

始于原型设计与试验

——瑞典哥德堡禧年公园的景观设计

Prototyping a Park

—Landscape Design of Jubileumsparken in Gothenburg, Sweden

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摘要

瑞典哥德堡禧年公园的设计采用“双轨并行”模式——其永久性园区将于2021年底竣工并开放；自2014年起，一系列临时公园和设施将随着若干公众工作坊的开展陆续建成。场地的逐步演化给了生态系统适应的时间，也使公众有机会直接参与建设和种植活动，同时间接表达自己对公园的关注点以及期望，帮助优化永久性公园的最终设计。针对场地原本以荒草为主的脆弱滨水生态系统以及社会文化遗产，在公众的配合下，一座1:1比例的景观实验室——“水岸园”得以建立，用于测试各类新材料、工作方法，以及种植和维护技术，以便应用于永久性“嬉学园”的建设。该设计过程强调观设计师与场地维护人员的紧密合作，以期在长远的未来实现可持续发展目标、创造美学价值，亦强调了景观设计师持续参与公园维护以及数字工具应用的重要性。该项目还采用岩土工程技术建造了一片缓坡湿地，并创建本土与引进物种混合的植物群落，促进其自然演替以应对气候变化，为生物多样性的长期提升创造先决条件。通过这样的原型设计和测试，广大公众、维护人员和专家都参与到项目中，从城市生态系统、荒野景观和美学角度促成了一场有关景观持久性的对话。

关键词

港口更新；场所营建；城市生态系统；渐进式设计过程；城市绿地维护

ABSTRACT

The design of Jubileumsparken in Gothenburg, Sweden runs on two parallel tracks—a permanent park will be completed and opened in late 2021, and before that a series of temporary parks and installations had been set up during several public workshops since 2014. The gradual evolution of the site allows ecosystems to adapt and invites the public to leave their imprint on the park through not only directly building and planting, but even more importantly, indirectly voicing their interests and desires which impacts the final design of the permanent park. With a focus on the existing fragile ruderal and coastal ecosystems, as well as the socio-cultural heritage of the site, a 1:1 scale landscape laboratory—the Shoreline Park—was built up together with the public. It allowed for testing new materials, work methods, planting and maintenance techniques that would then be used in the permanent Play & Learn Park. The design process also highlights the need for a closer collaboration between landscape architects and maintenance staff to achieve the sustainability goals and the aesthetic value of the park over a longer period, as well as the importance of landscape architects' continuous involvement in park maintenance and the use of digital tools. The project also adopted geotechnic infrastructure to create a gently sloping wetland and proposed a mixed planting plan of indigenous species, natural succession and exotics to address climate change, and to create preconditions for high biodiversity even in the long term. Through such prototyping and testing, the wider public, maintenance staff, and experts got engaged in this project, which initiated a dialogue about the persistence in landscape between urban ecosystems, wildscapes, and aesthetics.

KEYWORDS

Harbor Regeneration; Place Building; Urban Ecosystems; Evolutive Design Process; Urban Greenspace Maintenance

编辑 | 王胤瑜

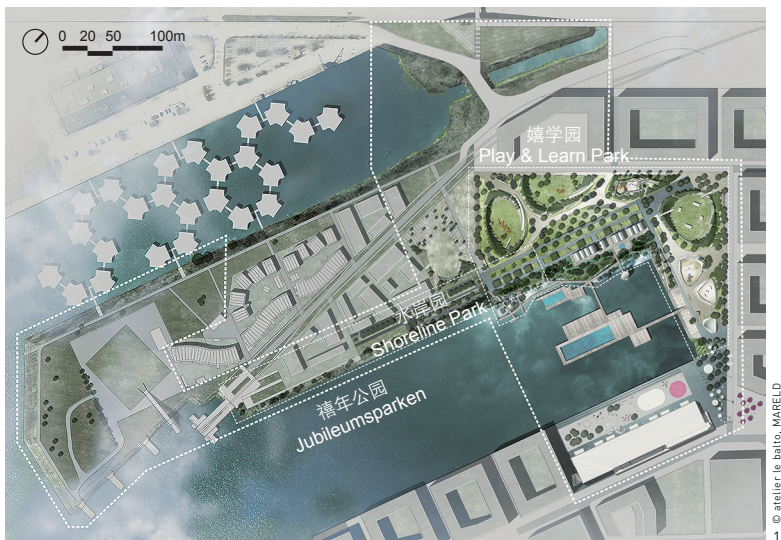
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<https://doi.org/10.15302/J-LAF-1-040023>
收稿时间 RECEIVED DATE | 2021-02-21

中图分类号 | TU984
文献标识码 | B



1. 禧年公园的平面图展示了周边所有的并行项目和未来街区。其中，嬉学园和水岸园组成了港口北部植被繁茂的区域。
2. 一张展现整个禧年公园区域及其周边新城区的早期蓝图。完成如图所示的这些项目需要历经数十年。

1. An overview of Jubileumsparken with all parallel projects and future city blocks. Play & Learn Park and Shoreline Park form the vegetated and lush northern part of the harbor.
2. An early image showing the whole Jubileumsparken and the new city district surrounding it. Completing these projects will take decades.

“时光流逝，自然生息。”

——朱利安·莱克斯沃西《杂草丛生》^[1]

1 背景

哥德堡是位于瑞典西海岸的一个港口城市，将于2021年迎来建市400周年。作为纪念，一个名为“禧年公园”的项目于2014年启动。该项目位于哥德堡市中心尤塔河岸边的一个前工业港口——“自由港”。在未来的数十年里，除了这座公园，这里还将建起一个新城区（图1，2）。

历史上，哥德堡城市规划一直遵循斯堪的纳维亚地区的传统做法，布局了充足的绿地和城市森林。在其城市绿化战略中，宽阔的绿色廊道从南、北两个方向渗入城市肌理，但在市中心的连接较弱。因此，禧年公园将成为这片区域中具有纽带意义的公共空间。尽管在自由港附近发现了大片的残存森林，但它们未能延伸至哥德堡市中心和尤塔河沿岸。因而，禧年公园场地所在地，以及交通廊道和溪流沿线现有的荒地将在提升城市森林连接性方面发挥重要作用（图3）。

禧年公园项目将持续数年，涉及多个地点和多种设计途径，与其说它是一座公园，不如说它是一个公园系统（图4）。项目采用临时性和永久性“双轨并行”的渐进式设计过程，这一做法在由亚历山大·谢默托夫领导的、1999年启动的法国南特岛前港口开发项目中已经取得了成功^[2]。这一项目也被作为自由港和禧年公园的参照案例。虽然原本的自由

港开发项目为了适应当前需要和更复杂的城市规划要求已经暂停，无法帮助完善禧年公园周边的城市肌理，但公园本身的设计过程一直在不断丰富与改进。这种相当独特的方法已经引起了研究人员^[3]和实践者的注意。近年来，自由港的总体规划和禧年公园的设计过程获得了由瑞典建筑师协会颁发的年度最佳景观设计奖项，这是对市政府以及相关建筑师和设计师的出色工作的认可。

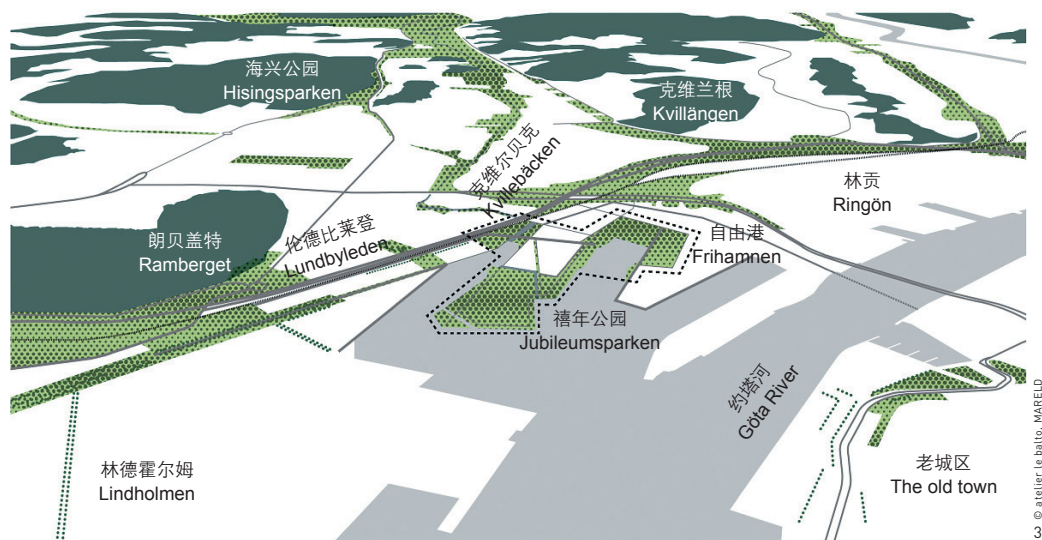
项目在初始阶段举办了若干公开工作坊，搭建了多处临时性装置，包括一处著名的公共桑拿浴室，以及Raumlabor建筑团队设计建造的一座河上漂浮泳池。2016年，随着市政府和土地所有者（一家市政公司）发起了一项设计公园永久园区的国际竞



赛，项目也进入了一个新阶段。最终，MARELD景观事务所与le balto工作室联合团队的“嬉学园”方案中选，该方案还包括一项前置任务，即设计、建造一座临时性“水岸园”（图5）。这座作为永久园区原型的水岸园已于2018年完工。嬉学园项目分为两个建设阶段，计划分别于2021年和2023年完成。本文将重点介绍这两部分的设计和施工过程。

为了理解场地和项目，团队追溯了自由港区域的历史：20世纪初，这里还是一片人迹罕至的湿地。在接下来的数十年里，大规模疏浚和填海作业将这里变成了一个工业航运港口，直到21世纪初该产业撤出市中心，只给港口区留下了大片污染严重的土地。

在过去的港口更新项目中，场地特征缺乏被认为是最主要的问题之一^[4]。对于设计团队来说，重要的是从自由港的历史中获得灵感，而非去模仿和复制。举例来说，最初的湿地和人类活动形成的后工业化景观具有同等的价值，二者都有着鲜明的特点、栖息地类型和社会文化意义，分别代表了场地的自然历史与人文遗产，两种景观在当下的欧洲城市中均珍贵少有，且同样面临开发活动的威胁。20世纪末，城市中的湿地几乎已经消失殆尽，而荒地虽然数量较多，但常被视为缺乏管理、杂草丛生的不安全场所，因此，设计过程从一开始就确定了一个至关重要的出发点——这两类景观的质量都必须得到提升。此外，湿地和荒地都能提供茂密的保护性植被，成为城市中罕见鸟类的栖息地^[5]。基于此前对整座城市的鸟类调查，团队发现自由港的情况也是如此，这为进一步深化此设计理念提供了坚实基础。



3. 图中深绿色区域是残余的大片森林，是现状绿地结构的一部分。浅绿色圆点填充的区域是应当被纳入绿地结构的荒草地和废弃地范围。禧年公园原本是一处杂草丛生的场地，在图中以深色虚线标记。
4. 禧年公园最初5年内的演变：场地的样貌在过去几年中已逐步变化。
3. Dark green areas mark the remnants of large forests considered as the existing green structure. Dotted light green areas show the extent of ruderal land and left-over spaces that should be valued as part of the green structure. Jubileumsparken, previously a ruderal site itself, is marked with a dark dotted line.
4. An early visualization of the evolution of Jubileumsparken over a five-year period. The original image has been updated over the past years.

在自由港，生态系统与社会文化遗产是不可分割的，这成为了设计的第二个出发点。哥德堡曾是斯堪的纳维亚半岛最大的港口和沃尔沃汽车公司的诞生地。然而，随着工业迁出以及瑞典向科研技术型国家转变，这一历史已渐渐湮灭在城市景观中。本次设计恢复了水岸特有的湿地和茂密植被作为背景，并通过材料选择和细节雕琢再现了对比性的工业景观色调，以呈现后工业场地的本真风貌。

简而言之，该项目的愿景是让人们从拥挤的市中心暂时解脱出来，使公园成为人类和动植物的庇护所。从前的港口将逐渐转变为城市中心亟需的绿心，并成为更大尺度的蓝绿网络的重要节点。尽管哥德堡已有大量绿地，但禧年公园显然是该市在未来几年内最重要的现代化公园设施工程之一。

2 作为试验场的临时公园

层次丰富的历史造就了自由港的场地复杂性：土壤受到污染，开放式景观承受着无情的风吹、日晒与雨淋；地表覆盖着沥青或砾石，植被极少且集中在滨水区——这样的条件却刚好可以作为1:1比例的临时景观实验室，用于新材料、方法和植物的试验，以及对现状土壤、水位、风、河岸及动植物等的研究——其中许多成果已经在嬉学园中得到进一步应用。如前所述，禧年公园项目通过公开工作坊建造了一系列临时装置。这种方式使人们有机会直接参与建设和种植活动，同时间接表达出对公园的关注点以及期望，并得以体现在最终方案中。工作坊研讨主题多样，包括老年人和年轻人对座椅的

偏好（图6，7），帆船和皮划艇等水上娱乐形式，以及跑酷、瑜伽、滑板、轮滑、卡波耶拉舞和跆拳道等城市娱乐形式。这虽然使设计师必须在不同季节、天气，甚至一天的不同时间亲临场地，但他们也得以与广大公众接触，并和不同市政部门与使用者群体就城市生态系统、荒野景观以及审美体验进行更广泛且贯穿项目全周期的交流（图8，9）。通过此类讨论，设计还整合并直观呈现了全球气候目标，以在未来的日常实践中建立应对快速变化的环境的韧性。

在2017年8月至2018年9月举办的4次工作坊中，老年人、新移民、园艺专业学生和市政工作人员等百余人参与了水岸园的种植、建造和维护工作（图10，11）。该公园将新的美学和工作方法引入瑞典语境，开启了讨论韧性城市绿地的新篇章。此外，设计团队还与曾参与临时公园工作的休闲爱好团体一起举办了一系列聚焦于多元化娱乐设施设计的工作坊，为永久性公园积累资料，以满足多样化的使用需求。通过与客户、使用者和维护人员的磋商，设计师可以了解如何推动公园发展和管理公园，更能意识到景观设计师在渐进式设计过程中所起的作用。

3 激活自发性

城市绿地管理不仅能显著影响绿地的美学或休闲价值，也关系到其生态质量。过度使用特定植物物种会显著降低绿地的韧性：首先，真菌、害虫和城市规模的植物病害在过去的一个世纪已经成为全球性

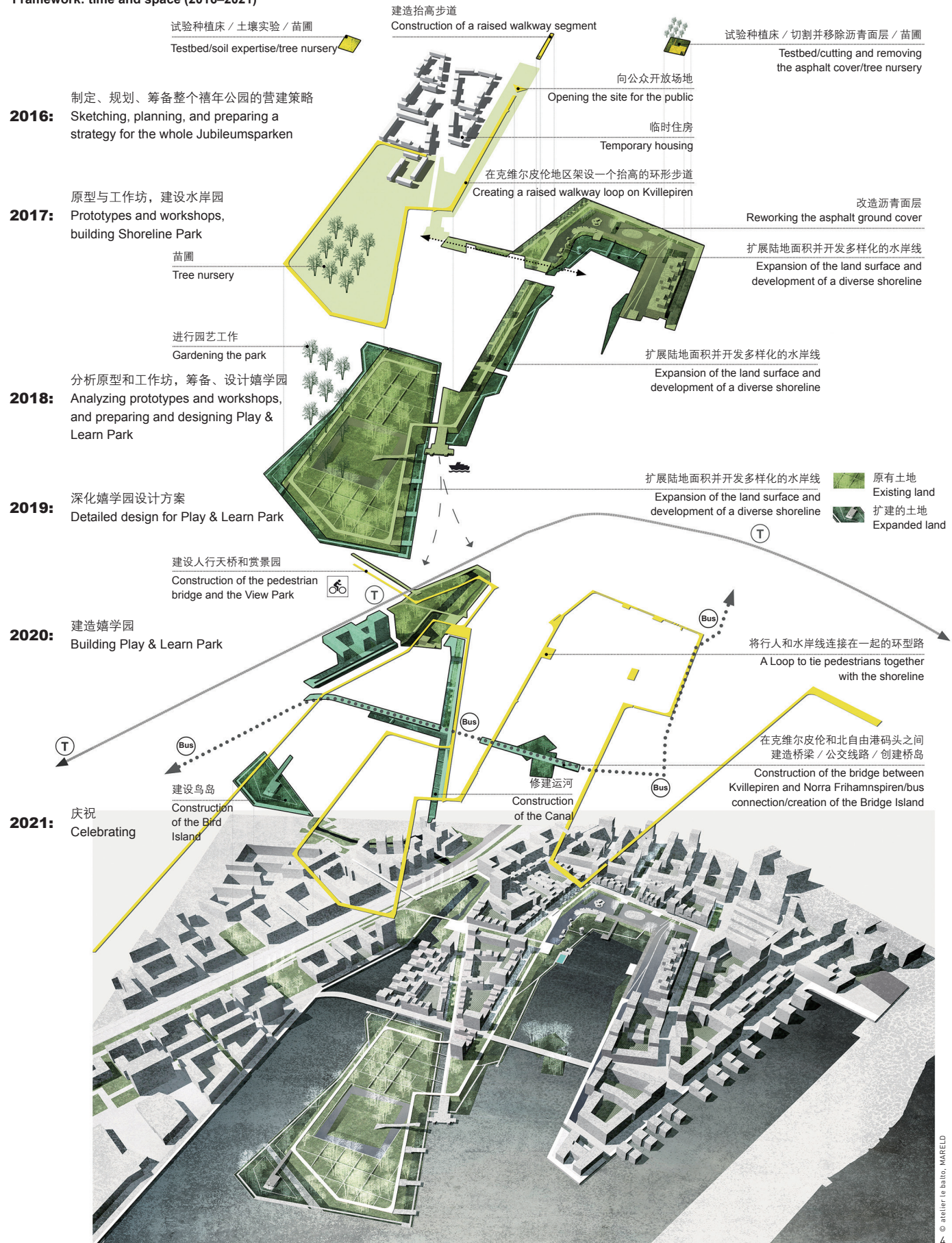
问题（对榆属和栲属树种的影响尤其显著）^{[6][7]}。其次，追逐潮流种植意味着，一旦潮流过去，绿地便可能因失去吸引力而被重新设计/种植，生态网络将因此被破坏。要保证城市绿地的持久性和韧性，关键在于建立一个灵活自由的设计方案。

因此，团队尝试以自然演替作为水岸园的补充种植策略，以期向委托方证明，自然演替不一定总是意味着杂草丛生，如果将其作为长期维护策略之一，也能收获良好效果。这一途径已经被纳入嬉学园的维护计划中，有望在日后改变人们对这里以及哥德堡其他公园中自发性植被的观感与利用方式。这种激活自发性的策略使场地植被生长不拘泥于最初的纸面设计效果，从而大大减少了新栽植被人工矫饰的痕迹——缺损的树冠、倾斜的花茎，或密不透风的幼树和灌木丛都可以增加植被结构的多样性，以及探索和游玩的价值。此类复层植被组成了先锋群落生境，吸引游客探索、体验城市中的自然，让儿童能更自由地游戏，也鼓励青少年挑战自我。不过，允许自然演替并不意味着不需要维护。设计师与市政维护团队进行了创造性园艺合作，以决定公园不同区域的植被演化方向，例如为保证安全性和视线通透而控制林下层，并培育城市荒野（图12）。协同工作有助于设计团队理解决策制定的模式，并推动现有维护实践向更具韧性的方向发展。

4 时间因素

曾经的工业活动使自由港的土地受到了污染。

框架：时间和空间（2016–2021）
 Framework: time and space (2016–2021)



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植物修复本应是逐步清理土壤和重建生境的首选方法，但由于周年纪念日临近，为快速见效，市政府早前决定改用移走受污染的土壤、铲除零星植被的处理方式。随之而来的问题是：如何保持已经很脆弱的生态系统的连续性？由于清除污染物需要在很长一段时间内分几个阶段进行，水岸园便成了节肢动物、小型哺乳动物、鸟类和其他生物的临时庇护所——它们将有20年时间逐步扩展自己的栖息地，直到现有场地逐渐变成未来的公园。保持连续性不仅是出于美学原因，也是对场地生态系统现状的考虑：在自由港这样的露天场地上，新的植被需要经过一定时间的生长才能开始为生物营造适宜的微气候。

由于公园必须在2021年400周年庆典之际建成，从开放的第一天起，其景观就应是令人愉悦、丰富多样的且亲切宜人的。今天设计并建造了它的这一代人必须能够和下一代人一样享受公园景观——这意味着在设计时要考虑到生态演替。方案用生长快、适应性强的桤树 (*Alnus spp.*)、桦树 (*Betula spp.*) 和柳树 (*Salix spp.*) 作为现有先锋植被的补充，这些小树林可以使公园的垂直植被结构很快成型，并为一些不耐强风、灼伤但对于成熟的水岸森林必不可少的慢生植物种类提供庇护 (图13~15)——只有当植被的组成和结构自然变化时，栖息其中的野生动物才会正常地繁衍生息；但这种变化是缓慢且渐进的，不会一蹴而就。景观设计师只是开启了这个进程，并为之定下提一个长期愿景，然后把结果交给自然去塑造。因此，长时间跨度的种植策略和设计方案是实现持久性的另一个关键点。

逐步的转变不仅使植被或城市野生动物易于适应，也是人们融入并体验大尺度的城市过程所必需的——由前文所述的南特岛案例的框架，以及谢默

托夫的“规划—引导”式方法可以得出这一结论。丽莎·迪德里克和卡罗琳·达尔将这一“规划—引导”式方法解释为一种“进化式”规划：在细致的场地调研基础上，其能够记录场地发展的历史痕迹，通过评估假设、融合相关讨论沟通结果及经验来预测场地的演化方向，并与场地一同转变^[2]。

5 应对气候挑战

像大多数滨水城市一样，哥德堡拥有大量的码头、临水步道和栈桥。尽管这些构筑物适用于工业活动、水上交通和步行休闲，但其硬质地表扼杀了生物多样性发育的可能性，也形成了阻止人们与水直接接触的物理屏障——尽管自由港已是哥德堡最后几处拥有较长半自然水岸线的区域之一。在开展设计工作的同时，团队还进行了岩土工程计算，结果表明需要一个水下压力堤，以防止未来的公园及其周边地面沉入河中。于是，团队决定进一步提升这一基础设施的生态与游憩价值，即与工程师合作，修改压力堤的剖面结构，增加基质层以便重新引入滨水植被，从而形成一片宽阔的缓坡湿地。游客可以沿木栈道在水上漫步，栈道下方则可以创建不受人直接影响的生物栖息地 (图16, 17)。根据瑞典岩土工程学会的指导报告，类似的防侵蚀方法已经在瑞典的其他河流和莱茵河沿岸的德国沃尔姆斯进行了测试^[8]。

设有木栈道的柔性水域边界是一种迎接21世纪气候挑战的韧性途径。随着水位的持续上升，湿地栖息地将逐渐向陆地高处后退。在此过程中，缓坡河岸将比坚硬的混凝土码头更持久耐蚀，也更能适应环境变化。到21世纪末，禧年公园的部分区域可

能会经常被洪水淹没，但公园主体仍然存在。大多数景观植物种植在稍稍抬起的地面上，在极端高水位时将形成由若干个环礁组成的迷你链岛——受北海、春季高山融雪或秋季暴雨引发的洪涝影响，尤塔河水位变化频繁，这也是哥德堡的最显著的自然特征之一。

新设计的水岸森林也与波动的河流水位相适应，体现了自发性种植方案的重要性。除了具备美学和探索价值，场地上的现有植被还可延续当地物种基因库，并借助风和鸟类传播种子以增加遗传变异。在未来10年间，这些本地植物将茁壮成长，新的生态系统也将稳定下来，使城市绿地的生物同质化现象得到改善。另一方面，团队发现测试新物种和引进物种同样十分重要。由于日益加剧的全球变暖 (城市区域尤为明显) 给本地植被带来更多威胁，团队提出了以斯堪的纳维亚滨海植被为主、以具有类似特征的引进植被为辅的植物配植策略。这样，新设计的生态系统即使面临严峻的气候变化，也能朝着稳定的方向演替。

6 园艺与数字化工具相结合

禧年公园的设计理念亦强调景观设计师要密切参与项目维护。在以往的项目中，景观设计师的参与往往在交付技术图纸后便结束了。朱利安·莱克斯沃西在其作品《杂草丛生》中指出，“园艺是参与植被生长的唯一工具”，后来又补充说，“专业景观设计师使用的表现手法无法准确把握植被的生长过程，而园丁使用的技术却可以”^[1]。设计师是否参与项目的建成后阶段将直接影响场地内生态系统的建立与演化，因为图纸上未曾表现出的植物会自发地生长起来，而这些植物也并非都是杂草。设计师需要在现场与维护人员进行沟通，才能了解如何利用如此多样的植物种类培育出复杂的生态网络。这些能自播繁衍的植物已被证明对农业生态系统^[9]和城市环境的生物多样性^[10]有益。在某种意义上，这代表了景观专业的其中一个发展支线——从19世纪时的园丁到21世纪的栖息地规划者和生态系统管理者。本项目证明，积极参与建设和管理阶段是设计师实现韧性目标的关键。

此外，设计师在现场时也应善用数字化方法和工具来辅助工作，而非忽视或排斥它们。目前，哥德堡正在快速搭建其数字孪生体——一座供市民、决策者、公务员、专家学者和其他利益相关团体在



5. 展示水岸园特征的效果图：港口遗留的巨大混凝土板完好无损，形成了贯穿公园的中轴线。

5. An illustration showing the character of the Shoreline Park. The massive concrete slabs left behind by the harbor are intact and form a central axis through the park.

线免费访问的虚拟城市，团队希望禧学园可以成为其中重点展示的细节节点。很明显，在未来的数十年里，“数字孪生”技术将改变城市监测并记录碳留存、生态系统健康程度和生物多样性等方面变化的方式，还可用于监测禧学园的土壤湿度和温度，以准确预测灌溉需求，尤其是在其竣工后的最初几年。随着整个自由港城区逐渐建成，更多相关测试也将展开，并将更多的实时数据纳入数字孪生城市。例如，各种类型和结构的植被及维护措施在不同季节、一天中的不同时段，以及不同天气条件下对噪音、温度和风力的影响。最终，整个城市生态系统的健康状况都可以实时纵览。

随着城市数字孪生体越发普及，蓝绿基础设施的数字化也将成为一种必然趋势。科恩·布鲁恩泽尔表示，绿地数字化让我们可以像评价建成环境那样评估蓝绿基础设施的价值^[1]。这意味着数字化将使设计师、规划师、决策者和市民认识到，有生命力的事物（如树木、灌木、水道）与人工造物（如建筑、公用设施、道路）对于保护和改善生物多样性以及城市环境的宜居性同等重要。不过，现场调研仍是正确解读数据的基础。

7 总结性思考

“唯一不变的是变化”——这是MARELD景观事务所与le balto工作室禧年公园设计方案的基本理念。植被生长而后死亡，地表随海平面上升而下沉，公众喜好的变化会催生新的爱好和活动，甚至用地性质也会改变；设计团队的任务就是接受这些变化，为其做好准备，并在某种程度上顺应它们——作为响应，在未来十年中水岸园也将局部重建，同时公园中的一些区域将成为面积更大的永久性禧学园的一部分。

临时性的水岸园和永久性的禧学园将始终保持紧密联系。禧学园采用的多个设计策略都受到项目初期工作坊和水岸园本身的启发，包括：1) 将自然演替作为种植策略的核心，以及由市政维护人员指导设计团队，共同监测未来数年的植被生长情况；2) 采用宽度、高度、尺寸和形状多样化的座椅，以精准满足不同需求；3) 公园偏硬化部分的设计和耐久性鼓励滑步车或滑板等非常规使用方式；4) 将部分区域留白，以鼓励探索及其他不可预见的用途；5) 在设计过程中重视利益相关群体的意见；6) 打破常规工作模式，让景观设计师在提交设计文

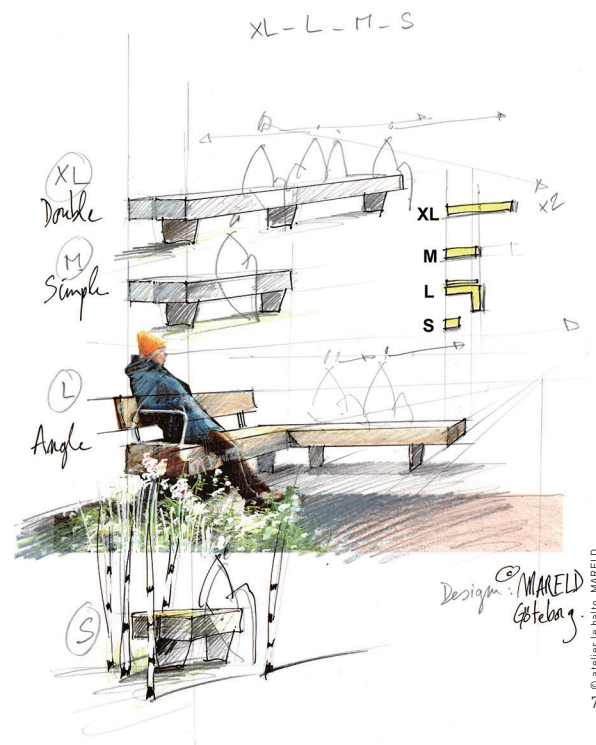


- 当地的老年人和年轻的新移民应邀参加了一次工作坊，讨论城市环境中人们对不同样式座椅的偏好。大家的建议被用于指导禧学园中各种样式的座椅设计。
- 根据工作坊上收集到的参与者意见绘制的一系列草图。
- The local elderly and newly arrived youths were invited to a workshop on different seating preferences in urban environment. Their suggestions led to a variety of seats in Play & Learn Park.
- The workshop led to a series of sketches that summarized the participants' input.

件后继续参与现场工作。

虽然禧学园的建设仍在进行中，但应当将此过程展示出来，并重点关注有助于在自由港新城区以及整个哥德堡构建韧性环境的必要步骤。在本项目中，景观设计师不只负责建造场所，还负责并积极参与场所的维护。此外，采用“边规划边建设”的方法，可以在公园周围的新城区竣工前，让自然过程更加自由地发生，从而逐步建立韧性城市绿地。作为瑞典景观项目的一种新型合作方式，禧年公园作出了鼓舞人心的示范：一方面，公园景观的营造、种植和维护回归了景观专业的本源；另一方面，它广泛采用当代技术来跟踪公园的长期发展，如生态系统服务分析，以及有望很快投入使用的数字化工具。设计团队和市政府在采用新方法处理复杂项目方面都获得了宝贵经验，这些经验可以应用于其他场地。景观设计师深度参与临时性公园的建设和维护，不仅可以指导永久性公园的开发，而且能为其开放后的一系列研究项目提供更多的反思和教训。

尽管有最佳的计划、翔实的指导文件和有远见卓识的政府官员，但全球可持续发展目标——其在某种程度上也可以解释为景观的持久性——仍很难实现。其中，韧性景观设计有助于实现可持续城市/社区、陆地生态系统健康等目标，但如果美学、生态、教育价值和维护措施不能全部恰当体现



并发挥作用，就无法营建真正的持久性景观。禧年公园项目在大约5hm²的场地上解决了这些问题，成为瑞典乃至其他国家开展韧性讨论的一次代表性试验。LAF

致谢

作者感谢来自le balto工作室的薇罗尼卡·福舍尔提供意见并参与撰写了此文初稿；感谢MARELD景观事务所的大卫·高夫就禧年公园的娱乐设施给出宝贵见解，以及他与卡德里·科佩尔为本文提供的意见和对文本的修改。

项目信息

项目地址：瑞典哥德堡
项目面积：5hm²
项目委托：哥德堡市政府
景观设计：MARELD景观事务所、le balto工作室
首席设计师：Véronique Faucher、Marc Pouzol、Nil Lachakreff、Oskar Ivarsson、Martin Allik
项目团队：Ludivine Gragy、Marc Vatinel、Kerstin Lönnhag、Charlotte Sellbrandt、Julia Vilkinas、David Gough、Lisa Erséus、Bo Larses、Johannes Josefsson、Laura Bergman
项目合作：哥德堡市公园管理部、Raumlabor设计事务所、New Order建筑事务所、Light Bureau建筑照明设计事务所、AFRY国际工程设计和咨询公司、Hifab管理咨询公司，以及参与禧年公园其他区域建设的伙伴（如Recetas Urbanas、Topotek1）
设计时间：2016-2021年
建设时间：2017-2035年
建成时间：禧学园一期2021年建成，二期2023年建成；水岸园2018年建成
所获奖项：2019年瑞典建筑师锡耶纳奖



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"Nature is interactions emerging over time."
—Julian Raxworthy, *Overgrown*^[1]

1 Background

Gothenburg is a port city situated on the west coast of Sweden. In 2021, it will celebrate its 400th anniversary. To commemorate this event, a park project—Jubileumsparken (the Jubilee park)—was launched in 2014. The project is situated in a former industrial harbor—Frihamnen (meaning literally “the free harbor”)—on the banks of Göta River in the heart of Gothenburg. In addition to the park a

8. 5行杨树 (*Populus spp.*) 幼苗被直接种植在沥青层下面的既有砾石层中。它们强化了沿河的公园轴线，同时为参观公园的师生带来了更多的乐趣。
9. 一群游客沿着水岸园的种植区散步。野生植物用栅栏围起，在形成整齐边界的同时也保护了植被，使其免受欧洲野兔 (*Lepus europaeus*) 的破坏。欧洲野兔已经入侵了瑞典许多城市地区。
8. Five rows of young poplars (*Populus spp.*) were planted directly into the existing gravels beneath the asphalt. They emphasize the park axis along the waterfront and create additional playful enjoyment to school classes visiting the park.
9. A group of visitors walking along the plantings in Shoreline Park. Wild plantings have been fenced in to create an orderly border but also to protect the vegetation from European hare (*Lepus europaeus*), a species that has invaded many urban areas in Sweden.

new city district is to be built in Frihamnen over the coming decades (Fig. 1, 2).

Historically, the Scandinavian urban planning tradition has provided Gothenburg with ample green spaces and urban forests. A glance at the municipal green strategy shows that wide corridors of greenery penetrate the city fabric from north and south, but the connection in the center is weak—Jubileumsparken will provide a valuable new link here. Although remnants of large forests are found near Frihamnen, they do not reach the heart of Gothenburg nor Göta River. But adding the former harbor where Jubileumsparken is situated and the existing ruderal land along traffic corridors and streams improves this picture (Fig. 3).

Jubileumsparken project stretches over several years. Involving many locations and design approaches, it should be seen as a park system rather than just one park (Fig. 4). It runs with an evolutive design process on two parallel tracks—temporary and permanent. Such a process has been successful in Ile de Nantes, France, led by Alexandre Chemetoff, where the development of a former harbor was launched in 1999^[2]. This project was identified as an exemplary case study for both Frihamnen and Jubileumsparken. Although the development of Frihamnen that would have provided the urban fabric around the park has stalled to adapt to current needs and more complex urban planning requirements, the design process of Jubileumsparken continues

to diversify and evolve. This rather unique method has been noted by researchers^[3] and practitioners. In recent years, both the master plan for Frihamnen and the design process of Jubileumsparken have been awarded the annual Architects Sweden prize for both the best urban planning and the best landscape architecture. This is a recognition for the fine work both the municipality and the architects and designers involved have done.

In the initial stage of the project, several temporary installations were set up in public workshops, including the notable public sauna and a floating river pool designed and built by Raumlabor. In 2016, the park entered a new stage in evolution as the city and the landowner (a municipal company itself) launched an international competition to design its permanent parts. Finally, the proposal of a Play & Learn Park by team MARELD + atelier le balto, with a prelude to design and build a temporary Shoreline Park (Fig. 5), was selected. The prototype Shoreline Park was completed in 2018. Play & Learn Park is expected to be completed in two stages: Stage one towards the end of 2021 with stage two aimed for completion in 2023. This article focuses on the design and construction process of both parts.

To understand the site and the project, it is necessary to go back to the early 20th century. At that time, the Frihamnen area was still mainly a wetland with minor human impact.

In the following decades, it was turned into an industrial harbor through heavy dredging and filling, which it remained until the shipping industry moved out of the city center by the early 2000s, leaving large swathes of heavily contaminated land across the harbor.

The lack of site specificity has been identified as one of the main concerns in former harbor regeneration projects^[4]. For the design team, it was important to be inspired by the past of Frihamnen and not to mimic or replicate it. For example, the initial wetland and the post-industrial landscape created by human activities were equally valuable. Both have their own distinctive character, habitat, and socio-cultural importance, one reflecting the natural history and the other reflecting the legacy of human activity on the site. On top of this, in urban areas, both landscapes are uncommon and threatened by development in the European context. In cities, most wetlands have vanished by the end of last century, and ruderal areas, although plenty, are often seen as unmanaged, messy, and even unsafe. Therefore, it was fundamentally important from the start of the design process to improve the quality of the two typologies. Besides, both wetlands and ruderal areas can provide dense and protective vegetation as habitats for bird species that are less common in the urban context^[5]. Based on previous bird surveys across the whole city, the team learned that this was the case at Frihamnen



10. 在现场测试从沙质土到粘土的多种土壤类型，并找出与之相匹配的植被和混播草籽种类。

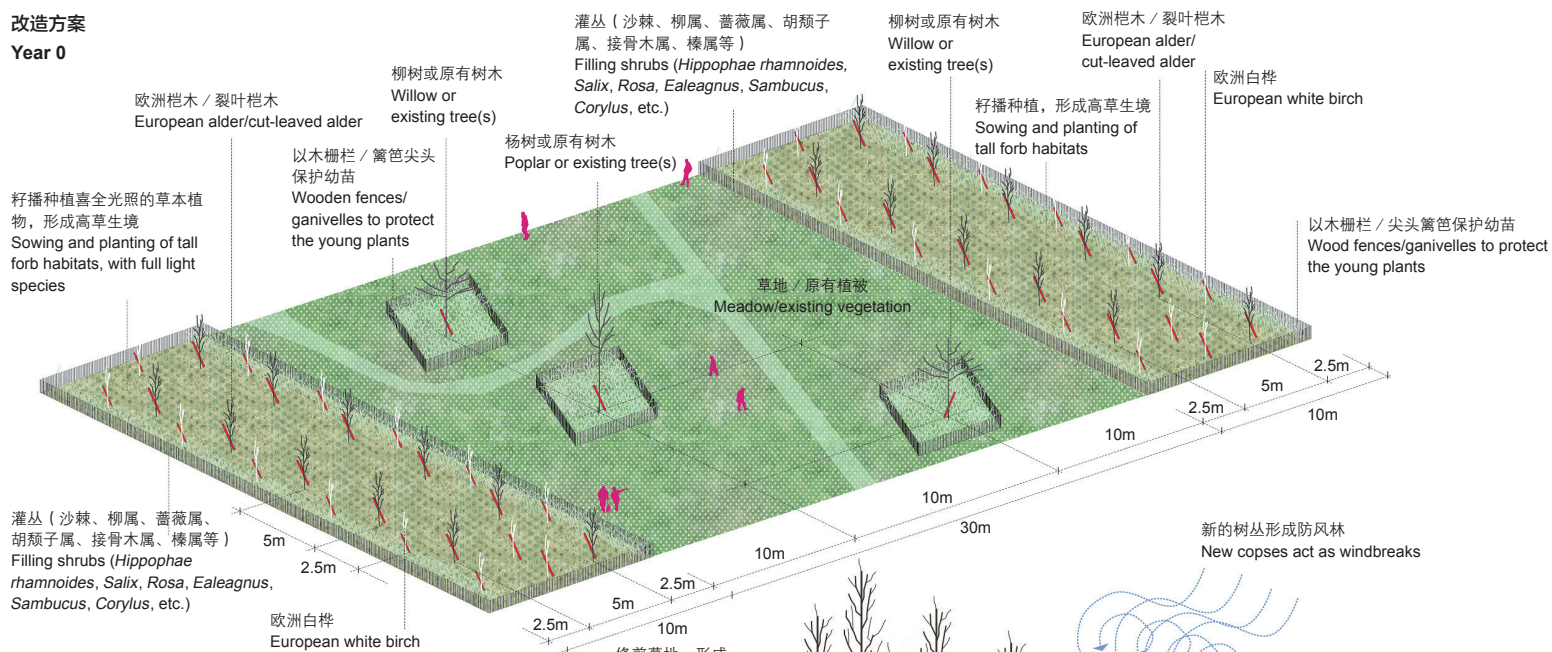
11. 100多人参与了栽植过程。在沥青下方压实的现有碎石层中创造足够的空间来容纳树木的根球是一项艰巨的任务。

10. Soil types varying from sandy to clay were tested on site and then matched with suitable vegetation and meadow seed mixtures.

11. Over 100 participants helped plant the vegetation. Creating enough space to fit the root balls of the trees in the existing compacted gravels beneath the asphalt was hard labor.

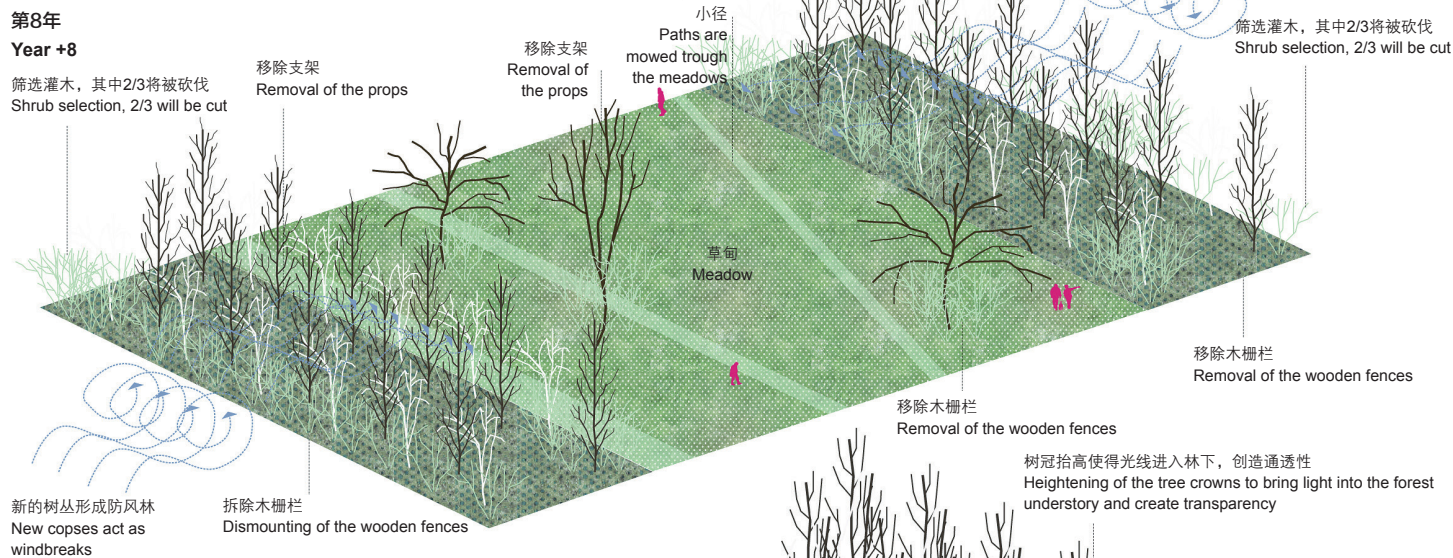
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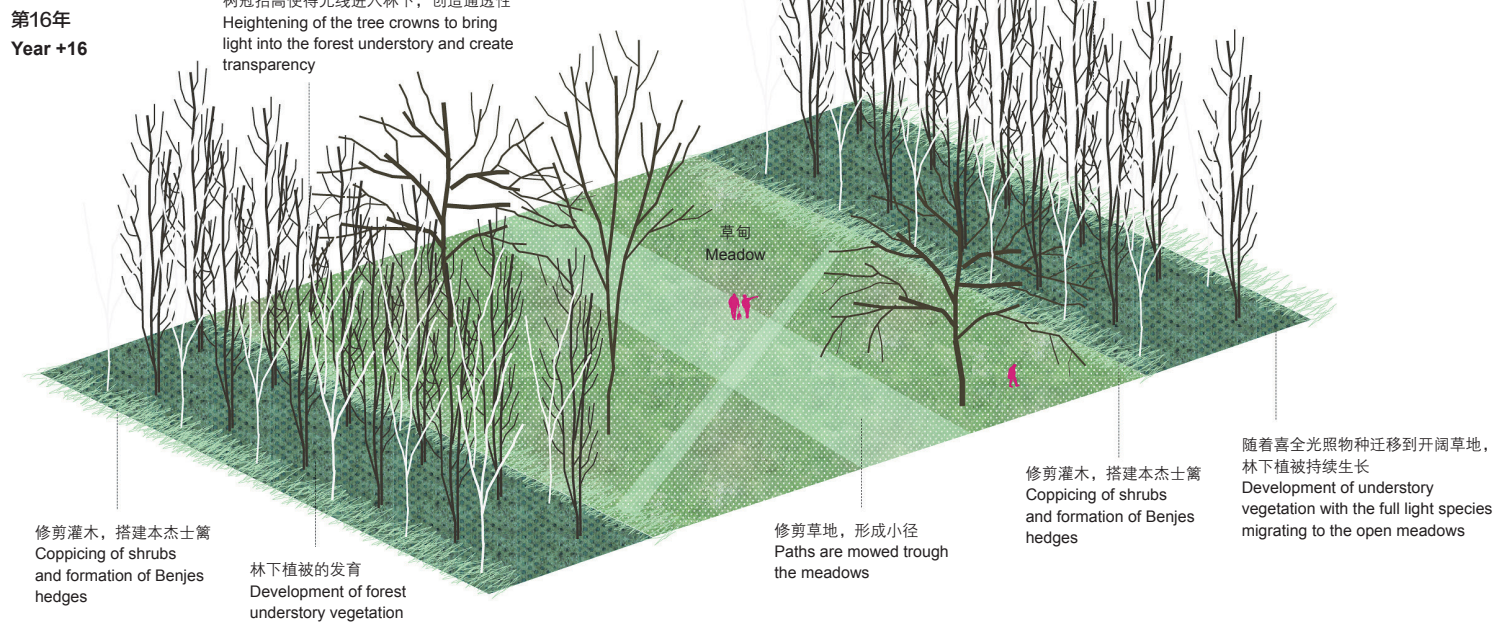
第8年

Year +8



第16年

Year +16



too, which provided a solid foundation to further develop the design idea.

In Frihamnen, the ecosystem is inseparable from its socio-cultural heritage, which became a second point of departure. Gothenburg has taken great pride in being the largest harbor in Scandinavia and the birthplace of Volvo car company. But as industry has moved out and Sweden has transformed to a research and technology-based country, this history has become less evident in the urban landscape. In this design, coastal character with wetlands and dense vegetation were re-created as the backdrop while the industrial tone was retrieved in choice of materials and details as contrast to express the nature of the post-industrial vernacular.

In short, the vision of this project is providing an escape from the dense city center. The park will create a refuge for people, flora, and fauna alike. It will gently transform the former harbor to a much-needed green heart for the city center, but also provide a vital steppingstone in the larger green-blue network. Despite the plentiful existing green areas in Gothenburg, Jubileumsparken is clearly one of the city's biggest commitments to provide modern park facilities for years to come.

2 Temporary Park as a Testbed

Rich layers of history make Frihamnen a complex site. The soils are contaminated, and the sun, wind, and rain mercilessly beat down on the open landscape. The surface is covered with asphalt or packed gravel and the little vegetation found on the site is concentrated

along the waterfront. But such conditions are perfect for a 1:1 scale temporary landscape laboratory, which allows for experiment with new materials, methods, and plants, and provide more knowledge about the existing soil, water level, wind, shore, flora and fauna, etc.—many of them have been developed further in Play & Learn Park. As mentioned earlier, in Jubileumsparken temporary installations are set up during public workshops. This approach invites people to leave their imprint on Jubileumsparken directly through building and planting, but even more importantly, indirectly by voicing their interests and desires so these can eventually be incorporated into the final design. Workshop topics ranged from seating preferences for elderly and youths (Fig. 6, 7), forms of water-based entertainments such as sailing and kayaking, to forms of urban recreation such as parkour, yoga, skateboarding, roller derby, capoeira, and taekwondo. In this way, the designers were required to be present in the project area in different seasons, weathers, and even different times of the day, but they were also able to get in touch with the wider public and initiate a broader dialogue on urban ecosystems, wildscapes, and new aesthetic experience with different municipal departments and users (Fig. 8, 9) throughout the lifespan of the park. Through such discussions, global climate goals would also be integrated and visualized in design to realize resilience to the rapidly changing environment in future everyday practice.

During 4 workshops between August 2017 and September 2018, over one hundred people—the elderly, newly arrived migrants, gardening students, and municipal staff—were engaged in planting, building and maintenance work in the Shoreline Park (Fig. 10, 11). This park introduces new aesthetics and work methods into the Swedish context, and opens the next chapter in the discussion on resilient urban greenspaces. A further series of

workshops were held with recreational groups who had been already engaged in the temporary park to inform about the permanent works, focusing on the design of multi-recreational facilities to meet with diverse user requirements. The negotiation with client, users, maintenance staff helped designers understand how a park could be facilitated and managed, and more importantly, what role a landscape architect plays in an evolutive design process.

3 Enabling Spontaneity

Urban greenspace management has a huge impact on not only the aesthetic or recreational value of a greenspace, but also on its ecological quality. Over-use of specific plant species can significantly decrease greenspace resilience: Firstly, fungi, pests, and plant diseases that can wipe out trees of an entire city have become a global problem over the past century (impact on *Ulmus* and *Fraxinus* genuses being two notable examples)^{[6][7]}. Secondly, planting according to trends means that once a trend has passed, the greenspace might lose its attractiveness and would be redesigned/replanted, destroying its ecological networks. In flexible and partially unprogrammed design lies a key to persistence and resilience of urban greenspace.

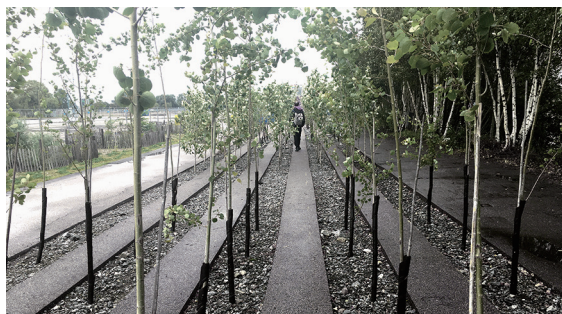
Therefore, the team tested natural succession as a complementing planting strategy in Shoreline Park. The aim was to convince the client that natural succession does not necessarily mean weeds and it can be a beneficial tool when used over a longer period and as part of the maintenance strategy. This approach has now been suggested in the maintenance plan for Play & Learn Park and over time will hopefully change the way spontaneous vegetation is perceived and used in Gothenburg's other public parks. Enabling spontaneity sets the plantings “free” from the initial design, thus substantially decreasing the manicured looks of newly planted vegetation—a broken treetop, a tilted stem, or

12. 概念方案展示了早期开发阶段的种植和维护策略：在未来数十年内，生态系统将从空旷的荒野变为由灌木和先锋树种构建的繁茂森林。

12. Conceptual scheme visualizing the planting and maintenance strategy for early development stages. The ecosystem is planned to change from an open ruderal area to a dense shrubbery and pioneer forest in decades.



13



14

13. 密植的树群为动植物提供了栖息地，并增加了自由港裸地的生物量。这些先锋树种的林下植被如夏栎 (*Quercus robur*) 为生长缓慢的海岸树种创造了适宜生长的小气候。背景中的欧洲赤松 (*Pinus sylvestris*) 原本位于哥德堡另一处的隧道建设项目场地，后被移栽至此，因为这些成熟的树木能够很好地补充场地上年轻的植被群落。
14. 选用的桤木和杨树具有强大的根系，可以有效地吸收地表下的水。除了本地的欧洲山杨 (*Populus tremula*) 外，还选用了更具观赏性的银白杨 (*Populus alba*)。与预期的演替一致，经过一个生长季，林下已经遍布垂枝桦 (*Betula pendula*) 和欧洲桤木 (*Alnus glutinosa*) 的幼苗。
15. 栽种两年后，新植被很好地融入了图中右侧原有植被中，成为鸣禽和昆虫的过渡性栖息地。此时背景中的嬉学园也已建成。
13. Densely planted groups of trees provide shelter for flora and fauna and add biomass on the exposed site in Frihamnen. The understory of these pioneer species creates a suitable microclimate for slow-growing coastal species such as common oak (*Quercus robur*) to grow. The large scots pines (*Pinus sylvestris*) in the background are from a tunnel construction project in another part of Gothenburg and needed to be replanted. The offer was impossible to refuse as these mature trees nicely complement the young vegetation.
14. The chosen alders and poplars have aggressive root systems that seek out the water underneath the pavement efficiently. Besides the native European aspen (*Populus tremula*), a more decorative silver poplar (*Populus alba*) was used. Within one growing season the understory was populated by young European white birches (*Betula pendula*) and European alders (*Alnus glutinosa*). This was exactly the expected succession.
15. Two years after completion, the planted vegetation has nicely blended into the existing vegetation on the right, forming a transitional habitat for songbirds and insects while Play & Learn Park in the background is completed.

a nearly impermeable group of young trees and shrubs can all increase the structural diversity, and the value of exploration and play. Such layered plantings become pioneer-community habitats, invite visitors to explore and experience urban nature, and enable children to engage in unprogrammed play and teenagers to test their boundaries. But permitting natural succession does not mean that maintenance is unnecessary. Creative gardening in collaboration between the designers and the municipal maintenance team determined the directions different areas within the park will take, where the understory is repressed for safety or sightlines, and urban wilderness can thrive (Fig. 12). Working in collaboration helps the design team to understand the patterns of decision making and enables them to push existing maintenance practices towards a more resilient direction.

4 Aspect of Time

The industrial history of Frihamnen had left the ground contaminated. Using phytoremediation would have been the preferred method for gradually cleaning the soil and re-establishing the habitat, but because of the approaching anniversary, the municipality decided earlier to take the faster alternative of removing the contaminated soil and eradicating the sparse vegetation on site. This immediately posed a problem of how to keep the continuity of an already fragile ecosystem. Since removing contaminants takes several stages in a long period, it enables Shoreline Park to become a temporary haven for arthropods, small mammals, birds, and other lifeforms. Species can gradually expand their habitat during the twenty-year overlap from the existing site to the future park. The motivation for keeping continuity was not only of poetic reasons, but also out of concern for the existing ecosystem: It takes time for new vegetation to start providing a suitable microclimate for living organisms on

an exposed site like Frihamnen.

Bound to be completed by the anniversary in 2021, the park landscape should be enjoyable, diverse, and welcoming to visitors from day one. The generation who design and build it today must be able to enjoy it as much as the next—this means designing with ecological succession in mind. The existing pioneer vegetation is complemented with selected fast-growing and adaptable alders (*Alnus* spp.), birches (*Betula* spp.), and willows (*Salix* spp.). Copses of these trees would create vertical structure in the park almost immediately. They also provide shelter for the slow-growing species which are susceptible to wind damage and even scorching, but essential to a mature coastal forest (Fig. 13 ~ 15)—As the composition and structure of vegetation changes naturally so does the wildlife that inhabits it. But this change will be slow and gradual, not abrupt. The landscape architects created a starting point and provided a long-term vision, and leave the natural processes to prescribe the outcome. Longevity in planting strategy and design is another key to persistence.

A gradual transformation is necessary not only for vegetation or urban wildlife, but also for people to be exposed to and experience large-scale urban processes. It is based on the framework of Ile de Nantes case, and Chemetoff's plan-guide method mentioned above. Lisa Diedrich and Caroline Dahl have explained the plan-guide as a kind of “evolutionary” plan: based on a meticulous site survey, it records traces of historical developments and accompanies transformations on the site by prefiguring them, by evaluating hypotheses, and by including the outcomes of discussions, exchanges, and experiences^[2].

5 Facing Climate Challenges

Like most cities with a waterfront, Gothenburg has extensive quays, boardwalks, and piers. As practical and enjoyable as these

constructions are for industry, sailing, harboring, and promenading along the water, there exists very little possibilities for biodiversity to flourish due to the hard surfaces of these areas, which also creates a physical barrier hindering people's direct contact with water while Frihamnen is one of the last locations in Gothenburg where semi-natural shoreline has prevailed. Parallel to the design work, geotechnical calculations were made to show a need for an underwater pressure bank to prevent the future park and its surroundings literally slipping into the river. The team then decided to turn this fundamental infrastructure into something valuable for both the local ecosystem and future visitors: In collaboration with engineers, the pressure bank's profile was altered incorporating a substrate layer for the reintroduction of shoreline vegetation. A gently sloping, wide wetland was created, along which wooden boardwalks take visitors up and over to the water while a habitat can develop underneath and be free from direct human impact (Fig. 16, 17). According to a guidance report from the Swedish Geotechnical Institute, similar erosion prevention methods have been tested along other rivers in Sweden and in Worms, Germany along the Rhein^[8].

A soft water edge with boardwalks is a resilient way to embrace the climate challenges of the 21st century. As the water level keeps rising, the wetland habitat will gradually move towards higher land. During this process, a sloping riverfront will be more durable and adaptable to change than a solid concrete quay. It is possible that by the end of this century parts of Jubileumsparken will be flooded quite often, but the park persists. Most landscape plantings are on slightly elevated ground, creating a mini archipelago of several atolls upon extremely high water levels—Frequently changing water levels are inscribed in Gothenburg's DNA, which is caused by either the North Sea, or the melting snow from the mountains during spring or heavy autumn rains that flood Göta River.

The new coastal forest is well-suited for such fluctuations in water level, and the spontaneous plantings are of importance. Besides the aesthetic and exploration aspects, the existing vegetation on the site can also enable continuity of the local gene pool and increase genetic variation through dispersing seeds by wind and birds. These local plants will thrive in the first decade while a new ecosystem can find its footing and counter biotic homogenization of urban greenspace. On the other hand, the team proved the importance of testing new and exotic species. Against the aggravating global warming especially in urban areas which will cause more stress on native vegetation, the team has suggested a backbone of local Scandinavian coastal vegetation complemented by exotics with similar traits. In this way, a steady direction for the development of this new ecosystem can be ensured even in face of severe climate changes.

6 Combining Gardening with Digital Tools

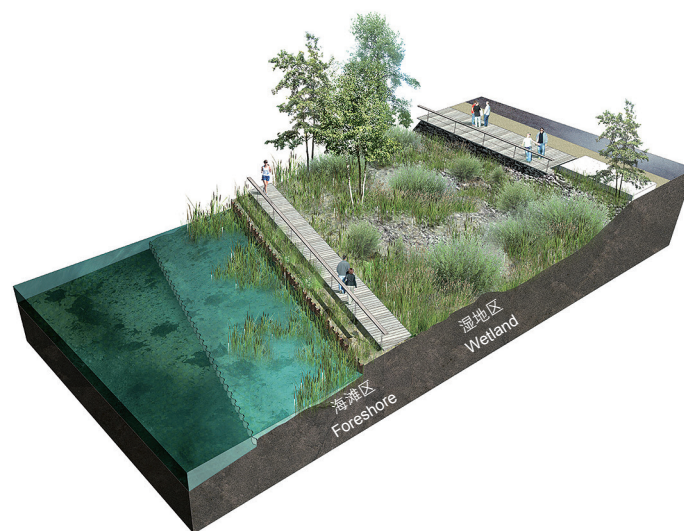
As part of the design concepts for Jubileumsparken, it should be underlined that landscape architects get closely involved in maintenance. Far too often the project involvement for landscape architects ends with the delivery of technical drawings. In his book *Overgrown* Julian Raxworthy argues that “Gardening is the only tool for engaging with growth” and later adds that “the representations used by professional landscape architects are not able to engage with growth, while the techniques used by gardeners are.”^[1] Such involvement after completion has direct influence on the forming and evolution of the ecosystem on the site, because there will be plants not presented in a design drawing, but this does not mean that they are all weeds. Being on site and in a dialogue with the maintenance staff is important to nurture the complex networks that form



and develop out of the diverse plant species. Such spontaneously spreading plants have been proven to contribute to biodiversity in both agroecosystems^[9] and urban environments^[10]. This may point out a branch for landscape profession that evolves from a gardener in the 19th century to a habitat visionary and ecosystem manager in the 21st century. This project proves that actively participating in the construction and management phases is what enables the designer to achieve the resilience goals.

Besides, rather than ignoring or resisting digitalization methods and tools, designers should complement their work on site with them. As Gothenburg is rapidly developing its urban digital twin—a virtual representation of the whole city available online for citizens, decision makers, civil servants, experts, and other interested parties—the team hopes that Play & Learn Park can become a detailed part of it. It is clear that in the coming decades digital twins will change how municipalities supervise and document changes in carbon retention, ecosystem health, and biodiversity, etc., and in Play & Learn Park it may help in measuring soil moisture and temperature to exactly estimate the need for watering, especially in the first years after the completion. Gradually, as the whole Frihamnen develops into a city district, further relevant tests will be carried out and more live data incorporated in the digital twin. For example, it could be possible to document what impact different types and structures of vegetation and maintenance practices have on noise levels, temperature, and wind throughout changing seasons, time of day, and weather conditions. Eventually an overview on the well-being of the whole urban ecosystem can be accessed live.

Digitalization of green-blue infrastructure is also inevitable as urban digital twins become more common. Koen Bruynseels states that digitalization of greenery provides an opportunity to value the green-blue infrastructure on the same basis as the built environment^[11]. This



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means that digitalization will help designers, planners, decision makers, and citizens to see the living material (i.e. trees, shrubs, waterways), equally important with the artificial structures (i.e. buildings, utilities, roads) in preserving and improving biodiversity as well as livability of urban environments. Nevertheless, being on the site to learn about it lays the groundwork for interpreting data correctly.

7 Concluding Thoughts

The only permanent thing is change—this was the founding idea for the work of MARELD + atelier le balto in Jubileumsparken. Vegetation grows and perishes, the ground sinks while the sea level rises, the public's preferences change and new hobbies and activities emerge, even land use changes; the team's task is to accept, prepare for and, to some extent, accommodate these. As a response, over the coming decade, parts of Shoreline Park will be rebuilt, while some areas of its will be woven into the permanent and larger Play & Learn Park.

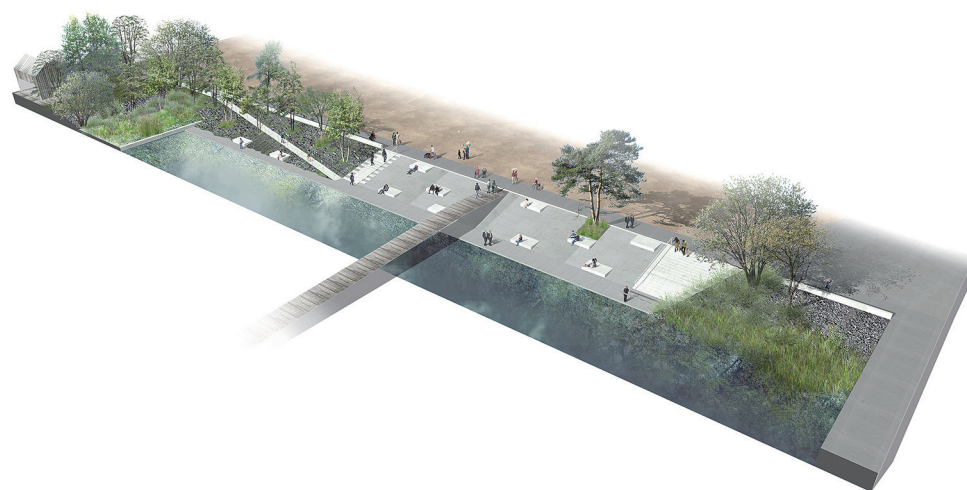
The bond between the temporary Shoreline Park and the permanent Play & Learn Park will always be strong. Both the introductory workshops and Shoreline Park itself have

inspired several design strategies used in Play & Learn Park, including: 1) natural succession as the core of the planting strategies, and the design team together with the municipal maintenance staff as the guiding hand to oversee the growing vegetation in the coming years; 2) the diversity of seating in width, height, size, and shape to accommodate even the most specific needs; 3) the design and durability of the more paved parts of the park to promote unprogrammed use of kick-bikes or skateboards; 4) leaving areas unprogrammed for discovery and other unforeseeable uses; 5) valuing the opinion and insight of interested groups in design processes; and 6) breaking down the barrier for landscape architects to continue working on the site after the design documentation has been handed over to the client.

While the construction of Play & Learn Park is underway, it is appropriate to lift the process and focus on the necessary steps that contribute to a resilient environment for the new city district at Frihamnen as well as for of the whole Gothenburg. On top of place-building, here landscape architects are responsible and actively involved in place-keeping. Moreover, a planning-and-building method provides more freedom for natural processes to occur and allows a resilient urban greenspace to gradually

16. 建立在压力岸上方的湿地是一个经常被淹没的新栖息地，人们无法进入。木质栈道穿行其中，使游人们能漫步于湿地之上，获得更好的亲水体验。
17. 矿质河岸是一个伸入水面的岩石斜坡。这里不仅吸引游客离开主要园路在此嬉戏，也为城市中的昆虫提供重要庇护所。

16. The wetland built above the pressure bank is a regularly flooded new habitat inaccessible to people. It is intersected by wooden boardwalks that take visitors closer to the water and above the wetland.
17. The mineral edge is a rocky slope down to the water level. It is a playful landscape that welcomes visitors off the official paths, but also an important urban refuge for insects.



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establish before the new city district around the park is completed. Jubileumsparken is an encouraging example of a new type of collaboration for landscape projects in Sweden: On the one hand, it goes back to the origin of the profession—building, planting, and maintaining the park landscape; On the other hand, it uses contemporary inclusive methods, e.g. analysis of ecosystem services and soon hopefully digital tools to document its long-term development. Both the design team and the municipality have gained valuable experiences on working with new methods in a complex project, which can be applied on other sites. The close involvement of landscape architects in construction and maintenance of the temporary park not only guided the development of the permanent one, but will also continue throughout a series of research projects following its opening to provide more reflections and lessons.

Despite the best intentions, well-written documents and informed politicians, global sustainable development goals—to some extent, the persistence in landscape—are hard to reach. Resilient landscape design can contribute to several of these goals from sustainable cities and communities to the health of terrestrial ecosystems, but the true

persistence cannot be realized unless aesthetics, ecology, education value, and maintenance are all balanced and represented in the landscape. Tackling these issues on its roughly five-hectare-site, the Jubileumsparken project becomes an experimental flagship taking the resilience discussion onwards in Sweden and beyond. **LAF**

ACKNOWLEDGMENTS

The author thanks Véronique Faucheur from atelier le balto for exchange of thoughts and co-writing an early draft of this article; David Gough from MARELD Landscape Architects for valuable insight on recreation in Jubileumsparken, exchange of thoughts, and editing the text; and Kadri Koppel for exchange of thoughts and editing the text.

PROJECT INFORMATION

LOCATION: Gothenburg, Sweden

AREA (SIZE): 5 hm²

CLIENT: City of Gothenburg

LANDSCAPE DESIGN: MARELD Landscape Architects, atelier le balto

CHIEF DESIGNERS: Véronique Faucher, Marc Pouzol, Nil Lachakreff, Oskar Ivarsson, Martin Allik

PROJECT TEAM: Ludivine Gragy, Marc Vatinel, Kerstin Lönnhag, Charlotte Sellbrandt, Julia Vilkénas, David Gough, Lisa Erséus, Bo Larses, Johannes Josefsson, Laura Bergman

COLLABORATORS: Park's Department of City of Gothenburg, Raumlabor, New Order Arkitektur, Light Bureau, AFRY, Hifab International and several others (e.g. Recetas Urbanas, Topotek1) in other parts of Jubileumsparken

DESIGN PERIOD: 2016 ~ 2021

CONSTRUCTION PERIOD: 2017 ~ 2035

COMPLETED TIME: Play & Learn Park stage 1 in 2021 and stage 2 in 2023, Shoreline Park in 2018

AWARD: 2019 Siena Prize of Architects Sweden

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