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上海三林楔形生态绿地设计

SHANGHAI SANLIN VALLEY PARK — LANDSCAPE DESIGN OF AN URBAN GREEN WEDGE

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摘要

作为上海中心城区总体规划中的8块楔形绿地之一，三林生态谷项目是上海黄浦江生态廊道及城市外环生态廊道的重要交汇。在上海市城镇化进程中，场地生态环境不断恶化，存在生物多样性丧失、城市热岛效应突出等问题。项目设计以“谷”作为核心设计概念，并采取了水管理、风道系统与微气候、生态系统、交通和体验优化五大设计策略，旨在提升场地的连通性，修复场地生态环境，重塑动植物栖息地及韧性景观，创建充满活力的城市宜居环境和城市生态科普及研究基地。

在整个项目设计过程中，设计团队将美国本土项目强调的社会各个层级的公众参与、重视公共利益的经验带到了中国，形成了一种具有借鉴意义的多边合作模式。在这种多边合作模式下，上海三林楔形生态谷项目不仅实现了对设计方案的持续优化，不断解决施工建造中的落地问题，同时也充分考虑了园区建成后运营管理和生态维护的成本和可行性，旨在使项目真正满足市民需求，为城市带来更加持久而显著的社会、生态和经济效益。

关键词

城市楔形绿地；多边合作；微气候；风道设计；设计模拟

ABSTRACT

As one of the eight major green wedges within Shanghai's overall urban planning in the city center, Sanlin Valley Park serves as an important intersection between ecological corridors along the Huangpu River and Shanghai's outer ring road. During the rapid urbanization process, the city's ecology has been facing constant deterioration. Furthermore, the city is experiencing an alarming loss of biodiversity, as well as increasingly severe urban heat island effect. To alleviate these issues, the project adopts a “valley” concept as the core of its design and utilizes thoughtful design strategies in five aspects: water management, wind corridors and micro-climates, ecosystem, transportation, and program and experience. With these strategies, the design team aims to improve the site's connectivity, restore its ecology, reshape habitats, create a resilient landscape, and forge a vibrant urban hub that can also serve as the city's ecological research base.

During the design process, the design team adopts certain principles of landscape practices within the USA — that a project should encourage public participation of all socio-economic levels and place emphasis on the experience and benefits of the public. This form of multi-lateral cooperation allows for the park to constantly have its design plan reviewed and improved. It also allows for iterative responses to issues on the ground during construction. Last but not least, it instigates careful considerations of how to manage the park and its ecosystem, both in terms of cost and feasibility. By adopting all of these principles, the design team aspires to truly accede to citizens' needs, all while introducing a sustainable ecosystem that would, ultimately, contribute to a much improved ecology and economy.

KEY WORDS

Urban Green Wedge; Multi-Lateral Cooperation; Micro-Climate; Wind Corridor Design; Design Simulation

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上海市城市总体规划（2016–2040）
Shanghai Master Plan (2016 – 2040)

1. 三林地区作为上海中心城区总体规划中的8块楔形绿地之一，主要发挥城市“风廊”和“绿肺”的作用。

1. Shanghai's urban plan illustrating how the eight proposed green wedges, including Sanlin, as ecological ventilation corridors and green lungs invite winds into the core of the city.

1 项目背景

作为上海中心城区总体规划中的8块楔形绿地之一，三林生态谷项目场地面积为240.6hm^2，是上海中心城区南部唯一一处紧邻黄浦江的公共绿地，也是黄浦江生态廊道及城市外环生态廊道的重要交汇。

20世纪初，三林地区仍保留着阡陌纵横、水网密布的农田景观——小黄浦、三林塘港、三林北港等水系流经场地，形成了当地的景观框架。由于场地毗邻黄浦江，土壤多为淤泥质黏土，因此不时出现较为严重的内涝情况。伴随着上海市的城镇化进程，城市人口密度大幅增长，三林作为城乡交界地带，逐渐成为新增外来人口的聚集地。因缺乏有效的规划管理，大部分原有农田被用作工业用地、居民私搭乱建现象随处可见，城市生活污水严重污染了河道水质，生物多样性丧失，场地原有生态环境不断恶化。

此外，城镇化使上海成为了全球人口密度第二大的城市，也使其城市热岛效应不断加剧。由于市区下垫面及人造地表的反照率较小、热容性较大，使得城市表层的热量储存更高；加之工业生产、交通及人类活动散发的大量热量，导致市区气温高于周边环境气温[1]。相关研究表明，当上海气温高于29.2℃时，人体热负荷较大而导致死亡风险上升。据预测，2050年时，上海市的热负荷过载日将增至2015年的2倍[2]。为缓解热岛效应，上海市政府于2001年提出了楔形绿地总体规划概念，划定了8块处于战略位置的楔形绿地[3]，主要发挥城市“风廊”和“绿肺”的作用。

2014年，上海市启动了对三林地区的整治及重新规划工作。然而，重新规划后的河道及市政道路将场地分割成了10个破碎的区块，这为项目设计提出了新的挑战。

2 设计目标

在新规划中，场地东西两侧分别为不同类型的居住区。设计团队通过场地调研、广泛走访以及与市场顾问进行合作，来获知和分析使用者需求。三林地区周边用地类型复杂，场地使用人群多元化，包括老三林居民、新迁入人群、高科技从业者、商务区白领、学生等，跨越各个年龄段。设计团队根据不同人群的需求，初步确定了场地的功能承载：这里要成为老三林人宅田记忆的精神场所，适宜社区居民社交、运动的休闲空间和活动场地，上班族放松身心的自然场所，以及可供各年龄段儿童和青少年玩耍的游乐空间和认知动植物的教育场所。

结合场地条件及其发展潜力，设计团队制定了以下规划设计目标：

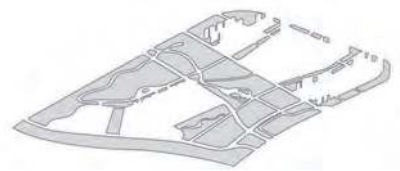
1）整合场地破碎区块，打造连续的城市绿地与慢行系统，并与黄浦江沿江长达40km的慢跑道、自行车道和步行道相贯通；

2）构建城市通风廊道，创造宜人的微气候环境，缓解城市热岛效应；

3）修复场地生态环境，重塑动植物栖息地及韧性景观；

4）创建城市宜居环境，满足市民活动需求，打造城市新地标；

5）创建城市生态科普及研究基地。



被河道和路网割裂的地块
Existing fragments by canal and road network

串联与整合
Connect pieces into holistic landscape

连续的慢行系统与生态系统
Consistent slow traffic loop and ecosystem

2

3

1. 健康中心 Health Center
2. 文化中心 Cultural Center
3. 足球场 Soccer field
4. 网球场 Tennis courts
5. 三林山 Sanlin Mound
6. 慢跑道 Jogging path
7. 游乐场 Playground
8. 水上运动中心 Water Sports Center
9. 运动会所 Sports club
10. 中央步行大道 Central promenade
11. 山地自行车道 Mountain bike trail
12. 水研究中心 Water research center
13. 温室 Greenhouse
14. 水质监测站
    Water quality monitoring station
15. 蓄水池 Bio-tetention pond
16. 社区公园 Community park
17. 风道 Wind tunnel
18. 生态桥 Eco-bridge
19. 茶室 Tea house
20. 风廊 Wind alley
21. 风谷沟壑 Wind gully
22. 花林净水湿地 Flower tree wetland
23. 社区花园 Community garden
24. 风桥 Wind bridge
25. 氧合阶梯净水湿地
    Terraced oxygenation wetlands
26. 社区花园 Community garden
27. 梅丘 Plum Hill
28. 果园 Orchard
29. 温室 Greenhouse
30. 互动农田 Interactive Farm
31. 乐活小镇 Lohas Village
32. 观光农田 Sightseeing Farmland
33. 南谷林地 South Valley Forest
34. 蓄水池 Bio-retention pond
35. 杉林溪地 Cypress-swamp
36. 现有林地 Existing forest
37. 海棠游道 Crabapple trail
38. 音乐广场 Music Plaza
39. 三林港 Sanlin Bay
40. 社区绿地 Community green finger

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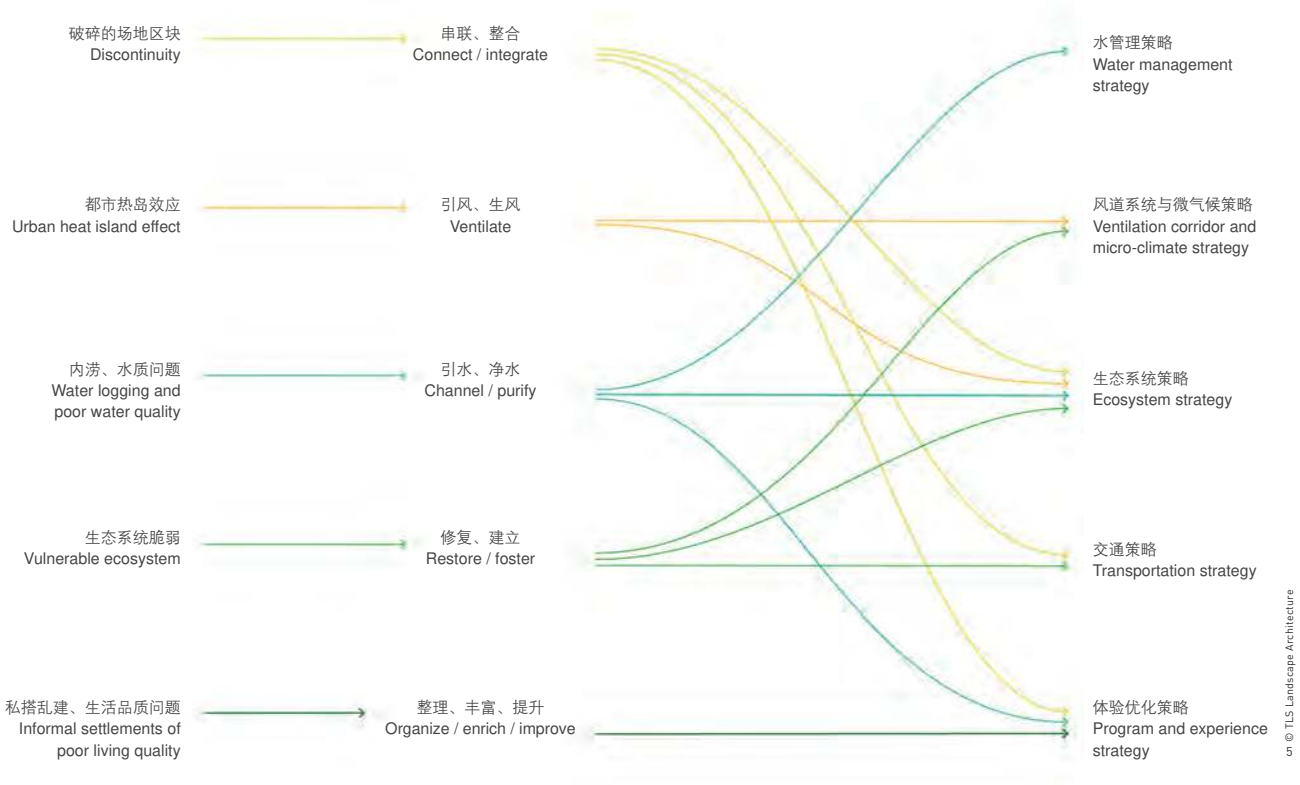
2. 设计目标之一：整合场地破碎区块，打造连续的城市绿地与慢行系统。
3. 5个主题“谷地”与三林滨江生活区连接成环。
4. 三林楔形生态绿地设计总平面图：地形、水系统、动植物栖息地、动线与活动相互交织。
5. 场地问题与五大设计策略

2. One of the design objectives is to reorganize the fragmented areas and connect them into a continuous urban green space that also allows for strolling.
3. Five different valleys and Sanlin Bund are integrated into one loop.
4. Master plan: topography, water systems, habitats, circulation, and programs work together to create a comprehensive vision of Sanlin Valley Park.
5. Site constrains vs. five design strategies



3 设计过程

3.1 核心设计概念——谷

本次景观规划设计致力于完善区域生态网络，构建城市通风廊道，缓解上海市区热岛效应、生物多样性缺失及环境污染问题。在尊重场地现有地形的基础上，为了实现上述设计目标，设计团队需要进行微地形、交通、水系、植被、公共空间等多层次构建，而这些方面都与高程设计相关，因此“谷”的设计概念应运而生。

通过进一步的场地潜力分析，设计团队在利用慢行系统串联各个区块的同时，对场地功能组团布局进行了梳理，划分了5个主题“谷地”与三林滨江生活区：场地北侧毗邻东方体育中心，且设有防风林，适宜进行户外活动，因此确定北部片区为突显运动文化主题的“动之谷”；东北部片区为场地水系的终点，水质良好，适宜开展亲水活动和水生态教育活动，因而确定此处为“水之谷”；场地中部片区为城市通风廊道的核心区，因而得名“风之谷”；场地东南片区外围的城市保育林为园区的林木缓冲带，此处环境静谧，被确定为“森之谷”；场地西南片区保留着原有农田肌理，在此基础上发展出以展示型农业和生态教育为主题的“土之谷”；场地中心规划有商住综合区、三林港滨水区，以及拟建地标“滨江音乐广场”，共同构成了三林滨江生活区。这5个城市谷地与三林滨江生活区实现了有机嵌合。

3.2 设计策略

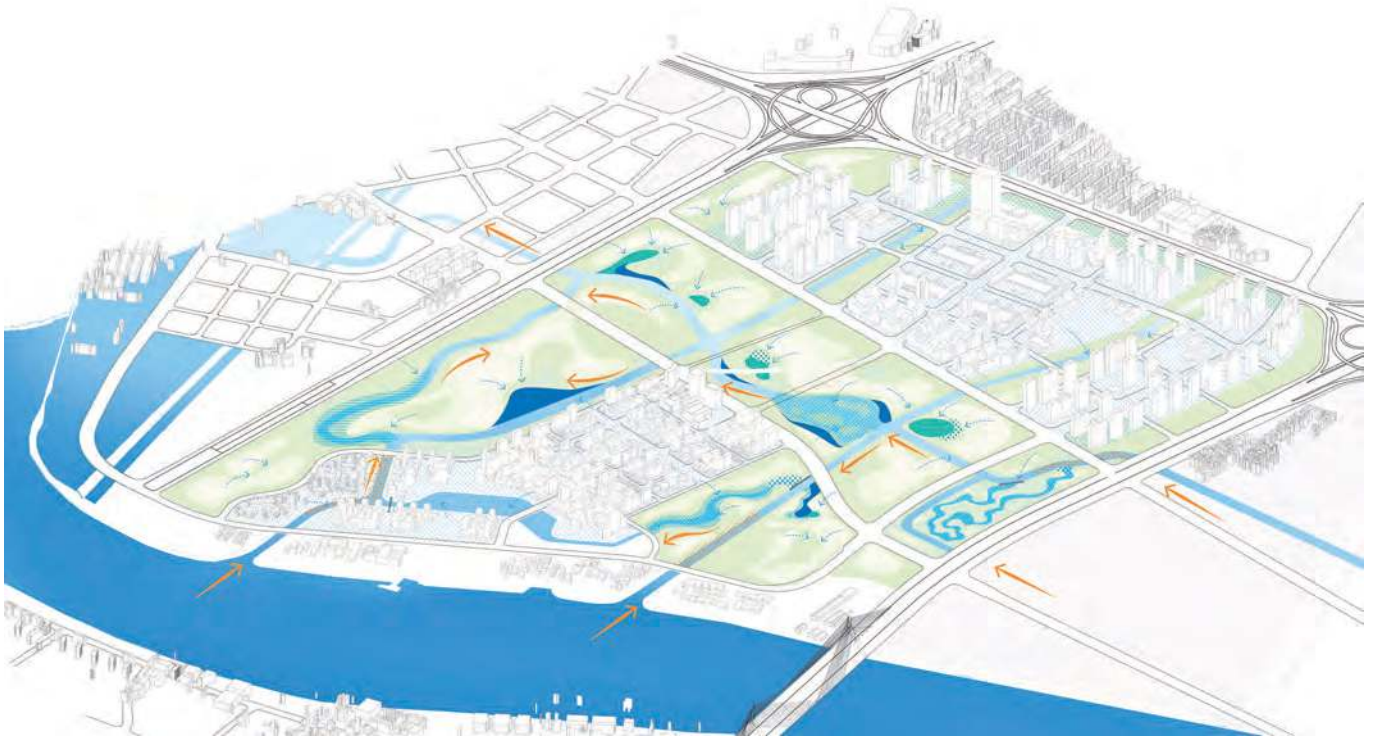
3.2.1 水管理策略

在规划设计前期，设计团队通过与雨洪管理专家合作，对场地内涝问题和水体净化处理能力进行了详细研究和计算，并确定了总体河道设计方案，聚焦于雨洪管理/低影响开发与河道净水湿地系统两个方面。

雨洪滞留区及散布于整个园区中的生物蓄水池是雨洪管理/低影响开发的重点。蓄水池借助植草过滤渠、净水阶梯和雨水花园等设施完成雨水收集和储存，并通过植被、土壤和微生物实现水体的净化和循环利用；雨洪滞留区则结合植被种植提升暴雨期间的场地容水率，旨在有效解决内涝问题，增强场地韧性。

在河道净水湿地设计过程中，设计团队与上海本地设计机构展开合作，通过对场地水体进行取样分析，明确了河道水体优化重点：1）减少沉淀物；2）避免水体富营养化；3）改善水质、提高透明度。方案在水处理源头设立了4个净水湿地，并结合区域风貌形成了4片各具特色的湿地景观：挺水植物净水湿地、氧合阶梯净水湿地、花林净水湿地，以及杉林溪地净水湿地。

同时，水质专家分别对各个谷地中的水处理负荷量进行了测算，提出了设计改进建议。例如，针对土之谷的氧合阶梯净水湿地设计，专家建议：1）采用垂直流人工湿地进行水体过滤；2）增大沉淀池面积，以充分沉降水体悬浮物并净化氮、磷氧化物；3）优化氧合设施，



通过水处理计算减少冗余的阶梯级数。

经过一系列上游湿地的净化处理后，水之谷的水质得到了提升，能够满足亲水活动的景观用水要求；水之谷还设有水质监测站、温室、小型雨水花园等设施，可供开展丰富多样的水生态教育活动。

3.2.2 风道系统与微气候策略

设计团队协同气候风道专家对上海基础数据及场地环境现状进行了分析。场地风速较小（2.7~3.4m/s），冬季盛行风为西北风和东北风，夏季为东南风。场地中受风和背风体感温差达10℃以上，尤其是在冬季和夏季的午后，体感温差尤其强烈——这更说明了引导风向的重要性。结合上述分析结果，设计提出了“阻挡冬季风、引导夏季风”的设计策略，将北部动之谷和南部土之谷打造为适合冬季活动的避风场所，并建立通风廊道，通过引导夏季盛行风来缓解高温对场地的影响，具体包括“疏导”“遮挡”“净化”“生成”4种气流运动策略。

1）疏导：构建与风向平行的通道，保持植栽排布与风向一致，从而引导夏季盛行风的通行；风廊路径尽量结合开放水面和河道，以增加空气湿度、降低气温。

2）遮挡：创造凸起的地形或采用与风向垂直的种植方式，形成能够阻挡冬季盛行风的屏障。

3）净化：选择具有空气净化功能的植被品种和垂直种植策略；结合地形，顺势、顺风穿插栽植高大乔木及矮灌木，增大迎风面积，以降低空气中的PM2.5水平。

4）生成：利用高地与谷底的地形及辐射差异形成温度及气压差，生成气流运动；借助开放的水面和周边地势产生的气压变化达到增强空气对流的效果。

此外，设计团队格外注重微地形塑造与种植设计的结合，以增强局地环境改善效果。例如，动之谷和水之谷的地形本身即具有一定的防风效果（在两倍植物高度距离范围内形成保护），而种植植被后防风效果可提升至10倍。同时，设计团队还考虑借助互动艺术装置和种植芳香植物，营造听风、闻风、观风的多维度体验。

随着设计的深入，专家提出了主要风廊、次级风道的优化建议。设计团队随之进行高程设计、种植设计的深化调整，对方案进行了反复推敲。例如，风之谷位于整个场地的主风道中心，预期主要起疏导作用。设计团队根据气候风道专家的建议确定了关键的风口方位，通过营造丰富的褶皱地形和运用高低相间的种植策略，达到疏导风向和空气净化的目的。再以森之谷的杉林溪地为例，在最初方案中，为了隔绝场地周边的交通噪音，设计团队在溪地南侧设计了10m宽的连续防护林带。但首次模拟结果显示，防护林带导致溪地内部通风不畅，可能会严重影响游人的夏季体验舒适度和栖息地营造。对此，专家建议移除部分乔木，引入局部风道。设计团队后采用多层级乔灌木搭配种植方案，在尽可能阻隔噪音的同时，也打开了将东南风引入森之谷的窗口。第二次模拟结果显示，溪地内的夏季风环境得到了明显改善，

符合微风徐徐的森林水景观设计愿景。

最后，专家对调整后的设计方案进行了场地热环境、风环境模拟，以确保风廊和风道的有效性，并在所有地块的方案设计完成后进行了全场地综合模拟，以检验整体设计效果。

3.2.3 生态系统策略

水与土的关系决定了不同的生态系统类型。设计团队力求在修复场地被破坏的生态系统的基础上，通过微地形塑造，形成多样化的生态群落，包括挺水湿地、沉水湿地、湿草甸、灌木林、低地落叶林、高地混交林等。

依据具体生态条件，场地被分为生态防护区、保育区及缓冲区：防护区主要位于东侧高密度居住区周边；保育区以风之谷、水之谷、森之谷为主，以连通生态廊道、创建动植物栖息地为前提，适当引入慢行系统及休憩空间；缓冲区位于动之谷南侧与土之谷北侧，是三林滨江生活区与保育区的过渡地段，也是园区中主要的休闲活动空间。

同时，为了突显5个谷地各自的区域特色、丰富游览体验，种植设计方案强调了对每个区域生态系统差异性的营造。设计团队基于生态功能和本土景观特色并重的原则，尽可能多地运用上海乡土植被物种。其中，动之谷打造了以针叶树种为主的防风林，以阻隔冬季盛行风；风之谷种植以彩叶林为主，利用娜塔栎（*Quercus nuttallii*）、鸡爪槭（*Acer palmatum*）、银杏（*Ginkgo biloba*）等秋色叶树种形成树阵，在强调地形变化的同时，也有助于引导风向；森之谷中的湿地种植则灵活运用包括水杉（*Metasequoia* spp.）在内的上海乡土物种，打造兼具净水功能的杉林溪地；土之谷在保留原有农田肌理的基础上，大量种植了中山杉（*Taxodium*‘Zhongshansha’）、桂花（*Osmanthus fragrans*）、朴树（*Celtis sinensis*）等乡土树种，结合农田（种植油菜花、上海青等作物）和果林（如梨树、柿树等）打造田野景观。

在生态系统设计过程中，设计团队得到了来自上海市园林科学规划研究院的专家的各方面建议和技术支持。在他们的帮助下，设计团队在场地内最大限度地确保了动植物栖息地的连续性，并设计了动物迁徙路径。

3.2.4 交通策略

场地内被河道及路网分割的破碎片区亟需通过交通流线进行整合。设计团队希望以一套慢行系统串联起各个区块，并通过竖向交通降低对生态系统的干扰。该慢行系统由内环滨水游道、中环景观游道、外环漫步游道、生态步道，以及近5km的自行车环线构成，在局部地段还设置了桥梁，为行人、骑行者和野生动物创建了安全连贯的移动路径。

在慢行系统和桥梁系统的设计过程中，设计团队与众多建筑师、结构工程师、桥梁工程师等专家展开合作，还面向当地青年建筑师举办了桥梁设计竞赛，并请生物学家就获胜设计方案提出指导意见，以预留出必要的动物迁徙廊道。

3.2.5 体验优化策略

考虑到场地使用人群需求的多元性，设计在园区活动安排上结合各个区域内的人类活动强度预期，在最低限度开发的基础上尽可能地丰富游览体验。

动之谷是主要的运动区域，区域内的建筑及活动空间设计与整体地形相适应，部分建筑物嵌入地势中，形成高低起伏的地形变化，并降低环境影响。水之谷设立了一系列水生花园和一座水质监测站，可开展水生态教育活动。风之谷极具特色的褶皱地形营造出野花草甸景观，结合风艺术装置，适合市民开展主动休闲活动。森之谷是场地中重要的动植物栖息地中心，可在不影响区域生态环境的前提下，开展户外生态教室等教育科普活动。土之谷中计划开展“乐活小镇”“互动农田”“观光农田”等项目，市民可在此体验农耕劳作、田园市集等活动，是亲子教育和集体出游的理想场所。这些特色体验项目由慢行系统一一衔接，游人可以在充满野趣的步道中感受不同于其他城市公园的生态景观。

4 多边合作模式

在整个项目设计过程中，设计团队整合了多种生态景观及城市韧性设计资源（包括美国的景观设计师和建筑师、加拿大的气候风道专家、德国的结构工程师、中国上海当地的植物生态学家等），这种协作模式大大提升了设计过程中解决问题的效率，成功地实现了技术的对接和落地。

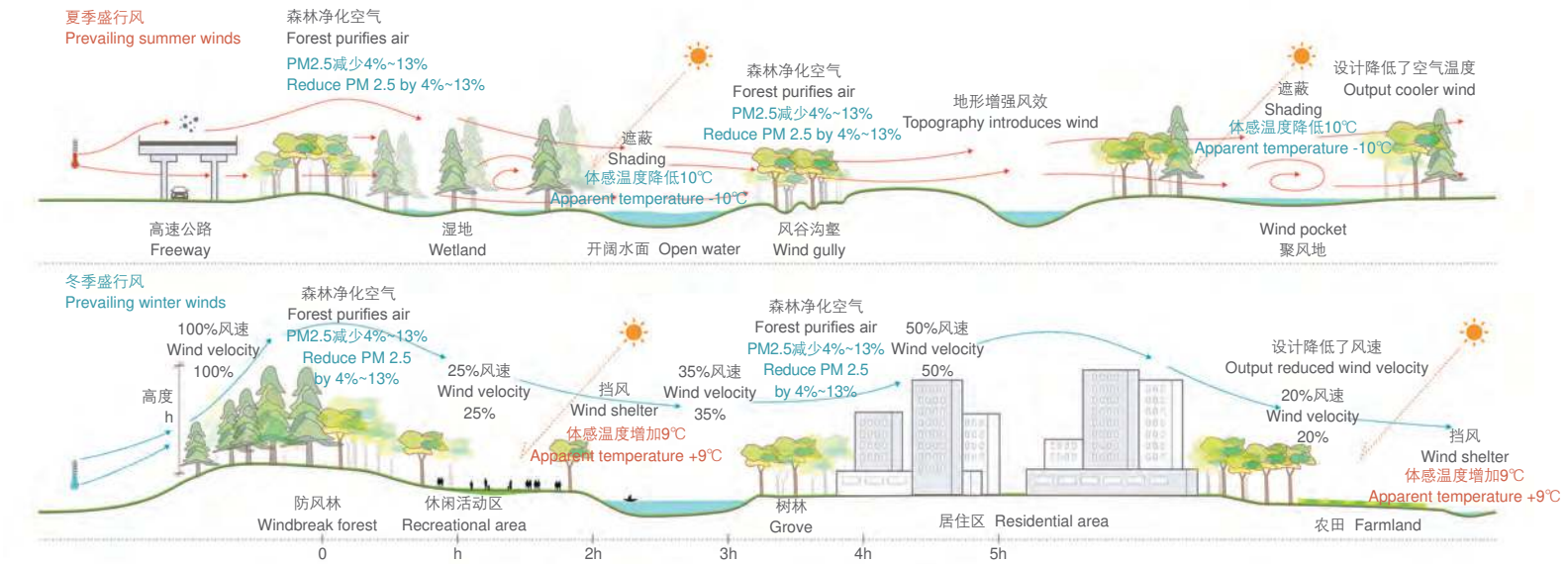
除此之外，设计团队也将美国本土项目在设计过程中强调的社会—经济各个层级的公众参与、重视公共利益的经验带到了中国，形成了一种具有借鉴意义的多边合作模式。

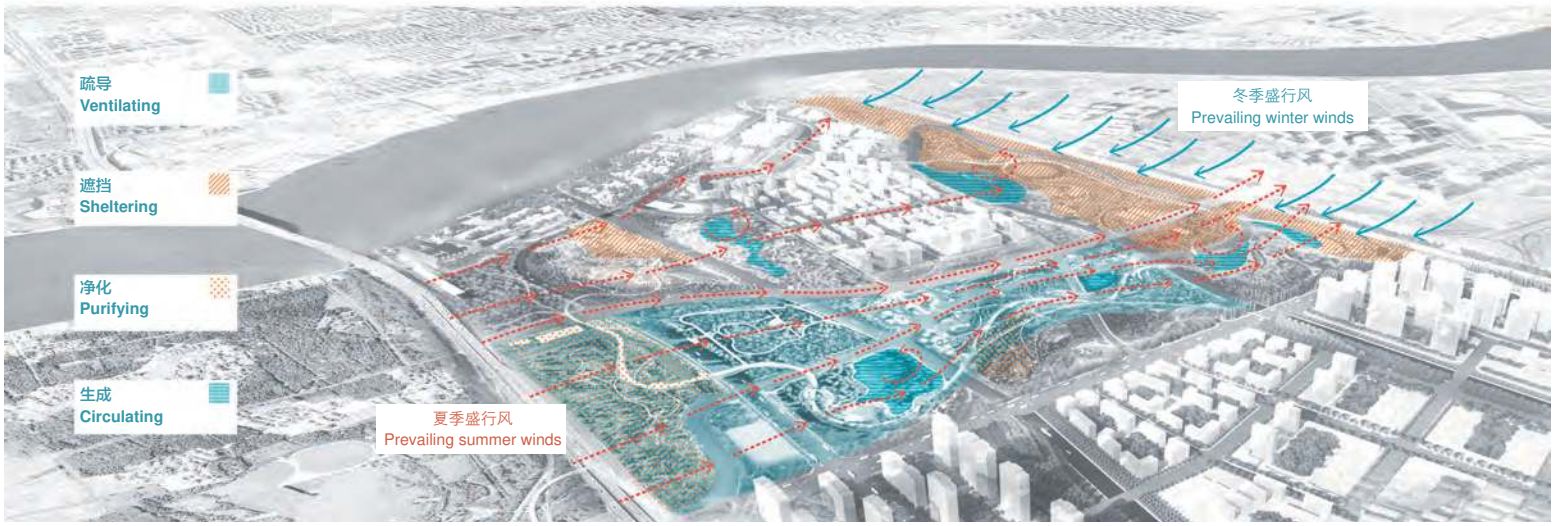
任何设计和规划问题都没有“最优方案”；当面对众多的解决方案时，通常的评判标准都基于客观条件（包括物质空间基础、经济条件、建筑规范等）和主观因素（包括公众意愿、风俗习惯、价值判断等）。[4]通过社会参与，市民可以介入规划和设计过程中的决策阶段，参与到解决问题的过程中来。

利益相关者（stakeholder）一词当前在规划和公共政策领域十分常见。广义上，利益相关者可以是项目周边的居民，也可以是纳税人，还可以是关注项目的任何市民。由于“利益相关者”和“公众”这两个概念往往会被混淆，因此有必要厘清为什么利益相关者应该参与到项目的设计过程中，以及如何选择利益相关者。[4]在美国的规划设计实践中，利益相关者通常包括4类：社区代表、利益组织代表、政府机构代表，以及能够代表公共利益的官员或专家。同时，这些利益相关者应对问题有决定权、掌握某些特定的信息或知识、能够代表某种实际冲突或潜在冲突的当事方，并能够融入项目所处的社会网络。[4]

对于三林项目来说，利益相关者发挥着非常重要的公共影响。筛选出的利益相关者包括：

1）来自场地周边社区的、具有影响力的代表，例如在周边社区组





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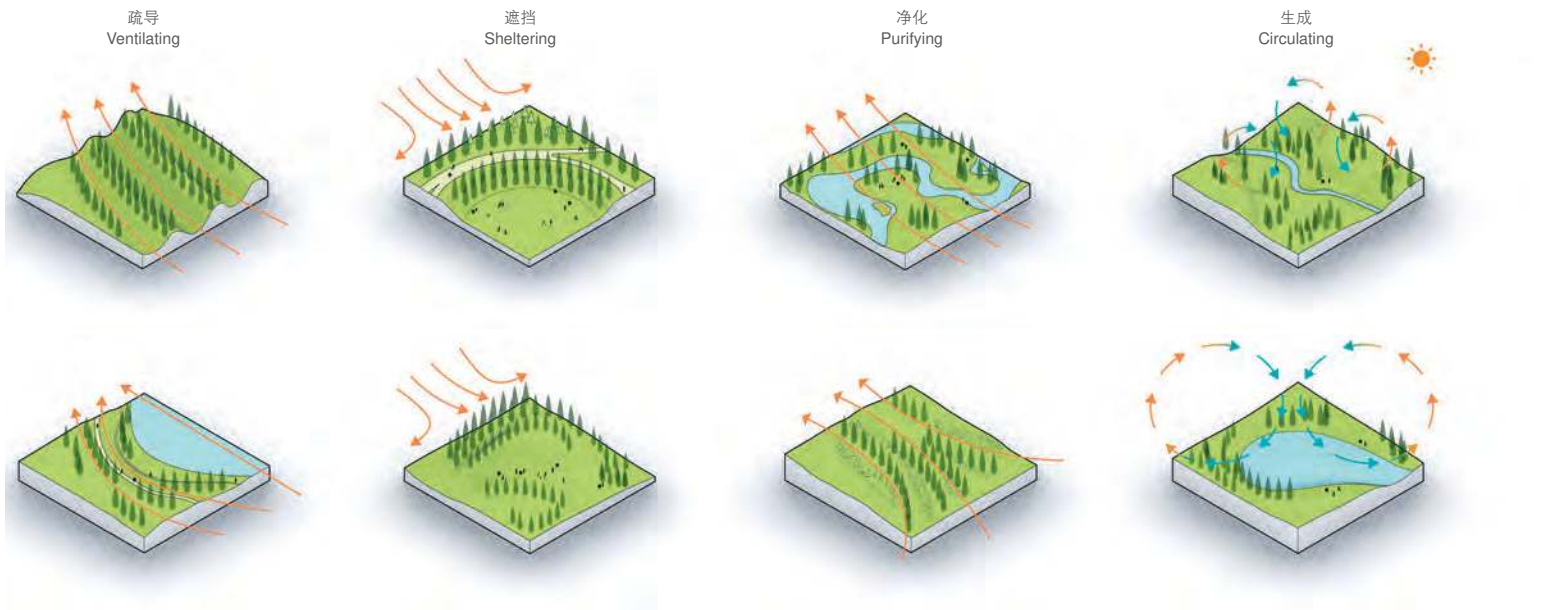

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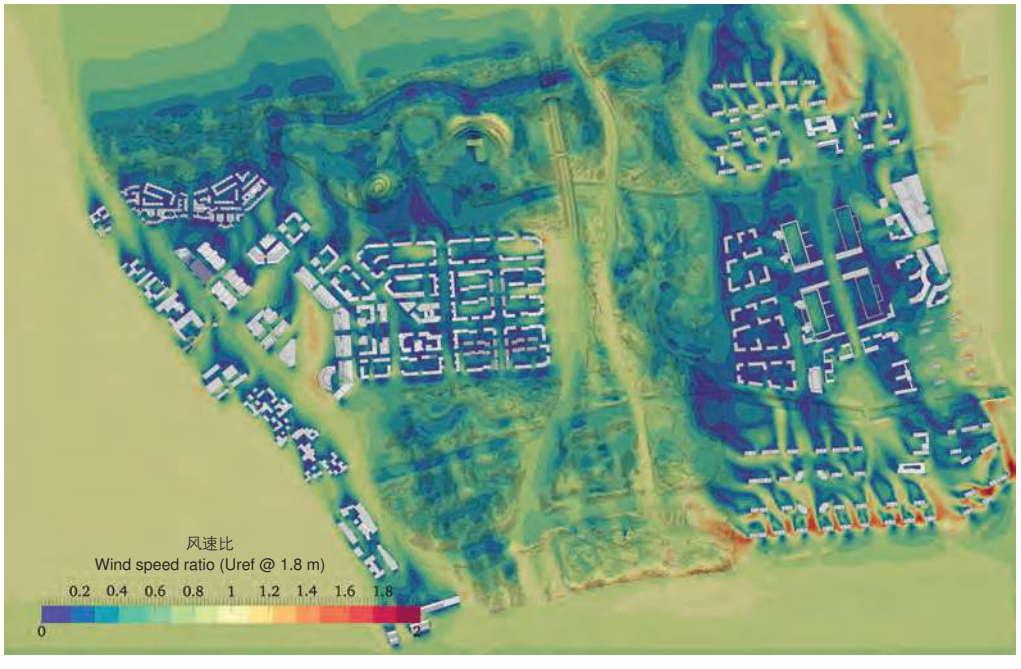
① 宫胁造林法强调并提倡使用乡土树种建造乡土森林，以在较短时间内建立适应当地气候、带有浓密冠层的群落结构。

7. 风道系统与微气候策略
8. 4种气流运动模型
9. 对全场地进行平均风速模拟，以验证设计的“风廊”效果。

7. Ventilation corridor and micro-climate strategy
8. Wind pattern toolkit
9. Final simulation of wind speed analysis of the design demonstrates the park's performance as an urban ventilation corridor.



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织中担任重要职务的领导；

2）场地实际问题或矛盾的当事方代表，包括开发商和场地周边的居民；

3）对意见及问题具有实际执行力的决策人，例如在项目中整体河道规划设计（如河道宽度、深度、荷载量等）问题上具有最终决定权的部门为上海水务局，所以水务部门的相关人员被邀请参与到设计过程研讨之中；

4）对项目相关内容具有专业知识背景、能够代表公共利益的专家，例如，设计研讨会邀请了包括上海辰山植物园园长、上海园林设计研究总院院长等在内的植物生态学专家，就项目的整体植被设计提出评价意见。

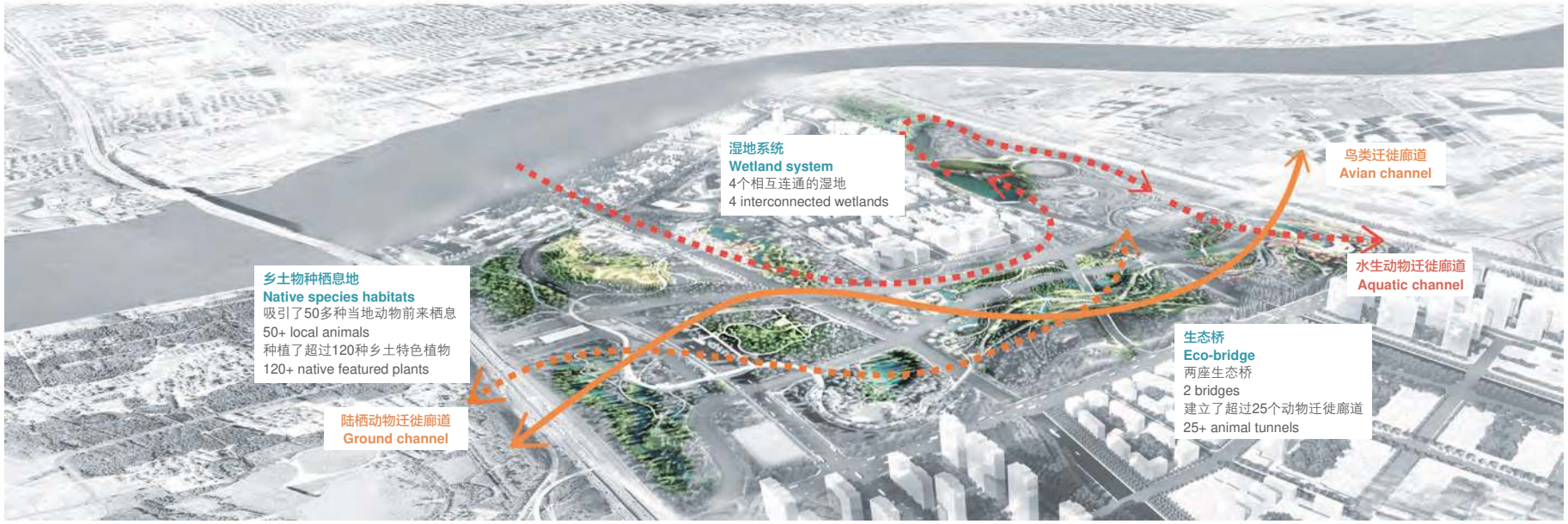
鉴于中国的具体国情，在三林项目中，设计团队和项目委托方组织的社会参与活动皆需要得到政府相关部门的许可，但每隔2~3个月还是会进行为期2~3天的利益相关方设计研讨会。考虑到本项目可能为上海市带来的更广泛的社会效益，设计团队和项目委托方也采用调查问卷、采访、专项座谈会等方式，积极收集来自社会各群体的意见。例如，在风之谷的初步设计中，生态湿地结合樱花林带的景观风貌构想得到了利益相关者的支持和肯定，并收到了“希望在这种山—水—花—林的浪漫意境中进一步增添中国传统园林特色”的建议。基于此，设计团队进行了多达5轮的中国传统园林设计研讨，提出了“园中园”的初步设计理念，并由苏州园林设计院进一步深化完成。

项目建成三年后，运营管理工作可能会直接移交至上海市政府，因而设计团队与各利益相关方充分考虑了公园的维护成本问题，达成了几项共识：1）减少高维护需求的设计内容；2）将高维护需求的设计集中排布；3）在构建生态系统时，充分发挥植物群落及生境本身的演替功能，例如在生态防护区及保育区运用宫胁造林法①。

在这种强调公共参与的多边合作模式下，上海三林楔形生态谷项目不仅实现了对设计方案的持续优化，不断解决施工建造中的落地问题，同时也充分考虑了园区建成后运营管理和生态维护的成本和可行性，旨在使项目真正满足市民需求，为城市带来更加持久而显著的社会、生态和经济效益。**LAF**

项目信息

项目地址：中国上海市
项目面积：240.6hm^2
项目委托：上海地产三林滨江生态建设有限公司
景观设计：TLS景观设计公司
首席设计师：Tom Leader、张文沫
设计团队：聂雨晴、邢晓晔、陈嘉雯、Pablo Alfaro、高露、孙辰、姜卓、王子莹、郑幻、范炜、张晨笛、刘京、郑嫚、薛雯瑜、黄雨烟、杨雪菲
合作团队：
政府部门：上海市水务局、上海市绿化和市容管理局、上海市规划和自然资源局
技术咨询顾问：Klimaat气候环境咨询公司、Lotus Water水环境工程顾问、UAP工作室、SBP工程咨询顾问、上海市园林科学规划研究院、同济大学建筑设计研究院、KDA建筑工作室
景观合作团队：上海市园林设计研究总院、上海市城市建设设计研究总院、上海市城市规划设计研究院、苏州园林设计院、华东建筑设计研究院
建筑及桥梁设计团队：华东建筑设计研究总院、上海市政工程设计研究总院、创盟国际、否则建筑、同济大学建筑设计研究院原作设计工作室、华东建筑设计研究院杨明工作室
设计时间：2016年12月至今
施工时间：2019年1月至今
所获奖项：
2019美国景观设计师协会北加州分会荣誉优胜奖
2019世界景观设计奖最佳概念设计奖提名
2017上海三林生态公园国际竞赛一等奖

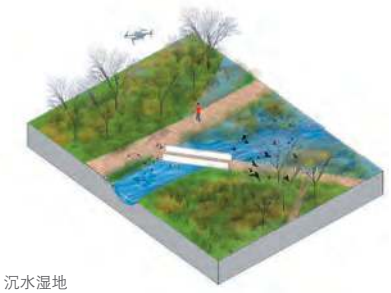


1 Project Background

As one of the eight green wedges defined by the Shanghai Master Plan, Sanlin Valley Park encompasses an area of 240.6 hm^2. It is the only public green space situated on the banks of the Huangpu River in the southern region of city proper and serves as an important intersection between ecological corridors along the Huangpu River and Shanghai's outer ring road.

During the early 20th century, the Sanlin area maintained a largely rural appearance — a high density of water systems including the "mini" Huangpu River, Sanlin Ponds, and Sanlin North Bank, to name a few. These systems essentially constituted the landscape of the area at that time. Due to the fact that this area was situated on the banks of the Huangpu River, its soil was of clay and frequently experienced floods or water loggings. As Shanghai urbanized, its population grew exponentially. Sanlin, situated between urban and rural, quickly became the gathering area for migrating population. This, coupled with ineffective planning and management, resulted in inappropriate usage of the land (as industrial areas), as well as unregulated construction of homes and buildings. The area's ecology had constantly deteriorated with severe water pollution and a loss of biodiversity.

Shanghai's rapid urbanization has made itself quickly grow

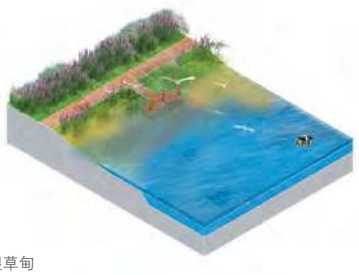


沉水湿地
Submerged wetland

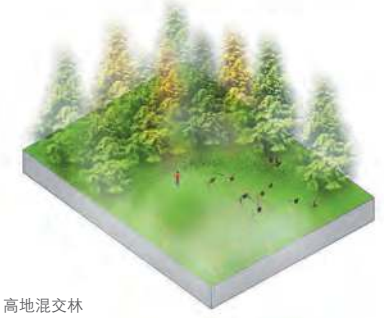
灌木林
Scrub shrub

挺水湿地
Emergent wetland

低地落叶林
Lowland deciduous forest



湿草甸
Wet meadow



高地混交林
Highland mixed forest

10. 生态系统策略
11. 通过微地形塑造，打造多样化的生态群落。

10. Ecosystem strategy
11. Shaping micro-terrains to create diverse habitats.

into a city that possesses the world's second largest population density. This caused the urban heat island effect to become even more severe. Due to the city's underlying geography and man-made surface features being of low reflectivity and high heat capacity, heat is easily trapped at high levels in the city. Other factors such as industrial activities, transportation, and human activities further contribute to the heat levels within the city, where temperatures are significantly higher than surrounding areas. In fact, research shows that when air temperatures are higher than 29.2°C, human beings are more prone to heat injuries and possible death. It is also predicted that by the year 2050, heat stress days (annually) are likely to be double that of the year 2015. To alleviate this issue, in 2001, Shanghai government endorsed eight green wedge projects that will serve as ventilation corridors and green lungs of the city.

In 2014, the city of Shanghai started to improve the management of the Sanlin area through a new land use planning, according to which, however, the area is divided into ten dispersed zones that consequently results in a considerable challenge to the landscape design project.

2 Design Objectives

Due to the new planning scheme, the eastern and western parts of the site are adjacent to different types of residential developments. The design team performed meticulous on-site research, conducted numerous interviews, and contacted with market consultants to determine user requirements. Both the usage and users of the surrounding areas are diverse and complex: users include native residents, new residents, high-tech workers, business people, and students. As such, the design team aimed for the area to provide multi-dimensional services: it should allow for natives to reminisce, for the community to interact, for the residents to have a healthy lifestyle, for the office workers to relax, and for the young ones to have fun and learn.

After careful consideration of the area's conditions, as well as its potential for development, the design team devised the following landscape planning and design goals:

1) To reorganize the fragmented areas and connect them into a continuous urban green space that also allows for strolling. It should also be combined with the existing 40-km trails and bike paths along the Huangpu River;

2) To shape ventilation corridors for the city, and in the process, create comfortable micro-climates and alleviate the existing urban heat island effect;

3) To restore the site's ecological environment, reintroduce living habitats, and create a resilient landscape;

4) To create a vibrant place for urban living, satisfy user needs, and construct a new urban landmark;

5) To establish an educational and research hub for the urban environment and ecology.

3 Design Process

3.1 Core Design Concept — "Valley"

Principally, this landscape planning focuses on improving the regional ecological network and building a ventilation corridor to alleviate Shanghai's urban heat island effect, loss of biodiversity, and environmental pollution. To accomplish these goals while also respecting existing ecological habitats, conceptual design was implemented on a multi-layer basis constituting micro terrain alteration, water systems, vegetation, public spaces, etc. All the operations are related to elevation

开阔水域：11.58hm²
Open water body: 11.58 hm²

水质：从Ⅳ类提升至Ⅲ类
Water quality: from level Ⅳ to level Ⅲ

绿地率：提升至81.18%
Green area ratio: increased to 81.18%

运动场地：14 000m²
Sports field: 14,000 m²

步行景观桥：25座
Pedestrian landscape bridge: 25

特色景观：20处
Featured landscape: 20

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design, and this brought about the inspiration of a design concept — "valley."

Through further site analyses, the design team not only utilizes the strolling system to link up all the areas, but also identifies five main themed "valleys" and a waterfront living destination. The northern part of the site is closely situated to Shanghai's Oriental Sports Center and enjoys a windbreak forest; thus, it is very suitable for outdoor activities and is dubbed the "Sports Valley." The northeast part contains the endpoint of the site's water system and possesses excellent water quality; thus, it is suitable for water activities and is dubbed the "Water Valley." A central area embodies the core design of the ventilation corridor system and is therefore dubbed the "Wind Valley." The southeast corner contains protected green lands and forests, where the landscape is peaceful and tranquil and it is therefore dubbed the "Forest Valley." The southwest corner remains its agricultural appearance; it will be further developed to display modern agriculture and ecology and is thus dubbed the "Earth Valley." The rest of the central area is slated to accommodate retail, residential, and waterfront activities in the Sanlin Bay area, as well as a large waterfront music plaza; all of these will come together to constitute the waterfront destination. Eventually, the five valleys and the waterfront would blend dynamically to form an incredibly natural yet urbanized park.

3.2 Design Strategies

3.2.1 Water Management Strategy

During the early stages of planning, the design team worked with stormwater management experts to accurately estimate the severity of flooding and water logging on the site and generated a water management plan, which mainly focuses on building a stormwater management system and a constructed wetland system.

The stormwater management system mainly includes a

12. 体验优化策略
13. 不同主题生态谷地的特色体验项目

12. Program and experience strategy
13. Various feathering programs in each valley

detention zone and several bio-retention ponds that distribute around the park. The bio-retention ponds are utilized to collect, store, and filter water with vegetated bio-swales and rain gardens. The detention zone will increase the overall retention capacity of on-site rainwater to respond to the water logging problem and to improve landscape resilience.

Particularly, during the design process of constructed wetlands along water courses, the design team worked with local design firms to identify the priority in water system improvement through on-site survey and sampling. Three recommendations were then generated: 1) to lower the amount of sediments; 2) to prevent eutrophication; and 3) to improve water quality and clarity. The plan introduces four constructed wetlands at the inlets, and each of them is integrated seamlessly with their respective landscapes to form four beautiful, distinguished wetland sights: the emergent wetland, the terraced oxygenation wetland, the flower tree wetland, and the cypress-swamp wetland.

At the same time, water quality experts calculated the water treatment load of each area and made recommendations accordingly. For instance, regarding the terraced oxygenation wetlands in the Earth Valley, the experts suggested to: 1) adopt vertical flows for water filtration, 2) enlarge the area of the sedimentation pool for a fuller settlement of suspended solids in the water and a fuller purification of oxides of nitrogen and phosphorus, and 3) optimize the oxygenation facility by reducing the number of terraces according to the calculations of water treatment capacity.

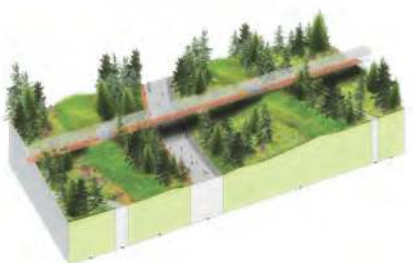
Through these improvements of upstream, the Water Valley will enjoy a better water quality that satisfies the requirements for water activities. Additionally, the Water Valley will establish a water quality monitoring station, greenhouses, and mini rain gardens, all of which can be used for public educational programs.

3.2.2 Ventilation Corridor and Micro-Climate Strategy

The design team worked with wind climate experts to analyze the general wind resource and characteristics of Shanghai, as well as those of the Sanlin area. The recorded average wind speed on the site is relatively moderate (at 2.7 ~ 3.4 m/s). During the winter, northwesterly and northeasterly winds are prevailing, while during the summer days southeasterly winds are prevailing. On the site, apparent temperatures in and against the direction of the winds can vary up to 10 °C, especially during mid-day times in winters and summers. This exemplifies the importance of directing the wind and results in a design strategy of “halting the prevailing winter winds and channeling the prevailing summer breezes.” The Sports Valley in the north and the Earth Valley in

动之谷：森林小剧场
Forest amphitheater in the Sports Valley

风之谷：风廊草甸
Wind tunnel in meadow in the Wind Valley



土之谷：水净化湿地
Water treatment wetland in the Earth Valley

水之谷：水质监测站
Water quality monitoring station in the Water Valley

森之谷：杉林溪地
Cypress-swamp in the Forest Valley

the south are conceived as areas suitable for winter activities due to their sitting advantages. Ventilation corridors that channel summer winds will help neutralize the high temperatures in summer days. Overall, the strategy recommends four airflow typologies: ventilating, sheltering, purifying, and circulating:

1) Ventilating: to create ventilation corridors or plant trees parallel to the wind to channel prevailing summer winds. These corridors will be combined with water areas or rivers to increase humidity and lower temperature.

2) Sheltering: to create protrusions from the ground or plant trees perpendicular to the wind, in order to deflect prevailing winter winds.

3) Purifying: to select vegetation species that can help purify the air and plant them perpendicular to the wind. Trees and bushes should be well blended with the geography to increase the windward area, so as to lower the PM 2.5 levels in the air.

4) Circulating: the highland and valley bottom geography, as well as the differences in solar radiation, results in a temperature and pressure gradient which facilitates airflows. Additionally, water surfaces and the surrounding geography will also create pressure gradients that strengthen the airflow effect.

In addition, the design team places an emphasis on the integration of micro-terrains and vegetation, so as to further improve the local comfortableness. For example, for the Sports and Earth Valleys, the geography alone can block some winds, but the blocking effect can be amplified five-fold when well-designed vegetation comes into play. At the same time, the design team also incorporates interactive art pieces and aromatic plants to induce a multi-dimensional sensing experience.

Throughout the design process, experts also made recommendations on the design of main and secondary wind corridors. The design team often responded quickly by altering and improving the design iteratively. For instance, situated in the main wind corridor area, the Wind Valley is anticipated to be the main corridor for wind channeling. According to wind experts' analyses, the design team identified the locations of wind gaps, maximized the flow of wind, and purified it by creating a large amount of small folds in the geography and combining plants of varying heights. The Forest Valley stands as another good example. In initial plans, the design team set up a 10-meter-wide forest belt in order to minimize noise from the surrounding transportation. However, initial simulations showed that this forest belt would result in broken wind flow and drastically affect comfort in summer and impact the establishment of natural habitats. The design team thus altered the planting design to still block off noise but also allow for a wind channel. Subsequent simulations generated a much better result.

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The experts also ran thermal-wind simulations for the entire site to ensure that the intricate geography and network of wind corridors would work and satisfy the goal of alleviating the heat island effect on the site.

3.2.3 Ecosystem Strategy

Soil and water conditions define the ecosystem type of a land. The design team aspires to restore the site's ecosystem by shaping micro-terrains to create a diverse network of habitats. These include emergent wetlands, submerged wetlands, wet meadows, scrub shrubs, lowland deciduous forests, and highland mixed forests.

In respect of the specific ecological conditions, the site is divided into eco-protection, eco-conservation, and eco-buffer zones. Eco-protection zones are mainly situated in the east, which neighbor upon high-density residential areas. Eco-conservation zones cover the Wind, Water, and Forest Valleys, which ensure the connectivity of eco-corridors and guarantee animal and plant habitats, while integrating the strolling system and recreational places. The eco-buffer zone is situated between the southern edge of the Sports Valley and the northern edge of the Earth Valley, which is conceived as a leisure and recreational center of the site and a buffer between the eco-conservation zone and the waterfront.

To highlight each valley's uniqueness and enrich user experience, the planting design creates varied landscape qualities and ecosystems. To celebrate local identity, the design team utilizes native vegetation species of Shanghai: in the Sports Valley conifer species are used to block the prevailing winter

winds; the Wind Valley adopts species such as *Quercus Nuttallii*, *Acer Palmatum*, and *Ginkgo Biloba* to form a beautiful rolling landscape in autumns and help channel winds; the Forest Valley creatively employs native vegetation species such as *Metasequoia* spp. to create alluring cypress-swamp wetlands which help purify water; the Earth Valley introduces large amounts of *Taxodium* 'ZhongShanSha,' *Osmanthus Fragrans*, and *Celtis Senensis*, along with the existing farmlands and orchards to exude an agricultural vibe.

In conclusion, the design team, with the help from local ecologists, manages to not disrupt the natural habitats on the site while designing a number of eco-bridges as migration paths for wildlife.

3.2.4 Transportation Strategy

A trail and path system is expected to link up all the land pieces cut by the weaving canals and road networks. The design team hopes to adopt a strolling network that connects each of the areas and to minimize impact on ecosystems by utilizing "vertical" forms of transportation. This system consists of the waterfront loop, the main loop, the outer loop, the eco trail, as well as a bicycle path of nearly 5 km and several eco-bridges in specific areas, creating a safe and interconnected path system for pedestrians, bicyclists, and animals.

During the design process, the design team worked with architects, structural experts, and bridge engineers to improve the design schemes of the networks. They also held a bridge design competition for young and aspiring local architects, and invited biology experts to provide suggestions to ensure the "walkways" for wildlife.

3.2.5 Program and Experience Strategy

Considering the various users, the design team estimated the activity intensiveness for each area, so as to diversify programs and user experience while minimizing the impact of park development.

The Sport Valley encompasses the main area of recreational activities, where the buildings and open spaces are well integrated into the overall geographical design to minimize human impact on the environment. The Water Valley possesses a series of water gardens, as well as a water quality monitoring station — well suited for educational programs related to water and the ecology. The Wind Valley combines folding geographical features, floral landscape, and art installations to enrich visitors' experience. The Forest Valley is an important natural habitat for plants and animals, allowing for "outdoor ecological classroom" educational programs. The Earth Valley plans to build features such as "Lohas Village," "Interactive Farmland," and "Sightseeing Farmland," for citizens to experience agricultural activities. All of the landscape programs are well connected by the strolling system, inviting tourists to have various experiences throughout the site that distinguishes from other urban parks in the city.

4 A Multi-Lateral Cooperation Model

Throughout the entire design process, the design team works with many other teams and individuals, including landscape architects and architects based in the USA, wind climate experts based in Canada, structural experts based in Germany, and ecological experts based in Shanghai, China. This multi-lateral

14. 水之谷：水质监测站及雨水花园。
15. 森之谷：具备净水功能的杉林溪地。

14. Water Valley: water quality monitoring station and rain gardens.
15. Forest Valley: cypress-swamp helps purify water.

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cooperation has greatly enhanced the working efficiency and connected different sorts of technologies and knowledge to yield a successful design.

Apart from these, the design team also adopts certain principles in landscape practices within the USA — that a project should encourage public participation of all socio-economic levels and place emphasis on the experience and benefits of the public. Bringing these principles to a project in China creates a meaningful multi-lateral collaboration.

There is no "best solution" to design and planning problems. Each problem can have a number of solutions, based on two sets of criteria: facts (material strengths, economics, building codes, etc.) and attitudes (interpretation of the facts, traditional and customary approaches, value judgment, etc.).[4] Through public engagement, citizens can play a role in the planning and design process and in solving the problems in their communities.

The term "stakeholder" is very commonly seen in planning and public policy today. A stakeholder is defined as someone with a "stake," or interest, in the issues being addressed: a resident, a taxpayer, or a concerned citizen. Indeed, such a broad definition of "stakeholder" can confuse people with "the public" — it is important to consider why stakeholders should participate in the planning and design process, and how to select them.[4] In planning practices in the United States, stakeholders usually include four types of people: community representatives, representatives of interested organizations, representatives of government, and elected officials or experts who speak for public interests. These stakeholders are selected according to their jurisdiction over the issue, particular information or knowledge, party in an actual or potential conflict, and connections to community networks.[4]

For this Sanlin case, stakeholders exert a large public influence. Selected stakeholders include:

1) Influential figures who can represent the surrounding communities, such as leaders of organizations based in nearby communities.

2) Representatives who have a direct stake in the issues related to the site, including developers and local residents.

3) Decision-makers who are capable to act on decisions that could potentially solve issues or problems. An example would be the Shanghai Water Affairs Bureau, who is the decision-makers on the overall design of the canals (e.g., width, depth, and load bearing capabilities). As such, they are invited to participate in the design process.

4) Experts who possess professional knowledge associated with the project and can represent public interests. For instance,

① The Miyawaki Afforestation emphasizes using local tree species to realize the best coenotype adaptive to local climate in a rather shorter time.

the design team invited ecologists and botanists such as the head of Shanghai Chenshan Botanical Garden and the head of Shanghai Landscape Architecture Design and Research Institute to provide valuable comments.

Considering specific conditions of China, the design team and the clients had to seek approval from relevant government departments for social activities and community meetings. Along with the approval, the team gathered the stakeholders for 2 ~ 3 days at an interval of two months or a quarter to discuss and review designs. The design team was also mindful of the colossal potential impact that this project could produce on the society of Shanghai. As such, field surveys, interviews, and panels were conducted to actively garner input from various levels and groups within the society. For instance, during the initial design stages of the Wind Valley, stakeholders approved and encouraged the plan of integrating ecological wetlands with Sakura trees after being consulted. They also added further useful comments, expressing the hope that a "hill-water-flower-forest" formation can bring about more romanticism and convey the uniqueness of China's traditional gardens. Following up on this comment, the design team conducted five rounds of research on traditional Chinese landscapes and developed a design ideology of "a garden within a garden." This conceptual and initial design was later continued by Suzhou Institute of Landscape Architecture Design Co., Ltd.

Three years after the completion of its construction, the project will be managed and maintained by Shanghai City government. The design team and the stakeholders took this into consideration and gave meticulous thoughts to lower the maintenance cost. Certain recommendations include: 1) to replace high-maintenance design elements with low-cost ones; 2) to consolidate high-maintenance design elements into concentrated areas; and 3) while shaping the ecosystem, to maximize the effects that vegetation communities and habitats can provide, for example, utilizing Miyawaki Afforestation① in eco-protection and eco-conservation zones.

Ultimately, by employing a multi-lateral cooperation mode that also emphasizes public engagement, the design of Shanghai Sanlin Valley Park was iteratively improved to culminate into what it is today. This model also allows for continuous response to on-the-ground construction issues and takes into consideration the cost and feasibility of future management and maintenance. All things considered, it should — and will — be able to satisfy the needs of citizens and contribute to a more efficient and sustainable society both in ecology and economy. **LAF**

16. 风之谷：风廊与草甸景观。
17. 三林滨江生活区新地标音乐广场与5个城市生态谷地实现了有机嵌合。

16. Wind Valley: distinct landforms define a clear wind corridor with waving meadow landscape.
17. Music Plaza, the new landmark in Sanlin Bund, and the five valleys blend dynamically, forming an incredibly natural yet urbanized park.

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PROJECT INFORMATION

Location: Shanghai, China
Area (size): 240.6 hm^2
Client: Shanghai Sanlin Binjiang Ecological Construction Co., Ltd.
Landscape Architecture: TLS Landscape Architecture
Chief Designers: Tom Leader, Zhang Wenmo
Project Team: Nie Yuqing, Xing Xiaoye, Chen Jiawen, Pablo Alfaro, Gao Lu, Sun Chen, Jiang Zhuo, Wang Ziying, Zheng Huan, Fan Wei, Zhang Chendi, Liu Jing, Zheng Hua, Xue Wenyu, Huang Yuyan, Yang Xuefei
Collaborators:
Government institutes: Shanghai Water Authority, Shanghai Landscaping and City Appearance Administrative Bureau, Shanghai Bureau of Planning and Land Resources
Sub-consultants: Klimaat Consulting and Innovation Inc., Lotus Water Engineering, UAP Studio, Schlaich Bergermann Partner, Shanghai Academy of Landscape Architecture Science and Planning, Tongji Architectural Design Group Co., Ltd, Studio KDA
Local design institutes: Shanghai Landscape Architecture Design and Research Institute, Shanghai Urban Design and Research Institute, Shanghai Urban Planning and Design Research Institute, Suzhou Institute of Landscape Architecture Design Co., Ltd., Landscape Department of East China Architecture Design Institute
Architectureand bridge design: East China Architecture Design Institute, Shanghai Municipal Engineering Design Institute, Archi-Union, Office Offcourse, Original Design Studio, Yangming Studio of East China Architecture Design Institute
Design Period: December, 2016 to present
Construction Period: January, 2019 to present
Awards:
2019 ASLA Northern California Chapter Honor Award
2019 WLA Concept Design Shortlist
2017 Shanghai Sanlin Bund Ecological Park International Competition First Prize

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