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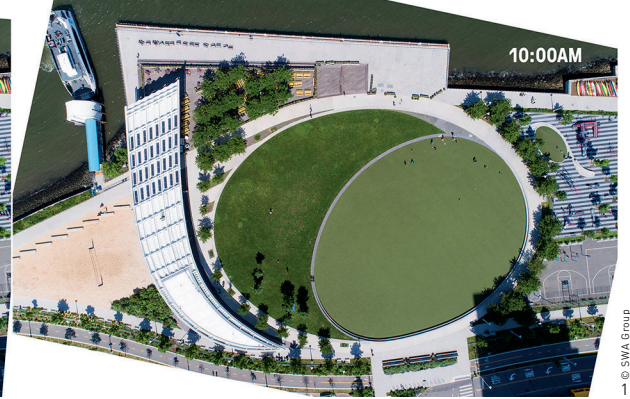
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在实践中孕育创新：
建筑、工程与景观设计领域的研究范例

INCUBATING INNOVATION IN PRACTICE:
RESEARCH MODELS FROM ARCHITECTURE, ENGINEERING, AND LANDSCAPE ARCHITECTURE

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摘要

愈加复杂的城市与环境正面临着前所未有的挑战，仅追求美学价值的设计已不再满足时代的需要。当今的城市设计、景观设计和规划实践都要求超越传统的设计服务范畴，通过倡导预见性、研究性、实验性和创新性以获得更深刻的洞见。两年前，SWA集团建立了公司结构化研究与项目创新平台——XL实验室，致力于解决设计领域新出现的复杂问题，其体系既借鉴了建筑、工程行业中设立研究部门来指导实践的经验，又具有景观设计行业的特色。本文以该实验室及其他两个代表性研究团队为例，对当代设计对研究的现实需求、行业内独立研究和创新团队的形成原因、运作模式和研究方法，以及企业如何确定研究主题并进行优先级排序展开探讨。

关键词

基于实践的研究；创新性；研究性；预见性；可视化与模拟

ABSTRACT

As our cities and environments become more complex and face unprecedented challenges, it is no longer sufficient to design for aesthetics alone. Urban design, landscape architecture, and planning now demand going beyond typical design services to support deeper insights via foresight, research, experimentation, and innovative advocacy. SWA is one example of addressing these emerging complexities through two-year-old XL Lab, the firm's platform for structured research and innovation projects. XL Lab differs and shares attributes with dedicated research teams in firms from allied fields such as architecture and engineering, where research entities that inform practice have been operating for longer than in landscape architecture. This article discusses the need for research in design now, what factors formed distinct research and innovation teams across the industry, their models and approaches, and how firms identify and prioritize research themes or issues taking XL Lab and another two research teams as examples.

KEY WORDS

Practice-Based Research; Innovation; Research; Foresight; Visualization and Simulation

① 该信息来源于2011年与哈佛大学设计研究生院勒布图书馆的特色馆藏管理员玛丽·丹尼尔斯的谈话。

1. XL实验室在为SWA集团的滨水设计作品进行飓风后绩效评估时，按时间顺序拍摄的一系列体现场地使用情况的航拍照片。

1. A series of sequenced drone imagery from XL Lab's post-hurricane performance assessment of the firm's waterfront design work shows user occupation.

当今时代对基于实践的研究的需求

如今，景观设计师参与的大型复杂项目越来越多，与多学科顾问的合作愈加深入，并在实现项目绩效和可持续性方面肩负起愈加重大的责任。查尔斯·瓦尔德海姆认为，景观设计师是"我们这个时代的都市主义者"[1]；当今的景观设计师多以团队形式、针对大型公共项目开展工作（如詹姆斯·科纳带领团队设计了纽约高线公园），而像老一辈景观设计师丹·凯利那种在晚饭后就着一大罐玛格丽塔酒画出一打景观规划图的日子已经一去不复返了①。当下的景观设计师必须理解多种议题，包括交通和移动性问题，无人驾驶、智慧城市、物联网设备等新兴技术，促进社区参与解决某些新兴但需要长期奋战的问题（如气候适应、公共空间与基础设施的公共投资缩水）的途径，以及场地绩效分析与监测的新方法等。这些新情况与新目标要求景观设计师们对减灾规划、传统上由灰色基础设施提供的安全防护（如洪涝防护）、快速城市化的压力、地方性或历史性

生态系统的重建、严重退化或污染土地的修复，以及陌生文化习俗与历史传统等方面均有所了解，而且不可仅仅满足于浅尝辄止的认识和外包的处理方式。当代景观设计师必须对这些复杂问题进行深入且广泛的钻研，才能提出真正具有创新性、综合性的总体解决方案。

因此，研究对当今的设计实践意义重大。有些问题无法通过文献综述、谷歌搜索或请教"最佳实践"专家来解答，其答案或设计策略有时必须通过目标场地分析或定制信息收集才能得到。某些为其他目的而开发的新技术必须经过修改或试验才能应用于新的项目。对于计划服务50年以上或者需要适应未来各种情况的项目，对未来情景的预测也至关重要，因为新的事件每年都会出现，可能是旱灾，也可能是新的制造工艺。

在实践中开展研究的一系列方法

下面将详细介绍建筑相关行业（包括建筑、工程与施工）内的三种基于实践的研究

团队名称：
SWA景观设计集团XL研究与创新实验室
公司地址：
美国加利福尼亚州索萨利托、旧金山、洛杉矶、拉古纳海滩，德克萨斯州休斯敦、达拉斯，纽约州纽约；中国上海
团队负责人：
安雅·多姆莱斯基、艾米丽·施里克曼
成立时间：
2016年

团队名称：
奥雅纳集团"预见+研究+创新"研究团队
公司地址：
美国加利福尼亚州旧金山、纽约州纽约；英国伦敦；德国柏林；澳大利亚布里斯班；中国香港
团队负责人：
克里斯·鲁埃克曼、西蒙·罗伯茨、约瑟夫·哈格里夫
成立时间：
2002年

团队名称：
MASS设计集团研究团队
公司地址：
美国马萨诸塞州波士顿
团队负责人：
帕特丽夏·格鲁迪斯、里吉纳·杨、安米·肖
成立时间：
2008年

TEAM NAME:
XL Research and Innovation Lab at SWA Group
LOCATIONS:
Sausalito, San Francisco, Los Angeles, and Laguna Beach, CA, USA; Houston and Dallas, TX, USA; New York City, NY, USA; Shanghai, China
TEAM LEADERS:
Anya Domlesky, Emily Schlickman
ESTABLISHED:
2016

TEAM NAME:
Arup Foresight, Research and Innovation
LOCATIONS:
San Francisco, CA, USA; London, England; New York City, NY, USA; Berlin, Germany; Brisbane, Australia; Hong Kong, China
TEAM LEADERS:
Chris Luebkeman, Simon Roberts, Josef Hargrave
ESTABLISHED:
2002

TEAM NAME:
Research Team of MASS Design Group
LOCATION:
Boston, MA, USA
TEAM LEADERS:
Patricia Gruitis, Regina Yang, Amie Shao
ESTABLISHED:
2008

模式——它们分别来自主攻城市设计、规划与景观设计的SWA集团、工程与咨询方向的奥雅纳集团与建筑设计方向的MASS设计公司。有别于行业内许多只进行临时性或间断性研究的公司，这三家公司均秉持"在实践中孕育创新"的理念，且拥有专门的研究团队、确定的方法体系与遍布全球的研究实践。但它们在研究动机与运营体系方面有所差异。

SWA成立研究团队的动力源于自2008年以来对于研究的积极推动、所承接项目尺度的多样性（从区、市到区域廊道），以及国际项目涉及的各类重大议题。奥雅纳希望通过监测影响未来建成环境变化的动因，来积极帮助自身与客户有效应对瞬息万变的世界而走向繁荣。MASS则认识到，要想提升其医疗保健项目的设计实力，来自研究的助力必不可少。越来越多的对于建成项目的轶闻式的反馈使这些公司意识到使用后评价的必要性，以及投入时间进行预设计的重要性。[2]

这三家公司的研究途径和运营模式明显不同：奥雅纳规模最大，MASS规模最小（但其研究人员与设计师之比最高）。奥雅纳专门的研究团队已成立16年之久，MASS是10年，SWA则是2年，不过SWA在设立专门的研究团队前已有其他方面的研究经验。奥雅纳的研究团队名为"预见+研究+创新"（以下简称FRI），其运营方式类似于咨询公司，团队成员分布在6个不同的办事处，引领5个区域的研究工作。MASS是一家非营利性企业，其专门研究团队常驻波士顿，会根据合作关系采取全职或兼职模式处理分析研究项目。2016年，SWA成立了研究和创新实验室，全称是"XL：景观和都市主义实验"，简称为"XL实验室"，有两位首席顾问，由两位负责人共同领导，另有8名成员在各个设计工作室之间轮值。

研究领域与实践项目

上述三家基于实践的研究团队涉及的项目多种多样。其中SWA囊括预见性项目、研
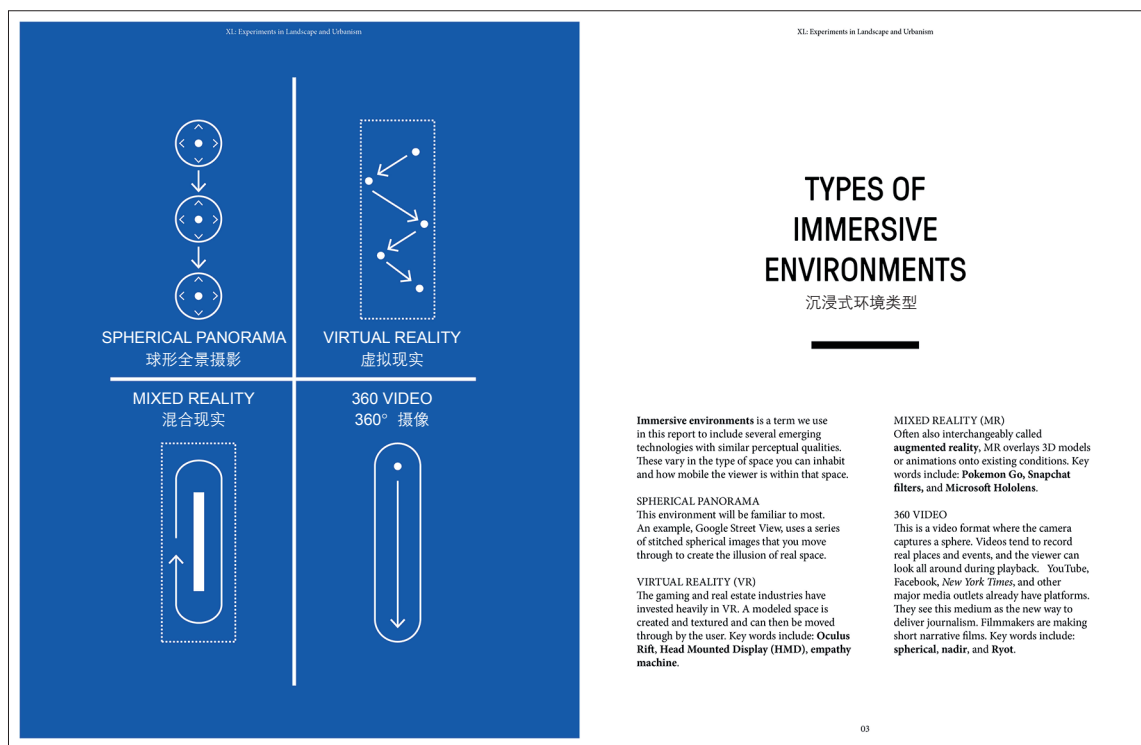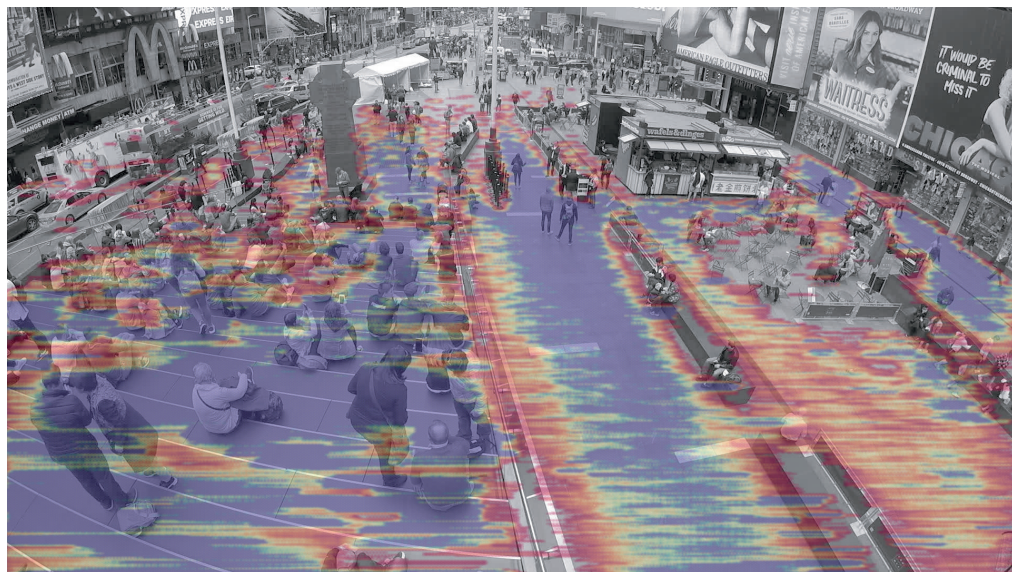
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究性项目、可视化与模拟实验项目，以及专题项目，采用预测性、分析性等多种研究方法，也会涉及新工具的试验与对具体问题的调查等。截至目前，XL实验室的研究与创新工作主要涉及SWA的六大专业领域：城市和城市环境、社区、水资源、基础设施、流动性以及健康。除进行原创研究项目外，XL实验室也协助其他个人或团体进行调研，对现有研究与创新成果及主流思潮进行整合、管理与传播，以建立项目之间的联系。研究员及设计与技术顾问会基于以往项目需求以及每个工作室的兴趣和关注点来确定重点研究领域。项目的优先排序则根据时间要求与合作协议，基于使最多项目与工作室受益的原则来制定。自成立以来，XL实验室的自有项目和合作项目包括：一系列关于沉浸式环境和技术（例如混合现实）的实验、一个展望全球5座城市的未来的预见性项目，若干公益性质的韧性城市项目、常规与非常规建筑材料的研究，以及对飓风后的滨水设计项目进行绩效评估。近期项目包括研究开放空间营造与健康之间的因果关系、利用机器学习研究城市广场上的人类行为，以及对现代美国

新兴城镇的经济与空间调查。

我们以SWA在美国迈阿密市的韧性城市项目为例，来具体说明XL实验室通过研究支持设计项目的模式。这是一项大型公益项目，由公司CEO领导，聚集了各部门的研究人员，旨在通过与政府合作、调查研究、实地考察和组织针对城市与区域问题的专家研讨会议，改善全球高密度城市空间的生活质量。XL实验室的研究为SWA三个小组重点关注的三种尺度的6个场地提供场所与场地信息，以及关于风险、韧性、预测和沿海地区适应性策略的现状与规划背景资料，其研究结果包括区域和场地尺度的海平面上升幅度预测、南佛罗里达州的沿海洪涝现状、开发模式规划和案例研究。它们被汇集在一份简报中，包括一系列区域与场地尺度的草图（表现了城市管辖区与社区、交通运输与物流、海平面上升0.3m时的洪水淹没范围、中位收入和土地使用情况等内容）；一份涵盖专业术语和当地实际问题的可视化词汇表（包括多孔石灰岩、回灌、盐水入侵、风暴潮、国王大潮、飓风受灾史、障壁岛和潮汐沼泽地）；场地信息；以及由合作机构文

件、相关新闻和精选报道摘录组成的附录。研究小组成员包括XL实验室的负责人与研究员、与迈阿密市首席城市复兴官密切合作的SWA成员，以及来自非营利性组织"公共土地信托"和南佛罗里达州区域规划委员会的成员。基于XL实验室的研究成果，三个SWA工作小组制定了利用景观基础设施提升韧性的策略，并在2017年6月迈阿密市的公共论坛上汇报了经专家研讨会商议后的版本。这份研究成果同时被提交给了迈阿密市海平面上升委员会。

奥雅纳公司的FRI团队将基于实践的研究的焦点放在了预见性项目上。这些研究项目主要涉及航空、建筑、能源、交通、水资源、规划、数字化和咨询服务等奥雅纳的擅长领域。该团队通过"变化的驱动力"框架确定重要的研究课题，并根据其主要影响领域将问题划分为社会、技术、经济、环境和政治[3]5类（合称"STEEP"）涵盖了水资源短缺、纳米危害、以用户为中心、大数据和人口增长等热点，信息获取渠道则包括访谈、研究、研讨会和专家咨询等。客户需求和内部优先级决定了各项目的推进计划。其

承接项目包括：未来校园、气候变化和海洋健康、重新思考城市的流动性、区块链技术、项目管理的未来、探索非洲城市的未来、2017年技术发展历程、会呼吸的工作场所、"变化的驱动力"移动端应用、建成环境中的循环经济、有活力的城市。上述项目由奥雅纳公司来自商业地产、规划、项目管理、铁路、零售、建筑等各领域的专家共同推进。

我们以奥雅纳"有活力的城市"项目为例进行具体分析。该项目是公司景观设计团队与FRI团队共同合作，重新思考绿色基础设施的产物[4]。这份厚达160页的最终报告包括社会、环境和经济效益，绿色基础设施案例与实现途径，以及设计策略参考等内容，涵盖了世界各地优秀项目的案例研究，并且得到了英国景观设计师协会及英国皇家植物园——邱园的支持。该项目发现了5个对城市影响巨大的关键性要求，分别是：1）城市绿化不仅提供美学功能；2）景观具有多种功能；3）利用创意性设计营造绿色城市生态系统；4）用技术手段评价自然所提供的生态系统服务；5）必须采取综合性运输方式。研究结论表明"当前的城市景观设计正愈加关注效率、社区健康、气候适应性、空间安全、资源生产和经济发展。我们的城市正面临着不确定的未来，地下道路、无人驾驶、可渗透的人行道和蓄水屋顶、垂直耕作甚至发光树都有可能在未来城市中得到广泛应用"[5]。

MASS主要开展分析性研究项目，涉及健康、设计及利益相关者参与等专业领域。公司领导人、慈善捐款人及非营利机构资助者负责确定研究课题，并根据合作关系对研究项目进行优先排序。研究项目包括："目标设立"项目（研究资本项目的影响）、"催化性基础设施"研究（深究霍乱的根源）、"真实价值"项目（探究设计与工程施工影响教育效果的方式）、"马拉维孕产妇医疗改善项目评估"②（研究设计如何影响用户满意度）、"临床护理环境设计对分娩的影响"研究项目（研究医院设计与剖宫产率的关系）。这些项目由MASS与哈佛大学张政汉公共卫生学院、美国国际开发署、潘

兴广场基金会、非洲发展中心教育部和卢旺达卫生部等多个合作伙伴共同完成。

我们选择"临床护理环境设计对分娩的影响"项目进行具体分析，以了解MASS的研究过程。这项研究由MASS与智囊团队阿里亚斯实验室合作，受罗伯特－伍德－约翰逊基金会资助，试图了解排除妊娠并发症（糖尿病、肥胖、高血压）及母体风险因素（如种族、收入、教育水平）的影响的情况下，产妇的实际剖宫产率存在差别的原因[6]。该项目第一阶段的研究选取剖宫产率从7.1%至69.9%不等的若干医院，调查了医院环境中的哪些因素可能影响剖宫产率，以及建筑设计是否可以降低剖宫产率。通过对全美12个分娩中心和医院的病房、分娩单间和设施规模进行调查，最终得出结论：医院设施本身是影响剖宫产率的风险因素之一。未来，MASS将以此为依据，向正在施工或翻新的医院设施提供设计指导，从而为产妇分娩提供最佳的护理。

SWA、奥雅纳与MASS的这三家实验室不仅着眼于预测未来趋势，也注重分析过去项目的影响。其基于实践的研究目标十分多样，包括向客户提供应对未来或未知变化的设计或计划，了解设计空间出人意料的使用方式，测试景观的预期绩效，试验用于可视化、模拟或用户参与研究的新工具和新技术，加深对相邻领域和学科的认识以提出综合设计课题，探索更有效的可持续性建筑设计手段与方法，以及研究设计对经济、健康和其他方面的多重影响。

为了解决日益复杂的环境、技术和文化问题，新的设计实践形式应运而生，而建成项目也在更新演变。面对极端的天气事件、快速的技术进步以及不断推进的城市化进程，仅追求外表及建造工艺的景观与城市环境设计已不再满足当今时代的需求。设计必须更加注重实效，这意味着找到更好的研究方法、建立更健全的协作网络，并积极响应设计领域、市场和技术的最新变化。面对不断提高的设计要求，这些研究实践有助于我们进一步探讨设计人员如何深入了解现状与问题、更好地构建环境并提升自身能力。**LAF**

② 了解该项目的更多信息，请访问https://massdesigngroup.org/work/design/maternity-waiting-village。

4. XL研究与创新实验室"迈阿密韧性城市项目"的一部分研究成果。

4. Part of XL Research and Innovation Lab's research for Resilient Cities Project: Miami.

The Need for Practice-Based Research Now

Landscape architects today are increasingly working at larger scales, on more complex projects with multiple consultants, and with greater accountability of performance and sustainability. Charles Waldheim has called landscape architects the urbanists for our age[1]. Teams are now led by landscape architects like James Corner on large public projects like the High Line in New York. Gone are the days when Dan Kiley, with a pitcher's worth of margaritas, would sketch out dozens of landscape plans after dinner①. Landscape architects today have to understand many issues: transportation and mobility, emerging technologies such as autonomous vehicles or smart cities / Internet of things (IOT) devices, ways to expand community engagement around new and long-period issues such as climate adaptation, the intricacies of shrinking public investment in public space and infrastructure, and new methods of site performance analysis and monitoring, for instance. New conditions or ambitions in the field ask designers to understand disaster mitigation planning, safety provisions conventionally provided by grey infrastructure like flood protection, the pressures of rapid urbanization, the renovation of endemic or historical ecosystems, restoration of heavily degraded or polluted sites, and unfamiliar cultural practices and histories, among other things. It is also no longer adequate to solely cursorily understand these issues or farm out the work to an outside expert. To develop truly innovative, synthetic and holistic approaches to designing or planning with these complexities, the contemporary landscape architects must acquire an intimate and sophisticated knowledge on them.

This is why research is so crucial in practice today. Some questions cannot be answered by a literature review, google search, or expert in "best practices." Answers or strategies sometimes must come from site-specific analysis or customized information gathering. Sometimes new technologies developed for other purposes have to be modified or guinea pigged for a new use or application. Scenario predication is also critical for projects to serve for over 50 years or adapt to multiple future conditions, because new causes may emerge every year, from droughts to new fabrication methods.

A Range of Approaches to Research in Practice

Here we will look closer at three models of doing practice-based research that span the architecture, engineering, and construction industry (AEC industry): the model of SWA Group focuses on urban design, planning, and landscape architecture, while those of Arup and MASS Design deal with engineering and consultancy, and architecture respectively. They are all committed to analysis, research, foresight, and other innovation efforts for questions and new challenges above, under the concept "incubating innovation in practice" with dedicated research teams, identified methods, and international practice, which distinguish them from those do ad-hoc research projects in many AEC firms, while different from each other on the research impetus and operation system.

SWA's impetus came from its history of research initiatives since 2008, the multiple site scales from district to corridor and international contexts with the accompanying large issues in its projects. Arup set out this "to actively help Arup and our clients manage and thrive in a changing world" by monitoring the potential drivers changing the future built environment. MASS Design recognized the research necessary and aimed to optimize their design work in healthcare contexts with it. They all realized from the increasing anecdotal feedbacks of completed projects that post-occupancy evaluations were necessary, and it was important to invest time in pre-design.[2]

In terms of research approaches and

AUTHORITIES 政府机构
Cleaner air 更清洁的空气
Cleaner water 更干净的水
Healthcare savings 节省医疗保健成本
Reduced flood risk 降低洪涝风险
Increased biodiversity 提高生物多样性
Increased economic activity 提高经济活跃度
Carbon and energy savings 碳排放削减与能源节约
Reduced costs of crime 降低犯罪造成的损失
Greater inward investment 更多的对内投资
Reduction in unused land 减少未利用的土地
Reduced pressure on city infrastructure
减轻城市基础设施负荷
Reduced costs of pollutants and contaminants
降低环境污染造成的损失

CITY DWELLERS 城市居民
Cleaner air 更清洁的空气
Cleaner water 更干净的水
Healthcare savings 节省医疗保健成本
Reduced flood risk 降低洪涝风险
Increased biodiversity 提高生物多样性
Increased economic activity 提高经济活跃度
Carbon and energy savings 碳排放削减与能源节约
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Greater inward investment 更多的对内投资
Reduction in unused land 减少未利用的土地
Reduced pressure on city infrastructure 减轻城市基础设施负荷
Reduced costs of pollutants and contaminants 降低环境污染造成的损失

DEVELOPERS 开发商
Saleability 销售力提高
Increased property prices 地产价格上升
Increased land values 土地价值提升
Inward investment opportunities 对内投资创造的机遇
Improved prospect of gaining planning permission
规划许可获批的可能性增加

TOURISTS 游客
Improved visual amenity
视觉体验改善
Improved microclimate
小气候改善

LANDOWNERS 土地所有者
Reduced heating and cooling costs
制暖与制冷花费降低
Increased property value
地产价值提升

RETAILERS 零售商
Increased attractiveness of shopping
environments and high streets
主要商业街及其他购物场所的吸引力提高
Increased footfall to shopping environments
购物场所的客流量增加

BUSINESSES 企业
Improved workplace productivity
生产能力提高
Reduced levels of worker Sickness
改善员工健康状况

5 © Arup

models, the three firms represent variety. Arup is the largest firm and MASS the smallest (but with the largest ratio of research staff to designers). Arup has had a dedicated research team for 16 years, which is also one of the longest established; MASS for 10 years, and SWA for 2 years, although its research may have been carried out in other contexts. The Arup Foresight, Research and Innovation (FRI hereafter) group as it is called, operates as a consultancy with staff spread across six offices, taking the lead in five regions. MASS Design, a non-profit enterprise, has a dedicated team based in Boston working part- or full-time on analytical research projects depending on partnerships. In 2016, SWA established a research and innovation lab, XL: Experiments in Landscape and Urbanism, or XL Lab for short. It operates with two principal advisors, two co-leads, and eight rotating members in each design studio.

Research Areas and Projects

These practice-based research teams do varied projects. At SWA, the project categories are: foresight, research, visualization and simulation, and topical. This means methods vary from anticipatory to analytical, and may involve experimentation with new tools and experiences or an issue-driven investigation. A review of XL Lab projects to date would include research and innovation work mainly related to six areas of expertise within the firm: cities and urban conditions, communities, water, infrastructure, mobility, and health. The XL Lab initiates original research projects, facilitates others' individual and group investigations, and curates and disseminates existing research, innovation, and thought
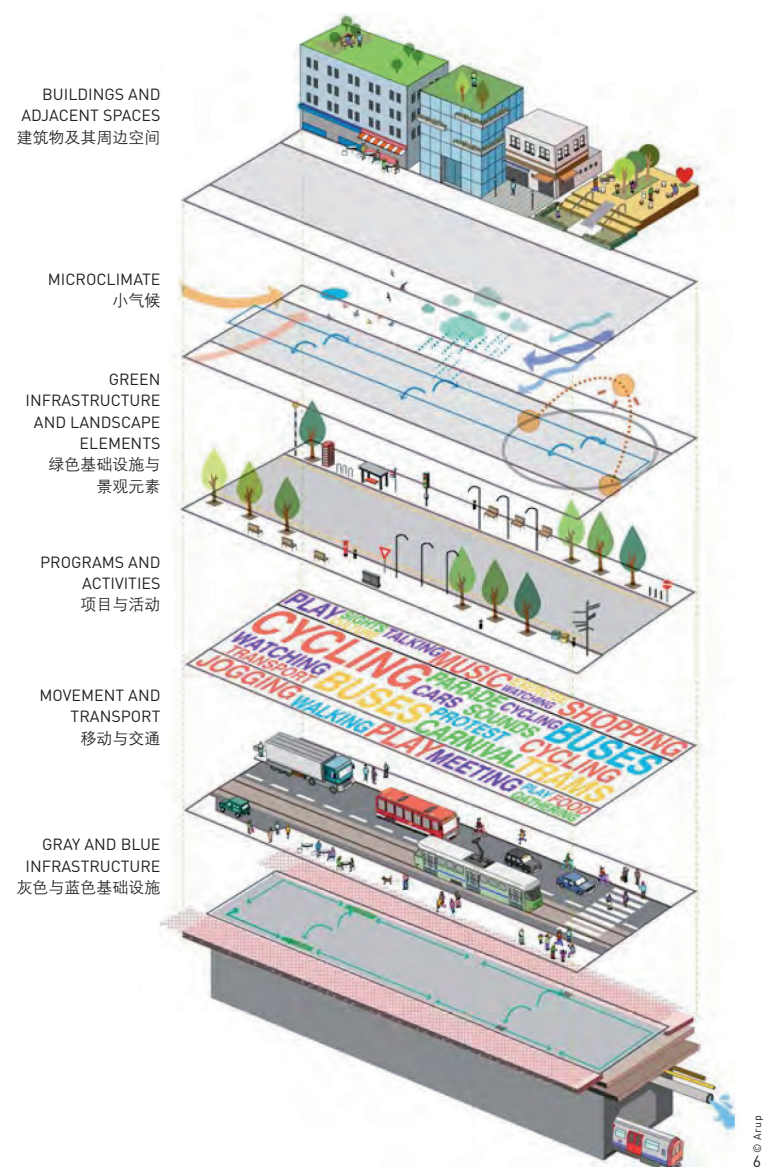
5. 由奥雅纳集团FRI研究团队领导的"有活力的城市"研究报告中的一页，分析了绿色基础设施的多重效益。

5. A page from Arup Foresight, Research and Innovation's "Cities Alive" report on the benefits of green infrastructure.

leadership in order to build links across projects. Research areas of importance are identified by XL researchers, design and technical principals from past design project needs, and the interests and concerns of each studio. Projects are prioritized according to their timeliness, benefit to the largest number of project types and studios, and partner commitments. Since its inception, XL Lab's independent and partnered projects have included: a series of experiments with immersive environments and technologies such as mixed reality, a foresight project looking at five global cities in the near future, contributions to the firm's wide pro-bono Resilient Cities Project, research on conventional and unconventional building materials, and a post-hurricane performance assessment of our waterfront design work. Current projects include a study on the relationship between open space creation and health outcomes, a research on human behavior in urban plazas using machine learning, and an economic and spatial investigation of modern American boomtowns.

The SWA Resilient Cities Project in Miami can elaborate XL's research mode as an example. The larger pro-bono Project, led by the CEO and gathering researchers from across the firm, sought to improve life in dense urban places around the globe through partnerships with city leaders, research, site visits and meetings, and a charrette-workshop focused on a relevant local and regional issue. The research for Miami supported three SWA teams focusing on three scales and six sites, providing place-based information, site information, and background material on risk, resilience, projections, and coastal strategies for adaptation, both physical and planned. Findings included projection of regional- and site-level sea level rise extents, conditions particular to coastal flooding in South Florida, planned development patterns, and case studies. They were gathered in a

briefing book that included: regional and site basemaps with city jurisdictions and neighborhoods, transit and circulation, flooding extents at 1 feet increments, median income, and land use; a visual glossary covering specialized terminology and local issues like porous limestone, backflooding, saltwater intrusion, storm surge, king tide, hurricane history, barrier islands, and tidal marshland; site information; and an appendix with documentation from partner agencies, relevant news, and excerpts from select reports. The research team included leaders and researchers of XL, SWA staff working primarily with the Chief Resiliency Officer at the City of Miami as well as individuals from the non-profit the Trust for Public Land, and the South Florida Regional Planning Council. The three SWA teams used XL research materials to develop resilience strategies using landscape infrastructure and presented their charrette results in a public forum in Miami in June 2017. The results were also presented to the sitting City of Miami Sea Level Rise Committee.

Practice-based research projects within the FRI Team at Arup are primarily foresight-focused. They mainly relate to Arup's expertise of aviation, architecture, energy, transport, water, planning, digital, and advisory services. Issues of importance are identified through their Drivers of Change framework organized into five categories, or lenses, based on their main area of impact: social, technological, economic, environmental, and political[3]. These categories, collectively referred to as STEEP, collect issues like water scarcity, nano-hazards, user-centricity, big data, and population growth, which were reflected from interviews, research, workshops, and consultation with specialists. Projects are scheduled based on client requests and internal priorities. Projects have included: Campus of the Future, Climate Change and Ocean Health, Rethinking Urban

BUILDINGS AND
ADJACENT SPACES
建筑物及其周边空间

MICROCLIMATE
小气候

GREEN
INFRASTRUCTURE
AND LANDSCAPE
ELEMENTS
绿色基础设施与
景观元素

PROGRAMS AND
ACTIVITIES
项目与活动

MOVEMENT AND
TRANSPORT
移动与交通

GRAY AND BLUE
INFRASTRUCTURE
灰色与蓝色基础设施

6. © Arup

6. "有活力的城市"项目由
奥雅纳集团的FRI研究团
队领导，展示了绿色基础
设施带来的经济效益。

6. "Cities Alive" shows the
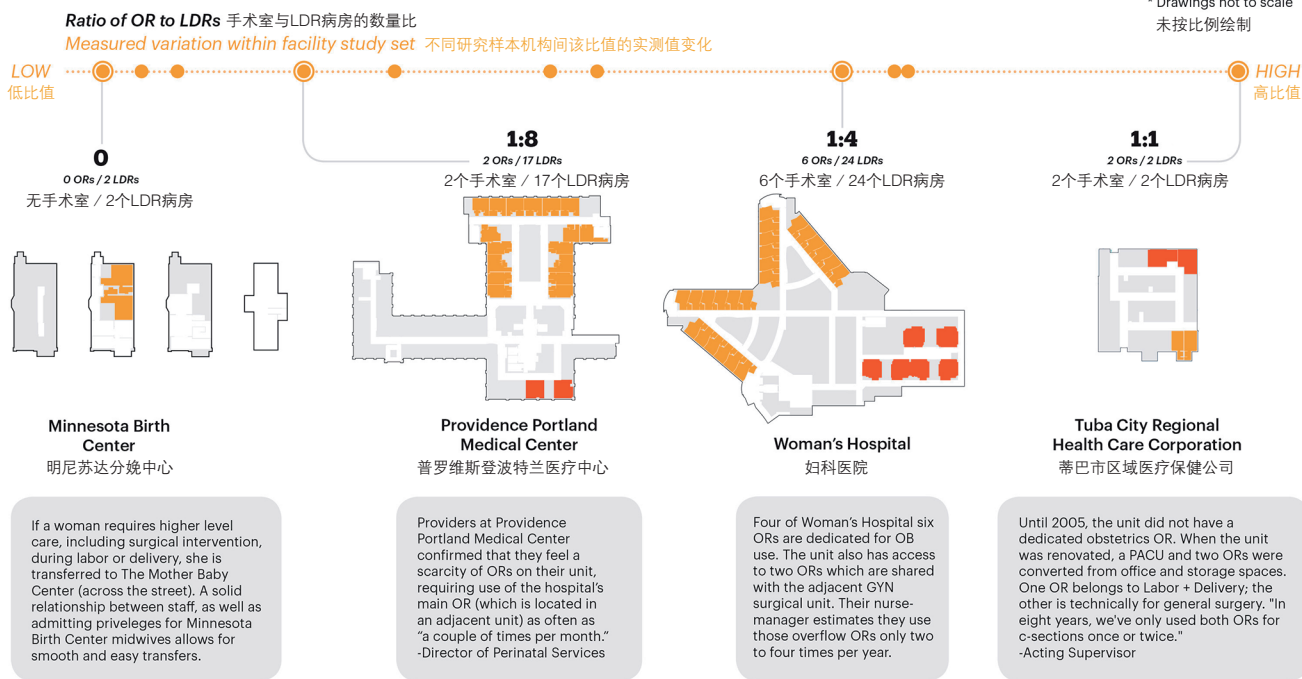economic benefits of
green infrastructure, led
by Arup's FRI team.

Operating Room Access 手术室可达性
(Ratio of ORs to LDRs) （手术室与LDR病房的数量比）

Operating room (OR) access is a critical component of capacity for performing both scheduled and emergent cesarean deliveries. Access is a function of the physical space (number and availability) as well as staff to provide anesthesia and perform the surgery. OR access was measured as a ratio of ORs to LDRs for each facility

to understand how the relative capacity of the unit to perform a cesarean delivery versus a vaginal delivery would impact treatment intensity. Based on insights from a facilities manager on our advisory board, we hypothesized that a higher ratio of ORs to LDRs may be associated with higher cesarean rates through a "supply-induced demand mechanism": the more readily accessible the OR, the fewer barriers to performing surgery. Of note, freestanding birth centers do not contain

ORs 手术室

LDRs LDR病房

* Drawings not to scale
未按比例绘制

Ratio of OR to LDRs 手术室与LDR病房的数量比
Measured variation within facility study set 不同研究样本机构间该比值的实测值变化

LOW
低比值

HIGH
高比值

0
0 ORs / 2 LDRs
无手术室 / 2个LDR病房

1:8
2 ORs / 17 LDRs
2个手术室 / 17个LDR病房

1:4
6 ORs / 24 LDRs
6个手术室 / 24个LDR病房

1:1
2 ORs / 2 LDRs
2个手术室 / 2个LDR病房

Minnesota Birth Center
明尼苏达分娩中心

Providence Portland Medical Center
普罗维登斯登波特兰医疗中心

Woman's Hospital
妇科医院

Tuba City Regional Health Care Corporation
蒂巴市区域医疗保健公司

If a woman requires higher level care, including surgical intervention, during labor or delivery, she is transferred to The Mother Baby Center (across the street). A solid relationship between staff, as well as admitting privileges for Minnesota Birth Center midwives allows for smooth and easy transfers.

Providers at Providence Portland Medical Center confirmed that they feel a scarcity of ORs on their unit, requiring use of the hospital's main OR (which is located in an adjacent unit) as often as "a couple of times per month." -Director of Perinatal Services

Four of Woman's Hospital six ORs are dedicated for OB use. The unit also has access to two ORs which are shared with the adjacent GYN surgical unit. Their nurse-manager estimates they use those overflow ORs only two to four times per year.

Until 2005, the unit did not have a dedicated obstetrics OR. When the unit was renovated, a PACU and two ORs were converted from office and storage spaces. One OR belongs to Labor + Delivery; the other is technically for general surgery. "In eight years, we've only used both ORs for c-sections once or twice." -Acting Supervisor

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7

Mobility, Blockchain Technology, Future of Project Management, Exploring the Future of African Cities, Technology Timeline 2017, Living Workplace, Drivers of Change Mobile App, The Circular Economy in the Built Environment, and Cities Alive. These projects worked with commercial property, planning, project management, rail, retail, architecture, and other experts within Arup.

One of the Arup projects, Cities Alive, was a collaboration between the landscape architecture and FRI teams rethinking green infrastructure[4]. The concluding 160-page report covered social, environmental, and economic benefits, the case for green infrastructure, how to achieve green infrastructure, and strategies for designers.

The research was supported by the Landscape Institute and Royal Botanical Gardens, Kew and included case studies of best practices across the globe. Five key requirements were found significant for cities: 1) urban green is recognized as more than aesthetic, 2) landscapes become multi-functional, 3) creative design delivers a green city ecosystem, 4) technology is utilized to evaluate ecosystem services of nature, and 5) an integrated approach to delivery is maintained. The research concludes "urban landscapes are increasingly being designed to support efficiency, community health, climate adaptation, space security, resource production, and economic development. Our cities are facing an uncertain future,

which may include underground roads and automated transport, permeable pavements and water roofs, vertical farming and even glowing trees."[5]

Research projects at MASS Design are primarily analytical, related to the firm's expertise in health, design, and stakeholder engagement. Issues are identified by firm leadership and philanthropic or non-profit funders and prioritized according to partnerships. Research projects have included: Purpose Built, which looks at the impact of capital projects; Catalytic Infrastructure, on the root causes of cholera; True Value, on the ways in which design and construction affect educational outcomes; Maternity Waiting Village Evaluation in

Malawi, looking at how design influences user satisfaction[2], and The Impact of Design on Clinical Care in Childbirth, on the relation between hospital design and C-section rates. Projects were completed with various partners such as the Harvard T. H. Chan School of Public Health, The United States Agency for International Development, Pershing Square Foundation, Ministry of Education at the African Development Centre, and the Rwandan Ministry of Health.

Looking at The Impact of Design on Clinical Care in Childbirth offers more detail into MASS' research process. The study, in partnership with the think-tank Ariadne Labs and funded by a grant from the Robert Wood Johnson Foundation, sought to understand why C-section rates varied when not informed by comorbidities like diabetes, obesity, or high blood pressure or maternal risk factors like ethnicity, income, or education level[6]. This Phase 1 study looked into what elements in a hospital environment might be affecting cesarean rates and whether architectural design could reduce cesarean delivery rates by looking at hospitals with C-section delivery rates as low as 7.1% to as high as 69.9%. The researchers concluded that the hospital facility itself was a risk factor after looking at hospital rooms, the delivery units, and the facility sizes in 12 birth centers and hospitals across the U.S. Future work on this topic is to provide guidelines to the design of facilities undergoing construction and renovation to optimize care in childbirth.

The aims of these three labs vary from understanding future trends and conditions to analyzing the impacts of past work. The purpose of a practice-based research project might be to offer clients the "future proof" designs or plans for change, to learn about unexpected ways their designed spaces are utilized, to test the intended performance of a landscape, to experiment with new tools and technologies for visualization, simulation, or engagement, to deepen knowledge in adjacent fields and sciences in order to arrive at a synthetic design proposition, to identify more sustainable means and methods of building, or to understand the design's multifaceted effects or influence on economic, health, and other outcomes.

To address increasingly complex environmental, technical, and cultural issues, new forms of practice in design have emerged, and established practices are evolving. In the face of issues such as extreme weather events, rapid technological advancements, and increased urbanization, it is no longer sufficient to make landscapes and urban environments that are solely beautiful and well built. We must consider how to design more effectively. In many ways that requires better research approaches, more collaborative networks, and being at the forefront of changes in the field, the market, and technology. In face of this increasingly demanding design environment, these research practices help to further a conversation on how designers can be more informed, more able to build, and evolve. **LAF**

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Education 教育
Environment 环境
Economic: Local Investment 经济：当地投资
Emotion 情感

74% Spent locally   74%的投资额用于当地发展
$281,494
Within 100 km radius
在半径100km范围内投资281 494美元

ILIMA
伊利马
100km
800km

KINSHASA
金沙萨

93% Spent regionally   93%的投资额用于区域发展
$351,727
Within 800 km radius or country
在半径800km范围内或在国家尺度上投资351 727美元

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