让设计决策有章可循： 循证设计作为景观实践的方法论

AN EVIDENCE-BASED METHODOLOGY FOR LANDSCAPE DESIGN

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1 用于支撑方案的循证设计

景观设计项目往往需通过各类决策系统的层层完善和整合，才能得出平衡各方权益的综合性方案。为了使解决方案尽量少地受到各决策者主观喜好的影响，设计师需要更多的科学依据支撑自身的设计方案，而循证设计是一条可行的路径。

循证设计是一种“基于可靠研究成果制定建成环境决策的设计过程”^[1]。其不需要颠覆原有的决策制度，只是更加重视决策依据的科学性，包括发散性思考、设定设计愿景、关键问题搜寻和解决、确定度量衡、景观绩效预测、使用后评价及数据筛选、数据反馈7个步骤（图1）。其中，关键问题搜寻和解决是循证设计流程中的重点，也是针对项目特征提出的景观策略核心所在。

2 循证设计实践

在设计实践中，是否成功完成“关键问题搜寻和解决”直接决定了项目是否有据可循，以及能否在多方决策的设计过程中站稳脚跟。笔者以自身参与的两个代表性项目为例，试图从区域规划和公共空间设计层面进一步阐释景观设计项目的循证设计方法论，以及“关键问题搜寻和解决”的具体过程。

3 美国德克萨斯州大学城生态廊道规划

3.1 项目概况

美国德克萨斯大学城位于该州中东部的布拉索斯郡，也是德克萨斯农工大学主校区的所在地（图2）。大学城生态廊道规划项目是基于探索大学城北侧开发土地作为生态廊道的可能性的一项衍生性研究课题，旨在为整个大学城范围内的生态廊道规划提供依据。

3.2 关键问题确定

由于生态廊道是动物栖息和迁徙的通道，因而在生物多样性较高的区域之间建立廊道将有助于更加高效和精准地实现其服务于动物栖息和迁徙的功能，而生物多样性较高的区域范围可以通过研究动植物分布得到。由此，项目团队确定了设计的基本原则，即整个区域的生态廊道建设应基于生物的实际分布数据得出。继而提出了三个关键问题：1）如何打通当地目标生物物种的分布通道？2）如何规避已有城市开发区域的用地影响？3）如何对濒危物种进行重点保护？

3.3 解决策略

项目团队通过利用地理信息系统（GIS）对布拉索斯郡所在的德州中东平原生态区进行分析，发现该郡与城市生态廊道

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摘要

作为一种以科学研究为支撑的设计方法论，循证设计已逐步应用到建筑及景观设计领域，是一种基于可靠研究成果制定建筑环境决策的设计过程。本文对循证设计的概念和流程进行了阐述，并以美国德克萨斯州大学城生态廊道规划与上海杨浦大桥桥头公园设计两个实践项目为例，从区域规划和公共空间设计层面进一步说明了作为循证设计核心环节的“关键问题搜寻和解决”的具体内容，并总结了该方法论的优势与挑战。

关键词

循证设计；关键问题；设计决策；研究；景观设计实践

ABSTRACT

As a design method supported by scientific knowledge and findings, evidence-based design now is widely applied in the field of architectural and landscape design. This design process makes architects and landscape designers' decisions about built environment sound and reliable. Combining two practice cases — the Urban Ecological Corridor Planning of College Station of Texas, a regional planning project, and Landscape Design of the Yangpu Bridge Park in Shanghai, an urban public space project — this article illustrates the concept and process of key issue identification and response, a pivotal step in evidence-based design, and points out the challenges in related applications of this method.

KEY WORDS

Evidence-Based Design; Key Issues; Design Decisions; Research; Landscape Design Practice

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1. 景观项目中的循证设计路线图

1. Evidence-based design roadmap for landscape projects

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规划相关的用地类型主要包括农田、草地、开阔水域、湿地和森林5类。随后，项目团队选择了覆盖该5种用地类型的目标物种：两种濒危动物——秃鹰（*Haliaeetus leucocephalus*）和黑头雀（*Vireo atricapilla*）——和4种当地常见物种——美国獾（*Taxidea taxus*）、东部虎纹蝾螈（*Ambystoma tigrinum*）、灰白蝙蝠（*Myotis grisescens*）和北部蟋蛙（*Acris crepitans*）。项目借助美国地质调查局的盖普（GAP）数据分析库获取这些物种的空间分布数据，绘制出了大学城区域代表性动物分布图（图3）。

由于在生物多样性较高区域间建立廊道的可行性同时也会受城市实际建设基底的影响，因此项目团队从洪泛区、公园、绿道、河流、树冠（鸟类主要栖息地）、城市建设区6个层次对大学城范围内的土地利用情况进行分析，并通过权重叠加得到了可建设区分布图（图4）。在对物种分布图和可建设区分布图进行再次叠加后，生成了适宜建造生态

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廊道的区域规划图。该图反映了大学城的物种分布情况，并同时考虑了濒危物种、实际建设情况等因素，最后的规划图纸是基于数据推导和事实证据而生成的（图5）。

通过上述数据叠加分析，设计团队在图6中展示了大学城生态廊道未来的走向和衔接点，其中城市建设区内的廊道以红色标示。如图3所示，6种目标动物在城市集中建成区内几乎没有生存空间。因此，在该区域内规划生态廊道意在拓展物种生存空间，提高生态多样性，并促进周边物种与人类共享生存空间。如图5所示，场地边缘地带的生物多样性最丰富、生态环境最优越，在未来城市发展中应避免对其进行干扰。这些基于证据研究获得的结论将为未来的规划制定和决策提供重要参考。

4 上海杨浦大桥桥头公园设计

4.1 项目概况

上海杨浦大桥桥头公园位于黄浦江东

滨，场地原为物流园区，部分区域位于桥下，且与黄浦江歇浦路轮渡码头相连。由于场地的独特性质与区位，公园需兼顾滨水休憩、传承后工业文化、服务社区、衔接商业、生态修复等多重功能。方案在创作之初进行了证据收集和研究，并最终确定了6个关键问题暨设计目标。

4.2 关键问题确定

1）南北拼接：如何在纵向上无缝拼接黄浦江的滨江绿地系统（包括区段主题、景点序列、功能定位、贯通绿道等）？在设计中需要考虑通道位置设置、断点贯通策略、公园整体风貌定位、景观视觉体量等因素。

2）东西缝合：基于人步行两小时的距离测算（基本是日常步行可达的极限值），我们将场地服务半径定为9km，那么如何使场地与服务半径范围内的其他开放空间系统衔接，以及如何与交通接驳点、人行道、周边用地类型连接、协调与互补？在设计中需要重点考虑入口位置及路径设置、不同功能的

布置需求等。

3) 突显场所特征：该地块如何形成有别于其他滨江绿地节点的场所特征？基于场地特征分析，项目需要着重考虑如何实现场地与杨浦大桥体量巨大的桥墩的视觉衔接并优化视觉体验。

4) 创造宜人空间：如何在公园中让人舒适停留休闲并提高场地使用率？设计需要对环境噪音、光照、绿荫覆盖、景观视线等场地影响因素进行定量分析，由此为方案的重点空间布局提供支持性证据，并进一步为地形、密植位置、视线空间廊道，以及工业遗址基本格局等提供决策依据。

5) 可持续设计：如何修复这处后工业土地？设计主要通过对场地降雨量、生物栖息地状况等进行分析，来确定雨水花园策略、绿地分布，以及建筑垃圾再利用措施等。

6) 记忆重拾：如何在保留场地文化与记忆的同时，兼顾场地设计愿景中的土地利用方式？设计需考虑工业遗址的改造更新策略，由此保留和延续场所精神。

4.3 设计策略

项目团队首先基于实践经验和资料查阅，对囊括这6个问题的世界范围内的优秀案例进行了广泛研究，通过了解当地居民的休闲喜好，以确定在场地内提供的活动类型——需要指出的是，已有论文对居民喜好进行过调研和数据统计，实践者应学会借用这些已有的研究支持。通过提出关键问题、案例研究分析、项目策划这三个步骤，具体的设计策略得以确定（表1）。

在最终的设计方案中（图7），设计团队改造了位于场地西北角的歇浦路码头建筑，使其带动整个地块，并通过防汛墙退让提高了滨水空间的开放性，激活了桥下空间，同时解决了滨水空间断点贯通的问题。为了满足周边居民的使用需求，公园在南侧沿街设计了开放式入口和半私密小型花园，为南侧规划的未来商业区预留出便捷的入口和休憩环境，同时在西南角设计了引导性入口空间，以吸引南部居民进入公园。

基于雨洪分析，方案除了对防汛墙做了

退后处理，还沿江设置了梯级台地以扩大行洪截面。同时，在台地南侧设计了带状雨水花园，在公园雨水径流进入黄浦江前对其进行截留和净化，且对流入黄浦江的瞬时雨量 and 水质起到了一定的管控作用。方案还在场地中央设计了空中连廊，借鉴杨浦大桥桥墩的颜色和风格，创造出了与大桥和谐共融的景观构筑物系统；同时，架空的廊下空间还可以被布置为展览场所，赋予了这一连廊文化展览和观景休闲的双重功能。

基于噪音检测（图8），我们发现园区东北角的噪音最低，且此地现有建筑的体量对桥上的交通噪音也起到了直接的削弱作用，因此我们将儿童活动区安置在此，并基于对场地文化的保护进行了建筑改造，将屋顶拆除后形成了半开放的“盒子花园”，为儿童提供了充满趣味且安全的活动空间（图9）。而在噪音最严重的场地西侧区域则设计了高起的地形和密植空间，为内侧用于居民集会的小型开放广场提供了屏障。

此外，方案还考虑了加入码头文化元素来加深场所记忆、在桥下设置可以容纳多种活动的草坪和广场等景观空间、将东侧建筑改造为茶室作为收入来源以补贴公园养护成本……这些设计结果都是基于对关键问题的分析和解决。

5 讨论与结论

在循证设计的思路框架内，设计师对于具体空间形态的艺术创作并不会被循证过程所牵制；相反，基于证据研究得出的决策性结论可以在方案深化阶段为原始创作意图提供有力保护。在项目设计中得到的研究成果，也可以为其他相关设计提供证据支持。

虽然大多数项目仍面临着时间周期有限、使用后评价实施困难、数据共享存在瓶颈等挑战，但作为一种能够提供牢靠设计依据的科学方法，循证设计可以帮助设计师建立起强大的方案逻辑，而在这一逻辑下得出的设计能够平衡各方权益，也将更加符合场地需求。**LAF**

2. 大学城所在区位
2. Location of the College Station

1 Evidence-Based Design to Support Solutions

In landscape practice, design often needs to be refined and gets more and more integrated through various decision-making systems in order to give considerations to the interests of all parties. Evidence-based design offers a path to building up sound solutions informed and supported by scientific knowledge to minimize the impact of decision-makers' preference on design interventions.

Evidence-based design is "a process of basing decisions about the built environment on credible research to achieve the best possible outcomes."^[1] It does not mean to overturn current decision-making mechanisms or processes in landscape design; it highlights the scientific basis of decision-making. The process of evidence-based design includes seven steps: multi-dimensional thinking; envisioning; key issue identification and response; developing metrics and criterion; landscape performance prediction / assessment; post-occupancy evaluation and data screening;

and data feedback (Fig. 1), among which key issue identification and response is the core in the entire process and pivotal to developing site-based design strategies.

2 Application of Evidence-Based Design

In the decision-making process of evidence-based design, key issue identification and response directly determines the rationality and credibility of proposed solutions. Combining two real projects, this article demonstrates the application of evidence-based design methods in regional planning and public space design, particularly the step of key issue identification and response.

3 Urban Ecological Corridor Planning of College Station of Texas

3.1 Project Overview

College Station of Texas is located in Brazos County in the east-central part of the state where houses the main campus of Texas A & M University (Fig. 2). The

Flood Plain
洪泛区

权重
Weighted **20%**

Parks
公园

权重
Weighted **15%**

Greenways
绿道

权重
Weighted **15%**

River and Streams
河流

权重
Weighted **15%**

Tree Canopy
树冠

权重
Weighted **25%**

Impervious Landcover
不透水的土地覆被

权重
Weighted **10%**

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3. 6种动物在大学城的空间分布，及进行权重叠加后的综合分布图。
4. 6种用地类型在大学城的空间分布，及进行权重叠加后的建设适宜性分布图。
3. Spatial distributions of the six species in College Station, and the comprehensive suitability of their weighted overlay.
4. Spatial distributions of six land types in College Station, and the construction suitability of their weighted overlay.

ecological corridor planning for the College Station is a research subject derived from the study on the possible scenarios of land development on the north of the College Station as an ecological corridor, which would also offer references for the ecological corridor network planning of the entire College Station area.

3.2 Key Issue Identification

Since ecological corridors are crucial for wild flora and fauna inhabitation and migration, establishing eco-corridors to link the regions of high biodiversity (which can be identified through species distribution survey) would help increase their ecological performance as habitats and migration corridors. Therefore, the primary basis for this design lies in the actual species distribution data of the whole region. Then three key questions are put forward: 1) how to establish an eco-corridor that links the areas of local target species? 2) how to minimize the development impact of built-up urban areas? and, 3) how to protect the endangered species in the project site?

3.3 Strategy Development Process

By using geographic information system (GIS), the project team investigated the eco-regions throughout the East Central Texas Plain and found that, in Brazos County, urban eco-corridor mainly involves five land typologies: agricultural land, grassland, open water bodies, wetland, and forest. Two endangered species — Bald Eagle (*Haliaeetus leucocephalus*) and Black-headed Vireo (*Vireo atricapilla*) — and four commonly-seen native species — American Badger (*Taxidea taxus*), Eastern Tiger Salamander (*Ambystoma tigrinum*), Hoary Bat (*Myotis grisescens*), and Northern Cricket Frog (*Acris crepitans*) — are identified as target wildlife species that are observed in all five land typologies. Related species distribution data were obtained from National GAP Analysis Program of the United States Geological Survey, informing the species mapping in the project area (Fig. 3).

The feasibility of eco-corridor establishment is also impacted by urban construction. A potential construction map of the College Station region is generated by

Legend 图例
Not Suitable 不适宜
Not Very Suitable 较不适宜
Suitable 适宜
Most Suitable 最适宜

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4-2

analyzing and weighting six typological layers — flood plain areas, parks, greenways, rivers, canopies (as bird habitats), and built-up urban areas (Fig. 4). By overlapping the species distribution with the potential construction areas, the suitable locations for implementing eco-corridors in the region were finally identified. The resulting plan reveals the distribution of target species, while taking a particular consideration on the protection of endangered species and existing built-up settings. The process exactly demonstrates an evidence-based design and deduction method (Fig. 5).

By information overlapping and data weighting, the direction and nodes of the regional eco-corridor network were also identified (Fig. 6). The corridors that locate in or across urban areas are presented in red. As shown in Figure 3, the existing intensively urbanized areas provide few habitats for the six target species. The planning of regional ecological corridor in College Station shed a light on creating more wildlife habitats, increasing biodiversity, and harmonizing human settlements with natural habitats. Figure 5 reveals that the fringe areas of the College Station see a higher biodiversity and a greener environment, where the impact of human construction should be minimized in future urban development. This evidence-based research is expected to provide reference for the decision-making process of similar planning projects.

4 Landscape Design of the Yangpu Bridge Park in Shanghai

4.1 Project Overview

The Yangpu Bridge Park is located on eastern bank of Huangpu River, Shanghai. Once occupied as a logistics campus, the site lies partly beneath the Huangpu Bridge and spans to the Ferry Terminal on Xiepu Road. This unique physical setting and industrial history makes the site envisioned

- 5. 大学城生态廊道规划图，展示了廊道适宜性的空间分布。
- 6. 大学城的主要生态游径和潜在生态廊道。
- 5. College Station ecological corridor planning showing the distribution of suitability for ecological corridors.
- 6. The main ecological trail and potential corridors of the College Station.

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as an urban park of multiple services, including waterfront recreation, nostalgia of post-industrial culture, community health, commercial-use integration, and ecological restoration. Through relevant research and evidence collection, six key issues were identified as design objectives.

4.2 Key Issue Identification

1) To create a north-south green riverfront: How to seamlessly splice the fragmented green space of the riverfront area, while developing scenarios of varied sections, spatial layout, functional planning, and greenway reconnection strategies? The

表1：设计决策制定过程
Table 1: The Process of Developing Design Strategies

关键问题 Key Issues		案例研究分析 Case Study Analysis	项目策划 Programming
南北拼接 To create a north-south green riverfront	以都市滨水生活为主题； 衔接沿江慢行系统； 衔接其他城市绿道系统 Create a park as an urban waterfront destination; Link pedestrian systems along the riverfront; Link other greenway systems	衔接上下游城市开发地块 Link up various built-up urbanized areas in up- and down-stream districts along the Huangpu River	对场地活动内容设定不同主题； 设立观光眺望平台 Define and organize different themes for each part on the site; Build a sightseeing platform
东西缝合 To build an east-west pedestrian network	创造滨水景观节点； 设置便捷的入口，提高可达性； 用地类型规划对应的未来人群使用特征 Create landscape nodes along the riverfront; Add accesses or shortcuts to increase accessibility; Optimize land uses for projected demands	水岸活动策划 Program waterfront activities	提供户外用餐空间； 在办公区域附近创建休憩空间 Provide outdoor space for lunch; Create leisure space close to office buildings
突显场所特征 To reshape place identity	突显码头渡口建筑特色； 借鉴大桥桥墩的颜色和质感 Celebrate architectural identity of piers on the site; Adopt the color palette and characteristics of the piers	延展场地特征构筑物质感 Continue the characteristics of existing constructs	辨识性强及多功能的渡口建筑 Create a strong identity and mixed-use buildings
创造宜人空间 To create a comfortable urban destination	降低噪音； 提升江景美学价值； 遮荫的植物及构筑物； 大桥的尺度感弱化； 人工照明设施亮度宜人 Reduce noise; Improve the aesthetic value of the riverfront landscape; Provide shade with trees and shelters; Reduce the visual impact of the bridge; Create comfortable lighting	亲水休憩设施； 具有防汛功能的景观 Build waterfront recreational facilities; Control flood through landscape elements	安全的儿童活动场所； 充足的市民活动空间； 沿路布置的林荫道； 阅读场所； 社交场所； 节庆场所； 无障碍设施； 临水座椅； 户外电影院 Create safe space for children's activities; Provide space for citizens' activities; Provide tree-canopies along riverfront boulevards; Create reading space; Create social space; Create places for festivals or ceremonies; Create barrier-free facilities; Create seatings facing the water; Create a place to accommodate outdoor film activities
可持续设计 To improve sustainable design	控制雨洪径流，提升水质； 将场地的部分不透水地表改造为透水地表； 植被及生态栖息地恢复 Control runoff and improve water quality; Replace part of the existing impermeable surfaces with permeable pavements; Restore the plants and habitats	提高场地韧性； 丰富岸线空间； 改造滨水驳岸 Increase resilience; Enrich waterfront landscapes; Replace the existing hard revetments with soft eco-revetments	/
记忆重拾 To refresh industrial memory	保留码头记忆及工业元素，使两岸主题呼应 Reserve the memory of the pier The themes of the side banks are echo with each other	改造及再利用现有构筑物设施； 延续历史和回忆 Rebuild and reuse of the existing constructs; Celebrate the site's industrial history and memory	创建历史文化展示空间 Create an exhibition place for various cultural events

design is expected to position paths and passages, re-link fragments and open up dean ends, and define landscape style and visual effects.

2) To build an east-west pedestrian network: The park is expected to serve its surrounding communities in a two-

hour walking distance (9 km, the longest daily walking distance a person can stand recorded). The design then needs to consider how to connect with other open space systems to form a continuous pedestrian network, and how to integrate with traffic interchange hubs, sidewalks,

and various land use typologies? The design also needs to optimize access locations and circulations and reorganize spatial and functional layout to serve different uses.

3) To reshape place identity: How to make the site distinctive from other riverfront landscapes? Based on site investigation, one

of the primary objectives in this design is to optimize visual connection and experience between the dynamic, green riverfront and the massive, concrete piers.

4) To create a comfortable urban destination: How to create a comfortable landscape where people love to stay and enjoy themselves, instead of passing through? And, how to improve the usage of the site? It is necessary to quantify the factors that impact visitors experience on the site such as noise, light, canopies, shade, landscape views, etc. (Fig. 6), to inform spatial layout of key landscape elements and programs, which would further support related decisions on terrain, planting design, spatial design, and industrial heritage protection.

5) To improve sustainable design: How to restore this post-industrial land into an urban oasis? By analyzing rainfalls, and wildlife habitats of the site, the design integrates a variety of sustainable designs through rainwater gardens, green infrastructures, and reuse of construction waste.

6) To refresh industrial memory: How to take consideration on recalling the past industrial glory of the site while meeting the current and future demands? In the design, strategies for industrial heritage revitalization and renewal should be carefully developed to accommodate various programs and celebrate the spirit of the place.

4.3 Design Strategies

By case studying on worldwide projects that well responded the above issues and extensively synthesizing recorded evidences and knowledge of people’s recreational activities in landscapes, the project team programed the site according to citizens’ leisure and recreational preferences. Through key issue identification, case studies, and programming, a series of design strategies were defined in details (Table 1).

In the final design (Fig. 7), the existing architectural structures in the northwest were transformed and reused as a register to reactivate the site. Waterfront space was re-qualified by retreating the existing flood control walls, widening riverfront landscape areas, revitalizing the passage under the bridge, and linking up fragmented landscape nodes. The park provides an inviting entrance and a series of small semi-private gardens along the boulevard on the south side, introduces a short-cut and a recreational place for the users from the planned business district on the south, and opens an access at the southwest corner to invite the residents of surrounding neighborhoods.

To control on-site runoff and to improve

7. 场地噪音测量分析

8. 杨浦大桥桥头公园总平面图

9. 公园东北角由旧建筑改造的“盒子花园”。
7. Measurement and analysis of noise on the site

8. Master plan of the Yangpu Bridge Park

9. The "box garden" renovated from the old building at the northeast corner of the park.

the water quality, the design introduced a terraced cascade parallel to the river course, as well as a linear rain water garden in the south of the cascade, for rain water detention and infiltration before it drains into Huangpu River. The design created an elevated walkway in the center of the site that adopted the same color palette and architectural style of the piers of Yangpu Bridge. The space under this landscape structure can also be used for exhibition events.

Through an on-site noise analysis (Fig. 8), it was found that the northeast area has the lowest noise impact, where the existing large constructs also help barrier the traffic noise on the bridge. The design set a children playground in this area by renovating the constructs into a

semi-open “box garden,” which reflects the site’s industrial history and provides a safe place for children’s activities (Fig. 9). In the noisiest area on the west side, traffic noise can be reduced through a landform reshape and a densely planted forest, forming a barrier for visitors’ social and recreational activities in the small gathering open spaces.

The process of key issue identification and response also provided solid evidences for other design decisions, including overlapping historic elements echoing its pier culture, creating open lawns and squares under the bridge that can be used for diverse programs, transforming the existing building in the east into a teahouse to increase the park’s income to cover its maintenance cost, etc.

5 Discussion and Conclusion

The framework and the process of evidence-based design would not confine designers’ spatial creativity; instead, it can strongly support the decision-making and implementation of their envisioned plans with solid scientific knowledge and findings. Research results generated or synthesized in one project can also be used as a scientific source for others relevant designs.

In reality, urban and landscape designers often face challenges such as limited time period for plan developing, lack of post-occupancy evaluation, and difficulties in data sharing. Evidence-based design can help designers establish a strong, reliable decision-making process with solid evidences through scientific methods. The resultant plans would be designed as a whole that cover the interests of all stakeholders and meet more different kinds of specific needs and requirements of the site at the greatest extent. **LAF**

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