in urban areas. As 95 percent of population growth occurs in developing world, 10 new megacities will appear in developing countries by 2010. Sustainable management of the urban environment represents one of the major challenges for the future.

There is a high potential in accommodating the growing population in urban areas: in the near future cities will be no longer viewed as a threat for the global environment, but rather as a remedy. Indeed, compact communities enable economical use of land and energy resources, saving natural landscapes and ecosystems. On the other hand, more people demanding higher quality of life, which include ambient and environmental quality.

Urban infrastructure development addresses both of the above issues and can provide pleasant environment for densely populated urban areas. Providing growing mega cities and historic towns with a sustainable infrastructure is an important challenge that requires analysis of many different multidisciplinary criteria. Sustainability goals, which include improvements in environmental, social, and economic spheres, are conflicting in most urban infrastructure development projects. Multiple criteria analysis can be of a substantial help in aggregation of miscellaneous criteria and understanding a trade-off between the positive and negative impacts of the project.

The paper will discuss sustainability assessment of urban infrastructure development policies, plans, programs, and projects. Multiple criteria analysis and analytic hierarchy process is used for evaluation. The study considers environmental quality in the urban areas. The assessment goal is to answer the question of how much improvement in the urban environmental quality can be gained by implementing different policies for urban infrastructure development.

A common framework for assessment has been developed, this framework include a flow-chart of steps and procedures that starts with problem identification (policy options setting) and leads to sensitivity analysis and optimization of assessment results. Analytic hierarchy process is used to analyze a number of conflicting criteria. Criteria selection and the way of their aggregation into the hierarchy structure are main research tasks. The hierarchy structure of environmental criteria has up to five levels that are named as theme, subtheme, sub-subtheme, indicator, and variable. The hierarchy structure components vary in different assessment experiments, although core elements include three pillars of sustainability. For environmentally focused projects higher level of hierarchy consists of the following aggregated criteria: lithosphere, hydrosphere, atmosphere, antroposphere, safety, biosphere, and energy. Several assessment experiments were performed, including pairwise assessments of adverse policies, and undifferentiated assessment of alternative policies.