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黄河国家湿地公园济南区段生态规划实践

ECOLOGICAL PLANNING PRACTICES OF THE YELLOW RIVER NATIONAL WETLAND PARK IN JINAN SECTION

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摘要

山东省济南市南依泰山，黄河自西南向东北方向从城中穿流而过，地势南高北低。济南位于黄河下游，黄河携带的泥沙在这里沉积形成地上“悬河”。在过去的几十年里，黄河大堤虽然确保了城市和村庄免受洪水的侵害，却犹如一道屏障，阻碍了黄河以北地区与济南中心城区的联系。与此同时，生态失衡、水环境恶化、栖息地碎片化等现象也愈发严重。自2017年起，SOM建筑事务所城市设计和景观团队与济南市政府协作，从生态、文化、交通、经济等多个层面对沿河区域进行改造，并提出了在整个黄河沿岸构建一条连续的黄河国家湿地公园的设想。本文从国家、流域、区域、城市等多个尺度上展开了分析，从183km河段规划中提出的建设目标，到30km核心示范段中的规划策略，再到鹊华秋色园中的具体设计，SOM由宏观规划到微观设计进行了一步步推导，保证了整个设计方案的统一性与连贯性。SOM期待以黄河济南段为例，为其他沿河城市加入到黄河国家湿地公园的建设中提供先行范本，也希望为长江流域或其他国家类似流域的规划设计提供参照。

关键词

黄河；悬河；流域；大堤改造；生态涵养；国家公园

ABSTRACT

Jinan in Shandong Province, China is a city with favorable location — the Yellow River runs through this region from southwest to northeast while the notable world heritage Mount Tai is its south background. The low reach of the Yellow River where Jinan is located is a “suspended river,” which is caused by a large amount of sediments from the upper and middle reaches. Over the past decades, the levee has ensured the city and villages free from floods. However, it blocks the connection between the north bank area of the Yellow River and the urban town. The problems of ecological imbalance, deterioration of aquatic environment, and fragmented habitats have become more acute. Since 2017, the City Design Practice team of Skidmore, Owings & Merrill LLP (SOM) has collaborated with the Jinan Municipal Government to envision a transformation of the riverfront from ecological, cultural, transportation, and economic aspects and further proposed the idea of building a continuous Yellow River National Wetland Park along the entire Yellow River. The design proposals address the national, watershed, regional, and city scales. From the concept proposed in the plan of the 183 km reach, to the planning strategies of the 30 km core demonstration area, and further to the specific design of the Autumn Colors on the Que and Huabuzhu Mountains Park, SOM has developed step by step from macro-planning to micro-design, to ensure the uniformity and consistency of the entire design at all scales. SOM looks forwards to presenting the Yellow River in Jinan as a proven model for other river cities to follow the construction of the Yellow River National Wetland Park, and providing a practical reference for the planning and design of the Yangtze River Basin and similar watersheds in other countries.

KEYWORDS

Yellow River; Suspended River; Watershed; Levee Renovation; Ecological Conservation; National Park

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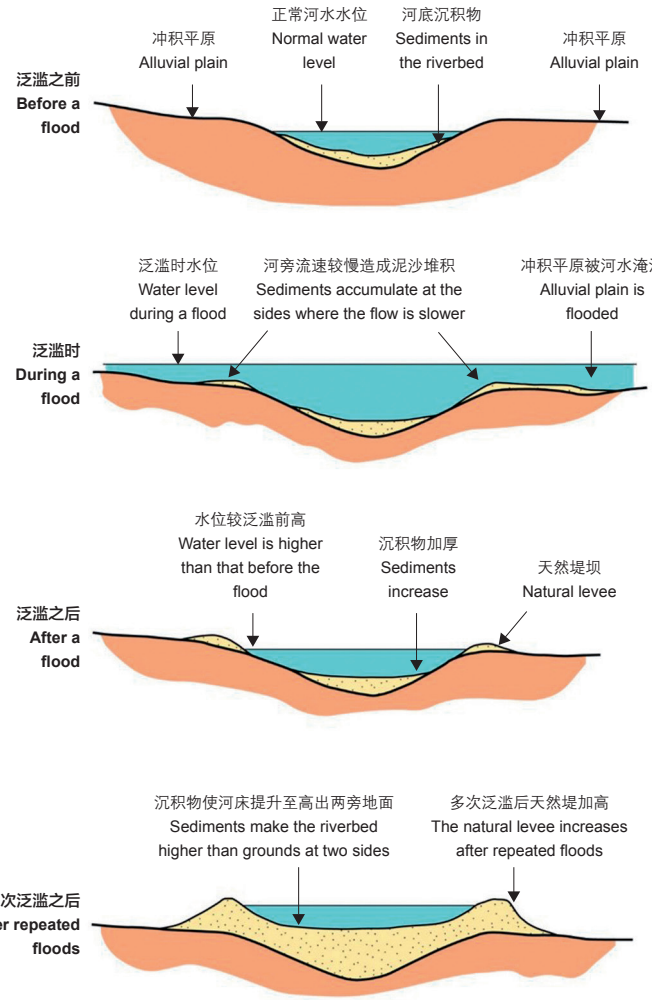
1

1 项目背景

山东省济南市南依泰山，黄河自西南向东北方向从城中穿流而过，地势南高北低（图1）。源自南部山区的众多河流自北向南流经城区，构成了济南的水网骨架。这些河流大多汇入与黄河平行走向的小清河并向东流走。由于济南所在的华北平原位于黄河下游，从上游和中游席卷而下的大量泥沙沉积于此，将河床抬升至地面之上，形成了地上“悬河”（图2），使其地势高于城区。因此，除了玉符河等支流与之联系，其他大多数水系都与之隔离（图3）。

黄河大堤是下游悬河防洪工程体系的重要组成部分，也是运输防汛抢险物资的重要通道[1]。在过去的几十年里，黄河大堤虽然确保了城市和村庄免受洪水的侵害，却犹如一道屏障，阻碍了黄河以北地区与济南中心城区的联系，也使人们难以亲近和到达。现状大堤防洪体系由堤顶路、堤防淤背加固区、防浪林和防护用地构成。堤顶路高出城市建设用地12~16m；堤防淤背加固区宽约100m；同时，为防止风浪对堤防的直接冲击和破坏，在临黄大堤具备种植条件的河段种植了宽20~50m的防浪林（图4）。长期以来，济南城市建设只集中在黄河以南的山前平原地带，城市以东西向扩展为主，形成了东西长、南北窄的城市格局[2]，黄河北岸则多为地势低洼的农田和村庄用地。2006年起，济南市提出北跨黄河发展新城区的构想，并由此开始从沿河发展城市向携河发展城市转型，黄河也由城区边缘流域转化为区域发展中心。

近年来，黄河下游频繁断流，严重破坏了生态平衡，使得水环境状况进一步恶化。湿地生态系统斑块的廊道连通性和生态完整性遭到破坏，珍稀鸟类赖以生存的黄河湿地面临消亡，生态稳定性受到严重



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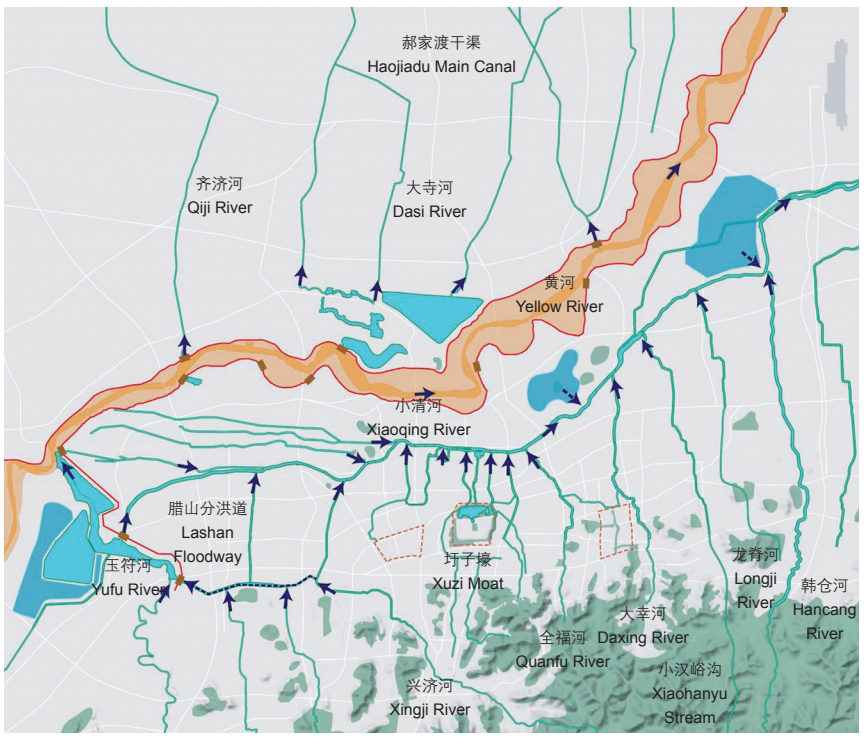
2

1. 冬季黄河河滩湿地
2. 黄河下游悬河的形成
3. 济南的水网骨架
4. 黄河大堤体系剖面图



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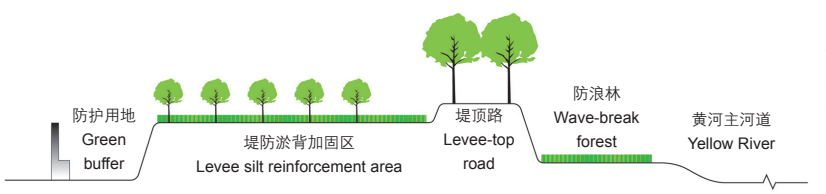
1. Yellow River floodplain in winter
2. Formation of the "suspended river" at the lower reach of the Yellow River
3. The water network of Jinan
4. Section of the Yellow River levee system



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4

威胁[3]。此外，目前黄河下游两岸多为人工种植的农田和林地，种植结构单一，极大地限制了生态系统服务功能的多样性。当地原生群落主要由旱柳（*Salix matsudana*）、狗牙根（*Cynodon dactylon*）、拉拉秧（*Humulus scandens*）等构成，群落结构较为简单，且缺乏护坡能力强的灌木及地被。这些问题不但削弱了景观效果，也阻碍了其发挥主要的防汛功能[4]。

2 黄河国家湿地公园的多维度愿景

2.1 黄河国家湿地公园

在前文所述背景下，受济南市政府委托，SOM建筑事务所计划对济南市黄河沿岸景观进行规划设计。考虑到济南所占据的优越地理位置，SOM从国家、流域、区域、城市等多个尺度上展开了分析，并提出了沿整个黄河沿岸构建连续的黄河国家湿地公园的设想。

作为中国的“母亲河”，黄河是中华文明的发源地之一，是千百年来中国人民赖以生存和繁荣的摇篮，也是中华民族精神的象征[5]。规划计划沿整个黄河流域创建国家湿地公园，串联起沿岸众多的自然及人文景观节点，同时确保生态系统结构、功能和过程的完整性（图5）。这一“大尺度景观”规划突破了传统行政区和尺度的概念，强调各级政府的协调与合作。其不仅是对中国的国家起源与文化的有力纪念，也能够增进居民与黄河之间的紧密互动。

规划计划从以下几个方面打造黄河国家湿地公园：1）从生态上，在黄河滩地上引入及保护生态湿地，并采用多种原生植物，提升生态系统及植被群落的多样性；2）从文化上，充分利用黄河两岸的名山大川、文物古迹，展示黄河文明的历史文化特点；3）从休闲娱乐功能上，将大堤转化为一座联系城市和黄河的公园，引入农业体验区、水上娱乐区、露营区、植物园、动物园、特色小广场等休闲娱乐项目；4）从经济上，打造黄河旅游项目及黄河旅游相关产品，结合周边村落设置特色酒店，并设立生态农业体验及示范区，同时利用国家湿地公园带来的良好环境及开放空间吸引并留住创新人才，带动片区经济发展。

后文将针对黄河在济南市域内的183km河段、30km核心示范段，以及一座3km^{2}的鹊华秋色园提出具体的规划设计策略（图6）。

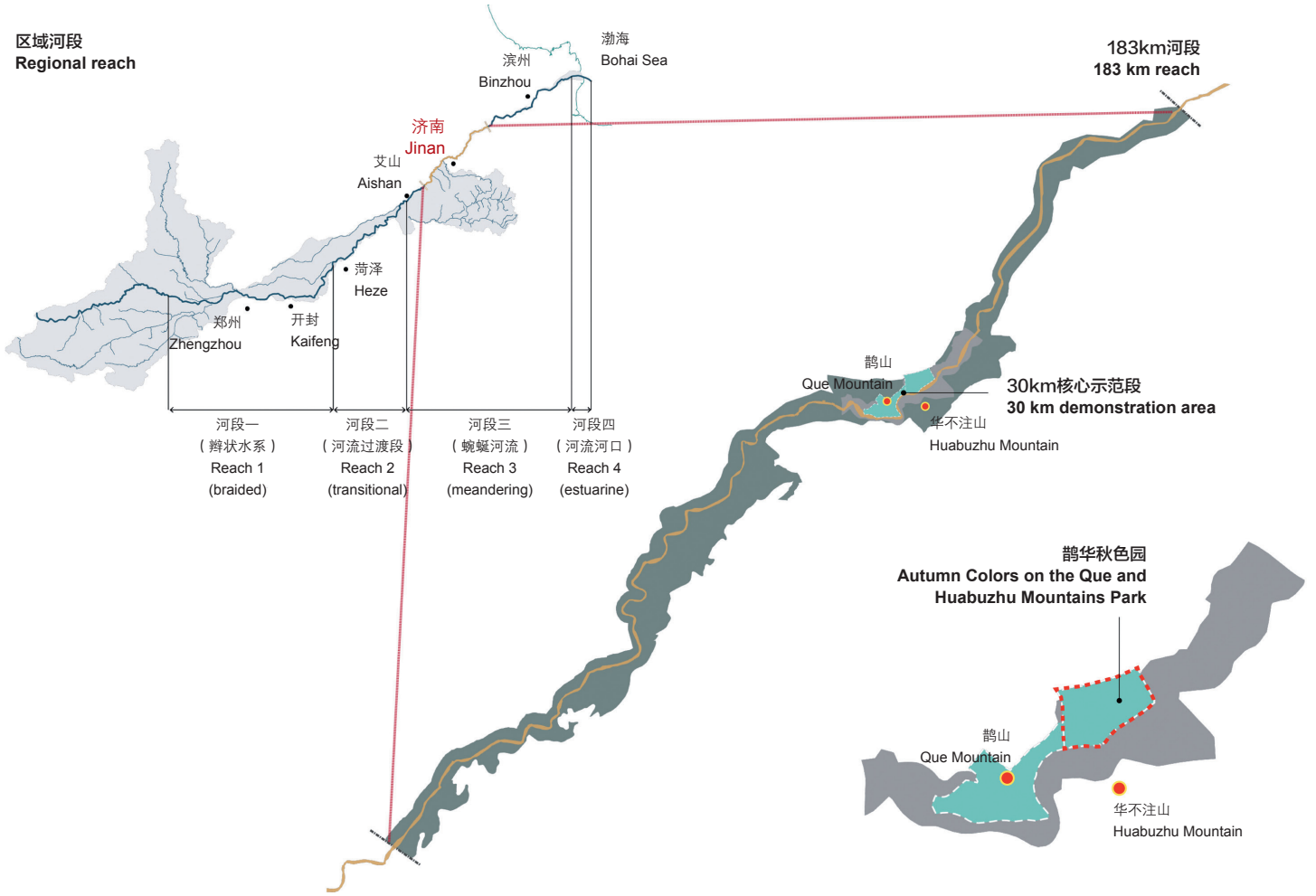
2.2 183km河段

183km河段两岸享有丰富多样的景观资源，包括多样的湿地、极具特色的大堤、大小村落和广阔农田。规划将此范围内原本分散的景观资源融合，串联成完整的黄河生态廊道和区域生态系统。主要规划理念包括：

1）联系新旧城区：原本孤立于城市之外的悬河将转化为一个人人可以亲近的国家湿地公园，将人们带往河滨，产生更多的交流与互动。在两岸采用相同的设计语言，从生态完整性、文化关联性和经济联动性上将济南老城与新旧动能转换先行区融为一体（图7）。

2）塑造灰绿结合的防洪系统：目前，整个河段都以工程化防洪为主。规划提出，在确保原有防洪功能不受干扰的基础上，结合现有灰色基础设施进行种植设计和地形处理，同时恢复整个洪泛平原生态系统来支持防洪和雨洪管理。规划计划在现有泄洪渠、引黄渠的基础上建立多条生态廊道，并且结合现状水道、湖泊及新增的集水区，将灰绿基础设施串联成完整的景观雨洪管理体系（图8），从而提高区域蓄水净水能力，减缓雨水径流速度，提高生物多样性，保护栖息地。

3）提供连续的公园体验：人们可以通过黄河附近的交通换乘枢纽——公园门户，无缝换乘旅游公交、电瓶车或自行车等旅游交通工



5. 沿整个黄河沿岸构建连续的黄河国家湿地公园
6. 制定多维度愿景

5. Build a continuous national wetland park along the Yellow River
6. Scenarios on different scales

具进入公园，并沿着交错的步道系统遍览黄河两岸众多的休憩空间、人文景观和历史遗迹。

4）连接两大文化要素：泰山与黄河在地理空间和视线空间上有着密切的联系。在古人的诗句中，不乏与从泰山顶极目远眺黄河相关的内容；“黄河金带”亦被称为泰山四大奇观之一。规划通过空间上的延伸和文化上的关联，将泰山和黄河这两项象征中国文化的重要元素在区域尺度上相连（图9）。

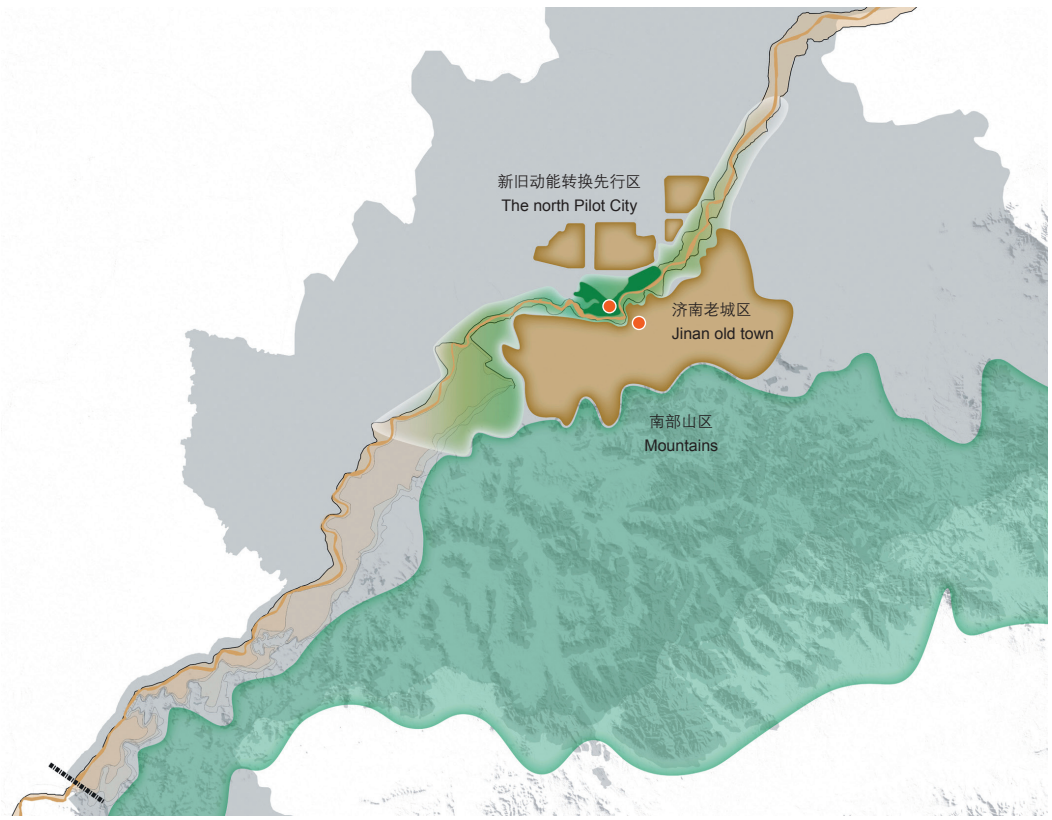
2.3 30km核心示范段

在183km河段范围内还划定了30km的核心示范段，包含了鹊山、华不注山之间的区域，黄河转弯处，以及重要的沿河景观节点。同时，该区段还衔接了南岸济南老城和北岸新旧动能转换先行区，并且毗邻济南国际机场，是济南黄河极其重要的区段。伴随着济南北跨发展，30km核心示范段也将成为济南的“中央公园”，现状孤立的黄河沿岸区域将转变为服务百万济南市民的公共空间，展现济南丰富的城市历史文化[5]。

规划沿河道横截面将该示范段分为7个区域，包括河道保护片区、河滩生态修复片区、大堤提升改造片区与堤外城市连接片区4种类型（图10）。规划将针对每个片区施行不同的防洪、生态修复、城市开发和农业生产策略[5]（图11~13）：

1）河道保护片区：河道保护片区以保护为主，尽可能不进行开发，从而保证水源涵养、洪水调蓄等自然生态过程的安全，避免水土流失、水体污染、生物栖息地破坏等发生。

2）河滩生态修复片区：河滩内现状主要为人工农田或林地，植物以杨树（*Populus* spp.）和柳树（*Salix* spp.）为主。规划将黄河水引入滩区，逐层净化形成季节性人工湿地，以增加生态系统多样性。同时引入森林细胞、湿地细胞、草甸细胞等“生态细胞”（图14），为物种创造丰富的栖息地类型。规划还设置了穿梭于细胞之间的木栈道系统，将人们与自然更加紧密地联系起来。各个生态细胞可自主串联成生态脉络，进而形成完整的河滩栖息地网络（图15）。这种点（生态细胞）—线（生态脉络）—面（河滩栖息地）结构有助于修复黄河生态系统，为促进自然更替和加强生物多样性奠定了基础。值得一提的是，该片区还保留了一座洪涝风险较低的村庄——冯塘村，这里仍保留着黄河滩区原始、完整的人居环境及生态面貌。规划保留了村庄原



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7

7. 连接济南新旧城区
8. 构建生态廊道体系
9. 连接泰山和黄河两大文化元素

7. Connecting the old town and the new city area of Jinan
8. Building an ecological corridor system
9. Linking Mount Tai and the Yellow River

有的小尺度肌理和自然性并逐步进行翻修，并设立文化和旅游设施，以更好地与周边城市相融合。此外，规划将以该片区为主要场地，引进杂交黄河大米试验田等体验式农业及生产性景观，鼓励农业旅游发展，形成教育、科研、产业为一体的教研区（图16）。

3）大堤提升改造片区：将堤顶路保留以供慢行交通、旅游公交和防洪抢险车辆通行（图17），形成公园主干路系统与大堤内外侧步道相连，形成完整的交通系统。同时，结合堤顶路加宽路面，设置台地、缓坡，以及增加便利设施、设计特殊的活动节点，以提供丰富的休闲场所（图18，19）。

4）堤外城市连接片区：由于黄河大堤与城市之间存在十余米的高差，且大堤外200m宽的区域为堤防淤背加固区和防护用地，城市与大堤存在着严重的脱节。由于场地现状仅为在设计建造防洪大堤时为满足单纯的防洪功能需求而进行的简单化处理，未充分考虑美观度和功能性，因此存在进一步改造的可能。在基于测算确保防洪功能不会因一定程度的土方工程而受到影响的前提下，规划计划通过景观设计和改造，实现城市与大堤的之间的地形过渡与功能衔接。

2.4 鹊华秋色园

鹊华秋色园连接起了济南北部新城和黄河，也是黄河国家湿地公园的一期公园，其名称源于鹊山和华不注山两座济南名山。唐代李白的诗《陪从祖济南太守泛鹊山湖三首》中，提到了鹊山旁的鹊山湖。元代画家赵孟頫的《鹊华秋色图》描绘的就是华不注山、鹊山和鹊山湖这一带的秋天景色（图20）。设计计划在核心景区部分恢复鹊山湖，将湿地、河滩、农田、森林、村庄有机结合，恢复两山之间的文化和生态多样性，重现“鹊华烟雨”的美景。

基于上述183km河段规划理念及30km核心示范段的规划策略，设计充分利用该区域内丰富的植物及生态资源、黄河流域的文化遗产，以及两岸的农田和村落[6]，为快速发展的济南和新兴的先行区提供一个安静的休闲去所（图21）。

鹊华秋色园将黄河大堤从简单的双车道防洪设施拓宽成一个广阔的阶地森林公园系统，同时还结合了公共通道和各式静态空间，让人们可以野餐、锻炼、漫步，眺望南部的黄河、农田和华不注山。其中布设着供市民游憩的基础设施，种植着观赏树木、传统中药草及传统作物。大堤上的望岳丘可以遥望泰山和黄河，在文化传承上将二者联系起来[5]（图22）。

设计将在河滩区域打造丰富的生态系统，将其塑造为野生动物的栖息地。鹊华秋色园引入多功能生态细胞实现生态修复，同时提供雨水管理与净化设施，为公众提供探索黄河滨河特色的公共通道。自然

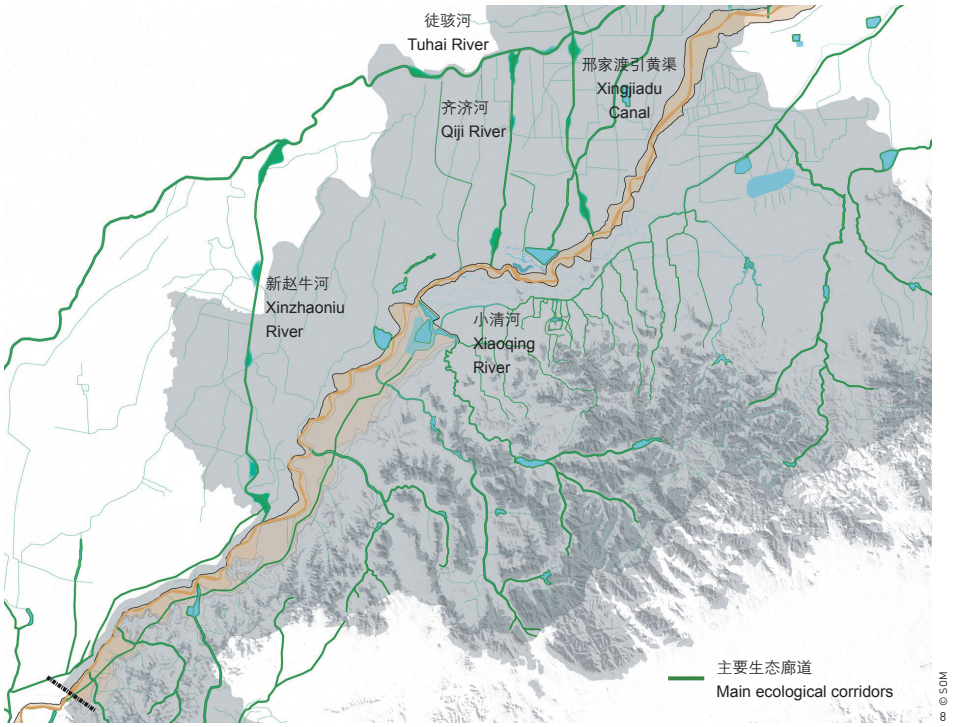
小径和木板道交织贯穿浅滩沼泽、跨越岛屿、通过柳树林，提供了观赏水生野生动物、筑巢鸟类季节性活动和植物季相变化的机会（图23）。

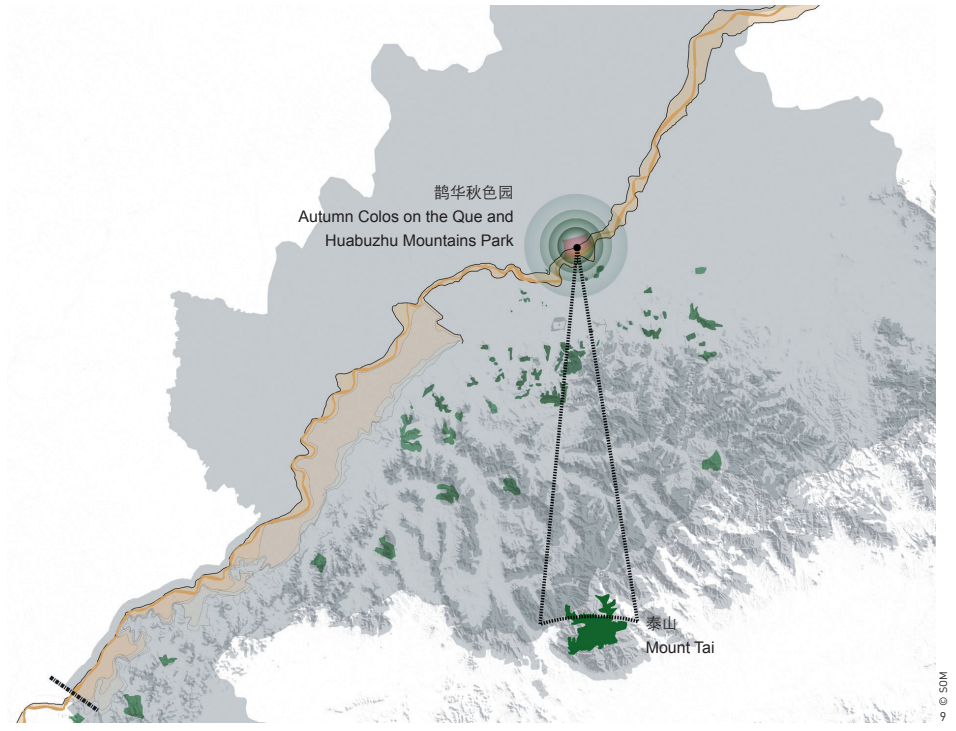
设计还提出将冯塘村修缮打造为一座集文化创意和农业旅游于一体的农业主题公园。同时将这一概念进一步向北延伸，将毗邻公园的新城门户——“都市阳台”打造成一处都市农园（图24）。将城市与示范农田景观联系起来，形成独具特色的城市名片。[5]

3 总结与讨论

黄河国家湿地项目探索了新时代发展背景下河流与城市的重要关系，以及如何利用黄河这一极具特色的自然资源，将其原有的限制性因素转变成推进城市发展的新动力。有别于传统城市规划，黄河国家湿地公园主要在以下方面带来了创新和启示：首先，项目突破传统行政区的概念，从国家、区域的层面入手，将整个黄河流域当作一个国家湿地公园。规划强调区域尺度的生态系统的连接，通过各级政府的沟通与合作，由点及面再到区域，形成完整的黄河生态系统廊道。其次，规划以生态涵养和自然保护为核心，将人为开发降到最低。同时，改变人们对传统工程意义上黄河的认知，强调市民与黄河的互动。在确保黄河大堤防洪安全的前提下，使其从一条令人敬畏的工程化河流变成一座市民共享的生态乐园。最后，从文化、交通、经济方面全面增强河流与城市的关系，让黄河成为提升城市竞争力的关键。

规划所聚焦的183km河段、30km核心示范段和鹊华秋色园主要回应了三大挑战，即突破悬河造成的城市与河流在水平和竖向的空间割裂，修复和改善现有和潜在的栖息地，以及提升现有河道、湿地的水质。从生态细胞到生态脉络再到河滩栖息地，规划在生态廊道之内引入了更多绿色基础设施，创建了更加健全的灰绿结合的防洪系统，并为自然净化过程提供了生发机制。规划以大堤为主体，利用台地、坡地等地势变化形成过渡，消化高差，将原先不能进入的大堤及周边防护区域改造为市民可以进行不同程度介入的公园区域。从183km河段规划中提出的建设目标，到30km核心示范段中的规划策略，再到鹊华秋色园中的具体设计，SOM由宏观规划到微观设计进行了一步步推导，保证了整个设计方案的统一性与连贯性。SOM期待以黄河济南段为例，为其他沿河城市加入到黄河国家湿地公园的建设中提供先行范本，也希望为长江流域或其他国家类似流域的规划设计提供参照。**LAF**





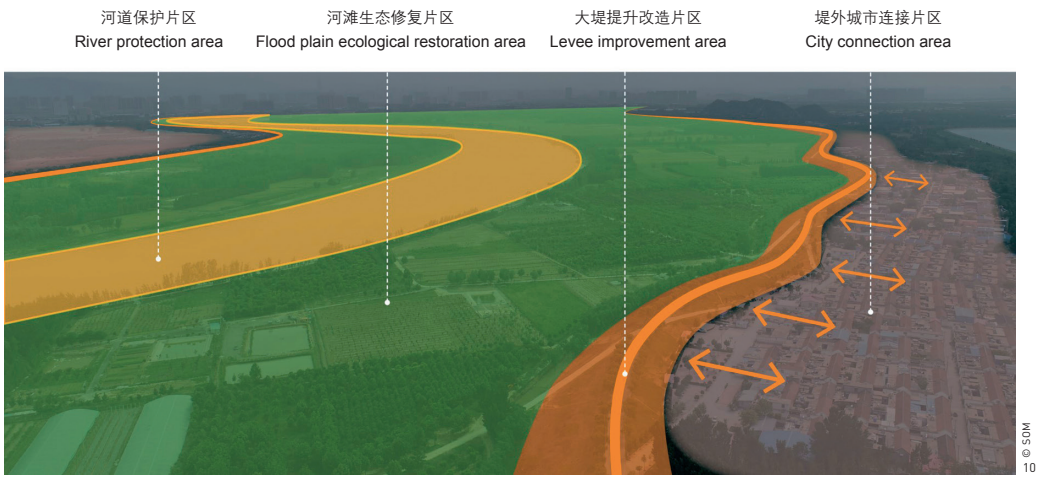
项目信息

项目地址：中国山东省济南市
项目委托：济南市政府
景观规划：SOM建筑事务所、Moriyama & Teshima规划事务所
首席设计师：Philip Enquist
项目团队：Doug Voigt、傅萱、Alan Lewis、周茵樱、张阳、Sean Kinzie、王焓、李诗晨、鲁晨、余晗、李屹华、Jisu Choi、Cameron Barradale
合作者：Drew Wensley、Khatereh Baharikhoob
规划设计时间：2016~2018年

1 Project Background

Jinan in Shandong Province, China is a city with favorable location — the Yellow River runs through this region from southwest to northeast (Fig. 1) with the notable world heritage Mount Tai as its south background. For the specific terrain there, numerous other rivers flow through the city from the southern mountain area to the north, framing the canal network of Jinan. Most of these rivers flow into the Xiaoqing River, which runs eastward in parallel to the Yellow River. The low reach of the Yellow River where Jinan is located is a "suspended river," of which the water level is several meters higher than the city elevation. It is caused by a large amount of sediments from the upper and middle reaches, raising the riverbed above the ground plain (Fig. 2). Therefore, except for a few of tributaries such as the Yufu River, most other canals are isolated from this "suspended river" (Fig. 3).

The Yellow River levee is a significant part of the flood control system in the lower reach, and its levee-top road serves the transportation of flood control and rescues materials when necessary[1]. Over the past decades, the levee has protected the



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10

河道保护片区
River protection area

- 保护现状河道 Protect existing watercourse
- 巩固险工段工程 Reinforce embankment
- 影响行洪 Interfere flood discharge

河滩生态修复片区
Flood plain ecological restoration area

- 生态修复与涵养，提高生物多样性 Restore ecosystem, increase biodiversity
- 新增建筑 New building
- 建设大型体育设施 Large-scale sports facilities
- 新增农田 New agricultural field
- 人流密集型活动项目 Heavy human activity influence

大堤提升改造片区
Levee improvement area

- 鼓励慢行系统 Encourage slow traffic
- 增加交通可达性 Increase accessibility
- 破坏大堤结构 Interfere the levee structure
- 阻碍抢险功能 Disturb emergency use

堤外城市连接片区
City connection area

- 结合历史文化，提升乡村景观 Enhance rural landscape with cultural consideration
- 连接城市与大堤 Connect the city and the levee
- 植入城市公园功能，满足城市需求 Introduce urban park programs to meet urban needs
- 大堤退界内违章建筑 Illegal construction within the levee protection zone

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11

10. 规划沿河道横截面将30km核心示范段分为7个区域，包含4种类型。
11. 规划将针对每个片区施行不同的防洪、生态修复、城市开发和农业生产策略。
12. 规划将对整个核心示范段进行不同程度的干预。
13. 大堤景观改造（虚线为现状大堤截面）

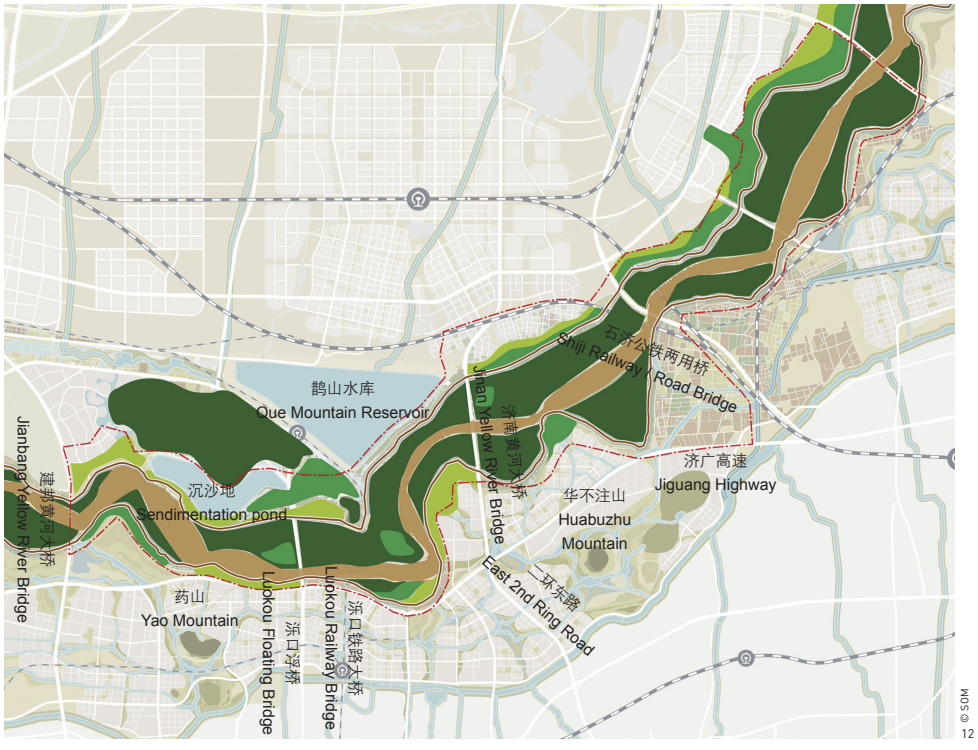
10. The 30 km demonstration area is divided into seven areas of four types.
11. Specific flood control, ecological restoration, urban develop, and agricultural production strategies and intensities are designated for each type.
12. Different degrees of intervention are adopted in the demonstration area.
13. Yellow River levee landscape transformation (dashed lines indicate existing levee section)

保护区：生态修复和涵养
Protection zone: eco-restoration and conservation

低强度活动区：以静态功能为主
Low-impact zone: passive programs

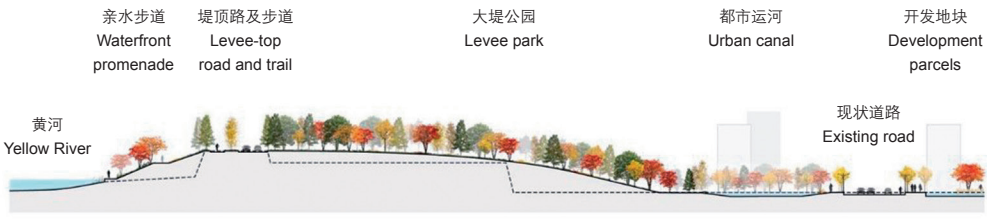
中高强度活动区：兼具静态与动态功能
High-impact zone: active and passive programs

0 1 2 4km

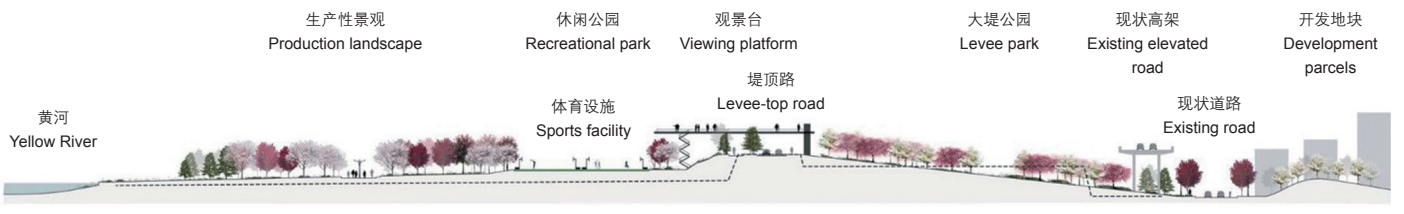


剖面1
Section 1

剖面2
Section 2



剖面3
Section 3



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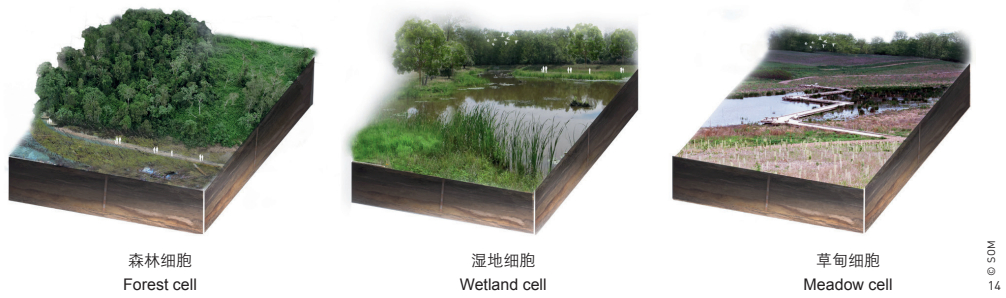

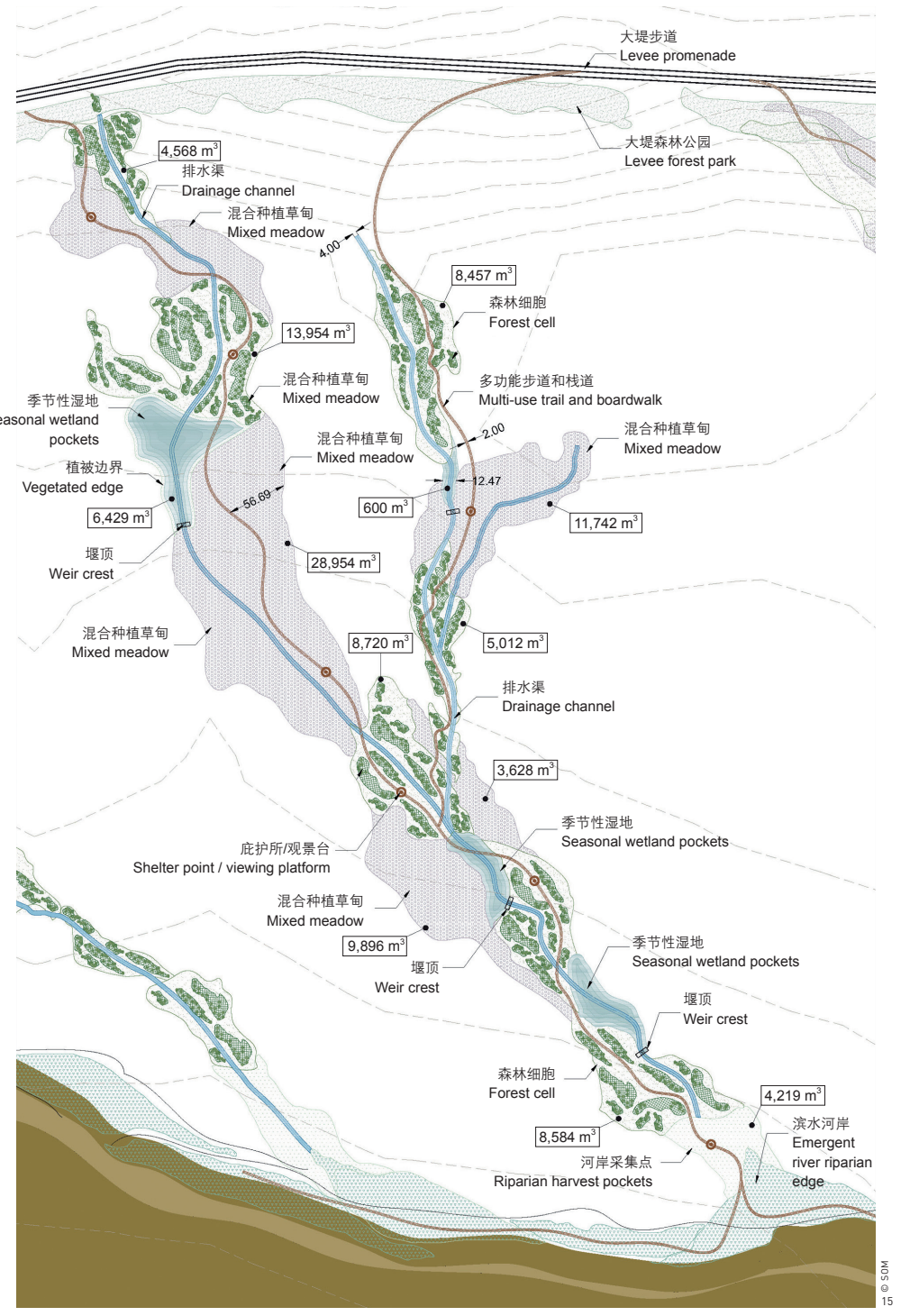

city and villages from floods. However, it blocks not only the connection between the north bank area of the Yellow River and the urban town, but the access to it. The existing levee flood control system consists of the levee-top road, the levee silt reinforcement area, the wave-break forest, and the green buffer. The levee-top road is approximately 12 ~ 16 m higher than the urban development area, and the levee reinforcement area is approximately 100 m wide. In order to prevent direct storm impact and damage to the levee, wave-break forests are planted in a width of 20 ~ 50 m along the river (Fig. 4). Over a long period, Jinan's city construction has expanded mainly east-west on the plain between Mount Tai and the Yellow River, forming an oblong urban pattern[2]. The north bank of the Yellow River is mostly occupied with low-lying farmland and villages. Since 2006, Jinan City has envisioned developing a new urban area in the north bank and connecting it wih the main city across the Yellow River. As a result, Jinan began to transform from a riverfront city to a river-integrated one. The Yellow River has also been transformed from an urban fringe basin to a regional development center.

In recent years, frequent interruptions in the lower reach of the Yellow River have severely damaged the ecological balance, and the water environment has been deteriorating. The wetland ecosystem patches fail to form continuous corridors or integral ecosystem network. The Yellow River wetland, which sustains the growth and survival of birds, is facing extinction as its ecological stability is seriously threatened[3]. In addition, the riverbanks in the downstream Yellow River Basin are mostly monoculture farmland and woodland with limited ecosystem services. Local plants such as *Salix matsudana*, *Cynodon dactylon*, and *Humulus scandens* compose simple communities. There is also a lack of shrubs and ground cover for slope protection. These problems impact not only the landscape aesthetics but also the flood control effect[4].

2 Visions of the Yellow River National Wetland Park at Different Scales

2.1 The Yellow River National Wetland Park

To solve the problems mentioned above, Jinan Municipal Government invited Skidmore, Owings & Merrill LLP (SOM) to update the landscape along the Yellow River in Jinan. Considering Jinan's exceptional location near the mouth of the Yellow River, SOM carried out analysis at various scales of country, watershed, region, and city, and proposed the idea of building a continuous Yellow River National Wetland Park along the entire Yellow River.

14. 森林细胞、湿地细胞、草甸细胞等生态细胞
15. 生态脉络
16. 农业旅游

14. Ecological cells of forest, wetland and meadow
15. Ecological veins
16. Agricultural tourism

Known as China's "Mother River," the Yellow River has been a cradle of Chinese people's survival and prosperity for thousands of years, and is a symbol of the Chinese spirit[5]. The planning envisions the entire Yellow River Basin becoming one national park through the connection of numerous natural and cultural landscape nodes, ensuring the integrity of the wildlife habitat structure, and the function, evolution, and sustainability of broader ecosystem services (Fig. 5). This "big scale landscape" does not follow political boundaries or traditional scales, but emphasizes inter-government coordination and cooperation at all levels. It is envisioned to serve as a strongest reminder of Chinese origins and culture, and to increase the close interaction between citizens and their river.

The plan creates the Yellow River National Wetland Park at four aspects: 1) Ecologically, introduce and protect wetlands on the Yellow River reach, using a variety of native plants to enhance the diversity of ecosystems and vegetation communities; 2) Culturally, take full advantages of renowned mountains, rivers, and cultural relics along the river to show the historical and cultural characteristics of Yellow River civilization; 3) Functionally, transform the levee into a park linking the city and the Yellow River, introducing many recreational nodes such as agricultural experience zone, water entertainment zone, camping ground, botanical garden, zoo, special plaza, etc.; 4) Economically, create Yellow River tourism projects and tourism-related products, build special hotels in surrounding villages, and offer ecological agriculture experiences and demonstration areas. The improved environment and open space can attract innovative talents to live there and thus spur the economic development of the region.

Specific planning and design strategies are proposed at each of the following scales: the 183 km Yellow River reach within Jinan, the 30 km demonstration area, and the 3 km^2 Autumn Colors on the Que and Huabuzhu Mountains Park (Fig. 6).

2.2 The 183 km Reach

The 183 km reach of the Yellow River presents rich landscape resources, including wetlands, the levee, villages, and farmlands. The plan merges these dispersed landscape resources into complete ecological corridors and a regional ecosystem. There are four main planning concepts:

1) Connect the old town and new city area: Transforming the isolated "suspended river" and its riverbanks into a national wetland park open to everyone. People will be attracted to the riverfront for more social exchange and interaction. Both banks will use the same design language, integrating the old town and north Pilot City ecologically, culturally, and economically (Fig. 7).

2) Introduce green infrastructure into the gray flood control system: Currently, most of Jinan section of the Yellow River has been engineered for flood control. The plan incorporates planting and terrain design into the existing gray infrastructure while maintaining the flood protection performance. Then restore the ecological systems throughout the flood plain to support flood control and stormwater management. Multiple eco-corridors to be built upon the gated control-relief channels, and will incorporate existing watercourses, lakes, and new catchment areas to connect the gray and green infrastructure into a complete, storm-management landscape system (Fig. 8), to improve the area's water retention and purification capacity,

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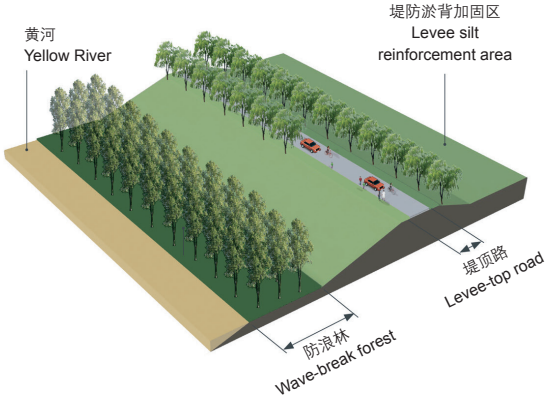
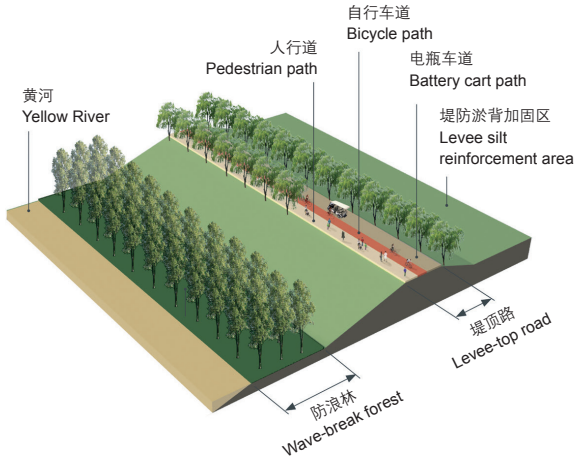
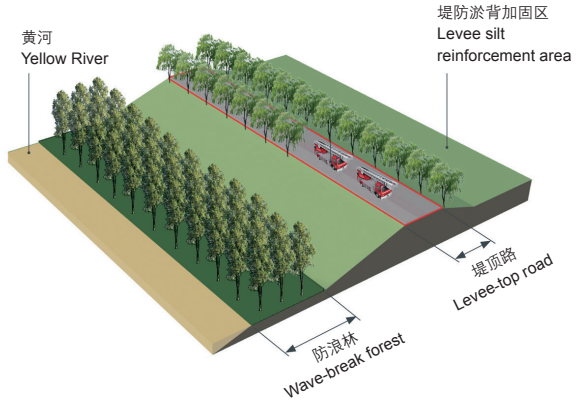
16



大堤现状
Existing levee



日常活动功能
Regular use



抢险功能
Emergency use

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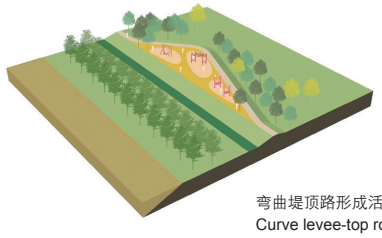
17

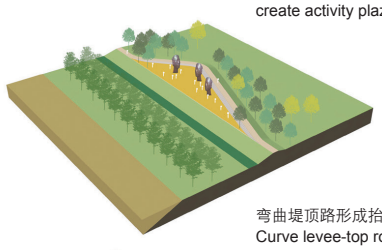
策略一：形成广场
Strategy 1: create plaza

游乐场
Playground



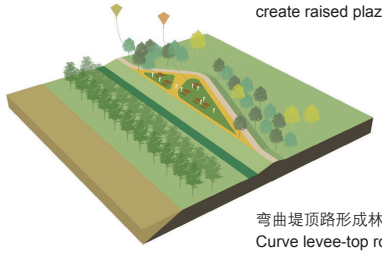
弯曲堤顶路形成活动广场
Curve levee-top road to create activity plaza

艺术展览
Art exhibition



弯曲堤顶路形成抬升广场
Curve levee-top road to create raised plaza

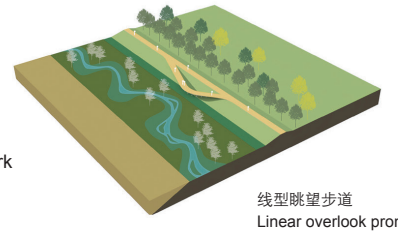
美食
Gourmet market



弯曲堤顶路形成林荫广场
Curve levee-top road to create shaded plaza

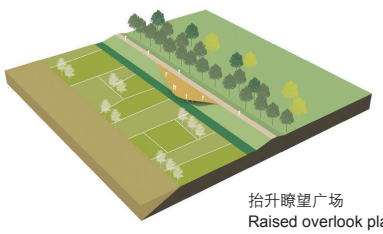
策略二：远眺黄河
Strategy 2: overlook towards river

湿地公园
Wetland park



线型眺望步道
Linear overlook promenade

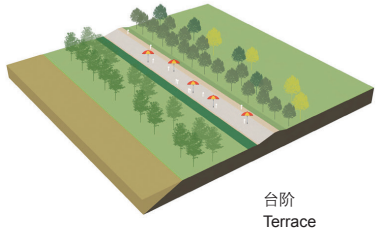
农业园
Farmland



抬升瞭望广场
Raised overlook plaza

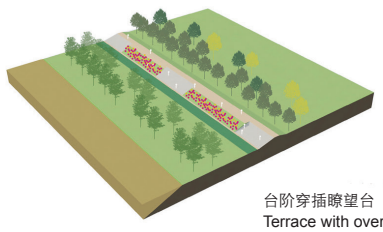
策略三：顺堤而下
Strategy 3: step down to river

休憩
Relax



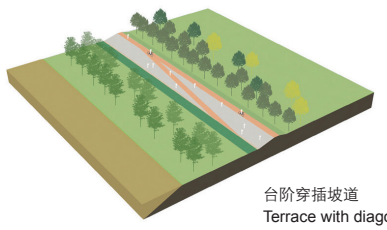
台阶
Terrace

花园
Garden



台阶穿插瞭望台
Terrace with overlook platform

跑道
Jogging



台阶穿插坡道
Terrace with diagonal path

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18

17. 将堤顶路保留以供慢行交通、旅游公交和防洪抢险车辆的通行。
18. 通过结合堤顶路加宽路面，设置台地、缓坡，以及增加便利设施，设计特殊的活动节点，以提供丰富的休闲场所。
19. 现状及改造意向

17. The levee-top road will be retained for slow-traffic, tourist buses, and flood emergency vehicles.
18. The levee can be transformed by widening, combining with terrace or slope, or introducing roadside amenities for better views and activity spaces.
19. Existing levee and proposed visions

slow down stormwater runoff, and enhance biodiversity and habitat protection.

3) Offer a continuous park experience: People can enter the park through the transportation hub near the Yellow River, a park gateway that will offer a seamless transfer to the park via tourist bus, battery cart path, or bicycle. Interwoven trails will lead residents and visitors to numerous leisure and cultural destinations and historic heritage sites along the Yellow River.

4) Connect two cultural elements: Mount Tai and the Yellow River, two important elements that symbolize the Chinese culture, are connected geographically and visually. Overlooking the Yellow River, from Mount Tai has been praised in many famous poems throughout history. Viewed from Mount Tai, the Yellow River is like a golden belt, which has become one of the Four Wonders of Mount Tai. The plan not only provides physical connection, but also creates a spiritual link between Mount Tai and the Yellow River (Fig. 9).

2.3 The 30 km Demonstration Area

A 30 km core demonstration area is defined in the scope of the 183 km reach. It includes the area between Que and Huabuzhu Mountains, where the Yellow River turns and contains significant riparian landscape elements. This area also connects the Jinan old town and the Pilot City, and is close to the Jinan International Airport. With the City of Jinan developing across the river, the 30 km demonstration area will become the flowing Central Park of Jinan. The plan will transform the isolated river and its bank area into a public amenity that serves millions of people and represents the rich culture of the city[5].

The 30 km Yellow River demonstration area is divided into seven areas of four types: the river protection area, the flood plain ecological restoration area, the levee improvement area, and the city connection area (Fig. 10). Specific flood control, ecological restoration, urban develop, and agricultural project strategies and intensities are designated for each type[5] (Fig. 11 ~ 13).

1) River protection area: It mainly focuses on preservation and conservation and minimizes development intervention, which will protect the natural processes such as water conservation and flood mitigation, and avoid soil erosion, water pollution, and habitat destruction.

2) Flood plain ecological restoration area: The Yellow River Basin is mostly comprised of monotonous farmlands and woodlands, mainly planted with *Populus* spp. and *Salix* spp. To increase the ecosystem diversity, the plan introduces the river water into the flood plain to form seasonal artificial wetlands for water purification. At the same time, ecological cells of forest, wetland, and meadow are introduced to create rich habitats for species (Fig. 14). A boardwalk system is designed to thread through ecological cells and to connect people closer to nature. The ecological cells form many ecological veins, further making a complete network of riparian habitats (Fig. 15). This structure of ecological cells, veins, and a network contributes to the restoration of the Yellow River ecosystem and lays the foundation for promoting natural succession and biodiversity. It is worth mentioning that there is a village named Fengtang with very low risk of flooding, retaining the original and intact living environment and ecological features of the Yellow

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River Beach. The previous small-scale and organic village fabric has also been retained, and incremental renovation will be introduced to establish cultural and tourism facilities to enhance integration with surrounding cities. In addition, this district is proposed as the key area for introducing a hybrid rice experimental field to create a scientific research base integrated with education, production, and industry (Fig. 16).

3) Levee improvement area: The levee-top road will be retained for slow-traffic, tourist buses, and flood emergency vehicles (Fig.17). It will form the park's main road system and define a robust mobility system by connecting with pedestrian paths inside and outside the levee. Meanwhile, it can be transformed by widening, combining with terrace or slope, or introducing roadside amenities for better views and areas for activities (Fig. 18, 19).

4) City connection area: There is a serious disconnection between the city and the levee due to a height difference of more than 10 meters and a 200-meter-wide gap serving as a levee silt reinforcement area and protection land. Since the current site only has a simple flood control function, there is a possibility of further renovation of the levee. The landscape will be renewed with some earthwork which will not impact the flood control. Thus a topographical transition and functional connection between the city and the levee will be achieved.

2.4 Autumn Colors on the Que and Huabuzhu Mountains Park

As a first phase project of the Yellow River National Wetland Park, this park links Jinan's north new town and the Yellow River. It is named after the Que Mountain and Huabuzhu Mountain, two famous historic mountains in Jinan. The venerable poet Li Bai of the Tang Dynasty mentioned in his poem that Que Mountain Lake is at the foot of Huabuzhu Mountain. The painting of Zhao Mengfu, a renowned painter of the Yuan Dynasty, depicts the autumn scenery of Huabuzhu Mountain, Que Mountain, and Que Mountain Lake (Fig. 20). Representing part of the Que Mountain Lake by creating wetlands around it, the plan introduces wetland, floodplain, farmland, forest, and village to reestablish the culture and biodiversity between the two mountains and recreate the beautiful scenery of "Misty Rain at Quehua."

Based on the above planning strategies for the 183 km reach and the 30 km demonstration area, the design will celebrate the rich botanical and ecological characters of the region, the cultural heritage of the river and its surrounding farmlands and villages[6], to provide passive recreation destinations for the growing communities of the new town (Fig. 21).

The park expands the levee from a simple two-lane road into a extensive, terracing forested park system with public access and passive destinations for picnics, exercise, nature walks, and overlooks to the Yellow River, farmlands, and Huabuzhu Mountain in the south. Ornamental trees, traditional Chinese herbs and medicines, and conventional crops as well as community amenities are introduced into the park for the citizen's relaxation and daily exercise. The Mount Tai Gazing Hill on top of the levee provides views towards the Yellow River and Mount Tai, two cultural symbols of Jinan[5] (Fig. 22).

The floodplain provides rich ecosystems for wildlife to reside there. The park introduces multifunctional ecological cells to achieve ecological rehabilitation, and provide stormwater management and purification facilities while offering public access to exploring the riparian character of the Yellow River. Nature trails and boardwalks weave over shallow marshes, across islands, and through willow groves, offering glimpses of

20. 《鹊华秋色图》

20. *Autumn Colors on the Que and Huabuzhu Mountains* by Zhao Mengfu

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20

21. 鹊华秋色园平面图

21. The plan of the Autumn Colors on the Que and Huabuzhu Mountains Park

aquatic wildlife, nesting birds, and botanical beauty through seasons (Fig. 23).

It is proposed in the design to transform Fengtang Village into an agricultural park with cultural innovation and agricultural tourism. This concept of "urban agriculture" will be further extended towards the north and introduced into the City Balcony, a new city gateway adjacent to the Fengtang Village (Fig. 24). Integrating urban developments with demonstration agricultural landscape is a unique pairing that will strengthen the city's identity.[5]

3 Summary and Discussion

The planning of the Yellow River National Wetland Park explores the important relationship between rivers and cities in the context of new era of development, and examines how to leverage the unique natural resources of the Yellow River and how to transform its limitations into new impetus for urban development. Different from conventional urban planning, the Yellow River National Wetland Park brings innovation and inspiration through the following aspects. First, the project

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22

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23

22. 大堤上的望岳丘可以遥望泰山和黄河，将这两个济南的文化符号联系起来。
23. 自然小径和木板道交织贯穿浅滩沼泽、跨越岛屿，通过柳树林，提供了观赏水生野生动物、筑巢鸟类季节性活动和植物季相变化的机会。
24. 从都市阳台远眺华不注山

22. The Mount Tai Gazing Hill on top of the levee provides views towards the Yellow River and Mount Tai, two cultural symbols of Jinan.
23. Nature trails and boardwalks weave over shallow marshes, across islands, and through willow groves, offering glimpses of aquatic wildlife, nesting birds, and botanical beauty through seasons.
24. City Balcony with Huabuzhu Mountain in the background

breaks through the concept of conventional administrative regions, starting from the national and regional perspectives, to define the entire Yellow River Basin as a national wetland park. The plan emphasizes the connection of ecosystems at the regional scale to form complete ecosystem corridors of the Yellow River based on communication and collaboration among governments at all levels. Second, the planning focuses on ecological conservation and nature protection and minimizes human intervention. Meanwhile, the plan changes people's awareness of the Yellow River by emphasizing the public engagement and interaction with the river, to transform it from an awesome engineered river into an ecological paradise shared by all citizens while maintaining the flood protection performance. Last, it enhances the relationship between the river and the city from cultural, transportation, and economic aspects, and makes the Yellow River the key to enhancing the competitiveness of the city.

Focusing on the 183 km reach, the 30 km core demonstration area and the Autumn Colors on the Que and Huabuzhu Mountains Park, the plan is to address three challenges: 1) to overcome the horizontal and vertical disconnection of the city and river space caused by the "suspended river"; 2) to restore and improve existing and potential habitats; and 3) to improve the water quality of the existing rivers and wetlands. Through ecological cells, veins, and the network, more green infrastructures will be introduced into the ecological corridors, creating a more robust gray-green combined flood-control system and providing a mechanism

for the natural self-cleaning process. With the levee as the main structure, the plan utilizes changes in topography and slopes to form a transition that smooths the height differences and transforms the previously inaccessible levee and surrounding protection areas into park areas where citizens can engage to varying degrees. From the concepts proposed in the plan of the 183 km reach, to the planning strategies of the 30 km core demonstration area, and further to the specific design of the Autumn Colors on the Que and Huabuzhu Mountains Park, SOM has developed step by step from macro-planning to micro-design, to ensure the uniformity and consistency of the entire design at all scales. SOM looks forwards to presenting the Yellow River in Jinan as a proven model for other river cities to follow the construction of the Yellow River National Wetland Park, and providing a practical reference for the planning and design of the Yangtze River Basin and similar watersheds in other countries. **LAF**

PROJECT INFORMATION

Location: Jinan, Shandong Province, China
Client: Jinan Minicipal Government
Landscape Planning: Skidmore, Owings & Merrill LLP, Moriyama & Teshima Planners
Chief Designer: Philip Enquist
Project Team: Doug Voigt, Fu Xuan, Alan Lewis, Zhou Yinying, Zhang Yang, Sean Kinzie, Wang Han, Li Shichen, Lu Chen, Yu Han, Li Yihua, Jisu Choi, Cameron Barradale
Collaborators: Drew Wensley, Khatereh Baharikhoob
Planning and Design Period: 2016 ~ 2018

REFERENCES

[1] Hu, J., & Zhang, B. (2003). Pavement Structure Design of Roadway on Yellow River's Bank. Zhihuang Keji Xinxi, (3), 10-11.
[2] Lv, B., Wang, Y., & Zhang, Y. (2007). Research on the Influential Factors and Mechanism on the Span River Expansion of Jinan. Urban Studies, 14(3), 37-41.
[3] He, Z., Huang, J., Pan, Y., & Zhang, X. (2010). Ecosystem Characteristics and the Lower Reach Ecology Rehabilitation Practice of the Yellow River Basin. Environment and Sustainable Development, 35(4), 9-13.
[4] Liu, S., Zang, D., Peng, J., & Zhang, L. (2009). Investigation of Waterfront Plants Landscape in Jinan. Journal of Shandong Forestry Science and Technology, 39(6), 46-50.
[5] Skidmore, Owings & Merrill LLP. (2018, September 20). Inspiring the World: Yellow River National Wetland Park of Jinan Section. Retrieved from https://mp.weixin.qq.com/s/zvkBNQuejZAWEARJd0FCpw

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24