KTH Architecture and
the Built Environment

Connecting the dots

Network analysis, landscape ecology, and practical application

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Doctoral thesis

Akademisk avhandling

Akademisk avhandling som med tillstånd av Kungliga Tekniska högskolan framlägges till offentlig granskning för avläggande av teknologie doktorsexamen fredagen den 9 december 2011 kl 14.00 i sal F3, Lindstedtsvägen 26, Kungliga Tekniska Högskolgan, Stockholm

Stockholm 2011

Abstract

Humans have a profound impact on ecosystems, and land-use change constitutes a primary driving force in the loss of biodiversity. Habitat loss and fragmentation are key factors in this process by seriously impeding the habitat availability and movement of species, leading to a significant decrease in population viability. Landscape connectivity management able of crossing administrative and ecological spatial and temporal scales has been identified as one of the most important measures to counteract these negative impacts. The use of graph-theory and network-based landscape-ecological tools has become established as a promising way forward to address these issues. Despite urgent needs to adapt and implement such tools in planning, assessment and decision-making, surprisingly little attention has been paid to developing approaches for their effective practical application. This thesis presents the development of a toolbox with network-based, landscape-ecological methods and graph-theoretic indicators, which can be effectively implemented by practitioners within environmental assessment, physical planning and design, to analyze landscape connectivity. Recent advances in network analysis and landscape ecology are brought together and adapted for practical application, bridging the gap between science and practice. The use of participatory approaches was identified as key to successful development, and several workshops, meetings, interviews, as well as prototype testing of the developed software were conducted throughout the study. Input data and selection of species were based on the experience gained through seven real-world cases, commissioned by different governmental organizations within Stockholm County. The practitioners' perspectives on effective practical application of the proposed toolbox were then assessed through an interview-study. The respondents anticipated improved communication with other actors in addition to being able to better assess critical ecological structures within the landscape. The toolbox was finally tested in a large-scale network analysis of impacts of the regional development plan (RUFS 2010), leading to important insights on the planning of connectivity in an urbanizing region.

Keywords: Landscape connectivity; Land-use planning; Urban and regional planning; Graph theory; Network analysis; Environmental assessment; Least-cost modeling; Biodiversity

TRITA LWR PHD 1062 ISSN 1650-8602 ISBN 978-91-7501-198-1