

专论与综述

基于LUCC的城市生态安全研究进展

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摘要 近代工业革命以来特别是二战以后, 世界范围内城市化发展迅速, 受城市化驱动的土地利用/覆盖变化 (Land use/ cover change, LUCC) 及其环境影响越来越突出, 不仅对城市生态安全产生了危胁, 甚至在区域和全球尺度上影响生态系统的结构与功能, 成为当今地球生态系统平衡与人类社会可持续发展的研究热点。尽管LUCC与城市生态安全态势有密切联系, 然而目前研究中对土地利用变化的驱动机制较为侧重, 涉及LUCC对城市生态安全影响的研究文献仍很缺乏。从城市生态安全的概念辨析入手, 评述了国内外LUCC与城市生态安全响应研究的进展, 将相关研究分为两个阶段: 即定性和(半)定量研究阶段。指出了现有研究在理论体系与研究方法在指导实践中的不足之处, 即: (1) 基于LUCC城市尺度的生态安全研究的理论体系尚不成熟, 目前的研究多未结合研究区域LUCC的动态特征对城市生态安全状态进行评价, 因而也难以应用于指导城市生态建设实践; (2) 目前的城市土地利用的生态影响实例研究中仍很缺乏采用数学模型、地理信息系统(GIS)、环境影响评价(EIA)、生态风险评价技术(ERA)及政策仿真等手段进行动态化的、多场景(Multi-Scenarios)模拟分析的综合运用, 也缺乏对这些研究方法在实践中的应用的比较研究; (3) 缺乏从土地利用动态监测、驱动力机制、生态响应等方面进行区域生态安全演变及调控的综合研究, 现实指导意义有限。在上述工作的基础上, 探讨了此研究领域未来的发展方向, 即: (1) 实现不同研究尺度的紧密结合; (2) 多种研究方法的集成运用; (3) 基于多学科知识体系的评价方法与指标体系的明细化与合理化。

关键词 [土地利用/覆盖变化\(LUCC\)](#) [城市生态安全](#) [城市化](#) [生态调控](#)

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Recent advances in research on LUCC: based urban ecological security

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Abstract Worldwide urbanization occurred since the industrial revolution, and this trend is expected to last in the coming decades. Dramatic land use/ cover change (LUCC) driven by urbanization has been the most prominent force in the degradation of the structure and function of the ecosystems, thus undermining the capacity of the ecosystems to sustain the development of human society. Therefore, LUCC driven by urbanization has recently attracted much attention.

Locally and globally, combined with the knowledge of socio-economic and biophysical sciences, modelling LUCC and its environmental impacts can be employed as a useful tool to assess the adverse or favourable impacts on the ecosystem functions, which are the key foundation for the sustainability of human society and balance of global ecosystems. So far many efforts have been made to enhance the effectiveness of LUCC models. However, due to the complexity of the interactive systems, it is still difficult to understand, explain, and predict the dynamics and trends of LUCC and its possible ecological consequences. Although there is the close correlation between LUCC and urban ecological security, and the driving forces of land use changes have been well documented, whereas papers of impacts of land use changes on urban ecological security are scarce

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e. Based on the review of published papers on LUCC and urban ecological security (UES), the concept of UES is redefined. Two stages of studies on UES have also been identified: the early qualitative research and the current quantitative research. Furthermore, three aspects worth further studies are emphasized: (1) Due to the incomplete theories of UES, the role of LUCC in the integrated assessment of UES was ignored. Therefore, it's still difficult to use LUCC as the guidance to the urban planning and construction; (2) Methods including information technique, mathematical model, GIS, Environmental impact assessment (EIA), Ecological risk assessment (ERA), and policy analysis were seldom incorporated in the studies of the ecological effects of urban land use. In practice, dynamical simulation and multi-scenarios analysis are expected to serve as the basis for decision-making. Also, the effectiveness of the above integrated methods needs to be assessed to produce the optimized paradigm for the study on urban security; (3) Detection of land use dynamics, mechanism of driving forces, and ecological responses were seldom employed in the comprehensive studies on regional ecological security and ecological control of urbanization. Therefore, such studies have limited practical significance. Finally, future trends of LUCC and urban security studies are discussed: (1) Close linkage of LUCC and accompanied ecological consequences at different levels should be achieved, given the widely adopted LUCC monitoring networks by national and international agencies; (2) Application of integrated methods, including GIS, RS, EIA, ERA, spatial analysis, economic models, metabolism models, etc., should be developed on the basis of explicit case studies; (3) Based on the theories and principles of interdisciplinary sciences, the detailed and rational frameworks for the evaluation methods and indicator systems should be developed.

Key words land use/ cover change (LUCC) _ urban ecological security (UES)
_ urbanization _ ecological control

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