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面向循证设计的景观绩效评估研究：发展、内涵与重点

THE DEVELOPMENT, CONNOTATIONS, AND INTERESTS OF RESEARCH ON LANDSCAPE PERFORMANCE EVALUATION FOR EVIDENCE-BASED DESIGN

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摘要

景观绩效评估是风景园林学走向循证科学的可行途径。虽然相关研究日益丰富，但是当前研究多侧重评估指标和方法的选择，或对建成项目的可持续性特征进行描述的层面，鲜有对景观绩效评估理论发展和本质内涵的深入探讨。因此，本文首先回溯了景观绩效评估研究演进中涌现的三种主要研究体系——POE、SITES和LPS，并通过对其理论特点和进阶关系的比较分析，明确了景观绩效评估研究逐步面向循证设计的发展过程；然后，进一步揭示了景观绩效评估概念蕴含的对“设计策略－实际效益”因果关系的探究；最后围绕其内涵属性和作用目标，提出“设计效能的反馈分析”和“生产具有实践操作性的知识”是服务于循证设计的景观绩效评估研究的两个研究重点，且能为高绩效的景观设计实践提供切实可行的证据支撑。

关键词

景观绩效评估；使用后评估；场地可持续性设计行动计划；循证设计；设计效能；研究与实践

ABSTRACT

Landscape performance evaluation plays an important role in Landscape Architecture's transformation to an evidence-based science. Most of existing relevant studies focus on the selection of evaluation indicators and methods, or description of the sustainability characteristics of completed projects, while in-depth theoretical discussion on its development processes and essential connotation is still in shortage. By tracing back and comparing the theoretical characteristics and development relationships of the three major systems — POE, SITES, and LPS, this paper clarifies the evolution of landscape performance evaluation towards serving evidence-based design, and further expounds its connotation of discovering the causality of design strategies and benefit results. Finally, two research interests, "feedback analysis of design efficiency" and "producing practical and operable knowledge" are proposed with significance as a key to support high-performance landscape design practices with reliable evidences.

KEYWORDS

Landscape Performance Evaluation; Post Occupancy Evaluation; Sustainable Sites Initiative; Evidence-Based Design; Design Efficiency; Research and Practice

1 引言

20世纪末以来，如何开展高品质或高绩效的设计实践成为人居环境科学探讨的重要议题之一[1][2]。特别是在风景园林学领域，为明确设计策略塑造高品质环境的有效性，“景观绩效评估”（landscape performance evaluation）已成为国内外学界的研究热点。其重要目的在于能够为项目管理者和客户提供关于方案实施效果的科学证据，这对

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风景园林学科的循证设计的发展至关重要[3]~[6]。现有部分研究致力于探讨可持续景观设计策略如何发挥多种效能及其影响机制，尤其是在生态系统服务和人类健康福祉方面的研究成果较为丰富[7]~[10]。然而，其他多数研究还仅仅聚焦于评估指标和方法的选取，或只是停留于简单揭示建成项目所具有的可持续性特征的层面。这类研究在对评估结果的反馈分析环节上常以描述性的经验总结为主，对于何种设计策略或设计要素通过何种方式将带来何种效益结果的深入解析仍显缺乏。所以，尽管这类研究能为设计师进一步优化设计策略提供部分参考依据，但其研究结论难以成为未来设计实践决策中可被普遍遵循、直接运用的有效证据。该研究现状表明，虽然研究者们已经普遍认识到景观绩效评估研究对于推动循证设计实践发展的重要价值，但是，目前景观绩效研究领域尚缺乏能指引生产设计实践所需科学证据的研究路径。

在探讨该研究路径之前，与之密切相关的景观绩效评估的发展过程、本质内涵和研究要点亟待进一步明晰。本文将通过追溯和比较分析景观绩效评估相关理论演进历程中的主要研究体系，明确其研究发展趋势和根本目的，继而从理论层面审视景观绩效评估的本质内涵，深入剖析其研究重点，以期为未来景观绩效评估研究提供面向循证设计的理论基础，加强景观绩效研究成果的实践应用价值。

2 景观绩效评估研究的发展过程

2.1 景观绩效评估研究的三种体系

受社会发展和学科思想变革的影响，景观绩效评估相关研究在发展演进中涌现出三种主要的研究体系（图1）：1）早期的相关研究可以追溯至20世纪60年代的人文主义兴盛时期，由建筑学领域发起针对建成项目的使用后评估（POE）；2）随着可持续发展理念的推广，

1 Introduction

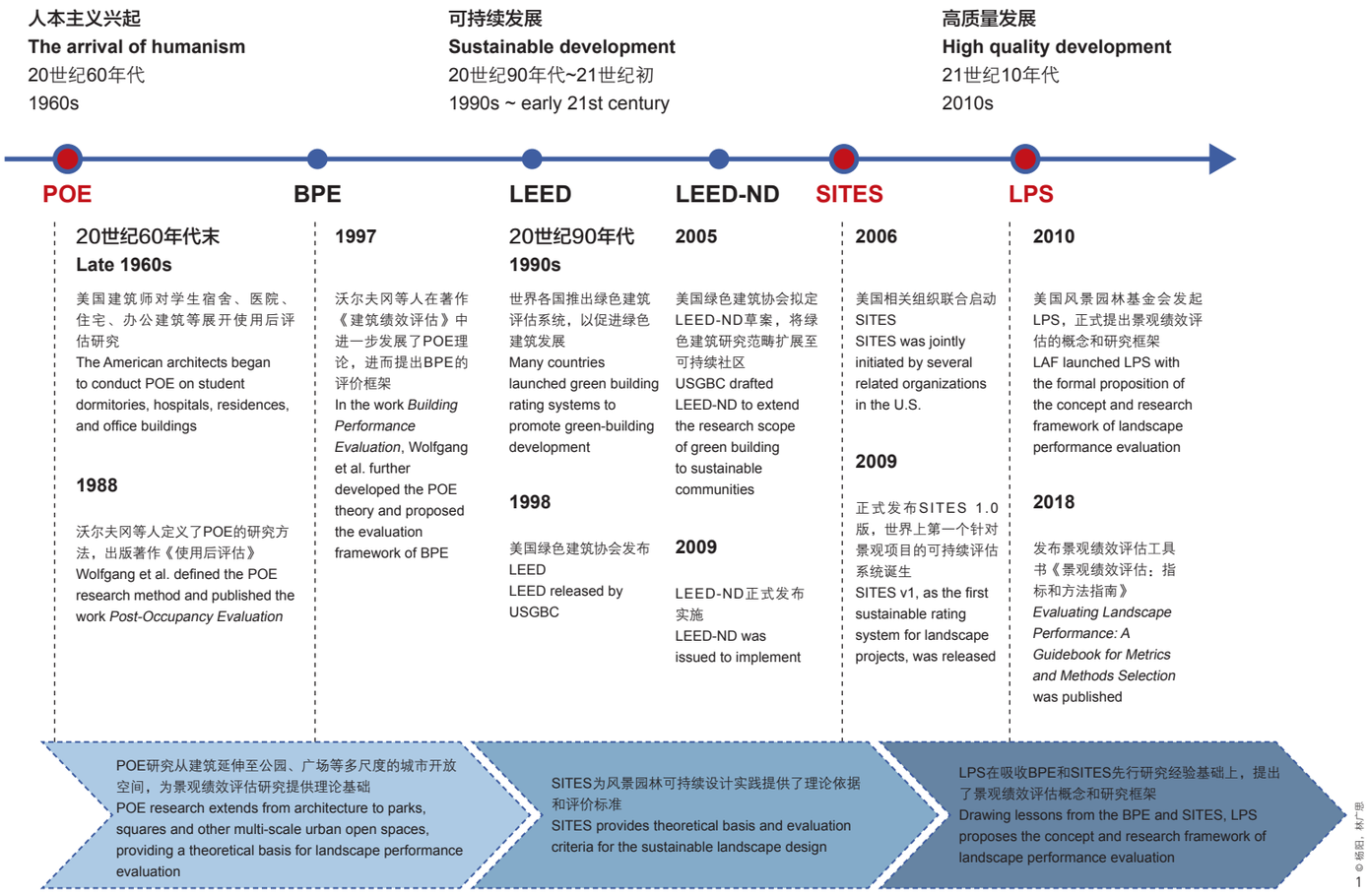
Since the end of the 20th century, how to carry out high-quality / high-performance design practice has become one of the key research topics in the Science of Human Settlements[1][2]. In Landscape Architecture, landscape performance evaluation witnesses a large amount of studies which have examined the effectiveness of design strategies in shaping high-quality environment. Relevant studies provide project managers and clients with scientific basis about the implementation effects of design strategies, greatly benefiting the development of evidence-based design in Landscape Architecture[3]~[6]. A number of current literatures explored the performing variety of sustainable landscape strategies and associated mechanisms, with rich research outcomes especially on ecosystem services and well-beings for human health[7]~[10]. However, most of studies simply focus on the selection of evaluation indicators and methods, or qualitatively describe the sustainability of completed projects. Obviously, such descriptive evaluation is not enough to interpret what and how design strategies / elements may perform and benefit, seeing few solid evidences that can be widely and directly used to inform design practice. At present, although researchers have generally recognized the importance of landscape performance evaluation to promote the development of evidence-based design, the lack of research method leads to the failure to produce scientific evidence for design practice.

Before exploring this research method, deep insights on the evolution, connotations, and interests of landscape performance evaluation should be clarified at first. Through review and comparative analysis of the main research systems in the evolution of landscape performance evaluation, this paper reveals the development trajectory and fundamental purpose of related research, then inspects its research connotations and interests to concrete the theoretical basis for landscape performance evaluation to evidence-based design.

2 The Development Trajectory of Research on Landscape Performance Evaluation

2.1 Three Systems during the Evolution

Along with the social development and ideological evolution in related disciplines, there have been three important systems in the current research on landscape performance evaluation (Fig. 1): 1) Post Occupancy Evaluation (POE), originated in the field of Architecture under the humanism flourishing in the 1960s; 2) Sustainable Sites Initiative (SITES), proposed as an authoritative standard for sustainable landscape design,



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1. 景观绩效评估主要研究体系的发展脉络

1. Development of major research systems for landscape performance evaluation

建成项目的生态绩效受到普遍重视，“场地可持续性设计行动计划”（SITES）被提出，旨在为推动可持续景观设计实践提供权威标准；3）21世纪，随着社会生态系统日益复杂，为了提高城市景观建设实践的品质并证明设计方案的可持续性功效，美国风景园林基金会（LAF）提出了“景观绩效系列”（LPS）研究计划。

2.1.1 景观绩效评估研究的雏形：POE

POE是大多数早期城市公共空间建成环境研究中的常用方法[11]~[13]。该研究方法兴起于20世纪60年代的建筑学领域，受当时人文主义思潮和系统论的影响，西方建筑师的关注点开始从形态美学转向设计合理性，强调基于使用者需求的设计理念，也更加重视人文

with the increasing emphasis on the sustainability, especially the ecological performance, of built projects; 3) Landscape Performance Series (LPS), developed by American Landscape Architecture Foundation (LAF) in the 21st century to improve the quality of urban landscapes and validate the sustainable performance of design strategies against the increasing complexity of social-ecological systems.

2.1.1 POE: Early Research on Landscape Performance Evaluation

Commonly used in most early studies on urban built public spaces[11]~[13], POE research emerged in Architecture in the 1960s when the prevailing humanistic thoughts and systematic theories initiated an architectural interest shift from aesthetics towards rationality, highlighting user needs and humane care and users' satisfaction feedback to design strategies. Wolfgang F. E. Preiser,

关怀，从使用者满意度视角反馈设计方案的绩效评估研究雏形由此形成。POE理论研究代表人物沃尔夫冈·F·E·普雷瑟在1988年出版了重要著作《使用后评估》[14]，并在之后的研究中完善了POE理论——进一步提出了更加综合的建筑绩效评估理论框架（BPE）[15]。随着POE研究和实践的不断积累，其逐渐成为影响相关设计领域的重要理论思想和实践方法，其研究范围也逐渐从建筑单体延伸至多尺度的景观项目，包括城市公园、广场、绿道、校园景观、居住区景观、医疗环境景观和康养花园等。

2.1.2 景观绩效评估研究的延展：SITES

20世纪80年代，随着全球能源危机和环境问题的日益凸显，可持续发展的概念被提出，并成为现代人居环境科学相关专业领域实践的重要指导思想和发展目标。相应地，绿色建筑成为城市可持续发展的重要研究议题，以此为目标的评级系统开始涌现，如美国绿色建筑委员会（USGBC）推出的能源与环境设计先锋（LEED）①体系，试图为可持续设计实践提供标准和导则。随后，在参考LEED评估体系的基础上，美国德克萨斯大学奥斯汀分校的伯德·约翰逊夫人野花中心、美国景观设计师协会（ASLA）和美国植物园于2006年联合启动了SITES评级体系[16]，并在2009年发布1.0版评估标准，形成了以可持续为目标的项目评级认证体系②。该评级体系开始紧密围绕可持续设计目标，研究重点从POE的使用者需求转向多功能效益的视角——以资源集约、生态修复、雨洪管理、调节气候等环境效益为主，兼顾社会和经济效益，旨在对设计方案的可持续性进行综合评估，以为各阶段工作提供绩效评估标准和实践指导，是景观绩效评估研究的进一步发展。

2.1.3 景观绩效评估研究的深化：LPS

进入21世纪，随着全球城市化实践活动的深入，诸多城市建设开始从数量扩张转向品质提升，由粗放式增长转向精细化发展。在风景园林学领域，业主和使用者对环境品质要求的不断提升，为了能够提升设计实践的可持续性价值，促使为设计策略的预期效果提供科学、可靠、有效的证据成为当代设计师不容忽视的责任[17]。在该背景下，LAF于2010年发起了LPS研究计划，并首次正式将“景观绩效”的概念定义为“景观解决方案（设计策略）在实现其预期目标和满足可持续性方面的有效性的度量”[18]。LPS建立了环境、社会和经济层面的可持续性效益评估框架以及基于生态系统服务和人类福祉的效益评估指标

① 建筑学领域率先提出了绿色建筑的评估体系，其中LEED评级体系的国际影响力最大，目前已经升级至4.0版本，其评估范围不仅关注建筑内外环境，还进一步增加了社区规划与发展评估系列（LEED-ND），尤为强调建筑与基础设施、社区与区域景观的融合。

② 经过来自160多个国家和地区的试点项目的检验，SITES又于2014年7月发布了重新修订的2.0版本。

a representative of POE theorist, published his masterpiece *Post Occupancy Evaluation*[14] in 1988 and further improved the POE theories by proposing the Building Performance Evaluation (BPE) framework[15]. Given its considerable growth in both research and practice, POE has become a theorical and practical approach applied in allied fields, from single building evaluation to landscape projects at varied scales, including landscapes for campuses, residential areas, medical spaces, and therapeutic places, in addition to urban parks, squares, and greenways.

2.1.2 SITES: Progression of Research on Landscape Performance Evaluation

In the 1980s, pushed by the growing global energy crisis and environmental issues, the concept of “sustainable development” was developed and considered a guideline and objective to the practice in the Science of Human Settlements, paralleled by the increasing application of green building in sustainable urban development, including the associated green rating systems. For example, proposed by the U.S. Green Building Council (USGBC), the Leadership in Energy and Environmental Design (LEED)① provides standards and guidelines for sustainable design practices. In 2006, inspired by LEED, the SITES was jointly initiated by Lady Bird Johnson Wildflower Center of the University of Texas at Austin, the American Society of Landscape Architects (ASLA), and the American Botanical Garden[16]. In 2009, the SITES v1, the sustainable rating and certification system was released②. Compared with POE, this system extents its focus onto the evaluation of multiple sustainable benefits, particularly on environmental benefits (such as resource intensive utilization, ecological restoration, stormwater management, and climate regulation). Social and economic benefits are also taken into consideration to improve the overall evaluation of design proposals, providing standards and guiding practice during the entire process of landscape design.

2.1.3 LPS: Refinement of Research on Landscape Performance Evaluation

The global urbanization in the 21st century has seen a wide transition from extensive urban sprawl to smart city growth through spatial quality improvement. This trend echoes the increasing demands for higher-quality landscape projects, which requires landscape architects to improve design strategies with scientific, reliable and effective evidences to enhance the sustainability of design practice[17]. In 2010, LAF launched LPS and formally defined “landscape performance” as the “a measure of the effectiveness with which landscape solutions fulfill their intended purpose and contribute to sustainability”[18]. This helps

① Architectural scholars proposed rating systems for green buildings, the most internationally influential one of which is LEED. The latest LEED v4 not only focuses on the indoor and outdoor environments of buildings, but also launches the Neighborhood Development (LEED-ND) to highlight the integration of architecture with infrastructure, community, and regional landscape.

② In July 2014, the SITES v2 was released after a verification by pilot programs in more than 160 countries and regions.

类别，为后续研究奠定了理论基础。随着LAF对景观绩效评估研究的推动，相关理论和实践研究得到了迅速发展，中国风景园林学界对其的关注度也在逐年递增③。

2.2 三种研究体系的比较分析

1）评估属性：POE和LPS都是在项目建成并使用一段时间后进行评估，可多次进行，属于回顾性评估；而SITES则在方案完成后到项目建成运营期间进行，其中方案完成后可开始部分评估，待项目建成运营后才能完成所有评估，属于预估性评估。需指出的是，SITES的评估标准和要求也是随着实践经验的积累而不断优化的，因此，其可靠性有赖于相关实证反馈的研究成果。

2）评估机制：POE是一种主观反馈式评估工具，主要基于社会行为学和社会心理学，借助使用者满意度调查的方法，对设计方案实施效果的合理性进行评估。SITES是一种等级评定的前馈式评估工具，首先围绕可持续发展和生态系统服务理论制定统一的评估标准，然后依据项目设计和施工管理文件，从选址、方案设计、施工建造、运营管理的全生命周期对被评估项目的工作质量进行评分。LPS是一种反馈式评估工具，同样基于可持续发展和生态系统服务理论，并以环境、社会和经济综合效益的可持续性目标为导向制定评估指标，通过量化项目建成后的实际效益为设计方案的实施效果寻求可靠证据。

3）评估内容：POE由于侧重使用者需求，评估内容以社会效益为主，也包含部分与使用者需求相关的环境效益方面的内容，如热舒适性、湿度、空气质量等；SITES评估内容偏重环境效益，兼顾社会效益，经济效益体现不明显；LPS则旨在明确评估环境、社会和经济的综合效益。

就三种研究体系的关系而言，LPS是在POE和SITES的研究基础上发展形成的：LPS融合了POE科学量化项目实际绩效的反馈式评估逻辑，以及SITES以可持续发展和生态系统服务理论为基础制定的评估目标和内容。此外，LPS在沿袭POE的社会效益评估方式的基础上，还根据多种社会效益的无形性特点进行了研究方法的创新——利用指标和多源数据来量化效益结果[19][20]；LPS和SITES在可持续设计实践程序中分别发挥反馈和前馈环节的作用，并且，LPS的研究成果还能为SITES评估指标和方法的优化提供更加全面而具体、科学且准确的依据[21]，而不必依赖特定专家和部分公众参与者的经验认知。因此，LPS和SITES的结合使用可以引导更高品质的可持续景观设计实践（图2）。

2.3 景观绩效评估研究发展过程的总结

综合前文所述，从POE到LPS，景观绩效评估研究逐步跳出建筑绩效研究框架，开始探索符合风景园林专业特点和需求的理论体系；其演进发展中三种典型体系的不同特点和相互关系，也在一定程度上反映了设计师们在设计思维上的转变，即从POE关注“设计是否符合使

build up a theoretical framework for sustainability evaluation in terms of environmental, social and economic benefits, while formulating the corresponding index on ecosystem services and human well-beings. LPS has promoted the development of landscape performance evaluation with both theoretical and practice significance, and inspired current studies among Chinese academia of Landscape Architecture③.

2.2 Comparative Analysis of the Three Research Systems

1) Evaluation attributes: Both POE and LPS are after-completion evaluation tools which allow for multiple-time evaluation; SITES is before-occupancy evaluation that can be done from the completion of scheme to that of construction, and its evaluation criteria, standard requirements, and reliability are dynamically improved with the constant updates of empirical case studies.

2) Evaluation mechanisms: By collecting users' satisfaction feedback, POE evaluates the rationality of design strategies according to the theories of Social Behavior and Social Psychology. As a feed-forward grade rating tool, SITES follows the theories of sustainable development and ecosystem services to establish unified evaluation standards to score each sections in a project's life-cycle (from site selection, design, construction, to operation and management) by reviewing related design proposals and construction and management schemes. LPS is a feedback evaluation tool sharing the same theoretical basis with SITES but focuses on evaluating a project's overall benefits by quantifying its environmental, social, and economic performances after completion.

3) Evaluation contents: Focusing on user needs, POE mainly evaluates a project's social benefits and the environmental ones associated with user needs, such as thermal comfort, humidity, air quality. SITES emphasizes on environmental benefits, complemented with social concerns, and economic benefits are considered the least; LPS is devised to evaluate a project's environmental, social, and economic benefits in a holistic way.

As mentioned above, this paper considers LPS an integration of POE and SITES. First, LPS combines the feedback evaluation logic of POE (for quantify real performance) with the theoretical guidelines of SITES (as evaluation objectives and contents). Second, LPS quantifies the intangible social benefits by improving POE's evaluation methods with specific indicators and multi-sourced data[19][20]. LPS and SITES can be complementary for their feedback and feedforward logics respectively in the procedure of sustainable design. Drawing from the relatively comprehensive, specific,

③ 如中国风景园林学会2013年年会论文中首次出现景观绩效引介文章，此后年会论文中有关景观效益和绩效的论文数量逐年增加，至2018年年会已共收录了17篇相关论文。

③ For example, since the Chinese Society of Landscape Architecture published the first paper that introduced the concept and knowledge of landscape performance on its 2013 Annual Conference, the number of relevant papers kept enlarging year by year and the total number of which reached 17 by 2018.

2. LPS与POE、SITES三个研究体系的关系

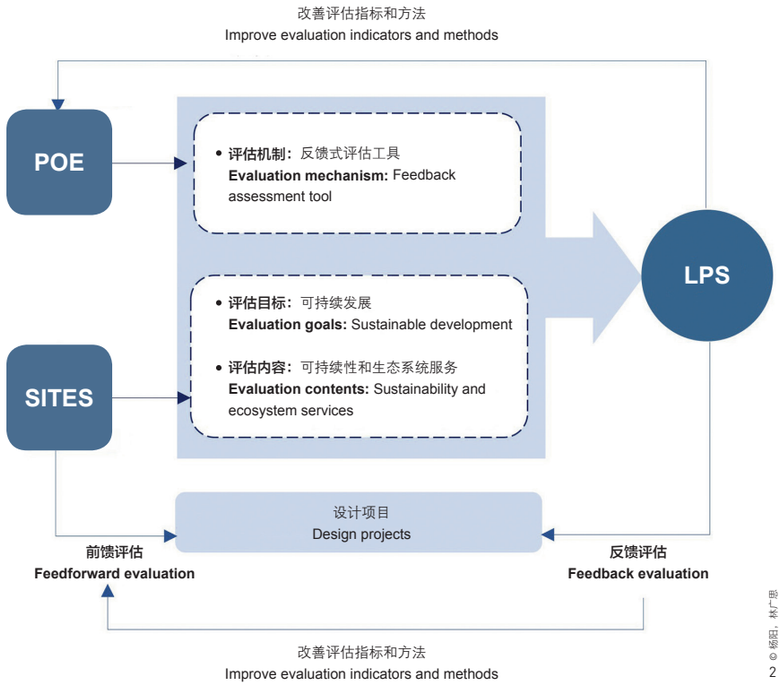
2. The relationship between LPS, POE, and SITES.

用者需求”，到SITES关注“设计是否符合可持续性”，再到LPS关注“设计是否且在多大程度上实现了可持续性”。具体来说，POE虽然在研究逻辑上具有反馈设计策略实施效果的意识，但是在具体研究中更侧重揭示使用者需求问题，并未强调设计策略在促使建成项目实现预期效益目标方面发挥的作用程度；SITES在评估内容上进行了扩展，侧重对设计能否带来多种可持续性效益的预先评估，但却仅按照统一标准对设计策略可能产生的效益结果进行粗略的等级评估；LPS则在理论层面将研究问题聚焦于设计策略能否产生多种具有可持续性的效果，及其带来多种实际效益的程度，即设计策略的效能（efficiency）评估。

该发展过程表明，景观绩效评估研究愈发关注设计策略与其实施效果之间的关联性，其研究的根本目的在于为提高设计效能提供更多有针对性的证据。景观绩效评估研究的成果能够为未来可持续设计实践提供可靠、可用的科学证据，最终将服务于景观项目的循证设计。

3 景观绩效评估的本质内涵：关注设计策略与实际效益的因果关系

如前文阐述，景观绩效评估研究是在建筑绩效评估的既有经验基础上发展形成的[22]。然而，广义来看，作为一类重要的实证研究方法，有关景观价值或效果的评估研究是风景园林学者长期探讨的重要内容[23]~[25]，尤其是在生态价值[26]~[28]和美学效果[29]~[31]方面。在这些研究中，不断出现“景观绩效评估”和“景观效益评估”（landscape benefit



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and accurate outcomes by LPS, the evaluation indicators and methods of SITES can get improved[21] with less dependence on experts' and public participants' empirical knowledge. In this sense, the combination of LPS and SITES can work together to strengthen the sustainability of landscape practices (Fig. 2).

2.3 Summary on the Evolution of Research on Landscape Performance Evaluation

From POE to LPS, research on landscape performance evaluation has gradually formed a theoretical system beyond the forms of architectural performance evaluation to get in line with the disciplinary characteristics and demands of Landscape Architecture. Furthermore, the differences and interrelationships between the three systems indicate a shift of design ideology in Landscape Architecture — from design for user needs (POE) and design for sustainability (SITES) to demonstrate whether and what degree of a design's sustainability (LPS). Specifically, although POE has recognized the necessity to evaluate the implementation effects of design strategies, most of POE case studies put more attention on user needs. SITES made a progress in pre-evaluating design strategies on multiple sustainable benefits, but adopts a rough rating system to evaluate the possible benefits with uniform criteria; comparatively, LPS equips with theoretical guidelines to assess the efficiency of design strategies, through which sustainable benefits can be measured qualitatively and quantitively.

Such shifts reveal the growing research interests of landscape performance evaluation on the relevance between design strategies and the implementation effects, corroborating the research aim that is to provide more targeted and reliable scientific evidences for enhancing design efficiency, and eventually informing the practice of evidence-based sustainable landscape design.

3 The Essence of Landscape Performance Evaluation: Discovering the Causality between Design Strategies and Benefit Results

Derived from architectural performance evaluation[22], landscape performance evaluation has drawn a broader discussion among the landscape academia given its significance to empirical landscape research[23]~[25], especially on ecology[26]~[28] and aesthetics[29]~[31]. However, among existing literature, the concept of “landscape performance evaluation” is often confused with “landscape benefit evaluation” but the differences are little studied. The paper holds a necessity to

evaluation）这两个概念，且二者在评估对象和评估内容上都有着诸多相似甚至重合的部分。但是，已有文献中对“景观绩效评估”是否等同于“景观效益评估”这一问题却鲜有探讨，本文认为有必要厘清这两个概念间的内涵关系，以便更清晰地理解和开展景观绩效评估理论的相关研究。

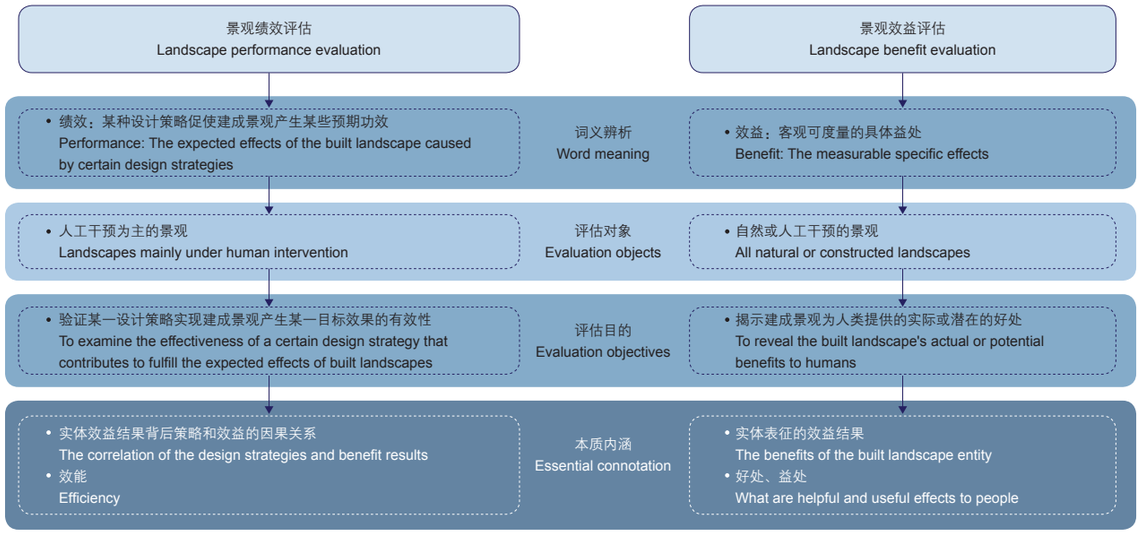
本文从三个方面对这二者的内涵进行了详细剖析：1）从词义来看，效益（benefit）是指广义上可客观度量的具体益处，强调建成景观实体具有的某种效益特征，而绩效（performance）则特指某种设计策略促使建成景观产生的某些预期功能效果，强调两者的因果关系，效益即指其中的结果；2）评估对象上，景观效益评估的范围更广，可涵盖地球上一切自然存在的或人工干预后的景观，景观绩效评估则主要针对人工干预为主的景观建成项目；3）评估目的上，景观效益评估用来揭示景观为人类提供的实际或潜在的好处，景观绩效评估旨在验证某一设计策略促使建成景观产生目标效果的有效性。由此可知，从本质上讲，景观效益评估研究关注景观实体对人的帮助和益处，即效益结果；而景观绩效评估在此基础上需进一步明确设计策略起作用的程度，即突出建成项目的“效能”（图3）。

经比较，笔者认为景观绩效评估的概念内涵应该拆解为两层：一是效益测量，即对可持续景观项目所具有的多种效益进行量化，这与景观效益评估研究范畴重合；二是效能反馈，即在效益测量结果的基础上验证设计策略的有效性，将其作为对具体设计策略实施效果的反馈，以增强设计过程的科学性。即相较于景观效益评估，景观绩效评估的独特内涵是将设计策略和实际效益作为一个整体，以客观量化的方式分析前

eliminate the misunderstanding on the two concepts in relevant research.

The differences between the two concepts are summarized as follows: 1) Literally, “benefit” refers to all kinds of measurable positive effects or characteristics what a built landscape entity actually has, and “performance” specifically refers to the expected effects that a built landscape entity performs through certain design strategies, wherein “benefits” is the “results”; 2) As for evaluation objects, landscape benefit evaluation can address all sorts of natural or constructed landscapes on the earth, while landscape performance evaluation mainly focuses on the built landscapes under human intervention; and 3) In terms of study objectives, landscape benefit evaluation aims to reveal what actual or potential benefits a landscape provides to humans, in contrast with landscape performance evaluation which examine the effectiveness of a certain design strategy to fulfill an expected effect. All in all, landscape benefit evaluation essentially explores what constructive effects the landscape entity has produced, and landscape performance evaluation focuses more on what extent of specific design strategies can result in these effects, namely the built landscape’s “efficiency” (Fig. 3).

In this sense, the connotation of landscape performance evaluation sees a two-fold interpretation: 1) Benefit measurement: to quantify the benefits of sustainable landscape projects, which is a shared objective with landscape benefit evaluation; 2) Efficiency feedback: to prove the effectiveness of corresponding design strategies with the results of benefit



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3. 景观绩效评估与景观效益评估概念比较

3. Comparisons of landscape performance evaluation and landscape benefit evaluation

者向后者转化的有效程度，既非对景观项目效益的单纯度量，也并非在度量效益结果之后仅仅进行经验性或主观性总结。然而，通过研究现有的相关文献，笔者发现多数景观绩效评估实际上仍停留于景观效益评估层面。只有将效益测量和效能反馈进行紧密结合的景观绩效评估研究才能真正为景观设计师提供“明确何种设计策略和方法将在什么程度上带来哪些正向效益”的可靠证据，从而有效支撑风景园林学的循证设计研究。

4 服务于循证设计的景观绩效评估研究重点

4.1 设计效能的反馈分析

反馈分析（feedback analysis）蕴含着项目前期设计方案的制定与项目实施后的效益之间的因果关联，旨在揭示影响景观系统绩效的设计知识，以供实践者进行及时、持续且高效的迭代应用。景观绩效评估是风景园林实践闭环式设计程序中的重要反馈环节。而设计效能反馈分析又是保障景观绩效评估研究高效发挥其反馈作用的重要内容，也是为多功能的可持续性设计寻求科学证据的有效途径。设计效能的反馈分析的研究成果，有助于增强风景园林设计实践的科学性，使景观绩效评估真正服务于循证设计。

设计效能反馈分析的重点在于明确指出效益结果与其所对应的设计策略之间的关联性。以实践项目的主要设计问题为导向，反馈分析的研究内容主要包括：1）解析具体的设计策略与效益结果的对应关系，即明确采用的何种设计方法带来了某种有利于环境质量、社会公平、经济发展的预期效益结果；2）进一步剖析影响各类效益结果的设计要素及其作用机制与影响程度；3）继而基于设计策略与效益结果的关联分析，更加精确地改善或优化相关设计策略，达到提升景观项目可持续性的目的。

当前，最常见的设计效能的反馈分析研究方法，是首先识别并选取影响效益的关键设计变量，并对项目建设前后或不同建成项目的效益结果进行纵向或横向对比分析，继而验证某种设计策略在实现某种效益方面的效能大小或不同设计策略的效能差异[32]~[34]。这类研究方法在环境效益研究方面运用得更加成熟，这与环境效益的关联因素较明确且更易量化有关，而社会效益和经济效益因其间接性和无形性的特征，相关影响要素和评估指标尚待完善。此外，部分研究中的反馈分析环节缺少对个案特殊性的考虑，加之样本量较少，导致其研究结论的推导和分析过程不严谨，结论的实践指导性和应用性也不强。因此，为使景观绩效评估研究对未来具有同类绩效目标的设计项目产生更普遍且可靠的指导意义，笔者建议通过对同类多案例研究样本进行系统分析或元分析（meta-analysis）④。

measurement to enhance the scientism of design processes. In other words, landscape performance evaluation correlates benefit results with the corresponding design strategies, rather than quantification or empirical / subjective description on projects' benefits. However, there is few of landscape performance evaluation studies grasping the both, while most of the rest are simply about landscape benefit evaluation. Neither the benefit measurement nor the efficiency feedback should be ignored in an authentic evidence-based design in Landscape Architecture.

4 Research Interests of Landscape Performance Evaluation for Evidence-Based Design

4.1 Feedback Analysis of Design Efficiency

By revealing the causality between design strategies and benefit results, feedback analysis explores the laws and principles of landscape performance to support dynamic and constant iteration of design strategies. Landscape performance evaluation is indispensable to the design processes of landscape projects with feedback analysis of design efficiency, which can substantially enhance the rationality of landscape design with reliable evidences.

To respond to the problems faced by a given landscape project, feedback analysis should: 1) measure whether the design strategies have brought any expected environmental, social or economic benefits or not; 2) identify the relations between specific design elements and actual benefits; and 3) improve the specific and accuracy of design strategies based on the analyses to boost the sustainability of landscape projects.

Commonly, the first step of feedback analysis of design efficiency is to identify the key design factors that impact the landscape benefits; then, through before-and-after studies on landscape performance of the sites or comparative studies among different built projects, the efficiency of a certain design strategy for specific benefits, or the efficiency variation among different strategies, can be discovered[32]~[34]. This method has been applied more widely in assessing ecological benefits because they are easier to quantify. Since social and economic benefits are often indirectly-effected and intangible, more efforts are required to improve the development of evaluation criteria on design factors. Besides, research should also consider the uniqueness of authentic cases and enlarge the amount of case studies to increase the reliability of research results and offer guidelines for a broader design practice. Therefore, systematic analysis or meta-analysis④ across case studies with similar design objectives should be encouraged.

4.2 生产具有实践操作性的知识

经过实践验证和科学甄别、具有实践指导性和应用性的知识，是衔接科学研究和设计实践的重要媒介，也能够推动人类社会不断进步和发展。对服务于循证设计的景观绩效评估研究，其重要价值即在于通过科学论证手段提炼出有助于高绩效景观设计实践的知识，这些知识的质量（即其实践操作性）是将景观绩效评估研究成果有效转化为实践决策所需的关键科学证据。此外，作为集合并管理相关领域知识的知识库，其结构形态亦将影响知识被传播和被习得的效果[36]——即知识在实践应用中的可操作性。因此，为避免研究产出的知识难以被实践者理解或有效使用而沉寂于文献中[37][38]，景观绩效评估研究应当面向实践需求，以设计实践问题为导向，以提高实践效用为目的，为实践者提供直接且实用的知识库。

关于如何生产具有实践操作性的知识，笔者认为，景观绩效评估研究应该注重实践决策者关心或面临的实际问题[39][40]，以及实践发展中知识的动态更新。具体来说：1）这类知识可涉及设计实践聚焦的问题和效益目标、设计策略或方法对应的效益类别和功效、设计要素影响效益的作用机制等，能够帮助决策者和管理者做出恰当判断、评估和决策；2）实践性知识还会随研究和实践的发展而演进，为使项目利益相关者能够获得最新的证据，需要建立一个能够链接研究成果与实践需求的动态更新的知识库，从而促进知识的共享和利用。

当前，在促进景观绩效评估研究创造实践操作性的知识成果方面，LAF做出了巨大贡献：其针对LPS研究计划在网上发布的“案例研究报告”⑤为行业提供了示范性的建成可持续项目数据库。该数据库囊括了相关项目案例的诸多重要信息，主要包括建成后效益数值结果、可持续性特征、问题与解决方案、经验教训等并随着案例研究的持续积累而不断更新。但是需指出一点：在该数据库中，能够体现设计策略与效益结果之间关联性的知识并不突出，知识的内容和结构相对孤立、零散，实践指导意义不足。因此，未来景观绩效评估研究的知识库还需增加具有实践操作性的知识。

5 结语

景观绩效评估研究有助于促进风景园林实践向循证设计方向发展，增强其科学性。基于文献分析，本文反思了当前景观绩效评估领域大量研究流于表面、成果实践应用性不强的现状，并厘清了景观绩效评估研究的发展过程、本质内涵和研究重点。笔者指出，关注设计策略和实际效益的因果关系是景观绩效评估概念的重要内涵，也是景观绩效评估研究发展的核心逻辑。该思想指导下的景观绩效评估研究

4.2 Actionable Knowledge Production for Authentic Practice

Knowledge boosts the progress of human societies. In Landscape Architecture, knowledge tested by scientific application bridges academic research and design practice. To evidence-based design, landscape performance evaluation is expected to provide actionable knowledge to enhance landscape performance of authentic projects — in other words, the knowledge can be translated from research findings into effective design strategies. Moreover, since the structure and form of knowledge base would impact the spread, learning, and application of knowledge[36], research on landscape performance evaluation is encouraged to address actual demands and problems of given cases by establishing an easy and practical knowledge base. That is also vital to avoid that the knowledge produced by research is difficult to be understood or effectively used by practitioners[37][38].

Such knowledge production ought to deal with decision makers' real concerns[39][40] and requires dynamic data updates. To be specific, knowledge production needs 1) to assist decision makers to evaluate and select design strategies and factors according to specific objectives, benefit types and efficiency, influencing mechanisms, etc.; and 2) to establish a dynamic knowledge base collecting the ever-growing research outcomes to meet practice demands and encourage knowledge sharing among as stakeholders.

At present, LAF has made a significant contribution to the knowledge production of research on landscape performance evaluation by devising the Case Study Briefs to LPS⑤, a database of demonstrative sustainable projects that introduces quantified benefit data, sustainable features, challenges and solutions, and lessons learned. All the online information keeps updated. However, the knowledge produced from each case in this database is relatively isolated and scattered, failing to guide design practice by explicitly indicating the relation between strategies and landscape benefits results. The creation of such a database deserves an improvement in practical evidences.

5 Conclusion

Research on landscape performance evaluation can catalyze the development of evidence-based design in Landscape Architecture. This paper points out the fact that the existing relevant literatures are inadequate in knowledge production to support design practice, and reviews the research development, connotations, and interests. It then probes into the causality of design strategies and benefit results, which is the basic logic of the research on landscape performance evaluation. The

④ 元分析又称荟萃分析或整合分析，是一种对现有文献中的同一主题进行定量的、系统的综述的研究方法，该术语由尊·加士在1976年提出，指“对大量的独立研究的分析结果进行统计分析，以获得整合后的研究结论”（来源：参考文献[35]）。现今，该研究方法已被广泛应用于教育、心理等社会科学和医学领域。

⑤ LPS研究计划将有关景观绩效评估的案例研究成果按照一定的要求进行统一编辑，并在LAF官方网站的“案例研究报告”栏目公开发布，并不断增加新的案例研究。

④ Meta-analysis is a quantitative and systematic review of a focused topic in the literature, and the term was defined by Gene Glass in 1976 as "the statistical analysis of a large collection of analysis results from individual studies for the purpose of integrating the findings" (Source: Ref. [35]). Nowadays it has been widely applied in Education, Psychology and other Social Sciences and Medicine.

⑤ The LPS publishes the case studies of landscape performance evaluation in a uniform format and keeps updating. Users can learn them on the "Case Study Briefs" channel of LAF's official website.

需超越效益度量，进一步强调两个研究重点：基于效益度量结果展开针对设计效能的反馈分析，和归纳出具有实践指导性和应用性的知识（作为循证设计的证据来源）。其落实将促进景观绩效评估研究成果切实可行地为循证设计服务，从而提升以高绩效为导向的可持续景观设计的实践品质，需要研究人员给予更多重视和深入探究。**LAF**

致谢

感谢审稿专家和本刊编辑为完善本文提出的中肯意见。

authors argue that related research should go beyond benefit measurement to invest efforts into two research interests: the feedback analysis of design efficiency based on measurement results, and the production of actionable and practical knowledge for evidence-based design. More in-depth research should be encouraged centering on these two interests to concrete the evidence foundation for sustainable design practice with higher performance and quality. **LAF**

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