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景观绩效研究：
社会、经济和环境效益是否总是相得益彰？

A Study of Landscape Performance:
Do Social, Economic and Environmental Benefits Always Complement Each Other?

摘要 ……

本研究的目的包括两个部分：1）介绍景观绩效的背景和景观设计学基金会的案例研究调查计划；2）探讨景观环境、经济和社会效益在可持续性方面是相互冲突还是相互融合。根据景观设计学基金会的定义，景观绩效是用来“衡量景观设计措施在多大程度上实现既定目标，并且是否有助于实现可持续发展”。景观设计学基金会根据可持续性概念，通过量化环境、经济和社会效益建立了调查景观绩效的研究框架。目前常见的可持续发展观念通常围绕着探讨环境、经济和社会这三方面的效益展开，但是尚难以了解这三者的相互关系。大量文献证实了人类活动已对自然环境造成了严重影响，这意味着，在获得某些效益的同时，其他一些效益将受到阻碍，因而有必要在景观绩效中权衡各个方面。了解环境、经济和社会效益间的相互关系能够使设计师提升这三者的共容关系、缓和冲突关系，并在未来创造出高绩效景观。本研究中，我们运用景观设计学基金会在2011年案例研究调查计划中发表的39个景观绩效案例研究对4种假设进行了检验。

关键词 ……

可持续性；冲突；让步；景观设计基金会；高绩效景观

Abstract ...

The purpose of this study is two-fold: 1) to introduce background of landscape performance and the Cast Study Investigation program of Landscape Architecture Foundation; and 2) to explore whether landscape's environmental, economic and social benefits are conflicting or converging for sustainability. Landscape performance, as defined by the Landscape Architecture Foundation, is “the measure of efficiency with which landscape solutions fulfill their intended purpose and contribute toward sustainability.” Landscape Architecture Foundation based on the concept of sustainability to establish the research framework for investigating landscape performance by quantifying environmental, economic and social benefits. The current common sustainable development concept often discusses the benefits in the three environmental, economic and social aspects whereas their interrelationship is hardly addressed. Considering the large body of literature supporting the fact that human activities have significant influences on the natural environment, it seems that certain benefits would impede other benefits, and therefore result in tradeoffs in landscape performance. Understanding the interrelationship between the environmental, economic and social benefits, allows designers to enhance the compatible relationships, mitigate the conflicting relationships and create high-performing landscapes in the future. In this study, we used the 39 landscape performance case studies published by the Landscape Architecture Foundation in its 2011 Case Study Investigation (CSI) program to test four hypotheses.

Key words ...

Sustainability; Conflict; Tradeoff; Landscape Architecture Foundation; High-Performing Landscape

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1 引言

近年来，“景观绩效”一词引起了景观设计研究群体的关注。景观设计基金会（LAF）于2010年开始倡导了解建成景观绩效的重要性。本研究源自一项在知名度较高的设计公司所展开的针对他们已建成项目绩效的调查。调查结果显示，很少甚至没有任何公司了解什么是景观绩效，也不知道如何衡量。普遍存在于这些公司中的问题之一是没有任何一家公司对项目前期、中期和后期的数据进行收集。LAF的这项简单调查引出了一个问题——景观设计领域和学科缺乏严格的科学训练，这可能会成为多学科合作中的一个严重劣势。此后，LAF在景观绩效的研究方面投入了很多努力，例如景观绩效系列（LPS）和案例研究调查计划（CSI）等。

作为景观绩效的灵感来源，建筑绩效由来已久。问题搜寻法、定量分析法及模拟[1]等多种方法已被用于评估建筑绩效。基于多年使用后评价研究所积累的知识，建筑绩效对各个阶段的使用者反馈进行了系统化的处理，并将这些反馈提供给建筑师、施工人员和建筑项目后期的其他相关人员[2]。相应

1 Introduction

The term “landscape performance” has caught attention of landscape architecture research communities recently. Landscape Architecture Foundation (LAF) began to advocate the importance of knowing performance of built landscapes in 2010. This effort starts from an inquiry among high-profile design firms on performance of their past built projects. The result is that very few to none was confident in articulating what landscape performance is and knowing how to measure it. One of the common problems is that no firm collects data pre, during and post project periods. LAF's simple inquiry leads to a concern that the landscape architecture field and discipline is lack of rigorous scientific training, which can be a serious disadvantage in multi-disciplinary collaborations. Subsequently many efforts have been devoted into the landscape performance research such as Landscape Performance Series (LPS) and Case Study Investigation Program (CSI) by LAF.

By which landscape performance is inspired, building performance has been recognized for long. Various methods have been developed to evaluate building performance such as the problem-seeking method, quantitative methods and simulation[1]. Based on knowledge accumulated from ages of post-occupancy research, building performance systemizes users' feedback at all delivery stages and provides the feedback to architects, builders and others involved in future building projects[2]. Correspondingly, landscape performance aims at accumulating valuable feedback information and providing design guidance to future landscape projects.

LAF defines landscape performance as “the measure of efficiency with which landscape solutions fulfill their intended purpose and contribute toward achieving sustainability”. Particularly, the theoretical framework of landscape performance is built upon the sustainability triad: environment, economy and society. Under this framework, participating landscape projects are required to be examined in the three environmental, economic and social aspects to document the benefits created in the three aspects. The metrics and criteria used to measure landscape performance usually depend on projects' design goals, objectives and employed landscape

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solution. Although landscape performance is still in its infancy, it catches increasing attention from researchers and practitioners and has been growing rapidly in recent years. It provides organized feedback of landscape solutions, reduces uncertainties of design decisions and contributes to success of sustainable development. As Scott Campbell describes, sustainable development is the balance of the three goals: environmental protection, economic development, and social equity; in order to achieve sustainable development in the center of the sustainability triangle, we need to resolve the conflicts among the three goals[3] (Fig. 1).

Quite a few planning ideologies were developed to achieve this balance, such as new urbanism, smart growth, transit-oriented development (TOD), and conservation subdivisions. In addition, numerous design solutions were created for the same purpose, such as reusing / recycling materials, using renewable energy resources, using arid-tolerant and native species, applying low impact development (LID) techniques, and so on. These planning and design solutions have been widely employed in the past two decades; however, very limited data and evidence were collected to prove that to what extent these solutions have improved the environment, boosted economic development and benefited public health and safety. This leaves a gap in the field of landscape architecture, and makes it difficult to demonstrate how landscape architects contribute to sustainability.

Various efforts have been made to fill this gap, such as LEED for Neighborhood Development (LEED-ND), Sustainable Sites Initiative (SITES), and LAF's LPS.

1. 可持续发展框架（来源：可持续场地倡议）
1. Framework of Sustainable Development (Source: Sustainable Site Initiative)

的，景观绩效也意在积累有价值的反馈信息，并为之后的景观项目提供设计指导。

LAF把景观绩效定义为“衡量景观设计措施在多大程度上实现既定目标，并且是否有助于实现可持续发展”。值得特别强调的是，景观绩效的理论框架是建立在环境、经济和社会三者的可持续性之上的。在这一框架下，参与评价的景观项目需要考察环境、经济和社会三个方面，以记录这三个方面所创造的效益。用于衡量景观绩效的指标和标准通常因项目的设计目标、对象和所采取的解决方案而异。虽然景观绩效至今仍不够成熟，它已经引起了研究者和从业者越来越多的关注，并在近年来取得了迅猛的发展。它提供了有条理的景观方案反馈，减少了设计决定的不确定性，将促进可持续发展。正如斯科特·坎贝尔所说，可持续发展是环境保护、经济发展以及社会公平三者的平衡，为了在“可持续性三角”的中心实现可持续发展，我们需要解决这三个目标之间的冲突[3]（图1）。

大量旨在实现这种平衡的规划理念被发展起来，比如新城市主义、精明增长、以公共交通为导向的开发（TOD）以及保护性社区开发。另外，还涌现了大量同样旨在实现这种平衡的设计方案，比如再利用/回收材料、使用可再生能源、使用抗旱性和本土物种、应用低影响开发（LID）技术等。这些规划和设计方案在过去20年中被广泛应用，但是，那些能够证明这些方案在何种程度上改善了环境、推动了经济发展、惠及了公众健康和安全的数据和例证却非常有限。这成为景观设计领域的一个缺口，难以证明景观设计是如何促进可持续性的。

为了填补这一缺口，人们进行了多种研究，比如社区开发的LEED认证（LEED-ND）、可持续场所倡议（SITES），以及LAF的LPS。LEED-ND和SITES都属于评价体系，为可持续性土地设计提供指导和绩效标准。但是，从评估的角度来看，这些评价体系的打分过程大多依据预测而非实际测量。例如，我们相信再利用/回收原料能够节省建筑成本并使环境受益，但是，节约了多少和环境在多大程度上得到了改善尚不得知。

LAF所创建的LPS作为“一个在线的互动资源集合，为设计师、政府机构和其他拥护者展示景观绩效的意义并提供衡量途径，使他们能够对景观绩效进行评估，并提出新的可持续景观解决方案。”不同于LEED-ND和SITES，LPS意在通过一系列的“案例研究调查”（CSIs）来准确量化建成项目的景观绩效。到目前为止，CSI计划已经迈入了第4个年头，并有超过29个研究团队和超过52个顶级景观设计公司参与其中。CSI的研究建立在大学教师、学生和先进从业者的合作的基础上。在此合作下，公司负责提供项目基本信息；大学教师作为项目的领导者，制定绩效效益指标和量化方法；学生作为研究助手，量化和记录景观绩效效益。目前为止，CSI计划已经分析和记录了超过90个景观案例。需要注意的是，将近半数的案例尚处于审查和发表阶段，截至本研究进行时（2013年1月），仅有39个案例可在线获取。

景观绩效包括两方面的含义。首先，它能够衡量景观方案是否或者在何种程度上符合设计师的意向，尤其是，所应用的景观方案创造的效益是否达到预期。例如，采用本土物种能否真正节约20%的饮用水？LID技术能否真正经受住百年一遇的风暴？这个层面的含义被表示为三角形的三个顶点（图2-1）。其次，它检验了这些效益是否有助于可持续性。尽管这似乎是自相矛盾的，但是我们不应该假设所创造的效益永远都是共融并且有助于实现可持续发展的。这个层面的含义被表示为三个点彼此之间的连线，即环境、经济和社会效益间的相互关系（图2-2）。理论上而言，环境、经济和社会三个方面在可持续性上存在利益的不一致，这决定了它们之间的冲突是不可避免的。

很多研究都对这种冲突进行了表述。布鲁斯·韦尔科克斯和丹尼斯·墨菲认为愈演愈烈的人类活动是生态价值降低和生物多样性缺失的最主要的原因[4]。此后，克里斯托弗·迪克曼和帕特里克·唐卡斯特指出城市环境会对小型哺乳类群体造成间接影响[5]。西奥多·科兹洛夫斯基指出由于城市发展所导致的土壤板结会对植物生长带来负面影响[6]。此外，威廉姆·里斯认为从生态经济角度而言，经济发展和环境保护之间存在不可避免的冲突[7]。里斯还提到，一个独立的地区如果人口持续迁移且增长，则很可能超出当地生物物理的极限，并且会因此加快自然资源的消耗[8]。最近，安东尼·麦克迈克尔和科林·巴尔特则指出工业化、人口增长和上涨的消费主义具有危及人口健康和导致生态不可持续性的风险[9]。

以上冲突解释了为什么我们需要寻求环境保护、经济发展和社会公平的平衡。本文意在探讨建成景观的环境、经济和社会效益在可持续性上是否存在冲突抑或融合的关系。目前普遍的可持续发展

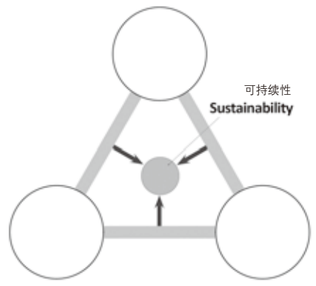
LEED-ND and SITES are both rating systems, providing guidelines and performance benchmarks for sustainable land design. However, from an evaluation point of view, the scoring process of these rating systems is mostly based on prediction rather than actual measurement. For instance, we believe reusing / recycling materials would save construction cost and benefit the environment; however, how much is saved in cost, and to what extent the environment is improved remain unclear.

LAF creates LPS as “an online interactive set of resources to show value and provide tools for designers, agencies and advocates to evaluate performance and make the case for sustainable landscape solutions”. Different from LEED-ND and SITES, LPS is intended to actually quantify landscape performance of built projects through a series of call for “Case Study Investigations (CSIs)”. By far, the CSI program is in its fourth year; more than 29 research teams and more than 52 leading landscape architecture firms have participated in it. The CSI research is built upon a collaboration of faculties, students and leading practitioners. Under the collaboration, firms provide projects’ baseline information, faculties, as team leaders, develop performance benefit metrics and quantification methods, and students, as research assistants, quantify and document landscape performance benefits. By now, more than 90 landscape cases have been analyzed and documented. It needs to be noted that, nearly half of the cases are under the review and publishing process, and by the time when this study was conducted (January, 2013), only 39 cases were available online.

Landscape performance has two levels of meanings. First, it measures whether or to what extent landscape solutions meet designers’ intention, specifically, whether the applied landscape solutions create benefits that were envisioned. For example, do native species actually save 20% of potable water? Do LID techniques really sustain 100-year storm? This level of meaning is represented in the three points of the triangle (Fig. 2-1). Second, it examines whether these benefits contribute toward sustainability. Paradoxical as it seems, we should not assume the benefits created always contribute toward sustainability. This level of meaning is represented in the connectors between the three points, which are the interrelationships between environmental, economic and social benefits (Fig. 2-2). Theoretically, the three environmental, economic and social aspects of sustainability have interest clashes, determining that there are unavoidable conflicts among them.

These conflicts are documented in various studies. Bruce Wilcox and Dennis Murphy claim intensified human activity is among the most serious reasons for ecological value degradation and biodiversity loss[4]. Thereafter, Christopher Dickman and Patrick Doncaster indicate urban environment indirectly affects small mammals’ populations[5], and Theodore Kozlowski reveals that soil compaction due to urban development negatively influences woody plants’ growth[6]. In addition, William Rees argues that there is an unavoidable conflict between economic development and environmental protection from an ecological economics perspective[7]. Rees also remarks migration and population growth in an individual region can exceed local biophysical limits, and thus accelerates

Level 1 meaning — landscape performance benefits
第一层含义——景观绩效效益



Level 2 meaning — whether interrelationships between environmental, economic and social benefits are converging and contribute toward sustainability
第二层含义——环境、经济和社会效益之间的关系相互融合，促进可持续性

2. 景观绩效含义
2. Meaning of landscape performance

观点对环境、经济和社会三个方面的效益进行了广泛的探讨，但它们之间的相互关系还尚待研究。

2 方法

为了研究景观的环境、经济和社会效益的可持续性是相互冲突还是相互融合，我们进行了一个基于文献综述和假设的案例分析研究（图3）。本文中使用的样本是39个LAF于2011年在CSI计划中发表的景观绩效案例。除了记录绩效效益，每个案例研究都记录了项目的基本信息，比如项目规模、选址、类型、预算、竣工日期、可持续特点、设计和施工过程中的挑战和措施、成本比较和经验教训。通过文献综述，我们得出了环境、经济和社会效益存在潜在冲突的结论。其次，我们将每个景观绩效案例研究的效益分为环境、经济和社会三个方面，并分析它们之间的融合和冲突关系。再次，我们根据项目类型、规模、位置（城市/农村）和建造前的土地利用情况将39个案例进行再分类，以研究它们对冲突和融合关系的数量可能产生的影响。

此外，我们建立了一个用来说明景观绩效效益组成比率的标尺，以更好地了解这三种效益类别之间的相互关系。在这一标尺中，总效益数值为100%，环境、经济和社会三个类别中的每个相对比率采用如下等式计算：

$$R=\frac{\text{每种类型的效益数量}}{\text{总效益数量}}\times 100\%$$

R值为每种效益的相对比率。

3 结果和讨论

3.1 潜在冲突与让步

文献综述表明，某些社会效益（如增加的教育、娱乐和社交机会）和某些经济效益（如新的工作和当地商业发展）可能导致汽车出行量增加、土壤板结、汽油消耗增加、碳排放增长，因而使得方方面面的环境问题进一步加剧。这些问题包括植物生长情况不佳、生物多样性降低、栖息地破坏及消失、空气和水资源污染、城市热岛效应、噪音等级提高、当地资源耗尽等。这些问题可能转而影响生活质量和降低居住者满意度。此外，房地产价值的增加可能导致中产阶级化①。

3.2景观绩效效益组成标尺

对景观绩效效益进行分类和分析的结果表明，每个项目中环境、经济和社会这三种类别的效益并不是均等的。大部分案例研究表明项目中的环境效益要高于社会和经济效益。效益组成比例如图4所示，它显示出大多数项目位于三角形的左下角，即环境效益比例较高，经济和社会效益比例较低。但是，也不乏例外，千禧公园（第16号）具有60%的经济效益，而环境和社会效益仅仅各占20%；西雅图儿童乐园（第24号）的效益分布平均，环境、经济和社会效益各占33.3%。托马斯杰佛逊大学鲁伯特广场（第32号）具有66.7%的经济效益，33.3%的环境效益，但不具备社会效益。

考虑到效益的组成可能受到项目规模的影响，我们将这些项目进一步分为了5组：1）面积小于0.4hm^2；2）面积介于0.4~4hm^2；3）面积介于4~40hm^2；4）面积介于40~400hm^2；5）面积大于400hm^2。如图5所示，第五组的项目都位于三角形的经济一侧的底端，表明环境效益比例较高，经济比例较低，不存在社会效益。其他4组项目趋于均匀分散，表明在效益组成上不存在明显差异。但是，由于第一、四、五组案例数量较少，使得该结果的准确性受到了影响。

每个项目的人口密度也有所不同[10]，39个景观效益案例研究中有7个位于（人口密度较低的）农村地区，32个位于（人口密度较高的）城镇地区。图6显示，相对于农村地区的项目，城镇地区的项目似乎具有更高的经济和社会效益。但是，由于农村地区的案例数量较少，这一结果的准确性也有限。

3. 研究方法示意图
3. Schematic of research method

natural resources depletion[8]. Lately Anthony McMichael and Colin Bulter purport industrialization, increasing population and rising consumerism have the risk of jeopardizing population health and causing ecological non-sustainability[9].

These conflicts explain why we need to seek a balance between environment protection, economic development and social equity. The purpose of this paper is to explore whether environmental, economic and social benefits of built landscapes are conflicting or converging for sustainability. The current common sustainable development concept has broadly explored the benefits in the three environmental, economic and social aspects, whereas their interrelationship is hardly addressed.

2 Methods

In order to explore whether environmental, economic and social benefits of landscapes are conflicting or converging for sustainability, we conducted a literature review and made assumptions based case study (Fig. 3). The sample we used in this study is the 39 landscape performance cases published by the LAF in its 2011 CSI program. In addition to documenting performance benefits, each case study records basic information of the project, such as project size, location, type, budget, completion date, sustainable features, challenge and solution during design and construction, cost comparison, and lessons learned. From the literature review, we identified potential conflicts existing among environmental, economic and social benefits. Then we classified the benefits of each landscape performance case study into three aspects: environmental, economic and social, to analyze their converging and conflicting relationships. Later, we reclassified the 39 cases by project type, size, location (rural / urban), and land use before construction to detect their probable influence on number of conflicting and converging.

Additionally, we created a scale to illustrate landscape performance benefit composition to better understand the interrelationship of the three categories. In this scale, the total benefits number is 100%, and the relative ratio of each of the three environmental, economic and social categories is calculated using the following equation:

$$R=\frac{\text{number of each type of benefits}}{\text{total number of benefits}}\times 100\%$$

Where R is the relative ratio of each type of benefits.

3 Results and Discussion

3.1 Potential Conflicts and Tradeoffs

The literature review suggests certain social benefits (for example, increased educational and recreational / social opportunities), and certain economic benefits (for example, new jobs and local business development), would possibly increase autotrips, compact soil, raise fuel consumption, increase carbon emission, and consequently aggravate diverse environmental issues. Some issues include poor vegetation health, decreased biodiversity, habitat fragmentation and loss, air and water pollution, urban heat island, increased noise level, and depleted local resources. These issues would, in turn, harm life quality and reduce residents' satisfaction. Furthermore, property value increase would possibly lead to gentrification①.

3.2 Landscape Performance Benefit Composition Scale

The results of classifying and analyzing landscape performance benefits indicate not every project has benefits equally distributed into the three environmental, economic and social categories. Most case studies documented more environmental benefits than social and economic benefits. The benefit composition scale is presented in Figure 4. It indicates most projects are located toward the triangle's left bottom corner, where environmental benefits have a higher ratio, while economic and social benefits have lower ratios. Yet, there are still exceptions: Millennium Park (No. 16) has 60% economic benefits, and only 20% environmental and social benefits each; Seattle Children's Play Garden (No. 24) has benefits evenly distributed to 33.3% environmental, 33.3% economic, and 33.3% social benefits. Thomas Jefferson University Lubert Plaza (No. 32) has 66.7% economic benefits, 33.3% environmental benefits, and has no social benefits documented.

Considering that benefit composition could be influenced by project size, we reclassified the projects

当然，环境、经济和社会这三个类别中的效益数量以及它们所占总效益的相对比例这一衡量标准并不能完全代表项目的可持续性。每种效益的权重和重要性等因素可能会使结果产生实质性差异。但是，我们认为它们可被用来粗略地说明每个项目的可持续性。

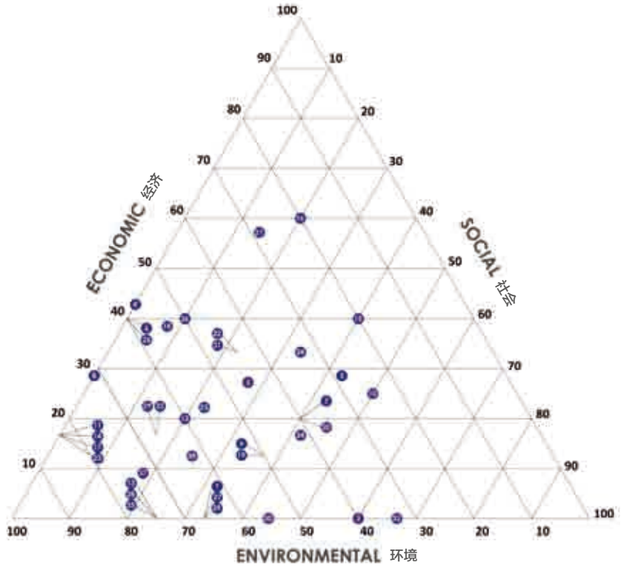
上述结果表明，大部分项目，尤其是在大规模的项目和位于农村地区的项目中，其所拥有的环境效益相对较多。有多种原因可以解释这一结果。首先，在有限时间内收集经济和社会数据十分具有挑战性。第二，缺乏足够有效的指标和准则对经济和社会效益进行测量和计算。第三，很多可持续策略都围绕环境效益展开，没有给予经济和社会效益足够的考虑。最后，部分环境效益阻碍了经济和社会效益。在缺乏进一步研究的情况下，我们无法断定造成以上结果的主要原因是什么。但是，通过考虑经济和社会效益的本质，我们相信时间阶段和更加行之有效的指标可以起到重要作用。因此，我们建议CSI应更加关注为社会和经济效益资料开发出高效的指标和导则。我们还需去研究不同的可持续策略对经济和社会效益的影响。此外，未来的CSI计划应该囊括更多位于农村地区的项目，以及面积小于0.4hm^{2}和大于40hm^{2}的项目。

3.3 假设检验

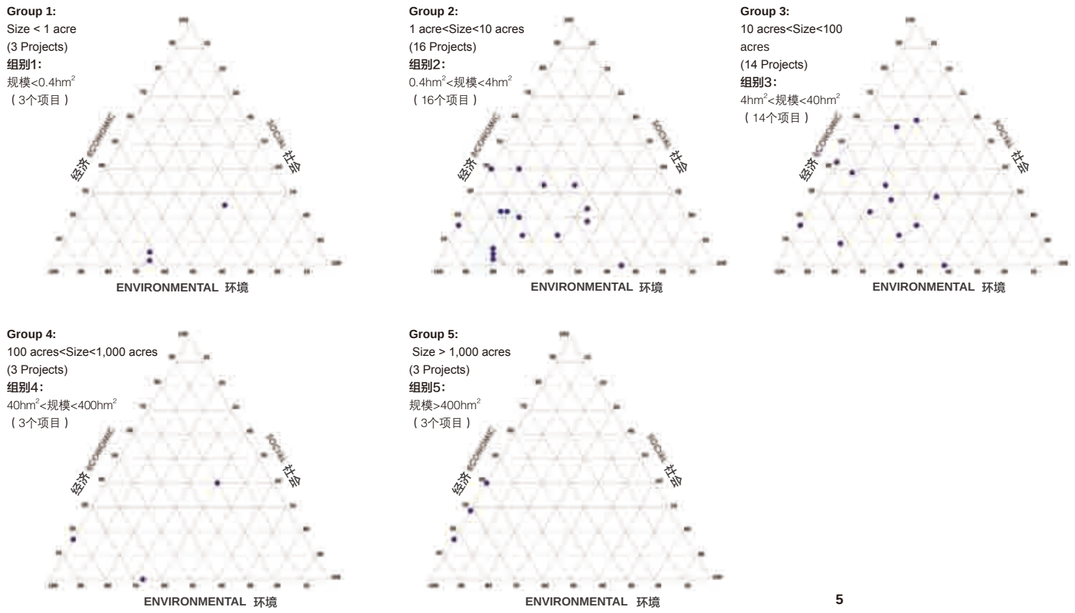
3.3.1 假设1：某些社会效益将让步于各种环境效益

对社会和环境效益之间关系的分析结果如图7–1所示。单箭头代表支持关系，相对的箭头表示冲突关系。效益的详情和表明效益的项目数量如表1所示。在环境效益中，水、部分碳和能量以及部分其他的效益能带来社会效益，比如防洪、增加可步行性、增加用户满意度、推动娱乐性、增加公共生态意识和生产食物。就环境和社会效益中的冲突和权衡而言，我们发现有些社会效益——比如提供更多的娱乐/社交机会、更多的教育机会——可能会导致机动车出行量的增多，以及碳排放和土壤板结的增加，这些将不利于植物和动物的健康生长，同时会导致部分环境效益会大打折扣。这些效益包括促进植物群落生态完整性、增加地区生物多样性、提高地区生态质量，以及为本土生物和濒危物种创造多种生境类型。

3.3.2 假设2：某些经济效益将对自然环境带来消极影响，因此一部分环境效益将受到损害



1 ASLA Headquarters Green Roof
ASLA总部绿色屋顶
2 Avalon Park and Preserve
阿瓦隆公园及保护区
3 Baldwin Hills Scenic Overlook
鲍德温山观景台
4 Cavallo Point
卡瓦略岬酒店
5 Cheonggyecheoon Stream Restoration Project
清溪川重建项目
6 Crosswind Marsh Wetlands Interpretive Preserve
侧风沼泽湿地解说保护区
7 Cusano Environmental Education Center
卡萨诺环境教育中心
8 Daybreak Community
黎明社区
9 Elmer Avenue Neighborhood Retrofit
艾莫尔大道社区改造
10 Gary Comer Youth Center
格力高莫青年中心
11 High Desert Community
高地沙漠社区
12 Kresge Foundation Headquarters
克雷斯吉基金会总部
13 Kroon Hall, Yale School of Forestry and Environmental Studies
林业与环境研究耶鲁学院克鲁恩大楼
14 Malibu Lumber Yard
马里布木材广场
15 Menomonee Valley Redevelopment and Community Park
梅诺莫尼福尔斯山谷再开发和社区公园
16 Millennium Park
千禧公园
17 Old Collier Golf Club
老矿工高尔夫俱乐部
18 Port of Los Angeles Wilmington Waterfront Park
洛杉矶港口威明顿滨水公园
19 Portage Lakefront and Riverwalk
伯蒂奇滨水区及滨河步道
20 Ravinia Festival South Parking Lot
拉维尼亚音乐节停车场
21 Richmond Canal Walk
里士满运河水道
22 Ruth Mott Foundation Gilkey Creek Relocation and Restoration
露丝莫特基金会吉尔凯溪改道及重建工程
23 Salvation Army Kroc Community Center
救世军克罗克社区中心
24 Seattle Children's Play Garden
西雅图儿童乐园
25 Shanghai Houtan park
上海后滩公园
26 Snoqualmie Falls Upper Park
斯诺夸尔米瀑布上游公园
27 Sydney Olympic Millennium Parklands
悉尼奥林匹克千禧公园
28 Taylor 28
泰勒28公寓
29 Teardrop Park
泪珠公园
30 The Dell at the University of Virginia
弗吉尼亚大学戴尔中心
31 The Lurie Garden at Millennium Park
千禧公园卢瑞花园
32 Thomas Jefferson University Lubert Plaza
托马斯杰弗逊大学鲁伯特广场
33 Thornton Creek Water Quality Channel
马库斯溪水道
34 Tianjin Qiaoyuan Park
天津桥园公园
35 Underwood Family Sonoran Landscape Laboratory
安德伍德家族索诺兰景观实验室
36 Uptown Normal Circle and Streetscape
近郊环道及街景
37 Westerly Creek at Stapleton
斯坦布莱顿西溪
38 Wharf District Park
码头区公园
39 Zoomazium at Woodland Park Zoo
林地公园动物园



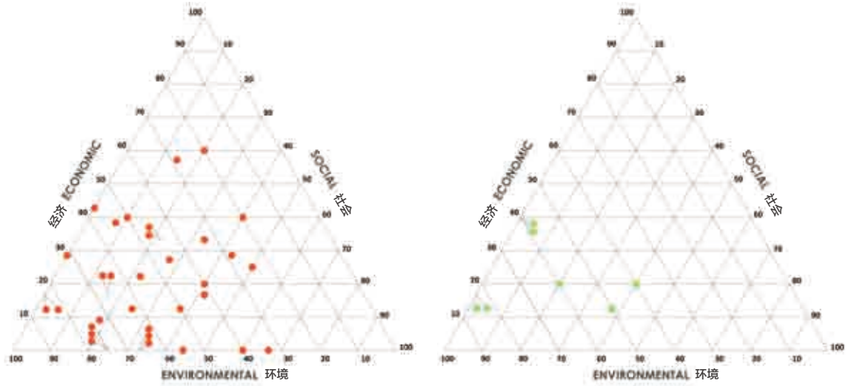
into five size groups: 1) smaller than one acre; 2) between one acre and ten acres; 3) between ten acres and 100 acres; 4) between 100 acres and 1,000 acres; and 5) larger than 1,000 acres. Figure 5 shows our results. It demonstrates projects in group 5 are all located on lower end of the triangle's economic side, indicating a higher environmental benefits ratio, lower economic ratio and no social benefits ratios. Projects in the other four groups tend to spread out evenly, expressing no distinct difference in the benefit composition. However, the accuracy of the results is limited by the small case numbers in group 1, 4 and 5.

Based on population density[10], 7 of the 39 landscape performance case studies are located in rural areas and 32 are located in urban areas. Figure 6 shows that projects in urban areas seem to report more economic and social benefits than projects in rural areas. However, the accuracy of the results is limited by the small case numbers in rural areas.

Certainly, number of benefits in each of the environmental, economic and social categories, associated with their relative ratios to all benefits could not represent the full spectrum of sustainability. Factors such as weight and significance of each benefit could make a substantial difference. However, we feel they could be used to roughly demonstrate each project's sustainability.

The results above suggest most projects have more environmental benefits documented, especially for projects of larger sizes and projects located in rural areas. There are several reasons to explain the results. First, collecting economic and social data within limited time is challenging. Secondly, there are not enough efficient metrics and guidelines to measure and calculate economic and social benefits. And thirdly, many sustainable strategies center on generating environmental benefits and fail to give economic and social benefits enough consideration. Lastly, several environmental benefits impede economic and social benefits. Without further study, we could not confidently determine which the major reasons are. However, by taking into account the nature of economic and social benefits, we believe time frame and efficient metrics could play a crucial role here. Thus we would like to recommend that CSI focus more on developing efficient metrics and guidelines for social and economic benefits

4. 景观绩效效益构成比例
5. 根据项目规模分类的效益构成
4. Landscape performance benefit composition scale
5. The benefit composition be influenced by project size



Rural (7 projects) **农村地区**（7个项目）

Urban (32 projects) **城市地区**（32个项目）

6

经济和环境效益之间相互关系的分析结果如图7–2所示。在环境效益中，原材料再利用/回收和减少废物能够有助于降低工程造价；缓解城市热岛效应和节约能源能够有助于减少电费及运营管理成本；提高空气质量、雨洪管理、节水、防洪、改善水质，这些将有助于提高房地产价值。

另一方面，一些经济效益（比如经济发展、税收增加和新岗位的创造）可能增加本地交通、刺激基础设施建设及加剧人为干扰。其结果导致很多环境效益被牺牲，表现在公共空间缩减、植物健康受损、本地和区域生物多样性降低，以及生物生境退化等方面。

3.3.3 假设3：相对于冲突关系，社会效益和经济效益之间的融合关系突显

经济利益和社会利益之间的相互关系如图7–3所示。社会效益和经济效益常常密切相关。例如，创造新的工作机会和节约建造及运营成本等经济效益通常会提升居住满意度，同时使公共卫生与安全受益。同样，增加娱乐/社交机会等社会效益通常会增加税收，创造新的工作岗位，有时还会提高房地产价值。

然而，经济效益和社会效益的相互关系并非一直是相融合的。如图7–3所示，当经济效益（比如影响商业发展）达到一定规模时，可能会影响社会效益（比如减少公共空间、降低水/大气质量以及增加噪音等级），因而降低生活质量和居住满意度、损坏公共健康和安全。此外，房地产价值的增加可能导致中产阶级化并损害社会公平。为此，我们暂无法为假设3提出有力的证据。

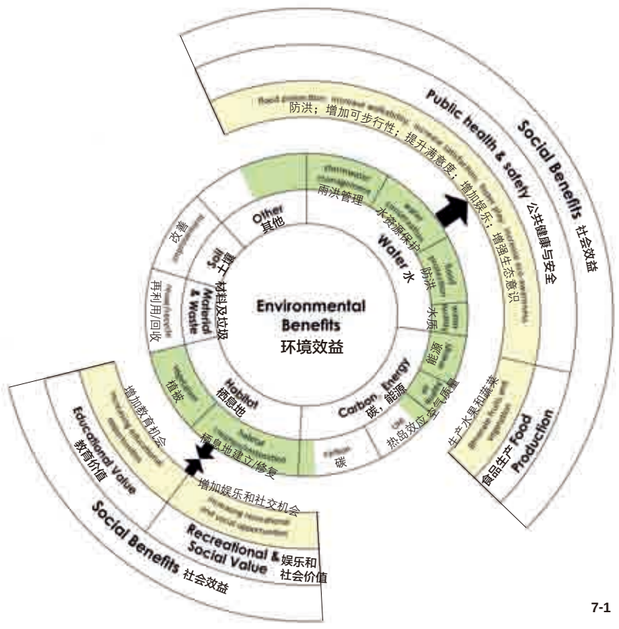
3.3.4 假设4：上述冲突因项目类型/规模、选址和原土地利用情况的不同而各异

（1）项目类型

图8显示了项目类型对融合和冲突关系的平均数影响的分析结果。我们根据LAF提供的项目类型对这些项目进行重新分类。蓝色列代表环境、经济和

6. 根据项目位置分类的效益构成
7. 环境、经济和社会效益的相互关系。

6. The benefit composition be influenced by project location
7. Interrelationship of environmental, economic and social benefits.



7-1

documentation. Additional efforts should be made to study the influence of various sustainable strategies on economic and social benefits. Further, future CSI program should include more projects located in rural areas, and projects that are either less than 1 acre or more than 100 acres.

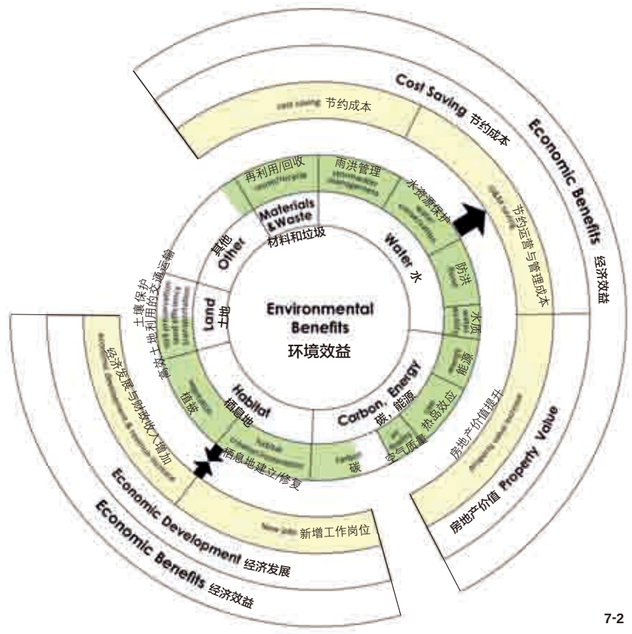
3.3 Testing Hypotheses

3.3.1 Hypothesis 1: certain social benefits will compromise various environmental benefits

The results of analyzing the relationship between social and environmental benefits are shown in Figure 7-1. The single arrow represents supportive relationships, and the opposite arrows represent conflicting relationships. The benefits' details and number of projects reporting the benefits are listed in Table 1. Among environmental benefits, water, part of carbon and energy, and part of other benefits contribute to generating several social benefits, such as flood protection, increasing walkability, increasing users' satisfaction, fostering play, increasing public's eco-awareness, and producing food. With regard to conflicts and tradeoffs between environmental and social benefits, we found some social benefits such as providing increasing recreational / social opportunities and providing increasing educational opportunities are very likely to increase autotrips, raise carbon emission and compact soil. As a result, plants and wildlife health would be hurt and several generated environmental benefits would be compromised. These benefits include increasing plant communities' ecological integrity, increasing the site's biodiversity, improving the site's ecological quality, and creating a variety of habitat types for native fauna and endangered species.

3.3.2 Hypothesis 2: certain economic benefits will negatively impact the natural environment and therefore sacrifice a number of environmental benefits

The results of analyzing the relationship between economic and environmental benefits are shown in Figure 7-2. Among the environmental benefits, materials reuse / recycle and waste reduction would help reduce construction costs, UHI mitigation and energy saving would help reduce electric bill and operation and



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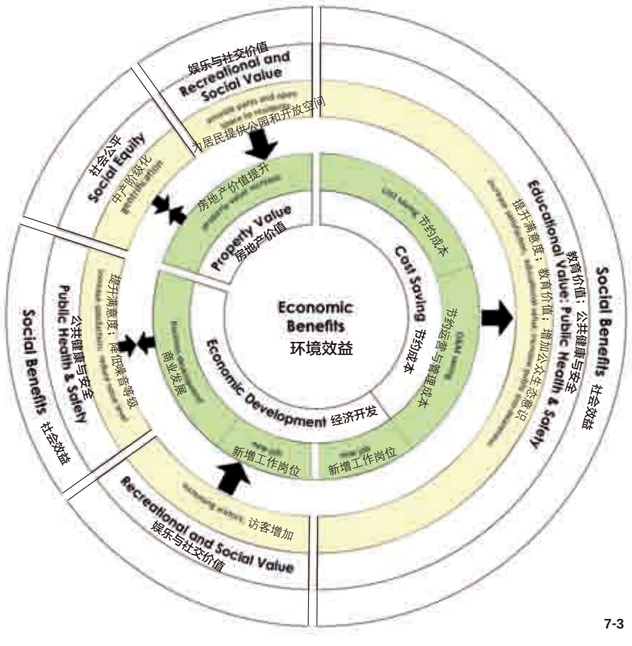


7-3

社会效益之间冲突关系的平均数，红色列代表它们之间融合关系的平均数。结果显示花园/植物园、自然保护区和河流恢复项目冲突关系的平均数最高。一些其他项目类型（比如社区、高尔夫球场、医疗设施和工业园区）完全不存在冲突。然而，我们并不能由此得出这些没有记录冲突关系的项目类型就可能不会出现冲突的结论，因为包括社区、高尔夫球场、公寓住宅、运动设施在内的部分项目类型的经济或社会效益并没有记录在案，这在一定程度上影响了冲突关系的分析结果。此外，经济和社会效益未被记录的原因可能是由于有些已产生的效益阻止了与之相冲突的利益的产生。

（2）选址

选址对于融合及冲突关系平均数的影响的分析结果如图9所示。它表明城镇项目中的冲突关系数量高于农村项目，城镇项目中的融合关系数量同样高于农村项目。相对于农村地区，城镇项目中的人类活动更为密集，从而更容易导致冲突关系。就具备更高数量的融合关系而言，这可能是因为在城镇地区，很多项目的所在场地已经被人类活动所干扰，所以这些再开发活动更倾向于改善自然环境，促进经济发展，同时造福人类。

（3）规模

就规模而言，我们发现面积小于0.8hm²的项目和面积大于445hm²的项目中的冲突关系数量最小（图10）。对此可能的原因是小项目通常是城市的补充项目，这些场地本身已经受到人类活动的严重干扰，所以人类活动并不被视为建造后的主要干扰因素。而就大项目而言，人类活动的影响可能会被这些地区的偌大面积所冲淡。

如上文所述，我们将这39个项目重新划分为5个规模不同的小组。图11展示了规模对冲突关系平均数的影响。结果表明面积为4~40hm²的项目中冲突最多。原因之一可能是在这个范围内，人类活动更为集中和频繁。

（4）建造前的土地利用情况

建造前的土地利用情况对冲突及融合关系平均数量影响的分析结果如图12所示。图中显示在运输和改造类土地的建造项目中，融合关系数量最多，而在绿地和公园的建造项目中，冲突关系数量最少。出乎我们意料之外的是，分析结果显示棕地或灰地[3]的建设项目中具有更多的融合关系以及更少的冲突关系，其原因可能是棕地和灰地的项目效益尚未被完全记录。

表1 2011年CSI计划编制的景观绩效效益调查表
Table 1 Landscape Performance Benefits Compiled from 2011 CSI Program

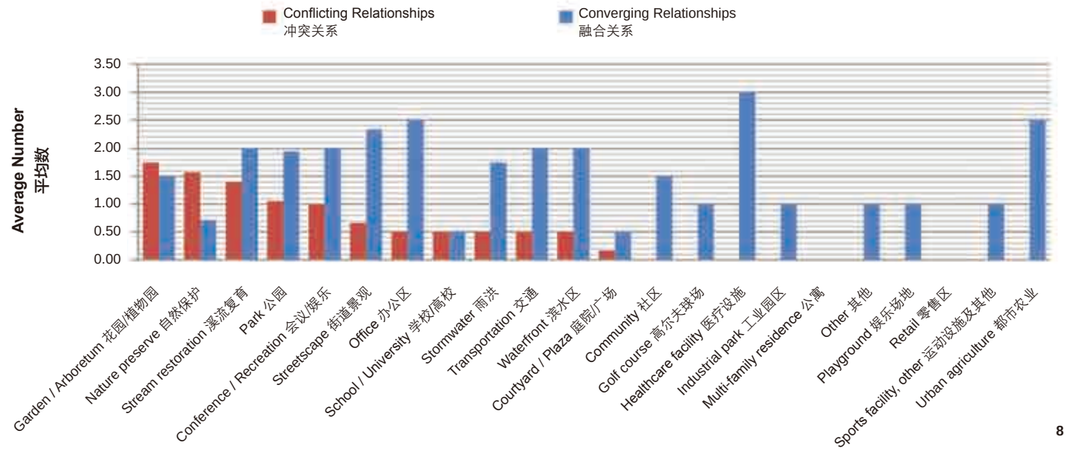
Environmental Benefits 环境效益		Number of projects 项目数量
Habitat 生境		
Habitat Preservation / Creation / Restoration 生境保护/创建/恢复	Restore and enhance native habitat / historical habitat 恢复和改善原生生境/历史生境	3
	Create a variety of habitat types for native fauna / for endangered species and rare species 为自然动物群/濒危物种/稀有物种创建各种生境类型	4
	Set aside habitat as wildlife preserve 在生境旁建立自然保护区	1
	Restore connectivity of corridor 恢复廊道连通性	1
	Restore and protect waterfront 恢复和保护滨水地区	1
	Restore piped stream to a more naturalized profile 以更自然化的方式恢复管道化的水流	1
	Increase number of local fauna and biodiversity 增加本地动物群数量和生物多样性	9
Vegetation 植被	Increase the ecological integrity of plant communities (Plant Stewardship Index) 增加植物群落的生态完整性（植物管理指数）	3
	Create meadow instead of lawn, improving ecological quality of the area 创建取代草坪的草地，提高地区生态质量	1
	Increase biodiversity of the site / create a variety of habitat types for native flora 增加地区生物多样性/为本土生物创造各种生境类型	6
	Add new trees / high rate of tree establishment 植树/高成林率	2
	Preserve existing trees / extend lifespan of trees 保护现存树木/延长树木寿命	2
Water 水源		
Stormwater Management 雨洪管理	Reduce runoff, peak discharge, flash flooding, and bank erosion 减少径流、洪峰流量、山洪暴发和河岸侵蚀	15
	Infiltrate stormwater to recharge groundwater 使雨水下渗，补充地下水	5
	Remove culverts and restore streams to improve the site's water conveyance capacity 拆除暗沟、恢复自然河流以提升地区输水能力	1
	Reduce impervious surface 减少非渗透性地表	5
	Reduce water velocities to reduce stream's shear stress / erosion force 降低流速以降低水流的剪应力/侵蚀力	1
Water Conservation 节水	Use drought-tolerant / native species to reduce irrigation water consumption 使用耐旱/本地物种以降低灌溉耗水量	7
	Restore native habitat to reduce water consumption 恢复原生生境以降低耗水量	1
	Use limited areas of irrigated landscape to reduce irrigation water consumption 限定灌溉景观的区域以降低灌溉耗水量	1
	Use water-conserving plumbing fixtures / low-flow irrigation system 使用节水型卫生设备/低流速灌溉系统	6
	Use rain water / reclaimed water / brackish water / recycled water for irrigation, landscaping, and toilets 使用雨水/中水/半盐水/循环水用于灌溉、景观和厕所用水	11
Water Quality 水质量	Reduce TSS, pollutants and nutrients entering water body 减少进入水体的总固体悬浮物、污染物、富营养物质	10
	Clean up polluted river water using biological processes / treat waste water in an onsite biomembrane reactor system 运用生物进程清理受污染河水/运用现场生物膜反应系统处理污水	2
Flood Protection 防洪	Provide flood protection for xxx-year event (for example, 200 year event), sustain flow rate, eliminate surface flooding 为xxx年一遇（比如200年一遇）的洪水提供防洪保护、维持流量、消减地面泛流	4
	Decrease upstream and downstream flooding 减少上下游洪水	1
	Eliminate flood-related restoration and clean-up demand 削减与洪水相关的修复和净化需求	1
	Decrease sub-watershed floodplain by increasing flood storage capacity 通过增强蓄洪能力减少支流的洪泛平原	1
Carbon, Energy 碳，能量		
UHI 城市热岛效应	Replace roof with the vegetated roof 用绿化屋顶替代屋顶	1
	Increase albedo by replacing the asphalt on the site with concrete permeable pavers 用混凝土透水砖替代沥青以增加反射率	2
	Reduce regional air temperature 降低区域气温	1
	Reduce surface temperature (roof) 降低地表温度（屋顶）	2
Air Quality 空气质量	Reduce emission (hydrocarbon, carbon monoxide, carbon dioxide, nitrogen oxides) 减少排放（包括碳氢化合物、CO、CO_2、氮氧化合物）	2
	Remove air pollutants (for example, small-particle) 清除空气污染物（比如小颗粒）	2
Energy 能源	Generate electricity via photovoltaic modules 通过光电组件发电	1
	Reduce building energy use 降低建筑物能源使用	1
	Improve microclimate (warmer in winter and cooler in summer) 改善微气候（冬暖夏凉）	1
Carbon 碳	Preserve trees by using decomposed-granite mulch instead of woodchip mulch 采用风化花岗岩面层替代木质面层，从而保护树木	1
	Replace motorized landscape equipment with hand weeding and prescribed burns 用人工除草和计划性焚烧替代机械化的景观设备	1
	Reduce carbon footprint / reduce carbon emission 减少碳足迹 / 减少碳排放	2
	Reduce auto trips/ increase bus and subway ridership 减少机动车出行 / 增加公共汽车和地铁的乘坐量	2
	Carbon sequestration 增加碳固定	11
Material, Waste 材料，废料		
Reuse and Recycle 再利用和回收	Reuse on site materials 场地材料的再利用	7
	Reuse materials from offsite (for example, old railroad ties) 异地材料的再利用（例如旧铁路轨枕）	1
	Recycle local-sourced materials (for example, concrete) 回收本地来源材料（例如混凝土）	1
	Recycle construction waste / eliminate waste 回收建筑废料/清除废料	2
Land 土地		
	Increase soil sequestration potential 增加土壤稳固潜力	1
	Treat contaminated soils 处理受污染土壤	1
	Regularly perform biological soil test and balance soil microorganisms to maintain healthy levels of nitrogen in soil 定期对生物土壤进行检测，并平衡土壤微生物以维持土壤含氮量达到健康水平	1
	Improve soil alkalinity 改善土壤碱性	1
Other 其他		
Other 其他	Increase open space 增加公共空间	1
	Reduce noise level 降低噪音等级	3
	Yield fruits and vegetables 产出水果和蔬菜	1
	Install combined sewer overflow interceptor to eliminate sewer discharge and reduce over flows 安装合流制截污装置，以减少污水排放和溢流	1
	Reduce long-term site maintenance cost by converting 6.6 acres of pavement and lawn to native landscape 将2.7hm²的人行道和草地改造为本土景观以降低长期的维护费用	1
	Reclaimed former university parking lot to create a viable Sonoran Desert landscape 将原有的大学停车场复垦为可自行生息衍替的索诺兰沙漠景观	1
	Reduce total area of building footprint 减少建筑占地总面积	1
Social Benefits 社会效益		
Recreational and Social Value 娱乐和社交价值	Receive increasing visitors 接纳越来越多的来访者	17
	Provide parks and open space to residents 为居住者提供公园和公共空间	7
Public Health and Safety 公众健康和安全	Increase residents' or employee's satisfaction 提升居住者或员工满意度	4
	Increase walkability 增加可步行性	5
	Provide flood protection 提供防洪保护	
	Reduce noise level 降低噪音等级	3
	Provide therapy to visitors 为访客提供医疗服务	3
	Foster playing 增加娱乐性	1
Educational Value 教育价值	Provide educational opportunities to increasing visitors 为不断增加的访客提供教育机会	12
	Increase public awareness / understanding of sustainable planning and design 提升公众对可持续规划和设计的意识/理解	
Food Production 食品生产	Generate fruits and vegetables 生产水果和蔬菜	1
Economic Benefits 经济效益		
Cost Saving 节约成本	Cost saving 节约成本	23
	O & M savings 节约运营成本	2
Property Value 房地产价值	Increase property value 提升房地产价值	5
Economy Development 经济发展	Increase economic development and revenue 推动经济发展和增加税收	8
	Revenue generation through new jobs 通过提供新工作岗位增加税收	8
Other 其他	Value provided by ecosystem 生态系统产生的价值	3

maintenance (O & M) costs, and air quality improvement, stormwater management, water conservation, flood protection, and water quality improvement would help raise property value.

On the other hand, several economic benefits (for example, economic development, revenue increase, and new job creation) would possibly increase local traffic, boost infrastructure construction, and exacerbate human disturbance. Resultantly, numerous environmental benefits would be sacrificed through reducing open space, impacting vegetation health, decreasing local and regional biodiversity, and degrading wildlife habitat.

3.3.3 Hypothesis 3: the relationship between social benefits and economic benefits is more converging than conflicting

The results of analyzing the relationship between economic and social benefits are shown in Figure 7-3. Social benefits and economic benefits are often closely associated. For example, economic benefits such as creating new jobs and saving construction and O & M costs normally would increase residents' satisfaction and benefit public health



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需要注意的是，由于CSI计划运行为时不久，可供我们进行此项研究的案例数量不多，使得统计结果——尤其是对假设4的检验——缺乏一定的可靠性。当有更多的CSI案例发表后，我们会将其添加到这一研究中来，以进一步检验这些假设。

4 结论

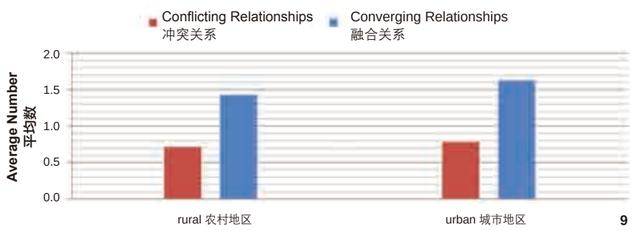
本文中，我们对39个发表于CSI的案例进行了分析，涉及项目组成、效益分类和效益间相互关系等研究。结果表明，由于人类活动的本质属性，环境、经济和社会效益之间存在不可避免的冲突。经济和社会效益之间的关系通常并不协调。我们建议未来的CSI计划致力于提供更多的时间、导则及有效的工具去记录经济和社会效益。此外，项目类型的构成并不均衡。有些项目类型仅包含一两个项目，从而对研究应具有的普遍性造成了局限。这包含社区、高尔夫球场、医疗保健设施、工业园区、公寓、交通、滨水区再开发及零售业项目。未来的CSI计划应对此类项目类型给于更多关注。同时，目前大部分项目的面积介于0.4~40hm^{2}之间，未来应更关注小于0.4hm^{2}和大于40hm^{2}的项目。对于建设之前的土地利用情况的研究结果表明棕地和灰地上的建设项目通常拥有更多的融合关系和更少的冲突关系。这一结果可能是由于这些项目的记录并不完全，加之项目数量有限所造成，在未来我们也应更多关注此类项目。

以可持续发展框架为基础，景观绩效从环境、经济和社会三个方面来记录景观效益。这三者相互影响，有时候相互冲突。如果不能透彻地理解它们的相互关系，设计师将难以缓和这些冲突、且无法提升彼此的相互依存性，而可持续发展将仅仅成为一个飘渺的目标。我们期望本文能够促使人们关注这三种效益之间的相互关系，由此未来的政策和景观发展可以促进效益的兼容性，降低冲突并有助于可持续发展。LAF

注释

① 中产阶级化：指一个原本聚集低收入人群的城市社区，逐渐迁入富有居民或商业人士，并抬升房价，最终取代原有低收入者的现象。

② 灰地用以描述那些经济衰退、失败、不景气或未充分利用的地产或土地。



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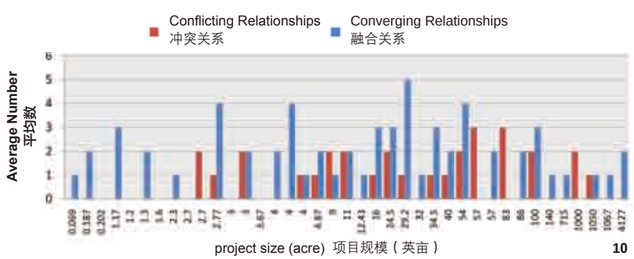

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and safety. Similarly, social benefits such as providing increasing recreational / social opportunities often increase revenue, create new jobs, and sometimes raise property value as well.

However, the interrelationships of economic and social benefits are not always converging. As shown in Figure 7-3, economic benefits such as affect business development, when growing to a certain extent, would affect social benefits (for example, reduced open space, degraded water / air quality, and increased noise level), and therefore decrease life quality, reduce residents' satisfaction and harm public health and safety. In addition, property value increase would possibly cause gentrification and impair social equity. For this reason, we could not confidently approve our hypothesis 3.

3.3.4 Hypothesis 4: the aforementioned conflicts vary by project type / size, location and original land uses

(1) Project type

Figure 8 shows our result of analyzing the influence of project type on the average numbers of converging and conflicting relationships. The reclassifying is based on project types provided by the LAF. The blue columns represent the average number of conflicting relationships among the three environmental, economic and social benefit categories, and the red columns represent the average number of converging relationships among them. The result shows that garden / arboretum, natural preserve, and stream restoration projects have the highest average number of conflicting relationships. Some other project types such as community, golf course, healthcare facility, and industrial park have no conflicting relationships at all. Nevertheless, we cannot conclude that the project types that have no conflicting relationship reported are less likely to create conflicts because several project types including community, golf course, multifamily residence, and sports facility have no economic or no social benefits documented, partially reducing the possibility of conflict. Further, the reason why economic and social benefits are not documented is possibly because some already generated benefits impede their generation, indicating a conflicting relationship.

(2) Location

The results of analyzing influence of location on the average numbers of converging and conflicting relationships are shown in Figure 9. It suggests the number of conflicting relationships in urban projects is higher than in rural projects, and the number of converging relationships in urban projects is also higher than in rural projects. Compared to rural areas, human activities in urban areas are more intensive, which are more likely to create conflicting relationships. As for the higher number of converging relationships, it is possibly because, in urban areas, many project sites were already disturbed by human activities, so the redevelopment tends to improve the natural environment, boost economic development and benefit human as well.

(3) Size

As for the sizes, we find the number of conflicting relationships is minimal in projects smaller than 2 acres and projects larger than 1,100 acres (Fig. 10). One possible explanation to this is the smaller projects are often urban refill projects where the sites were already badly disturbed by human activities, so human interaction after construction is not considered a major disturbance. In terms of the large projects, the areas probably dilute human activities' influence.

We reclassified the 39 projects into five size groups as mentioned before. Figure 11 shows the influence of size on the average number of conflicting relationships. It suggests projects ranging from 10 to 100 acres have the highest number of conflicts. One possible reason is people's activities in this size range are more concentrated and intensive.

(4) Land uses before construction

The results of analyzing the impact of Land Uses Before Construction on the average number of conflicting and converging relationships are shown in Figure 12. The figure suggests that the projects constructed on transportation and retrofit lands have the most number of converging relationships, and the projects constructed on greenfields and parks have the least number of conflicting relationships. This information is beyond our expectations, because generally, projects constructed on brownfield and greyfield② tend to have more converging relationships and less conflicting relationships. It is possible that

8. 项目类型与冲突及融合关系的平均数之间的关系
9. 选址与冲突及融合关系数量之间的关系
10. 规模与冲突及融合关系数量之间的关系

8. Relationship between project types and the average number of conflicting and converging relationships
9. Relationship between location and number of conflicts and compatibility relationships
10. Relationship between size and number of conflicts and compatibility relationships

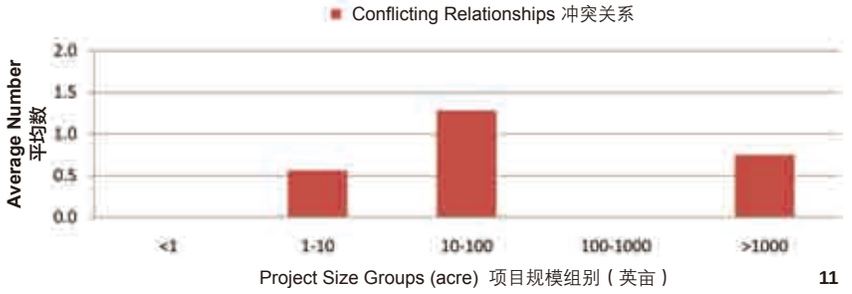
the benefits of projects constructed on brownfield and greyfield have not been fully recorded.

It needs to be noted that, since the CSI program is still new, the number of cases available for us to conduct this study is not big, which limits the statistical reliability of our results, especially for the test of hypothesis 4. As more CSI cases being published, we will add them to this study to further test the hypotheses.

4 Conclusions

In this study, we analyzed 39 published CSI case studies for project composition, benefit classification and interrelationships between the benefits. The results suggest that, because of the nature of human activities, there are unavoidable conflicts among environmental, economic and social benefits. Particularly, the relationships between economic and social benefits are not always converging. We recommend that future CSI programs make more efforts to document economic and social benefits by providing more time and guidelines and efficient tools. In addition, the composition of project types is not balanced. Some project types have only 1 or 2 projects studied, which limits the study's generalizability. Some examples include community, golf course, healthcare facilities, industrial park, multifamily, transportation, waterfront redevelopment, and retail projects. Future CSI program should give more attention to these project types. Meanwhile, more notices need to be paid to projects that are either smaller than 1 acre or larger than 100 acres, since currently most project sizes range between 1 ~ 100 acres. Our findings about land use before construction indicated that, generally, projects built on brownfield and greyfield tend to generate more compatible relationships and less conflicting relationships. We believe it could be because that the documentation of projects constructed on brownfield and greyfield is not complete, and the number of the projects is insufficient. In the future more study could be focused on these projects.

Built upon the framework of sustainability, landscape performance attempts to capture landscape benefits in the three environmental, economic and social categories. These three categories interact and sometimes conflict with each other. Without thoroughly understanding these interrelationships, designers would not be able to mitigate the conflicts and enhance the inter-dependencies, and sustainability will just be a vague goal. We expect an important contribution of the study is drawing people's attention to the relationships among the three categories of benefits, so that future policies and landscape developments will enhance compatible benefits, reduce conflicts and contribute toward sustainability. LAF



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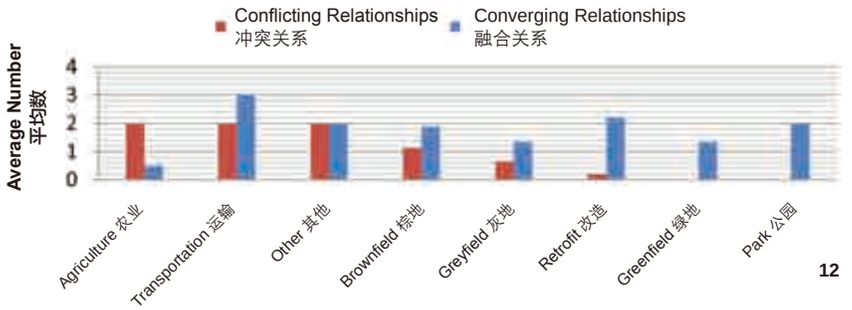

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11. 不同规模的组别与冲突数量之间的关系
12. 建造前土地利用情况与冲突及融合关系数量之间的关系

11. Relationship between size groups and number of conflicts relationships
12. Relationship between before land uses and number of conflicts and compatibility relationships

NOTES

① Gentrification is a shift in an urban community toward wealthier residents and / or businesses and increasing property values, sometimes to the detriment of the poorer residents of the community.

② Greyfield is a term used to describe economically obsolescent, failing, moribund and / or underused real estate assets or land.

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