



时间 1995年5月 制图 俞孔坚

作者早期的某项生态安全格局研究^[1]。作者以广东丹霞山为例，研究了三种土地利用格局——生态安全格局、旅游开发格局和农业生产格局之间的博弈关系。图片展示的是生态安全格局，其用以保护生物多样性，包括核心区、缓冲区、廊道、辐射道和战略点等，显示了生态过程如何通过克服阻力来实现对空间的控制。

Date May, 1995 Cartographer Kongjian Yu

An early ecological security pattern study by the author^[1]. The author used Red Stone Mountain, Guangdong, as a case study in the gaming relationship between the ecological security pattern, tourism development pattern, and the agricultural development pattern. The image shows the ecological security pattern developed for the purpose of bio-diversity protection, and is composed of Source Areas, Buffer Zones, Inter-source Linkages, Radial Routes, and Strategic Points. The pattern illustrates how ecological process can overcome spatial resistance to achieve spatial control.

REFERENCE

[1] Yu, K. J. (1995). Security Patterns in Landscape Planning: With a Case Study in South China (Doctoral Thesis). Graduate School of Design, Harvard University, MA. USA.

生态安全格局 与国土空间开发格局 优化

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2012年11月8日，举世瞩目的中国共产党第十八次全国代表大会（以下简称十八大）在北京召开。此次大会工作报告的重要内容之一是非常具体而专业地表述了国土空间开发格局在生态文明建设中的意义，并使用了“生态安全格局”这样的专业词汇，明确提出其在优化国土空间开发格局中的地位：“国土是生态文明建设的空间载体，必须珍惜每一寸国土。要按照人口资源环境相均衡、经济社会生态效益相统一的原则，控制开发强度，调整空间结构，促进生产空间集约高效、生活空间宜居适度、生态空间山清水秀，给自然留下更多修复空间，给农业留下更多良田，给子孙后代留下天蓝、地绿、水净的美好家园。加快实施主体功能区战略，推动各地区严格按照主体功能定位发展，构建科学合理的城市化格局、农业发展格局、生态安全格局。”

一年之后，2013年11月12日，中国共产党第十八届中央委员会第三次全体会议进一步提出“加快生态文明制度建设”，并指出应“建立空间规划体系，划定生产、生活、生态空间开发管制界限，落实用途管制。健全能源、水、土地节约集约使用制度”，并具体提出应“划定生态保护红线，坚定不移实施主体功能区制度，建立国土空间开发保护制度，严格按照主体功能区定位推动发展。”

这其中涉及三个核心概念：国土利用的空间格局（包括城镇化格局、农业生产格局和生态安全格局）、生态红线和主体功能区。这三个概念明确了将国土作为生态文明建设空间载体的定位。而这其中有一个关键的学术概念“格局”，尤其是“生态安全格局”。

生态安全格局的概念最早于1995年提出，是景观安全格局的一种。景观安全格局的精髓是把景观中的水平过程（包括雨洪过程、火灾蔓延、动物迁徙、城市扩张、农业开垦等）作为竞争性的空间控制和土地覆盖过程来理解，它们必须有效地克服空间阻力来完成这样的空间覆盖。换句话说，要维护某种过程的安全和健康，必须占据一个关键性的格局，这个格局就称为景观安全格局。景观安全格局研究主要针对中国国土和城市规划建设中面临的重大问题：紧张的人地关系问题，即保护和开发这两类基本的水平空间过程。在这两大类格局之下，可以细分为多种竞争性的控制和覆盖过程，形成包括农业用地、工业用地、城市建设用地、旅游用地等用地类型的格局。

正如围棋中的“金角、银边、草肚皮”所描绘的，无论对白方或黑方来说，占据“角”和“边”这样的空间位置都至关重要。城镇化格局、农业生产格局、生态安全格局有时是互不相干的，但更多情况下是重叠的，如平原滨水地带，它们既是农业的高产地带，也是城镇建设的关键地段，更是保障生态安全的关键地段。必须强调的是，与围棋博弈不同的是，这场格局间

的博弈不是非赢即输，而是以平衡与和谐为目标的多赢博弈。其理论支点是博弈论关于平衡点或者安全点的研究——事实上，安全格局概念本身最初也是受到了博弈论中的“安全点”的启发。

生态安全格局是维护生态过程（如雨洪过程、动物栖息地和迁徙等）的安全和健康的关键性格局，即空间意义上的生态底线，或称为生态红线。由于生态过程在当今快速的城镇化过程中总是处于劣势，因此，确定生态安全格局、划定生态底线（生态红线）就显得格外重要，除了其科学的意义之外，还有环境伦理的意义。相仿，农业用地在中国的城镇化过程中也极易被侵噬，因此，耕地保护红线也至关重要。好在中国政府对粮食问题一直较为关注，所以有了“18亿亩耕地保护红线”的概念——这一数据的准确性暂且不论——但相对于生态安全格局来说，农业生产格局的保护要受重视得多。

真正使生态安全格局被提升到今天这样高度的是十八大之后新一届政府的认识水平。过去30年的城市扩张带来的一系列生态安全危机日渐凸显，特别是近年来的城市洪涝问题日益严峻，生态危机已经成为危及人类生存的问题。但相较于农业生产格局，生态安全格局或生态底线空间的研究、规划和管理等则相对滞后得多。过去30多年，尽管在达成三个格局的和谐方面，我们已经失去了许多机会，但所谓“亡羊补牢，未为晚矣”，今天来推动关于生态安全格局和生态基础设施的研究仍然具有重要意义。而且，中国的经验将与其他发展中国家及早开展国土生态安全格局研究，以及协调生产、生活与生态三个格局提供借鉴。



ECOLOGICAL SECURITY PATTERN AND SPATIAL DEVELOPMENT PATTERN OPTIMIZATION OF NATIONAL TERRITORY

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On November 8, 2012, the Eighteenth National Congress of the Communist Party of China was held in Beijing. One of the most important topics of this congress meeting was to convey the significance of territorial development on ecological civilization construction. Terms such as “Ecological Security Pattern” were used, along with intentions to optimize national spatial development pattern. “It is in geographical space that ecological civilization can be advanced, and we must cherish every bit of it. Guided by the principle of maintaining balance between population, resources and the environment and promoting economic, social and ecological benefits, we should keep the pace of development under control and regulate its spatial composition. We should ensure that the space for production is used intensively and efficiently, that the living space is livable and proper in size, and that the ecological space is unspoiled and beautiful; and we should leave more space for nature to achieve self-renewal. We should keep more farmland for farmers, and leave to our future generations a beautiful homeland with green fields, clean water and a blue sky. We should ensure the speedy implementation of the functional zoning strategy and require all regions to pursue development in strict accordance with this strategy, and advance urbanization, agricultural development and ecological security in a scientific and balanced way.”

One year later, on November 12, 2013, the Third Plenary Session of the Eighteenth Central Committee of the Communist Party of China further defined the strategy to speed up systems building to promote ecological civilization progress by calling for the establishment of a spatial planning system that would designate the control limits in spatial development in production, life and ecology. The same planning system would be used to implement land use regulations for the economical use of energy, water, and land. Specifically, the Central Committee called for “delimiting a redline for ecological protection; firmly implementing functional zoning system; establishing protection system of national spatial development; progressing the development in strict accordance of functional zone positioning.”

There are three concepts at work here: 1) spatial pattern of land uses, including urbanization, agricultural, and ecological patterns, 2) ecological redline, and 3) functional zones. Together, these concepts illustrate how land is the spatial foundation for ecological civilization construction. Still, the most important academic concept to understand is that of “pattern,” specifically, “ Ecological Security Patterns.”

The concept of Ecological Security Pattern was first introduced in 1995 as a type of Landscape Security Pattern, which was developed as a framework for treating horizontal landscape processes, such as stormwater management, fire control, animal migrations, urban expansion, and agricultural reclamation as active spatial land processes. These processes seek to maximize their spatial coverage through overcoming spatial limitations and resistances. In other words, to maintain the safety and health of a landscape process, the key patterns at work must be identified beforehand. These came to be known as “Landscape Security Patterns.” The studies of Landscape Security Patterns focuses on the human-environment relationship in China’s territorial development and urban growth. The tension between

protection and development creates various competitive control and coverage processes, seen in the protection and development of agricultural land, industrial land, urban land, and tourism land.

As in Go game, it is critical to occupy as much space in the corners and edges of the board as possible. The planning and management of urbanization patterns, agricultural patterns, and ecological security patterns are pieces in a Go game of national territory. The different patterns can be unrelated, but more often are overlapped. Waterfront plain areas, for example, have potential to be high-yield agricultural land as well as spaces for urban construction and ecological protection. It must be emphasized however that this is not a win-or-lose game, but seeks balance and harmony — in fact, the theoretical foundation in the game of landscape security patterns is that of Game Theory and security points.

Ecological Security Patterns play a pivotal role in maintaining ongoing ecological processes such as stormwater management, animal habitat and migration. In a physical sense, it is the ecological bottom line (red line) of territorial land. In the context of rapid urbanization, ecological processes are often pushed towards a disadvantaged position. It is important to establish ecological security patterns as a way to mark the ecological bottom line. In addition to maintaining the scientific importance of these landscapes, marking the ecological bottom line helps establish an environmental site ethics. Agricultural land also faces similar challenges, thus making the agricultural redline equally important. Fortunately, the Chinese central government pays close attention to grain issues, going as far as establishing a “1.8 billion Mu of agricultural land redline.” However, when compared with the ecological security pattern, agricultural protection is greater.

The new government after the Eighteenth National Congress helped lift the concept of an ecological security pattern into mainstream governmental work. The urban expansion of the past 30 years has brought about an ecological security crisis resulting in a question of survival. Compared with agricultural security pattern, the research, planning, and management of ecological security pattern have remained lackluster. Although we may have lost lots of opportunities to achieve harmony among the three patterns, there is still room for ecological security patterns and ecological infrastructures. The experiences of China can help other developing countries to start early on ecological security pattern studies in order to coordinate the three patterns of production, life and ecology.

