

# 多效益基础设施：以洛杉矶河总体规划为例

## Multi-benefit Infrastructure: A Case Study of the LA River Master Plan

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文章编号: 1000-0283(2023)03-0029-10

DOI: 10. 12193 / j. laing. 2023. 03. 0029. 004

中图分类号: TU986

文献标志码: A

收稿日期: 2022-12-19

修回日期: 2023-02-07

### 摘 要

在过去的35年里,关于洛杉矶河的重新构想和未来发展方向存在着争论。该议题的关键在于激发一种河流与沿河公众更为全面和真实的关系,深刻理解城市发展、生态修复和基础设施之间复杂的关联性,以多效益思维重新认知基础设施的多元价值。全长约82 km的洛杉矶河提供了城市区域尺度上的机遇。相较于封闭的基础设施或单一的自然化景观,《洛杉矶河总体规划》旨在创造一种新的编排和框架,通过与环境相适应的策略支持生态系统和社区发展,具体体现在三个方面:环境研究、基于数据的方法和多效益策略。研究的关键是将城市和河流的综合信息转化为数据集的统一格式,即“河流标尺系统”,其整合了生态、水文、水力和建成环境的实际条件。规划提出“多效益基础设施”的概念,涵盖了河流与城市在自然、社会和文化层面的多重关系,探讨了基础设施未来的发展方向,为大型城市河流及滨水社区和城市公共空间的整体规划研究提供了新的视角,以及兼具创新性和实操性的策略和方法。

### 关键词

多效益基础设施;洪水风险管理;社区更替;社区参与;基于数据的方法;河流标尺系统;环境负担

### Abstract

Over the past three and a half decades, a debate has existed about the future of the LA River. Is it infrastructure, or will it be a “natural” river ever again? The Los Angeles County LA River Master Plan explored this question through multiple years of technical research, a data-based methodology for understanding community needs, and a community engagement process. From the data-based methodology of the LA River Master Plan, it is clear that focusing on multi-benefit infrastructure is critical for the Los Angeles River and that the community and urban connections to the river cannot be ignored in the river’s reimagination. Adopted in June 2022, the Master Plan suggests several strategies for multi-benefit infrastructure that focus on community needs, uniting ecological, social, and hydrological realities. The relationship between communities and the river studied during the LA River Master Plan is described in this essay. Flowing 51 miles through one of the most famous metropolises of the world, the LA River is bordered by some of the most expensive real estates in the United States, and despite LA’s fame as a sprawling city, communities along the river are crowded, and land is in short supply. Along the Lower LA River, communities rank in the worst 10% of environmentally burdened cities in the State of California, and many communities have less than 1 acre of open space per thousand people. For the last century, the LA River has been seen as “infrastructure”, a mostly concrete, engineered channel to move water to the Pacific Ocean as quickly as possible during large storm events, which can stack off the Pacific and pour large amounts of rain across the 830-square-mile watershed. A dream of a fully “naturalized” river is largely incompatible with contemporary Los Angeles. Those who hold fast to an extreme image of a fully “restored” natural system can mislead the public. The river has gone through many evolutions and exists now as a distinct cultural landscape. We have to reconsider what an “urban river” can and should be. This is not about rejecting the idea of nature in the city or denying a river a connection to its “natural” past. The LA River Master Plan is about embracing a new permutation that supports ecosystems and communities through strategies that align with the context. Complexity exists between urban development, ecology, and infrastructure. Landscape architects can accept this challenge to design a better urban relationship between our ecological and social systems. The LA River offers this opportunity on a grand scale of public space, with over 1 million people within 1 mile of the 51-mile channel and over 4 million people in the relatively small watershed. The LA River is likely to be a centerpiece for ever-increasing density and urban connections for generations to come. While the endless debate between infrastructure and nature goes on, generations of children grow up without parks, with poor air quality, without space to exercise, and without ecological function in the neighborhood. It’s time to accept complexity and be creative as designers, recognizing that the LA River and the city can co-exist.

### Keywords

multi-benefit infrastructure; flood risk management; community displacement; community engagement; data-based methodology; river ruler system; environmental burden

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“对于环境的想象和实践是复杂的遗产，生活在今天的每一个人都有意无意地决定着如何应对，如今，关于自然的简单观念已经一去不复返。”——杰迪迪亚·珀迪<sup>[1]</sup>

洛杉矶河发源于海拔2 133 m的圣加布里埃尔山脉流域中的制高点，数代洛杉矶人都认为该河水量充沛。事实上，这条河在大多数时候已经干涸，仅有个别区段尚有浅表的水流淌在河道中间的低流量渠道（图1）。要了解洛杉矶河，必须在下雨时来到河边，感受来自2 160 km<sup>2</sup>的山脉和城市建成环境的降水汇入这条82 km长的河流。这里在过去的几十年间没有严重风暴，洛杉矶河作为城市生活乏善可陈的背景，逐渐消隐。渠化且铺满了混凝土的洛杉矶河更像是“基础设施”而非“河流”。但倘若雨天前往河边，就会明白为什么设计师用混凝土包裹着整条河流，将其驳岸硬化，并将河道固化。褐色而浑浊的水从周边的山脉奔流直抵洛杉矶市及其他城市所在的洛杉矶平原（图2）。河道会在数小时甚至数分钟内发生改变，渠道很快被水填满，由干涸的河床变成危险洪流。设计师在20世纪30年代利用混凝土将水更快地排入海洋，以确保河流泛洪区内居民的生命和财产安全。如今，洛杉矶河河道是城市雨洪管理基础设施的支柱，当雨水开始下降时，数百万人需要依赖它。然而，关于洛杉矶河的未来存在着争论：它仅仅是基础设施，还是会再次成为“自然”的河流？

为了从水、人和环境的角度研究洛杉矶河，由欧林事务所（OLIN）和盖里建筑事务所（Gehry Partners）领衔的团队配合洛杉矶县于2016年开始更新洛杉矶河总体规划，其范围涵盖全部的82 km长的河流及周边区域。总体规划的核心是在过程中将社区作为基本，通过一种目标驱动的、基于数据的方法

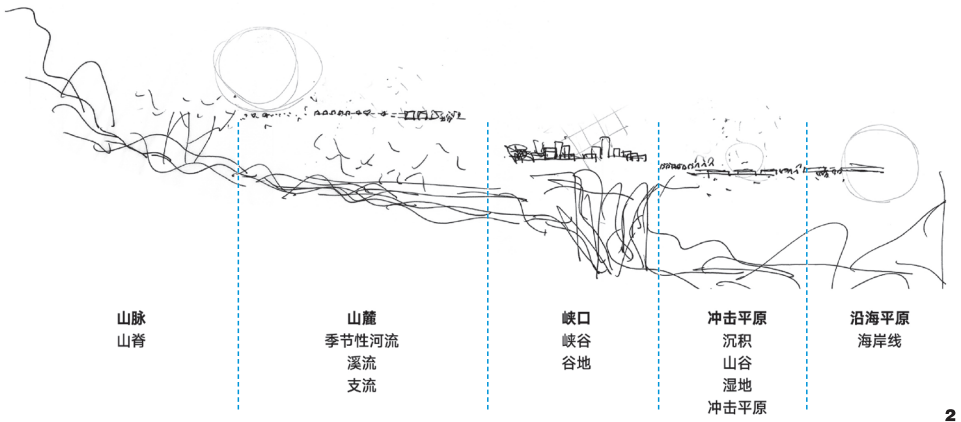


图1 洛杉矶河在枯水期和汛期水位对比  
Fig. 1 Comparison of water levels of the LA River during dry and flood seasons

图2 从圣费尔南多谷至太平洋的横断面示意  
Fig. 2 The transect of the river from San Fernando Valley to the Pacific Ocean

来考虑与河流相邻的社区的需求和机遇，并创造性地首次提出将数据集和全长82 km的河流紧密结合，形成一个综合性的整体，即“河流标尺系统”（River Ruler System）。该研究包括对于水力和水文的深入研究，以检验河流策略在技术上的可行性，这些策略主要致力于实现改善生态系统功能和自然服务功

效、加强城市公共空间的可达性、增强住房负担能力并帮助无家可归者、使社区参与继续教育、提升水源供给能力及质量，以及强化洪水风险管理等多效益目标。本研究采用的视角、策略和方法将为城市河流及其周边城市空间的整体规划和设计提供具有创新价值的理念与方法。



## 1 洛杉矶河与城市的关系

### 1.1 洛杉矶河河道与邻近社区

尽管洛杉矶河在雨洪管理方面发挥着重要作用, 但其在全球范围的知名度或许来自于流行文化。洛杉矶河流经市中心, 电影、音乐视频和艺术活动经常在此取景。然而, 很多人缺乏对于该河及其沿岸复杂情况的了解, 包括不同区域是如何受到上游条件的影响, 以及下游条件是如何受到人类活动的影响(图3)。对于相关复杂背景的理解是重新设计洛杉矶河的基础, 因此, 洛杉矶河总体规划研究的一个关键组成部分是帮助社区理解自身与河流的关系, 即一个更大的生态和水利系统。

洛杉矶河发源于圣费尔南多谷的西部边缘地带, 流向长滩并在那里汇入太平洋。该河流经居住区、工业区、商业区, 以及公园和开放空间, 其中包括洛杉矶一些最值得被关注的公园, 如塞普尔维达盆地和格里菲斯公园(图4)。洛杉矶河廊道是人们生活、工作和娱乐的场所。步行和骑行是洛杉矶河游径上的主要活动, 沿河的一些地方还有骑马的游径, 现有自行车道和多用途小径提供了整个河道(82 km)的51 km的通道(图5)。河道的通行权范围(right-of-way)内有9.3 km<sup>2</sup>的土地<sup>[2]</sup>。考虑到洛杉矶县的人口密度以及对于开放空间的需求, 这一空间存量实在不容小觑。距离洛杉矶河直线距离1.6 km范围内有17个城市, 而沿河廊道的14个社区中有12个无法达到洛杉矶县为每1 000位居民提供约16 200 m<sup>2</sup>面积公园的目标<sup>[3]</sup>, 因此洛杉矶河沿岸尚未被开发的开放空间将有潜力改善人均公园面积的条件。尽管如此, 这条河流依然很难被发现, 特别是难以从城市街区进入, 沿河的许多地区缺乏绿阴和公共设施, 使得一些社区无法从河流廊道提供的公共空间中获益。

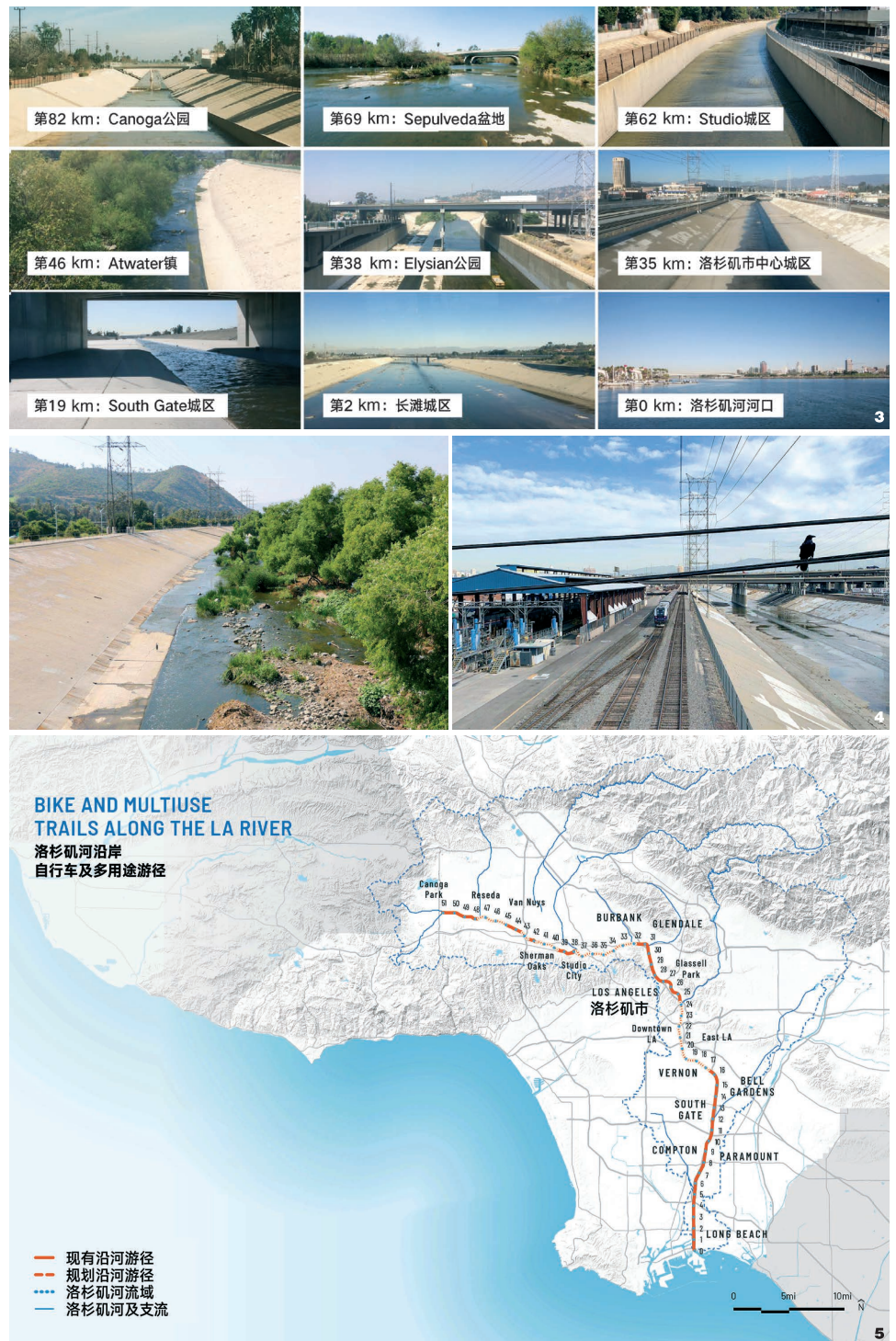


图3 洛杉矶河沿岸宽度各异的复杂地形  
Fig. 3 Complex terrain with different widths along the LA River

图4 洛杉矶河流经的多种类型的城市环境  
Fig. 4 The LA River flows through various types of urban environments

图5 现有自行车道和多用途小径通往河流的通道  
Fig. 5 Existing bikeways and multiuse trails provide access to rivers



图6 洛杉矶河沿岸警告游客可能发生山洪暴发的警示牌  
Fig. 6 Signage along the LA River warns visitors of the potential for flash floods

## 1.2 洛杉矶河河道与社区人口

一些沿河的社区已经见证了洛杉矶河在过去半个世纪的显著改变。如今，洛杉矶县的半数居民是西班牙和拉丁族裔，且人口非常多样化<sup>[4]</sup>。虽然洛杉矶县的一些地区较为富裕，但整体情况并不都像好莱坞那般夺目。家庭收入减少的同时，住房成本却在增加。租金不断增长，自2000年以来租金占收入的平均份额从28%增加到34%，致使大约1/3的租户成为租金负担过重的群体<sup>[5]</sup>。洛杉矶县正面临住房危机，特别是在经济适用房方面。目前经济适用房短缺数量达50万套<sup>[6]</sup>，而洛杉矶县的无家可归人数为6.6万人<sup>[7]</sup>。洛杉矶县存在显著的社会和经济差异，因此在对洛杉矶河的重新构想中，对于公平和住房的考虑变得尤为关键，相关内容已成为2022年洛杉矶河总体规划中的重要部分。

## 2 洪涝的实际情况

对于洛杉矶河的重新构想和洛杉矶河总体规划的更新需要将社会、公园、生态系统

与沿河公共安全和洪水风险的实际情况相结合（图6）。鲜有人记得洛杉矶河丰水时的情形，笔者在参与由洛杉矶县公共建设局领衔的洛杉矶河总体规划时，发现仅有6%的人见过河流满负荷的情形<sup>[2]</sup>。由于大型风暴出现的间隔时间不同，许多居住在河边的人并不知道与洪水相关的风险。2016年，美国陆军工程兵团发表的研究表明，在百年一遇的洪水发生时，沿河将会增加多达3 000个面临洪水泛滥风险的地块<sup>[8]</sup>。在美国，联邦应急管理局根据相关研究更新洪水地图，一旦达到相应的洪水风险水平，则要求生活在该区域的家庭购买洪水保险。这一信息引起了居民的关注，部分居民担心保险费用，希望看到洛杉矶河的河道得到改善，从而提高环境抵抗洪水风险的水平。

事实上，洛杉矶河在历史上曾频发洪水，在圣费尔南多谷和洛杉矶城以南的洛杉矶平原蜿蜒流淌，为社区招致不少麻烦，甚至是在洛杉矶城人口变密集前，以及圣费尔南多谷的卡诺加公园等地区被吞并之前就已如此<sup>[9]</sup>。1922年，《河滨日报》在圣费尔南多谷的一篇文章中引用了几位居民对河流的不可预测性表示失望<sup>[10]</sup>。“头天我们的高中还在河岸边，等第二天的时候已经不见踪影”，一位受访者说，“也许是流经我家前院，也许是流经城镇的另一端”。文末表达了居民希望看到该河被渠化的诉求：“会议最终通过一项请愿书，要求洛杉矶市建造堤坝和挡土墙，以竭力解决河流不受控制的局面。”2023年初，太平洋大气流导致的暴雨使加利福尼亚州被淹。虽然洛杉矶没有迎来与北部地区相同程度的降雨量，但这场覆盖全州的降雨提醒人

们，暴雨确实会发生，并可能对整个州造成严重破坏。

尽管如此，洛杉矶河在历史上一直是重要的区域资源。正如许多全球性城市，洛杉矶的区位很大程度上取决于河流可靠的全年流量。从Tongva原住民开始，其Yaanga聚落的选址就靠近今天的市中心。随着水被基岩推至地表，洛杉矶城就依靠这些自然资源发展起来<sup>[11]</sup>。直到1913年开通引水渠前，洛杉矶河始终为该市提供主要的水源。到20世纪早期，对于愈发靠近河岸生活的洛杉矶居民来说，洛杉矶河问题频发。20世纪初发生了一系列的洪水，以1938年破纪录的洪水告终，河流的最终命运是被美国陆军工程兵团进行渠化和混凝土化。在许多洛杉矶人眼中，曾经至关重要的河流就此变成了一个露天水渠<sup>[12]</sup>。了解洪水的实际情况对于从区域的视角展望洛杉矶河的未来至关重要，这些现实条件直接影响着更新后的洛杉矶河总体规划。

## 3 洛杉矶河的多重愿景

### 3.1 近年来的洛杉矶河规划

从1985年开始，由麦克亚当斯（Lewis MacAdams）领导的洛杉矶河之友（Friends of the Los Angeles River）试图唤起人们对这条被忽视的河流的关注。1996年，洛杉矶县完成了洛杉矶河全部82 km的总体规划<sup>[13]</sup>；2007年，洛杉矶市完成了市区段的总体振兴规划<sup>[14]</sup>；2017年，完成了下游段的振兴计划<sup>[15]</sup>；2020年，完成了上游段和支流的规划<sup>[16]</sup>；2022年，洛杉矶县更新了洛杉矶河全部82 km的总体规划<sup>①</sup>。每一项规划都伴随着社区层面的规划，诸多相关研究都希望洛杉矶河能够获得

① 欧林事务所参与的洛杉矶河项目是作为由River LA非盈利组织、盖里事务所、欧林事务所和Geosyntec工程咨询公司于2014年共同发起的一项公益计划的一部分。2016年，这项工作发展为洛杉矶河索引，这是一个受到资助的基于网络的工具，用于可视化82 km洛杉矶河沿岸数据。2018年，洛杉矶县公共建设局着手根据原型化自索引阶段的基于数据的方法更新1996年洛杉矶河总体规划。洛杉矶河总体规划于2022年6月获得通过，可于LARiverMasterPlan.org在线获取。



关注, 并共同指向一种多效益的工程, 探讨如何使社区和生态与河流建立更好的关系。很多人希望通过植被将洛杉矶河“自然化”, 去除混凝土并在水文上与泛洪区重连。然而, 由于19世纪晚期及20世纪的开发活动已经非常接近河床, 洛杉矶河的规划十分复杂, 很难做出任何决定。一些规划文件强化了错误概念, 即认为自然化一条河流是“轻易”的, 就好像只需要移除河道表面的混凝土一样。但这仅仅是空间层面和社会层面复杂过程中的一个步骤。例如, 移除混凝土会增加河道的摩擦力, 降低流速, 因而有必要加宽渠道以在暴雨期间输送相同的流量。要拓宽河道并将之与82 km的泛洪区重连将需要动迁沿河定居的数万人<sup>[2]</sup>, 更不必说重要的基础设施和文化遗址。也许对于绝大多数洛杉矶人来说, 增加洪水风险或者动迁社区并非明智的选择, 特别是考虑到洛杉矶地区当前的住房危机。洛杉矶县公共建设局局长在2022年接受纽约时报的采访时指出: “数百万人根本无法从河谷迁出, 也不会离开他们的滨河家园。同时, 也无法迁走那些沿河的铁轨和高压电线。河道在绝大多数时候是干涸的, 但在降水集中的少数时间里, 河渠将发挥重要作用。”<sup>[17]</sup> 考虑到需要平衡社会、水文和生态的综合需求, 设计师必须更富创造力地制定策略, 整合公共空间、城市社区和生态。正如本文开头所引珀迪的话, 关于自然的单一观念已经不复存在, 每个人都在努力解决洛杉矶河这一复杂的遗留问题。这意味着洛杉矶河是一个绝佳的试验场, 可供探索自然和文化的价值是如何形成、转化并融入城市。

### 3.2 作为文化和生态景观的洛杉矶河

洛杉矶河是一个文化景观, 也是标志性

的基础设施, 人们对其评价褒贬不一。洛杉矶河的未来将落在两种极端方向的中间地带: 一方面, 将社区弃之不顾的单一利益的工程方向已是穷途末路; 另一方面, 完全“自然化”的设想几乎不适合当代的洛杉矶市, 幻想一条不会发生洪水且不需要动迁的“绿色”的河流是一种谬论。“城市河流”作为城市公共领域的一部分, 设计师必须重新构想其能够扮演的角色, 并且避免陷入某一种极端。这并非要拒绝在城市中拥有自然, 也不是否定河流与自身曾经的“自然”之间的联系, 而是创造一种新的编排, 即通过与环境相适应的策略来支持生态系统和社区。最近的规划试图做如下努力: 克服技术上无法实现的“浪漫”观念, 而是对社会问题、公平、健康、水质、供水、艺术和文化、教育、生态系统、住房、无家可归者和洪水风险进行全面思考。

## 4 重新构想的洛杉矶河

### 4.1 基于数据的方法

考虑到洛杉矶河与其沿岸社区的关系, 对洛杉矶河的重新构想和对总体规划的更新需要在设计过程和实施过程中采用创新策略, 以支持生态功能、解决水文和水力现实问题, 而不是取代邻近河流的社区。《洛杉矶河总体规划》在很大程度上依赖于最初以洛杉矶河索引(LA River Index)为试点的基于数据的方法, 该方法在2021年6月的《风景园林前沿》文章《重塑洛杉矶河: 连接公共开放空间的51英里》中进行了讨论。

洛杉矶河流总体规划过程的关键是将城市和河流的综合信息转化为数据集的统一格式。自洛杉矶河的索引系统开始建立“河流一英里与数据”对应系统, 规划团队研发出一种基于数据的决策方法, 以突出社区需

求。该方法的关键之处在于构建一套洛杉矶河的标尺系统。通常情况下, 大型系统规划的复杂性会因数百张地图而变得千头万绪, 从而无法确定需要关注的数据。洛杉矶河标尺系统是82 km长的洛杉矶河的线性化表达。规划团队使用地理信息系统(GIS), 将数据在标尺上绘制并形成线性参照, 由此获得根据洛杉矶河数据集创建的逾200个标尺。该方法能够使工程、风景园林和规划之间产生真正的跨学科进程, 并且可以快速识别沿河的视觉模型。如借助该标尺系统, 能够轻易了解公园需求和环境负担的重叠处, 或者洪水风险和住房问题共同发生的地点<sup>[18]</sup>。

### 4.2 多效益策略

通过多样化的数据采集和社区参与过程, 很明显, 在气候不稳定、不公平的城市条件和环境负担的情况下, 洛杉矶河沿线的需求需要创新的多效益策略来平衡文化和自然系统。洛杉矶河总体规划基于研究和社区需求确定的9个目标: 生态系统、洪水风险管理、水源供给、水质、住房承受能力、公众教育和参与、公园创建、艺术和文化, 以及可达性(图7)。随着时间的推移与条件的变化, 根据目标调整设计策略至关重要。正如《洛杉矶前沿》(LA Frontiers)一文所指出的, “洛杉矶河总体规划与传统的总体规划最显著的区别之一在于该项目不是预先规定的。该规划被设计为一种框架式计划, 具有有意识的灵活性, 允许在未来出现未知的情况。”<sup>[18]</sup> 规划的过程包括: 探索河道水力学的可能性, 以及开发一套服务于“多效益基础设施”设计策略的“工具包”, 并将其与本土植物和特有野生动物的生物多样性相关联<sup>[2]</sup>。这些方法最终可以帮助到几十年来截然对立的基础设施和自然重新联系起来。

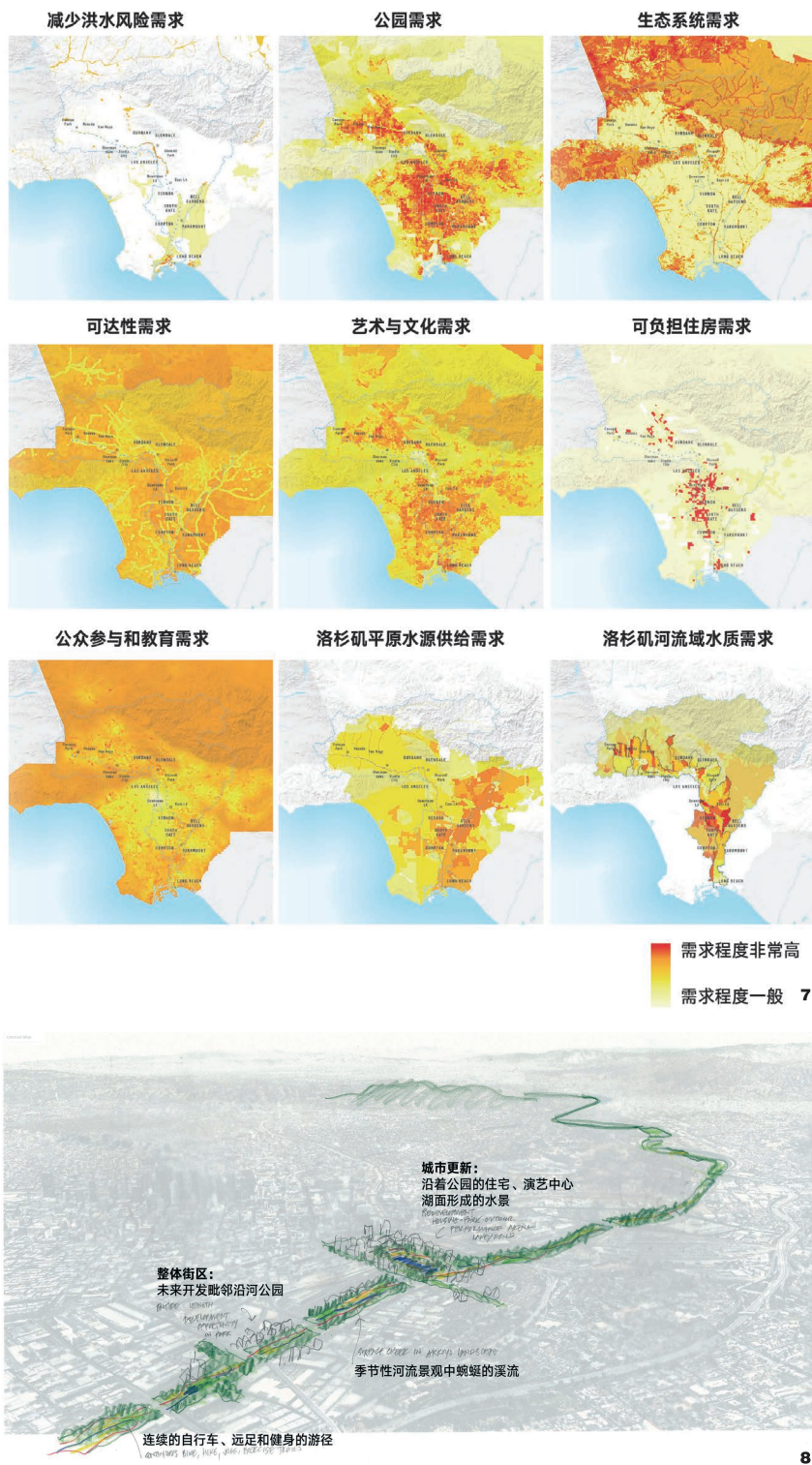


图7 洛杉矶河总体规划包含的9方面需求评估  
Fig. 7 The LA River Master Plan includes nine aspects of needs assessment


图8 以洛杉矶河为载体的82 km相连的公共开放空间概念草图  
Fig. 8 Concept sketch for 82 km of connected, public open space using the LA River as an armature

## 5 整体且多效益的设计

洛杉矶河的未来会如何? 当今的任务是激发沿岸人民与河流更加全面而真实的关系。虽然洛杉矶市在20世纪的大部分时间都背弃了河流, 并在其河滩上大兴土木, 但无论洛杉矶河“看起来”是自然的还是工程化的, 未来人们会意识到可以培育与河流的新的关系, 同时通过公共空间的连通性来强化沿河城市肌理, 以及增加人类与自然的共同福祉(图8)。克服极端化的倾向需要理解基础设施兼有社会和文化系统。基础设施通常被过于狭义地定义为街道、大坝、水渠和诸如此类的实体, 这既限制了多效益思维可能出现的潜在途径, 也限制了对于社会和生态系统复杂性的深入理解。同样, 人们常常根据形象来过于狭义地定义自然, 而大多数的野生动物和植物是根据生态系统的功能被定义的。推动河流的自然化仍在许多方面是短视的, 尽管这不完全是单一利益的心态, 且与当初导致河道被渠化的“河道作为泄洪渠道”的策略有本质不同。也有观点武断地强调当前的洛杉矶河状态不理想(例如并非一条葱郁而灵动的河流), 却忽略了该河为洛杉矶的不同社区所创造的价值, 如休闲廊道、艺术场地、文化聚集空间、电影布景等等。换言之, 河流及其廊道成为当前状态的条件虽不够理想, 但绝不是“毫无生机”的景观。

城市发展、生态和基础设施之间存在着复杂性。风景园林师有能力接受这一挑战, 在生态和社会系统间设计一种更好的城市关系, 同时重新思考对于城市区域中的文化和自然系统的整体理解范式。洛杉矶河提供了巨大的区域尺度上的机遇, 在河道1.6 km范围内有超过100万人, 以及在相对临近的流域有超过400万人<sup>[2]</sup>。尽管许多人建议在河流边缘地区进行动迁, 但这将驱逐大量的低收入群体和以有色人种为主的社区。因而除非发生大灾难, 否则在短期内不太可能实现。如果未来没有发生气候和地震灾害, 洛杉矶河很可能成为未来数代人将会选择的核​​心区域, 这些区域具有不断增长的密度和与城



市的连接性。在关于基础设施与自然的无休止争论的同时,一代又一代的儿童在没有公园、空气质量差、缺少运动空间,以及缺失生态功能的社区环境中成长<sup>[19]</sup>。现在是时候接受复杂性,同时以设计师的创造力重新认识到:洛杉矶河和城市可以共生,就像自然和基础设施可以共存一样。

注:图1-4、图6、图8源自欧林事务所;图5、图7源自洛杉矶河总体规划。

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*"Everyone living today is involved, intentionally or inadvertently, in deciding what to do with a complicated legacy of environmental imagination and practice, now that all the simple ideas of nature are irretrievably gone."*<sup>[1]</sup> To understand the LA River, one must stand next to it when it is raining. Eight hundred and thirty-four square miles of mountains and urban development drain to this 51-mile river. From the highest point in the watershed in the San Gabriel Mountains, poised over 7 000 feet above the Pacific Ocean, the fast-flowing and steep river has fooled generations of Angelenos. Most days, the river runs dry except in a few locations where a shallow skim of water passes through the river's middle low-flow channel (Fig. 1). Decades go by without large storms, and the river recedes as an arid backdrop to urban life. Channelized and lined with concrete, it reads to many as "infrastructure" far more than "river". But if you

arrive on a rainy day, it becomes clear why engineers encased the river in concrete, hardening its edges and immortalizing its route. Brown, muddy water rushes off the surrounding mountain ranges into the Los Angeles Plain, where the City of Los Angeles and other cities are located (Fig. 2). The channel quickly fills; conditions can change within hours and sometimes even minutes, turning the dry channel into a dangerous torrent of water that has claimed many lives over time. Engineers in the 1930s used concrete to move water to the ocean more quickly and keep people and property safe where development had encroached into the river's floodplain. Today, the LA River channel is the backbone of the LA flood management infrastructure, and millions of people rely on it when the rain starts falling. However, an intense debate exists about the future of the LA River: is it solely infrastructure, or will it be a "natural" river ever again?

Seeking to study the LA River through lenses of water, people, and the environment, Los Angeles County began a process in 2016 to update the 1996 LA River Master Plan for all 51 miles. Central to this process was a community-based process that would consider adjacent community needs and opportunities through a goal-driven, data-based methodology that, for the first time in history, would combine databases and engagement for all 51 miles of the river in a single study. The effort included intensive hydraulic and hydrological studies in determining the technical feasibility of strategies for the river that could improve ecosystem function, improve parks and park access, address housing affordability and help persons experiencing homelessness, engage communities in ongoing education, enhance water recharge and water quality, and improve flood risk management.

## 1 The LA River and Urban Relationships

### 1.1 LA River Path and Adjacent Communities

Despite its essential role in flood management, globally, the LA River is probably most famous for its role in pop culture. Movies, music videos, and art are commonly filmed in the LA River, which flows through Downtown LA. However, many people lack knowledge about the river and the variety of conditions along its banks (Fig. 3). This type of understanding is foundational in the redesign of the LA River because many communities do not understand how the conditions along the river in their neighborhood are affected by upstream conditions and how downstream conditions are affected by their actions. Therefore, a critical component of the LA River Master Plan effort was to help situate communities in their understanding of the river as a larger ecological and hydraulic system. This requires understanding that the LA River begins at the Western edge of the San Fernando Valley and flows to Long Beach, where it empties into the Pacific Ocean. The river passes through residential, industrial, and commercial zones as well as parks and public open spaces, including some of LA's most significant parks, such as Sepulveda Basin and Griffith Park (Fig. 4). The LA River corridor is a place where people live, work, and play. Walking and biking are predominant uses along the LA River Trail, and equestrian trails are found in some areas along the river (Fig. 5). Within the river channel right-of-way, there are over 2 300 acres of land<sup>[2]</sup>. This amount of space is truly remarkable when considered in light of the density of LA County and the need for public open spaces and parks. There are seventeen cities within one mile of the LA River, and twelve of the fourteen communities directly adjacent to the river corridor do not meet LA County's goal to provide 4 acres of parkland per 1 000 residents<sup>[3]</sup>; the untapped potential of new open spaces along the LA River could improve this. Still, the river can be difficult to locate and even more difficult to access from the urban grid, and many areas along the river lack

shade or public amenities, making it difficult for some neighborhoods to benefit from the public space the river corridor offers.

### 1.2 Community Demographics

Some neighborhoods along the LA River have seen significant changes in the last half-century. Today, LA County is nearly half Hispanic / Latino, and there is an incredibly diverse population<sup>[4]</sup>. While areas of LA County hold extreme wealth, the overall picture doesn't match the common Hollywood image of fame and fortune. Household incomes are decreasing while housing costs are increasing. Rent is also increasing, with the average share of income spent on rent increasing from 28% to 34% since 2000. This has resulted in about a third of renters falling into the severely rent-burdened category<sup>[5]</sup>. LA County is facing a housing crisis, particularly in relation to affordable housing. Currently, the shortfall in affordable housing is around 500 000 units<sup>[6]</sup>, and the LA County population of persons experiencing homelessness is 66 000<sup>[7]</sup>. There are significant social and economic disparities in LA County, which makes the considerations of equity and housing even more important in the re-imagining of the LA River, which is envisioned in the 2022 LA River Master Plan.

## 2 The Realities of Flooding

The re-imagining of the LA River in the LA River Master Plan requires fusing the social, parks, and ecological systems with the realities of public safety and flood risk along the river (Fig. 6). Few people can remember times when the LA River channel was full. Engagement during the LA River Master Plan project led by LA County Public Works found that only 6% of people had seen the river at capacity<sup>[2]</sup>. Because the return interval of large storms varies, many people living along the river today do not know the risks associated with flooding in LA. In 2016, the United States Army Corps of Engineers published research showing that

an additional 3 000 parcels in one area along the river are at risk of flooding in a 1% event<sup>[8]</sup>. In the United States, this level of flood risk would require those homes to purchase flood insurance if the Federal Emergency Management Association updates the flood maps for the area, according to the study. This information raised concern among residents who feared the cost of insurance or who would like to see improvements made to the LA River channel to increase the level of flood risk mitigation.

Despite our recent forgetfulness, the LA River has always flooded. The wandering nature of the river, which moved around the sandy San Fernando Valley and the Los Angeles Plain south of the City of LA, caused issues for communities even before the City of LA had densified and before areas like Canoga Park in the San Fernando Valley were annexed<sup>[9]</sup>. In 1922, an article in the *Riverside Daily Press* in the San Fernando Valley quoted several residents who expressed frustration about the river's unpredictability<sup>[10]</sup>. "One day, our high school is on the bank of the river; the next day, the river isn't anywhere in sight", stated one interviewee. "Maybe it's flowing through my front yard or over in the other end of town." The article concludes with an expressed desire of residents to see the river channelized: "The meeting culminated in the passage of a petition requesting the city of Los Angeles to build bulkheads and retaining walls in an effort to cure the alleged river of wanderlust." At the beginning of 2023, heavy rains due to an atmospheric river in the Pacific drenched the state of California. While LA did not receive the amount of rain that areas north of the region experienced, the rains across the state were a reminder that heavy rains do occur and can cause serious damage across the state.

Still, the LA River has also historically served as a critical regional resource. Los Angeles, like many global cities, was established in its current location largely due to the river's reliable year-round flow of water. Beginning with the Indigenous Tongva Peoples, whose settlement



of Yaanga was located close to today's downtown, the city of LA grew from this natural resource as the water was pushed to the surface by bedrock<sup>[11]</sup>. The LA River continued to provide the main source of water to LA until the 1913 opening of the LA Aqueduct. By the early 1900s, the LA River was increasingly troublesome to residents of LA, who moved closer and closer to its banks. A series of floods in the early 1900s, culminating in the record-breaking 1938 flood, sealed the fate of the river as the US Army Corps of Engineers finished channelizing and concretizing the river to the extent feasible, leaving the once critical river to become little more than an open sewer in the eyes of many Angelenos<sup>[12]</sup>. As the region looks to the future of the LA River, it is critical to understand the realities of flooding, and this reality has guided the updated LA River Master Plan.

### 3 Visions for the LA River

#### 3.1 Recent Plans for the LA River

Beginning in 1985, renewed interest in the LA River took shape as Friends of the Los Angeles River, led by Lewis MacAdams, sought to bring attention to the overlooked river. Since that time, LA County completed a 1996 Master Plan for all of its 51 miles<sup>[13]</sup>; the City of LA completed a 2007 LA River Revitalization Master Plan for the section of the river in the City of LA<sup>[14]</sup>; the Lower LA River Revitalization Plan was completed in 2017<sup>[15]</sup>; the Upper LA River and Tributaries Plan was completed in 2020<sup>[16]</sup>; and LA County updated its 51-mile Master Plan in 2022.<sup>①</sup> Each planning effort, along with many other studies and community-level plans, has longed to bring attention to the river and highlight how multi-benefit projects could bring communities or ecology into a better relationship with the river. Many would like the LA River to be 'naturalized' with vegetation, removed concrete, and a reconnection hydrologically

to the floodplain. However, because development encroached so closely to the bed of the river during the late nineteenth and twentieth centuries, planning for the LA River is complex and requires difficult choices. Some planning documents reinforce a misconception about the 'ease' of effort that would go into naturalizing the river as if all it would take is to break up and remove the concrete lining its surfaces. But this is just one step in a spatially and socially complex process. For example, removing concrete would increase friction, reduce the rate of flow, and necessitate the widening of the channel to carry the same flow during storms. To widen the channel and reconnect the river to a larger floodplain along all 51 miles would require displacing tens of thousands of people along the banks of the river<sup>[2]</sup>, not to mention the critical infrastructure and cultural sites. Increasing flood risk or the displacement of communities are unappealing options to many, perhaps most, Angelenos, particularly in light of the LA region's current housing crisis. The Director of LA County Public Works noted in an interview with the New York Times in the fall of 2022, "Millions of people are simply not going to move out of the valley or agree to leave their homes along the river. You're also not going to move all those rail and power lines that run right along the channel. Much of the time, the channel is dry. But on those rare days when the rains are worst, the channel does its job."<sup>[17]</sup> Given the need to balance social, hydrological, and ecological needs, designers must be more creative to develop strategies for integrating public space, urban communities, and ecology. The simple ideas of nature are gone, as Purdy writes in the quote that begins this essay, and we are all part of figuring out what to do in this complicated legacy of the LA River. What this suggests is that the LA River is an incredible testing ground for exploring the way values around natural and cultural resources are formed, trans-

formed, and built into the city.

#### 3.2 The LA River as Cultural and Ecological Landscape

The LA River is a cultural landscape, a piece of infrastructure that is iconic, loved by some, and despised by others. The future of this channel is somewhere between two extremes. On one side, the extreme of single-benefit engineering that turns its back on communities is over. On the other side, the dream of a fully 'naturalized' river is also largely incompatible with contemporary Los Angeles; the idea of a "green" river without floods and without displacement is an unfortunate fallacy. Instead of assigning an extreme, designers must reimagine what an "urban river" can and should be as part of an urban public realm. This is not about rejecting the idea of nature in the city or denying a river a connection to its "natural" past. It is about embracing a new permutation that supports ecosystems and communities through strategies that appropriately align with the context at hand. This effort is what recent planning efforts have sought to do: Overcome "romantic" notions that are unachievable technically and instead think holistically about social issues, equity, health, water quality, water supply, art and culture, education, ecosystems, housing, homelessness, and flood risk.

### 4 The Reimagined River

#### 4.1 Data-based Methodology

Given the relationships between the LA River and the communities along its banks, the LA River Master Plan reimagination of the river requires innovative strategies for the design process and for implementation that can support ecological function, address hydrological and hydraulic realities, and not displace communities adjacent to the river. The LA River Master Plan relies

① OLIN began working on the LA River as part of a pro-bono initiative undertaken by River LA, Gehry Partners, OLIN, and Geosyntec in 2014. In 2016, the effort evolved into the LA River Index, a grant-funded, web-based tool for visualizing data along the 51-mile Los Angeles River. In 2018, Los Angeles County Public Works began to update the 1996 LA River Master Plan following the data-based methodology that was prototyped during the Index. The LA River Master Plan was adopted in June 2022 and is available online at [LARiverMasterPlan.org](http://LARiverMasterPlan.org).

heavily on a data-based methodology originally piloted on the LA River Index, which is discussed in the June 2021 Landscape Architectural Frontiers article *The Los Angeles River Reimagined: 51 Miles of Connected Public Open Space*. Pivotal to the LA River Master Plan process was bringing information into a unified format across urban and river datasets: “Working from the river-mile and data system that began with the LA River Index, the Master Plan team developed a data-based methodology for decision making that would highlight community needs. Fundamental to this methodology was the creation of the LA River Ruler System. Oftentimes the complexity of large systems planning becomes overwhelming with hundreds of maps, making it impossible to determine what data to focus on. The LA River Ruler is a linearized representation of the 51-mile LA River. The team used Geographic Information System (GIS) mapping and linear referencing to project data along the ruler. The result is a series of over 200 rulers that were created from LA River datasets. This method allows for a truly transdisciplinary process between Engineering, Landscape Architecture, and Planning, and visual patterns can be quickly recognized along the river. For example, it is easy to understand where park needs and environmental burden overlap, or where flood risk and housing issues collide”.<sup>[18]</sup>

## 4.2 Multi-benefit Strategies

After the collection of diverse data and the community engagement process, it was evident that the needs along the LA River require innovative multi-benefit strategies that balance cultural and natural systems in light of climate instability, inequitable urban conditions, and environmental burden. The plan is based on nine goals that were determined based on research and community needs: ecosystems, flood risk management, water supply, water quality, housing affordability, education and engagement, park creation, arts and culture, and access (Fig. 7). As conditions shift over time, it's

important that the design strategies are adaptable based on the goals. As noted in the LA Frontiers essay, “One of the most significant departures of the LA River Master Plan from traditional master planning is that projects are not prescriptive. The plan, which is designed as a framework plan, is intentionally flexible, allowing for unknown scenarios in the future.”<sup>[18]</sup> The planning process included an exploration of the hydraulic possibilities for the river channel and the development of a kit of parts for potential multi-benefit design alternatives that are linked to biodiversity profiles for native plants and endemic wildlife<sup>[2]</sup>. These approaches can finally help link infrastructure and nature, which have been extreme opposites for decades.

## 5 Holistic and Multi-Benefit Design

What's next for the LA River? The task for today is to inspire a more holistic and authentic relationship between the river and the people along its banks. While the cities turned their backs to the river for much of the 20th century and built in its floodplain, perhaps the future is in realizing that the relationship of the river and the people can be nurtured, simultaneously strengthening the urban fabric through public space connectivity and the wellbeing of human and natural communities along the LA River regardless of whether the river “looks” natural or engineered (Fig. 8). Overcoming our tendency toward the extremes will require an understanding that infrastructure includes social and cultural systems, as well as ecological systems. The world often defines infrastructure too narrowly as streets, dams, channels, and similar features, which limits the potential ways that multi-benefit thinking can emerge and allow a richer understanding of the complexity of our social and ecological systems. Similarly, we often define nature too narrowly in terms of what it looks like, whereas most wildlife and plants are defined by how ecosystems function. The push to naturalize the river, while not quite hinging on a single-benefit mentality like the “river-as-flood-

channel” strategy that led to channelization in the first place, is still, in many ways, myopic. In emphasizing so resolutely what the LA River in its current state is not (e.g., a verdant, flowing river), it overlooks the many things that the river has become for the diverse communities of Los Angeles, such as a recreational corridor, artistic canvas, cultural gathering space, film set, and so much more. In other words, the river and its corridor came into its current state by less than ideal circumstances, but in no way is it a ‘dead’ landscape.

Complexity exists between urban development, ecology, and infrastructure. Landscape architects can accept this challenge to design a better urban relationship between our ecological and social systems and rethink paradigms of our understanding of the integration of cultural and natural systems in our urban areas. The LA River offers this opportunity on a grand scale of public space, with nearly one million people within 1 mile of its channel and over four million people in its relatively small watershed<sup>[2]</sup>. While many have suggested a planned retreat from the river's edge that would displace large populations of low-income and primarily neighborhoods of color, this is unlikely in any near-term timescale unless there is a large disaster. Barring climate or seismic catastrophe, the LA River is likely to be a centerpiece for ever-increasing density and urban connections for generations to come. While the endless debate between infrastructure and nature goes on, generations of children grow up without parks, with poor air quality, without space to exercise, and without ecological function in the neighborhood<sup>[19]</sup>. It's time to accept complexity and be creative as designers, recognizing that the LA River and the City can co-exist, just as nature and infrastructure can co-exist. 