

当低碳与生态技术遇见景观建造

Low-carbon and Ecological Techniques in Landscape Construction

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摘要 / 本次访谈围绕如何使低碳和生态技术渗透到景观建造中的诸多具体问题，与中国生态修复和生态景观建造的领军企业——铁汉生态进行了讨论，旨在为景观设计师提供可供借鉴的指导方针与切实的实践措施。

关键词 / 低碳；生态技术；能效；景观建造

Abstract / Shenzhen Techand is a leading ecological restoration and landscape construction company in China. We discuss low-carbon and ecological techniques for landscape construction in order to begin establishing a referential guide and practical measures for landscape architects.

Key words / Low-carbon; Ecological Technique; Energy Efficient; Landscape Construction

您如何理解“能效景观”？

刘水（以下简称刘）：能效景观理念孕育于当代可持续发展思想。从狭义上讲，能效景观是指在景观规划设计、材料与设备生产、施工建造和使用的整个生命周期内，用更少的能源投入实现更佳的景观服务功能。而广义上则是指人们对更加生态、健康、艺术的景观环境的考量和追求。如何实现能效景观，我们还面临着许多亟待解决的问题，例如景观设计、施工、管理、维护过程中能效定量数据的获取；能效景观的功能、结构和状态的评价，包括对能效景观的动态变化过程、调控机制以及适应性的评价等。在实际的景观建造和运行中，能效景观理念的基本思想在我们当下倡导的“生态设计”、“乡土景观”、“节约型园林”中均可得到展示和体现。

我们了解到，铁汉生态参与的项目类型主要包括生态修复、生态景观、生态旅游等，请问针对这三种项目类型，在降低能耗与减少维护方面的具体技术手段有何不同？

刘：作为国内生态修复和生态景观建造的领军企业，铁汉生态通过十几年的努力摸索与实践，并基于对生态与景观理解的不断深化，逐步形成了一条具有核心竞争力的从规划、设计、研发，到工程施工、苗木生产及生物有机肥制造的完整而成熟的产业链。在这些环节上，我们自始至终秉承着一个核心理念：形成生态技术与景观艺术高度融合的脉络和机理，这也是我们多年来在全国各地建设高标准、高质量的生态修复、生态景观等工程的强有力的支撑条件和可靠保证。

在生态修复方面，我们降低能耗与减少维护方面的具体技术手段以抗逆植物选育为主，通过乡土植物筛选、常规育种和分子育种等技术筛选出抗旱、耐寒、耐盐碱、耐重金属污染等抗性强的植物品种，以改善环境的自我调节能力，强化被修复环境的能量流动、物质循环和信息传递等功能，并发挥抗逆植物的种质资源优势，降低修复材料和项目养护成本。在生态景观方面，主要以营养基质制备和特色苗木选育为基础，运用绿色环保新技术、新材料和新工艺，降低景观设计、施工、管理和维护过程中的能耗。例如，我们拥有一套具有公司自主

What is your opinion of Energy Efficient Landscapes?

Shui LIU (LIU hereafter): The idea of Energy Efficient Landscapes was developed as part of modern sustainable development. In a narrow sense, Energy Efficient Landscapes refer to using less energy to achieve better landscape services throughout the full life cycle of landscape planning and design, the manufacture of materials and devices, and construction and use. There are still many problems that need to be solved to achieve Energy Efficient Landscapes. For example, we still need better methods for obtaining quantitative data for energy efficiency during design and construction and during management and maintenance; for evaluating the function and structure of Energy Efficient Landscapes, including dynamic processes, regulatory mechanism, and adaptability. However, in my opinion, the basic tenets of Energy Efficient Landscapes can be seen in the current work of ecological design, as well as vernacular landscapes and affordable landscapes.

Techand's projects mainly include ecological restoration, ecological landscape, and ecological tourism. What are the specific techniques for reducing energy costs and maintenance according to these three types?



LIU: As the leading ecological restoration and ecological landscape construction company in China, Techand works to integrate the industrial chain with core discipline fundamentals such as planning, design, research, construction, and fertilizer manufacturing, all of which have been developed through years of effort and research into ecology and landscape. From the beginning to the end of each project, we are guided by a principle that combines ecological techniques and landscape art, while providing technical support and a guarantee that our projects meet high quality standards.

With regard to the specific techniques used to reduce energy costs and maintenance, in **ecological restoration** projects, we mainly focus on using plants that are stress tolerant. In order to improve environmental self-growth and reduce energy cycles, we typically use plants that are drought-resistant, cold resistant, salt-resistant and heavy metal-resistant. We use techniques of vernacular plants filtration, conventional breeding, and molecular breeding. We can also reduce the cost of material and project maintenance by taking advantage of stress tolerant plants.

In the **ecological landscapes**, largely based on the preparation of nutrient medium and the seed selection of specific species, we like to use new environmental

1. 广州南沙采石场。采用针对性的生态技术手段，克服陡峭石壁和恶劣环境的重重困难，对近百万平方米的裸露面进行了复绿，旨在重现青山郁郁葱葱、绿水碧波荡漾的美景。
1. Nansha Quarry in Guangzhou. Overcoming the difficulties from the steep and adverse site circumstances, the proposal of re-vegetating a bare ground of millions square meters aims to restore the natural landscape of lush hills and clean lakes by employing targeted ecological techniques.

知识产权的立体绿化技术体系，集合绿色建筑和园林科技关键技术，可对各类建筑物、构筑物以及其他空间结构表面进行生态设计，包括屋顶、墙面、阳台、柱廊、立交桥，以及围栏和棚架等。该技术体系不仅能够运用资源循环利用技术来改良基质，还可通过特色苗木配置技术提高绿量，缓解热岛效应，改善空气质量。在生态旅游方面，我们把旅游资源运筹为一种生态产品，它具有提供良好的自然要素、保障生态服务和维系生态安全的基本功能。我们的旅游规划设计在遵循人与自然共生发展的设计理念的同时，也融入了包括低冲击开发、绿色能源利用等生态元素。例如，矿山公园、湿地景区以及生态廊道等生态旅游工程的低冲击开发，利用餐厨垃圾制造沼气等相关生态技术的应用。

您认为我国在推广低碳、低维护景观方面存在哪些困难与制约？

刘：近些年来，我国的低碳、低维护景观设计与研究取得了长足的进步，但仍存在许多问题。归纳起来有以下几点：一是理念落后。人们对于景观优劣的评判往往只是关注造型的美学效果、功能的布局、规模的大小以及用材的档次，而忽视景观的内涵品质，如空气质量、热环境和声环境等，这些会导致景观在维护和使用中耗能巨大，且缺乏奉行节俭、低碳的思想。二是基础薄弱。中国对城市低碳景观的研究起步较晚，在研究探讨、技术方法、设计案例等方面均有欠缺，且理论争鸣不足，尚未形成成熟、系统的理论体系。三是模式制约。生产和消费领域的“高碳”模式在短期内难以改变，节能、节地、节水、节材料等综合性的低碳标准体系还没有建立，并且缺乏有效的法律、法规和行政监管体系。四是人才短缺。作为当今的景观设计师，不仅需要了解景观设计的艺术与“硬科学”、工程技术的关系，还应掌握城市景观环境规划设计与生态建设的规律与技能，但目前设计师的知识体系建设还远远不足。

作为生态景观建造者，请您谈谈如何在项目工程建造过程中减少能耗？

刘：在景观规划建设中，铁汉生态始终坚持“自然、低碳、降耗”原则。采取的主要方式遵循以下三点：

第一，因地制宜，就近取材。我们从规划入手，尊重场地的自然精神内涵，努力减少生态扰动，尽量结合原有地形地貌进行景观设计，植物配置尽量选用本土品种，构筑物尽量选择原木、本地石材等乡土材料。

第二，尽量利用再生资源 and 环保材料。例如，我们积极研发并利用植物废弃物生产生物有机肥的相关技术，合理利用可回收、可降解材料，包括采用节能玻璃幕墙、竹材、再生木、钢渣透水砖等进行景观建设。

第三，低碳施工和低碳养护。在施工过程中，统一调运安装大型高能耗机械，合理安排使用频次，尽量减少车辆使用；在施工管理上，对生产规模、施工人员、材料设备等进行统筹安排，控制施工成本；在施工工艺上，严把质量关，谨防二次施工；在能源利用上，以清洁能源为动力，采取扬尘控制措施，确保不对施工工地周边的大气环境质量造成污染；在工程养护上，我们尽量选用群植效果好、无需大面积整形修剪、易于粗放式管理且后期养护成本低的植物，从而实现低碳低维护的目标。LAF

2. 深圳星河丹堤居住区。该生态景观项目通过错落有致的空间营造和精心的植物配植，创造出了人与自然的和谐共生。
2. Xinghe Vermillion-dam Residential Area. In this ecological landscape project, a harmonious environment between human and nature is created by well-arranges spaces and elaborate planting design.



protection methods, materials and technologies that help reduce the energy cost of landscape design, construction, management and maintenance. For instance, vertical planting techniques combine key green building and landscape methods which can practically beautify the surfaces of buildings and structures. These techniques can improve nutrient absorption and increase the area of green space, relieve heat island effect, and lower PM2.5.

In terms of **ecological tourism**, we see the resources for tourism as an ecological product, which can help with maintaining ecological security. Inspired by the idea of design with nature, we construct ecological tourism landscape projects, such as low-impact development of mine park, wetland, and ecological corridor, and the application of biogas generating with kitchen waste and other technologies.

There are difficulties and limitations to achieving low-carbon landscapes in China. Can you speak to this?

LIU: The design and research of low-carbon landscapes in China has made great strides in recent years, but there are still many problems. The first is the idea of backwardness. What I mean by this is people are only focused on the aesthetics of form when they evaluate the value of landscape. They tend to neglect intensions and qualities of the landscape, such as air quality, thermal environment, and acoustic environment. Secondly, a weak knowledge base on urban low-carbon landscapes in China contributes to a lack of implementation. The investigations, methods, and implementations are weak. Best practices and general theories of low carbon landscapes in China have not been established or systemically applied. Third is the high-carbon model in production and consumption that cannot be changed in a short time. A standard low-carbon system that would help to save energy, water, land resources has not been established. We are short on effective laws, regulations, and supervision and

management systems. Finally, China faces a shortage of domestic talent. Partially because of landscape education, designers today need to understand the relationship between the art of landscape design and the science and engineering technology that supports it. Students need to master techniques of landscape planning, design, and ecological construction.

As a landscape designer who is also involved in the construction process, what is your opinion of reducing energy consumption during the construction?

LIU: During construction, Techand always insists on natural methods that are low-carbon and reduce consumption. We use three approaches as follows:

The first is to respond to local conditions and acquire materials locally. We respect the natural spirit of the site. We try to reduce disruption to the existing topography and use native plants species and local materials.

Secondly, we use renewable resources and environmental friendly materials. For example, we have actively developed techniques for producing bio-fertilizer by using plant waste and use recycled and biodegradable material in the landscape construction, such as energy-saving glass, bamboo, recycled wood, steel slag, and permeable brick, to name a few.

Finally, we try wherever possible for low-carbon construction and maintenance. During construction, we often transport and install high-energy mechanical systems, but try to depend on auto transportation for short periods of time. During construction management we control costs by purchasing materials and equipment as a whole. We implement rigid controls on technology, use clean energy, and take dust control measures for atmospheric quality on the construction site, wherever possible. To achieve low maintenance landscapes, we try to use plants that are good in groups, because their maintenance costs are low and decrease with time. LAF